SAP Input Summary

Land at Tesco Extra Car Park

Prepared for:
Ridgepoint Homes

Created by:
Charles Sims & Shivapriya Yadhuru

Prepared by:
Darren Evans
1, Russell Mews
High Street
Bristol
BS37 6BJ

Project Name	**Land at Tesco Extra Car Park**
Client	**Ridgepoint Homes**
SAP Assessor	**Charles Sims & Shivapriya Yadhuru**

Design SAP Data Input Table					
		Reference / Source	**Details**	**Comments**	
Floor U-Values	All Floors	Specification	0.11 W/m²K	Nu Span Flooring System	
Wall U-Values	External Walls	Specification	0.18 W/m²K	150mm Blown Fibre (λ = 0.034 W/mK), Celcon(λ=0.011W/mK), Blockwork(λ=0.18W/mK)	
Roof U-Values	External Flat Roof	Specification	0.13 W/m²K	150mm PIR Insulation	
Opening U-Values	Windows	Specification	1.2 W/m²K	Double Glazed, Low-E Coated G Value: 0.63	
Thermal Bridging	y - value	Calculated	Varies per flat	Accredited Construction Details & Supplier PSI values Used	
	PLEASE NOTE: For calculated / bespoke psi value details to be used in the SAP Calculations the thermal Junction checklist guidance MUST be implemented on site. Failure to adhere to these standardised junction details will require the use of default PSI values for the junction heat loss which will advesely affect the performance of the dwelling(s) against Part L. If you cannot meet the requirements of the ACDs or the construction changes, please inform us at the earliest stage so compliance can be achieved before the project progresses.				
Ventilation	Air Tightness	Specification	4.00	**ACTUAL:**	
	Mechanical ventilation	Specification	From dMEV	dMev systems - Vent Axia Low Carbon x 2 per dwelling (assumed basic model 474496)	
Heating and HWS	Primary heating system	Specification	From Electric Panel Heaters	Electric Panel heators	
	Controls	Specification	Programmer and TRVs	Programmer and room thermostat	
	Heat distribution	Specification	From Panel Heaters		
	Main Heating 2	Specification	From Heat Pump Cylinder	Dimplex Edel Heat Pump Cylinder - EDEL 200UK	
	Water heating	Specification	From Main Heating 2	200L Hot Water Storage Maximum Standing Heat Losses: 1.61 kWh per day Cylinder to have thermostat, all primary pipework to be insulated, and water heating on separate timer to main heating	
Renewables		Specification	Solar Photovltaic Panels	4 Panels per dwelling with 410W, Panels are oriented horizontal in a flat roof	
Low Energy Lighting		Specification	100% Low-Energy Fittings	Minimum Efficiency 45 Lumens per Circuit Watt	
UK Building Regulations		Specification	L1A	England (2013)	

DISCLAIMER: Please note that the inputs outlined above are key to the project's compliance with Part L1 of building regulations. Should any of the details above not accurately represent the proposals of the project or if any of the measures above cannot be incorporated for any reason, please let us know, as the project may fail the regulations. If changes are made to the above specification without contacting us, and the project fails there will be a **consultation fee** charged to help ensure the building passes the relevant regulations

Notes	**As Built Address**

Revision	**Description**	**Date**
0	First Issue	25/01/2023

Developer's / Client's Statement (As Designed)		
I confirm that this dwelling will be built in line with the above construction specification details		
Print Name and Signature	**Company**	**Date**

Darren Evans

Project Name: Land at Tesco Extra Car Park

Date: 25/01/2023 **Signed:**

Completed by: Charles Sims & Shivapriya Yadhuru

			Junction Used				
Ref	**Junctions with an external wall**	**Psi Value used in SAP Calculation**	**APA Detail**	**ACD Detail**	**Bespoke**	**Default**	**Junction Ref.**
E2	Other lintels (including other steel lintels)	0.021					CBA-313
E3	Sill	0.021					CBA-314
E4	Jamb	0.017					CBA-315
E5	Ground floor	0.057					CBA-301
E7	Intermediate floor between dwellings (flats)	0.070					
E23	Balcony within or between dwellings, balcony support penetrates wall insulation	1.000					
E15	Flat roof with parapet	0.560					
E16	Corner (normal)	0.046					CBA-316
E17	Corner (inverted)	-0.040					
E18	Party wall between dwellings	0.060					
E25	Staggered party wall between dwellings	0.120					
Ref	**Junction with a party wall**	**Psi Value used in SAP Calculation**	**APA Detail**	**ACD Detail**	**Bespoke**	**Default**	**Junction Ref.**
P1	Ground floor	0.160					
P3	Intermediate floor between dwellings (flats)	0.000					
P4	Roof (insulation at ceiling level)	0.240					

PLEASE NOTE: For calculated / bespoke psi value details to be used in the SAP Calculations the thermal Junction checklist guidance MUST be implemented on site. Failure to adhere to these standardised junction details will require the use of default PSI values for the junction heat loss which will advesely affect the performance of the dwelling(s) against Part L. If you cannot meet the requirements of the ACDs or the construction changes, please inform us at the earliest stage so compliance can be achieved before the project progresses.

PREDICTED ENERGY ASSESSMENT

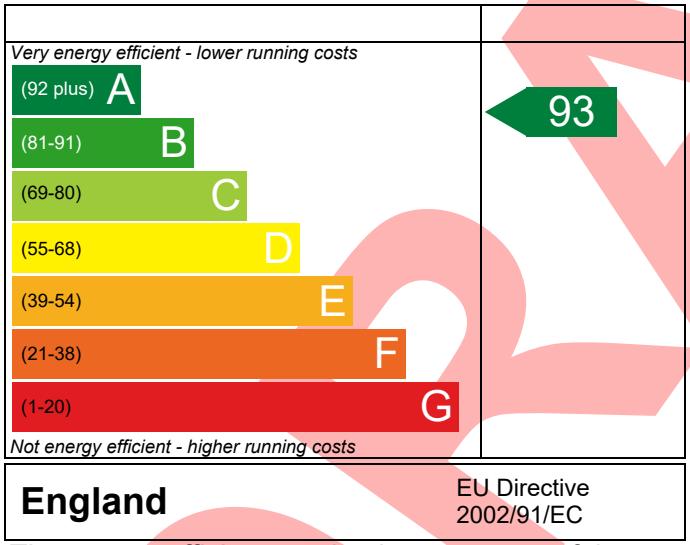
Land at Tesco Extra Car Park,
05,
1 Bath,
2B3P

Dwelling type:	Flat, Mid-Terrace
Date of assessment:	25/01/2023
Produced by:	Charles Sims
Total floor area:	65.09 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 (CO_2) emissions.

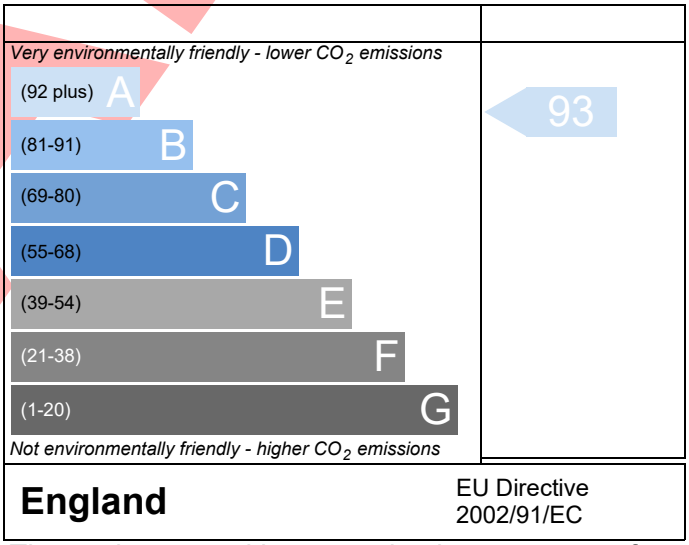
Energy Efficiency Rating



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 (CO_2) 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 (CO_2) emissions. The higher the rating the less impact it has on the environment.

DRAFT

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BUILDING REGULATION COMPLIANCE
Calculation Type: New Build (As Designed)

Darren Evans

Property Reference	DE-21912 - Plot 05	**Issued on Date**	25/01/2023
Assessment Reference	Plot 05	**Prop Type Ref**	GF Flat
Property	Land at Tesco Extra Car Park, 05, 1 Bath, 2B3P		

SAP Rating	93 A	**DER**	12.75	**TER**	26.21
Environmental	93 A	**% DER<TER**	51.36		
CO_2 Emissions (t/year)	0.37	**DFEE**	38.23	**TFEE**	46.52
General Requirements Compliance	Pass	**% DFEE<TFEE**	17.82		

Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Electricity		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	26.21	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	12.75	$kgCO_2/m^2$	Pass
	-13.46 (-51.4%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	46.52	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	38.23	$kWh/m^2/yr$	
	-8.3 (-17.8%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	Pass
Openings	1.20 (max. 2.00)	1.20 (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	4.00 (design value)	$m^3/(h.m^2)$ @ 50 Pa	
Maximum	10.0	$m^3/(h.m^2)$ @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system 1	Room heaters - Electric Panel, convector or radiant heaters	

DRAFT

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

Main heating system 2	Heat pump with warm air distribution - Electric Dimplex EDL200UK-630		
Secondary heating system	None		
5 Cylinder insulation			
Hot water storage	No cylinder		
6 Controls			
Space heating controls 1	Programmer and room thermostat		Pass
Hot water controls	No cylinder		
7 Low energy lights			
Percentage of fixed lights with low-energy fittings	100	%	
Minimum	75	%	Pass
8 Mechanical ventilation			
Continuous extract system (decentralised)			
Specific fan power	0.1200 0.1600		
Maximum	0.7		Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)	Slight	Pass
Based on:		
Overshading	Average	
Windows facing North Windows facing East	4.50 m², No overhang 7.14 m², No overhang	
Air change rate	3.00 ach	
Blinds/curtains	Dark-coloured curtain or roller blind, closed 100% of daylight hours	

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value		
Solid Wall	0.00	W/m²K	Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals	4.00 (design value)	m³/(h.m²) @ 50 Pa	
Maximum	10.0	m³/(h.m²) @ 50 Pa	Pass

10 Key features

Party wall U-value	0.00	W/m²K
Floor U-value	0.11	W/m²K
Photovoltaic array	1.64	kW

DRAFT

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

	Typical cost	Typical savings per year	Energy efficiency	Environmental impact	Result
Low energy lights			0	0	Already installed
Solar water heating			0	0	Not applicable
Photovoltaic			0	0	Not applicable
Wind turbine			0	0	Not applicable
Totals	**£0**	**£0**	**A 93**	**A 93**	

DRAFT

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

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

Darren Evans

Property Reference	DE-21912 - Plot 05	**Issued on Date**	25/01/2023
Assessment Reference	Plot 05	**Prop Type Ref**	GF Flat
Property	Land at Tesco Extra Car Park, 05, 1 Bath, 2B3P		

SAP Rating	93 A	**DER**	12.75	**TER**	26.21
Environmental	93 A	**% DER<TER**	51.36		
CO_2 Emissions (t/year)	0.37	**DFEE**	38.23	**TFEE**	46.52
General Requirements Compliance	Pass	**% DFEE<TFEE**	17.82		

Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

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

Orientation	South
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	Flat, Mid-Terrace
2.0 Number of Storeys	1
3.0 Date Built	2023
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	18.69 m	65.09 m²	2.46 m

7.0 Living Area	24.70	m²

8.0 Thermal Mass Parameter	Simple calculation - Medium	
Thermal Mass	250.00	kJ/m²K

9.0 External Walls

Description	Type	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Wall 1	Cavity Wall	0.18	45.98	34.34

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall 1	Solid Wall		0.00	43.32

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Heat Loss Floor 1	Ground Floor - Solid		0.11	65.09

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Windowss	Manufacturer	Window	Double glazed			0.63		0.70	1.20

13.0 Openings

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

Darren Evans

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
E Windows	Window	[1] External Wall 1	East	Dark-coloured curtain or roller blind	0.00					7.14	100
N Windows	Window	[1] External Wall 1	North	Dark-coloured curtain or roller blind	0.00					4.50	100

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	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	6.40	0.021	No	CBA-313
Independently assessed	E3 Sill	2.00	0.021	No	CBA-314
Independently assessed	E4 Jamb	17.40	0.017	No	CBA-315
Independently assessed	E5 Ground floor (normal)	18.69	0.057	No	CBA-301
Table K1 - Approved	E7 Party floor between dwellings (in blocks of flats)	15.41	0.070	No	
Table K1 - Default	E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.28	1.000	No	
Independently assessed	E16 Corner (normal)	9.84	0.046	No	CBA-316
Independently assessed	E17 Corner (inverted – internal area greater than external area)	4.92	-0.040	No	
Table K1 - Approved	E18 Party wall between dwellings	2.46	0.060	No	
Table K1 - Default	E25 Staggered party wall between dwellings	2.46	0.120	No	
Table K1 - Default	P1 Party wall - Ground floor	17.61	0.160	No	

Y-value: 0.085 W/m²K

18.0 Pressure Testing	Yes	
Designed AP_{50}	4.00	m³/(h.m²) @ 50 Pa
Property Tested ?		
As Built AP_{50}		m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Windows half open
Cross ventilation possible	Yes
Night Ventilation	Yes
Air change rate	3.00

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - decentralised
MV Reference Number	500661
Duct Type	Flexible

19.1 Mechanical extract ventilation - Decentralised

SFP	Fan/Room Type	Count
0.12	Through Wall Fan Kitchen	1
0.16	In Room Fan Other Wet Room	1

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				0
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	10	
Total number of L.E.L. fittings	10	
Percentage of L.E.L. fittings	100.00	%
External		
External lights fitted	No	
23.0 Electricity Tariff	Standard	
24.0 Main Heating 1	SAP table	
Percentage of Heat	100	%
Main Heating	REA	
SAP Code	691	
Efficiency (SAP Table)	100.0	%
Controls	CRD Programmer and room thermostat	
Sap Code	2605	
25.0 Main Heating 2	Database	
Percentage of Heat	0	%
Database Ref. No.	190006	
Fuel Type	Electricity	
Main Heating	PEH	
SAP Code	524	
In Summer	367.8	
Controls	CWD Time and temperature zone control	
Sap Code	0	
Community Heating	None	
28.0 Water Heating	HWP From main heating 1	
Water Heating	Main Heating 2	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery	No	

Instantaneous System 2		
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
SAP Code	914	
Immersion Only Heating Hot Water	Yes	

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	201.00	L
Loss	1.610	kWh/day

32.0 Photovoltaic Unit One Dwelling

PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
1.64	Horizontal	Horizontal	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

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

Property Reference	DE-21912 - Plot 05	**Issued on Date**	25/01/2023
Assessment Reference	Plot 05	**Prop Type Ref**	GF Flat
Property	Land at Tesco Extra Car Park, 05, 1 Bath, 2B3P		

SAP Rating	93 A	**DER**	12.75	**TER**	26.21
Environmental	93 A	**% DER<TER**	51.36		
CO_2 Emissions (t/year)	0.37	**DFEE**	38.23	**TFEE**	46.52
General Requirements Compliance	Pass	**% DFEE<TFEE**	17.82		

Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

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

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

DWELLING AS DESIGNED

Ground-floor flat, total floor area 65 m²

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

1a TER and DER
Fuel for main heating:Electricity
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 26.21 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 12.75 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)46.5 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)38.2 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.20 (max. 2.00)	1.20 (max. 3.30)	OK

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

3 Air permeability
Air permeability at 50 pascals: 4.00 (design value)
Maximum 10.0 OK

4 Heating efficiency
Main heating system 1: Room heaters - Electric
Panel, convector or radiant heaters

Main heating system 2: Heat pump with warm air distribution - Electric
Dimplex EDL200UK-630

Secondary heating system: None

5 Cylinder insulation
Hot water storage No cylinder

6 Controls
Space heating controls 1: Programmer and room thermostat OK

Hot water controls: No cylinder

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

8 Mechanical ventilation
Continuous extract system (decentralised)
Specific fan power: 0.1200 0.1600
Maximum 0.7 OK

9 Summertime temperature
Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing North: 4.50 m², No overhang
Windows facing East: 7.14 m², No overhang
Air change rate: 3.00 ach
Blinds/curtains: Dark-coloured curtain or roller blind, closed 100% of daylight hours

10 Key features
Party wall U-value 0.00 W/m²K
Floor U-value 0.11 W/m²K
Photovoltaic array 1.64 kW

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	65.0900 (1b)	x	2.4600 (2b)	=	160.1214	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.0900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	160.1214	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		4.0000	
Infiltration rate		0.2000	(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) =	0.1700	(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	0.2168	0.2125	0.2083	0.1870	0.1828	0.1615	0.1615	0.1573	0.1700	0.1828	0.1913	0.1998	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation: 0.5000 (23a)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(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	
Windowss (Uw = 1.20)			11.6400	1.1450	13.3282			(27)
Heat Loss Floor 1			65.0900	0.1100	7.1599			(28a)
External Wall 1	45.9800	11.6400	34.3400	0.1800	6.1812			(29a)
Total net area of external elements Aum(A, m2)			111.0700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.6693			(33)
Party Wall 1			43.3200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	9.4125	(36)
Total fabric heat loss (33) + (36) =	36.0818	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.4200	26.4200	26.4200	26.4200	26.4200	26.4200	26.4200	26.4200	26.4200	26.4200	26.4200	26.4200	(38)
Heat transfer coeff	62.5018	62.5018	62.5018	62.5018	62.5018	62.5018	62.5018	62.5018	62.5018	62.5018	62.5018	62.5018	(39)

Average = Sum(39)m / 12 = 62.5018 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9602	0.9602	0.9602	0.9602	0.9602	0.9602	0.9602	0.9602	0.9602	0.9602	0.9602	0.9602	(40)
HLP (average)												0.9602	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.1213	(42)
Average daily hot water use (litres/day)	84.5809	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	93.0390	89.6558	86.2726	82.8893	79.5061	76.1229	76.1229	79.5061	82.8893	86.2726	89.6558	93.0390	(44)
Energy conte	137.9742	120.6731	124.5239	108.5629	104.1687	89.8897	83.2960	95.5834	96.7249	112.7236	123.0466	133.6207	(45)
Energy content (annual)										Total = Sum(45)m =		1330.7876	(45)
Distribution loss (46)m = 0.15 x (45)m	20.6961	18.1010	18.6786	16.2844	15.6253	13.4835	12.4944	14.3375	14.5087	16.9085	18.4570	20.0431	(46)

Water storage loss:		
Store volume	201.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.6100	(48)

```
  Temperature factor from Table 2b                                                                                0.5400 (49)
Enter (49) or (54) in (55)                                                                                        0.8694 (55)
Total storage loss
              26.9514    24.3432    26.9514    26.0820    26.9514    26.0820    26.9514    26.9514    26.0820    26.9514    26.0820    26.9514 (56)
If cylinder contains dedicated solar storage
              26.9514    24.3432    26.9514    26.0820    26.9514    26.0820    26.9514    26.9514    26.0820    26.9514    26.0820    26.9514 (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)
Total heat required for water heating calculated for each month
             164.9256   145.0163   151.4753   134.6449   131.1201   115.9717   110.2474   122.5348   122.8069   139.6750   149.1286   160.5721 (62)
Solar input      0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (63)
                                                                                  Solar input (sum of months) = Sum(63)m =      0.0000 (63)
Output from w/h
             164.9256   145.0163   151.4753   134.6449   131.1201   115.9717   110.2474   122.5348   122.8069   139.6750   149.1286   160.5721 (64)
                                                                                  Total per year (kWh/year) = Sum(64)m =   1648.1186 (64)
Heat gains from water heating, kWh/month
              45.8764    40.1238    41.4042    36.0972    34.6361    29.8883    27.6959    31.7815    32.1610    37.4806    40.9130    44.4289 (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        106.0651   106.0651   106.0651   106.0651   106.0651   106.0651   106.0651   106.0651   106.0651   106.0651   106.0651   106.0651 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
              16.9155    15.0242    12.2185     9.2502     6.9146     5.8376     6.3078     8.1991    11.0048    13.9731    16.3086    17.3856 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
             185.5781   187.5038   182.6510   172.3201   159.2791   147.0225   138.8343   136.9086   141.7613   152.0923   165.1332   177.3899 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
              33.6065    33.6065    33.6065    33.6065    33.6065    33.6065    33.6065    33.6065    33.6065    33.6065    33.6065    33.6065 (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)
             -84.8521   -84.8521   -84.8521   -84.8521   -84.8521   -84.8521   -84.8521   -84.8521   -84.8521   -84.8521   -84.8521   -84.8521 (71)
Water heating gains (Table 5)
              61.6619    59.7081    55.6508    50.1350    46.5539    41.5115    37.2257    42.7170    44.6681    50.3771    56.8236    59.7162 (72)
Total internal gains
             318.9750   317.0556   305.3398   286.5248   267.5672   249.1912   237.1873   242.6442   252.2537   271.2620   293.0850   309.3113 (73)


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

[Jan]                                  Area          Solar flux              g                FF            Access            Gains
                                       m2             Table 6a       Specific data    Specific data      factor                W
                                                         W/m2         or Table 6b      or Table 6c     Table 6d
-------------------------------------------------------------------------------------------------------------
North                                4.5000            10.6334            0.6300           0.7000           0.7700           14.6237 (74)
East                                 7.1400            19.6403            0.6300           0.7000           0.7700           42.8566 (76)
-------------------------------------------------------------------------------------------------------------

Solar gains     57.4802   111.7831   185.5549   277.6402   349.5304   362.6207   343.2043   288.0690   217.6735   132.7458    71.4773    47.4342 (83)
Total gains    376.4552   428.8387   490.8947   564.1650   617.0976   611.8119   580.3916   530.7132   469.9272   404.0079   364.5623   356.7454 (84)


-------------------------------------------------------------------------------------------------------------
7. Mean internal temperature (heating season)
-------------------------------------------------------------------------------------------------------------
Temperature during heating periods in the living area from Table 9, Th1 (C)                                     21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)
                Jan        Feb        Mar        Apr        May        Jun        Jul        Aug        Sep        Oct        Nov        Dec
tau          72.3201    72.3201    72.3201    72.3201    72.3201    72.3201    72.3201    72.3201    72.3201    72.3201    72.3201    72.3201
alpha         5.8213     5.8213     5.8213     5.8213     5.8213     5.8213     5.8213     5.8213     5.8213     5.8213     5.8213     5.8213
util living area
              0.9983     0.9960     0.9869     0.9466     0.8267     0.6336     0.4706     0.5346     0.8144     0.9753     0.9963     0.9988 (86)

MIT          20.0017    20.1344    20.3696    20.6679    20.8937    20.9815    20.9972    20.9944    20.9274    20.6174    20.2444    19.9632 (87)
Th 2         20.1166    20.1166    20.1166    20.1166    20.1166    20.1166    20.1166    20.1166    20.1166    20.1166    20.1166    20.1166 (88)
util rest of house
              0.9978     0.9947     0.9824     0.9287     0.7776     0.5547     0.3779     0.4357     0.7443     0.9637     0.9948     0.9984 (89)
MIT 2        18.7749    18.9685    19.3093    19.7288    20.0155    20.1047    20.1156    20.1143    20.0591    19.6668    19.1296    18.7186 (90)
Living area fraction                                                                          fLA = Living area / (4) =      0.3795 (91)
MIT          19.2404    19.4109    19.7116    20.0852    20.3488    20.4374    20.4501    20.4482    20.3886    20.0275    19.5527    19.1909 (92)
Temperature adjustment                                                                                                  0.0000
adjusted MIT 19.2404    19.4109    19.7116    20.0852    20.3488    20.4374    20.4501    20.4482    20.3886    20.0275    19.5527    19.1909 (93)


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

                Jan        Feb        Mar        Apr        May        Jun        Jul        Aug        Sep        Oct        Nov        Dec
Utilisation   0.9970     0.9932     0.9798     0.9279     0.7915     0.5841     0.4132     0.4734     0.7677     0.9622     0.9935     0.9978 (94)
Useful gains  375.3183   425.9331   480.9665   523.4977   488.4142   357.3648   239.7993   251.2361   360.7800   388.7283   362.2052   355.9445 (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
             933.8044   906.9590   825.7522   699.0954   540.5629   364.8495   240.6389   253.0223   393.0492   589.2385   778.3147   936.9596 (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
             415.5136   323.2494   256.5206   126.4304    38.7986     0.0000     0.0000     0.0000     0.0000   149.1796   299.5988   432.2752 (98)
Space heating                                                                                                  2041.5662 (98)
Space heating per m2                                                                                (98) / (4) =     31.3653 (99)


-------------------------------------------------------------------------------------------------------------
8c. Space cooling requirement
-------------------------------------------------------------------------------------------------------------
Not applicable
```

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	2041.5662	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	415.5136	323.2494	256.5206	126.4304	38.7986	0.0000	0.0000	0.0000	0.0000	149.1796	299.5988	432.2752	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	415.5136	323.2494	256.5206	126.4304	38.7986	0.0000	0.0000	0.0000	0.0000	149.1796	299.5988	432.2752	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
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)
Space heating fuel used, main system 2												0.0000	(213)

Water heating		
Water heating requirement		
164.9256 145.0163 151.4753 134.6449 131.1201 115.9717 110.2474 122.5348 122.8069 139.6750 149.1286 160.5721		(64)
Efficiency of water heater	349.4100	(216)
(217)m 349.4100 349.4100 349.4100 349.4100 349.4100 349.4100 349.4100 349.4100 349.4100 349.4100 349.4100 349.4100		(217)
Fuel for water heating, kWh/month		
47.2012 41.5032 43.3517 38.5349 37.5261 33.1907 31.5524 35.0691 35.1469 39.9745 42.6801 45.9552		(219)
Water heating fuel used	471.6862	(219)
Annual totals kWh/year		
Space heating fuel - main system	2041.5662	(211)
Space heating fuel - secondary	0.0000	(215)

Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.6500, total flow = 21.0000, SFP = 0.1738)		
mechanical ventilation fans (SFP = 0.1738)	33.9534	(230a)
Total electricity for the above, kWh/year	33.9534	(231)
Electricity for lighting (calculated in Appendix L)	298.7330	(232)

Energy saving/generation technologies (Appendices M ,N and Q)		
PV Unit 0 (0.80 * 1.64 * 951 * 1.00) = -1247.2082	-1247.2082	(233)
Total delivered energy for all uses	1598.7306	(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	2041.5662	0.5190	1059.5729	(261)
Space heating - main system 2	0.0000	0.5190	0.0000	(262)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	471.6862	0.5190	244.8051	(264)
Space and water heating			1304.3780	(265)
Pumps and fans	33.9534	0.5190	17.6218	(267)
Energy for lighting	298.7330	0.5190	155.0424	(268)
Energy saving/generation technologies				
PV Unit	-1247.2082	0.5190	-647.3011	(269)
Total CO2, kg/year			829.7412	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			12.7500	(273)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES			
DER		12.7500	ZC1
Total Floor Area	TFA	65.0900	
Assumed number of occupants	N	2.1213	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.8950	ZC2
CO2 emissions from cooking, equation (L16)		2.6104	ZC3
Total CO2 emissions		32.2554	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		32.2554	ZC8

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	65.0900 (1b)	x	2.4600 (2b)	=	160.1214	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.0900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	160.1214	(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) =	0.1249	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3749	(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) =	0.3187	(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	0.4063	0.3983	0.3904	0.3505	0.3426	0.3027	0.3027	0.2948	0.3187	0.3426	0.3585	0.3744	(22b)
Effective ac	0.5825	0.5793	0.5762	0.5614	0.5587	0.5458	0.5458	0.5434	0.5508	0.5587	0.5643	0.5701	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opening Type (Uw = 1.40)			11.6400	1.3258	15.4318			(27)
Heat Loss Floor 1			65.0900	0.1300	8.4617			(28a)
External Wall 1	45.9800	11.6400	34.3400	0.1800	6.1812			(29a)
Total net area of external elements Aum(A, m2)			111.0700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.0747			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.5715	(36)
Total fabric heat loss					(33) + (36) =		37.6462	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	30.7815	30.6122	30.4461	29.6664	29.5205	28.8414	28.8414	28.7156	29.1030	29.5205	29.8157	30.1242	(38)
Heat transfer coeff	68.4277	68.2584	68.0924	67.3126	67.1667	66.4876	66.4876	66.3619	66.7492	67.1667	67.4619	67.7704	(39)
Average = Sum(39)m / 12 =												67.3119	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0513	1.0487	1.0461	1.0341	1.0319	1.0215	1.0215	1.0195	1.0255	1.0319	1.0364	1.0412	(40)
HLP (average)												1.0341	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.1213	(42)
Average daily hot water use (litres/day)	84.5809	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	93.0390	89.6558	86.2726	82.8893	79.5061	76.1229	76.1229	79.5061	82.8893	86.2726	89.6558	93.0390	(44)
Energy conte	137.9742	120.6731	124.5239	108.5629	104.1687	89.8897	83.2960	95.5834	96.7249	112.7236	123.0466	133.6207	(45)
Energy content (annual)										Total = Sum(45)m =		1330.7876	(45)
Distribution loss (46)m = 0.15 x (45)m	20.6961	18.1010	18.6786	16.2844	15.6253	13.4835	12.4944	14.3375	14.5087	16.9085	18.4570	20.0431	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage

	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
	184.5691	162.7588	171.1188	153.6548	150.7636	134.9815	129.8909	142.1783	141.8168	159.3185	168.1385	180.2156 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
									Solar input (sum of months) = Sum(63)m =			0.0000 (63)
Output from w/h												
	184.5691	162.7588	171.1188	153.6548	150.7636	134.9815	129.8909	142.1783	141.8168	159.3185	168.1385	180.2156 (64)
									Total per year (kWh/year) = Sum(64)m =			1879.4050 (64)
Heat gains from water heating, kWh/month												
	83.1523	73.7924	78.6801	72.1706	71.9120	65.9618	64.9718	69.0574	68.2345	74.7565	76.9865	81.7048 (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	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	16.9155	15.0242	12.2185	9.2502	6.9146	5.8376	6.3078	8.1991	11.0048	13.9731	16.3086	17.3856	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	185.5781	187.5038	182.6510	172.3201	159.2791	147.0225	138.8343	136.9086	141.7613	152.0923	165.1332	177.3899	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	(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)													
	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	(71)
Water heating gains (Table 5)													
	111.7639	109.8101	105.7528	100.2370	96.6559	91.6136	87.3277	92.8191	94.7702	100.4792	106.9257	109.8183	(72)
Total internal gains													
	372.0770	370.1576	358.4419	339.6268	320.6692	302.2932	290.2893	295.7463	305.3558	324.3641	346.1870	362.4133	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	4.5000	10.6334	0.6300	0.7000	0.7700	14.6237	(74)
East	7.1400	19.6403	0.6300	0.7000	0.7700	42.8566	(76)

Solar gains	57.4802	111.7831	185.5549	277.6402	349.5304	362.6207	343.2043	288.0690	217.6735	132.7458	71.4773	47.4342	(83)
Total gains	429.5572	481.9407	543.9968	617.2670	670.1997	664.9140	633.4936	583.8153	523.0292	457.1099	417.6643	409.8475	(84)

---

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	66.0571	66.2210	66.3825	67.1514	67.2973	67.9847	67.9847	68.1135	67.7182	67.2973	67.0029	66.6978	
alpha	5.4038	5.4147	5.4255	5.4768	5.4865	5.5323	5.5323	5.5409	5.5145	5.4865	5.4669	5.4465	
util living area	0.9968	0.9935	0.9819	0.9364	0.8146	0.6193	0.4583	0.5159	0.7880	0.9640	0.9933	0.9975	(86)
MIT	19.9501	20.0884	20.3335	20.6514	20.8839	20.9797	20.9967	20.9940	20.9285	20.6197	20.2297	19.9258	(87)
Th 2	20.0408	20.0430	20.0451	20.0550	20.0568	20.0655	20.0655	20.0671	20.0621	20.0568	20.0531	20.0492	(88)
util rest of house	0.9958	0.9914	0.9758	0.9154	0.7622	0.5376	0.3629	0.4149	0.7124	0.9477	0.9907	0.9967	(89)
MIT 2	18.6434	18.8462	19.2018	19.6538	19.9479	20.0526	20.0643	20.0647	20.0073	19.6206	19.0603	18.6141	(90)
Living area fraction									fLA = Living area / (4) =			0.3795	(91)
MIT	19.1393	19.3176	19.6313	20.0324	20.3031	20.4044	20.4181	20.4173	20.3569	19.9997	19.5040	19.1119	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1393	19.3176	19.6313	20.0324	20.3031	20.4044	20.4181	20.4173	20.3569	19.9997	19.5040	19.1119	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9945	0.9892	0.9724	0.9148	0.7769	0.5680	0.3992	0.4534	0.7380	0.9465	0.9887	0.9956	(94)
Useful gains	427.1752	476.7357	529.0078	564.6628	520.7022	377.7041	252.8902	264.7032	386.0058	432.6489	412.9265	408.0558	(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	1015.4188	984.1202	894.1382	749.3482	577.8411	385.9236	253.8588	266.5968	417.6416	631.3497	836.8000	1010.5851	(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	437.6532	340.9624	271.6570	132.9735	42.5113	0.0000	0.0000	0.0000	0.0000	147.8334	305.1889	448.2818	(98)
Space heating												2127.0615	(98)
Space heating per m2											(98) / (4) =	32.6788	(99)

8c. Space cooling requirement

Not applicable

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												93.5000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												2274.9320	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	437.6532	340.9624	271.6570	132.9735	42.5113	0.0000	0.0000	0.0000	0.0000	147.8334	305.1889	448.2818	(98)
Space heating efficiency (main heating system 1)													
	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)													
	468.0783	364.6656	290.5423	142.2176	45.4666	0.0000	0.0000	0.0000	0.0000	158.1106	326.4053	479.4458	(211)
Water heating requirement													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	184.5691	162.7588	171.1188	153.6548	150.7636	134.9815	129.8909	142.1783	141.8168	159.3185	168.1385	180.2156	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.0382	86.7419	86.0414	84.4311	81.9306	79.8000	79.8000	79.8000	79.8000	84.6151	86.3854	87.1493	(217)
Fuel for water heating, kWh/month													
	212.0553	187.6357	198.8796	181.9883	184.0137	169.1498	162.7705	178.1683	177.7153	188.2862	194.6376	206.7894	(219)
Water heating fuel used												2242.0897	(219)
Annual totals kWh/year													
Space heating fuel - main system												2274.9320	(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)												298.7330	(232)
Total delivered energy for all uses												4890.7548	(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	2274.9320	0.2160	491.3853	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2242.0897	0.2160	484.2914	(264)
Space and water heating			975.6767	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	298.7330	0.5190	155.0424	(268)
Total CO2, kg/m2/year			1169.6441	(272)
Emissions per m2 for space and water heating			14.9897	(272a)
Fuel factor (electricity)			1.5500	
Emissions per m2 for lighting			2.3820	(272b)
Emissions per m2 for pumps and fans			0.5980	(272c)
Target Carbon Dioxide Emission Rate (TER) = (14.9897 * 1.55) + 2.3820 + 0.5980, rounded to 2 d.p.			26.2100	(273)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	65.0900 (1b)	x	2.4600 (2b)	=	160.1214	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.0900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	160.1214	(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) =	0.1249	(8)
Pressure test		Yes	
Measured/design AP50		4.0000	
Infiltration rate		0.3249	(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) =	0.2762	(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	0.3521	0.3452	0.3383	0.3038	0.2969	0.2624	0.2624	0.2555	0.2762	0.2969	0.3107	0.3245	(22b)
Effective ac	0.5620	0.5596	0.5572	0.5461	0.5441	0.5344	0.5344	0.5326	0.5381	0.5441	0.5483	0.5526	(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	
Windowss (Uw = 1.20)			11.6400	1.1450	13.3282			(27)
Heat Loss Floor 1			65.0900	0.1100	7.1599			(28a)
External Wall 1	45.9800	11.6400	34.3400	0.1800	6.1812			(29a)
Total net area of external elements Aum(A, m2)			111.0700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.6693			(33)
Party Wall 1			43.3200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	9.4125	(36)
Total fabric heat loss (33) + (36) =	36.0818	(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	29.6957	29.5685	29.4439	28.8582	28.7487	28.2386	28.2386	28.1442	28.4351	28.7487	28.9703	29.2021	(38)
Heat transfer coeff	65.7776	65.6504	65.5257	64.9400	64.8305	64.3204	64.3204	64.2260	64.5169	64.8305	65.0521	65.2839	(39)
Average = Sum(39)m / 12 =												64.9395	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0106	1.0086	1.0067	0.9977	0.9960	0.9882	0.9882	0.9867	0.9912	0.9960	0.9994	1.0030	(40)
HLP (average)												0.9977	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.1213	(42)
Average daily hot water use (litres/day)	84.5809	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	93.0390	89.6558	86.2726	82.8893	79.5061	76.1229	76.1229	79.5061	82.8893	86.2726	89.6558	93.0390	(44)
Energy conte	137.9742	120.6731	124.5239	108.5629	104.1687	89.8897	83.2960	95.5834	96.7249	112.7236	123.0466	133.6207	(45)
Energy content (annual)										Total = Sum(45)m =		1330.7876	(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)
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)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Heat gains from water heating, kWh/month

	29.3195	25.6430	26.4613	23.0696	22.1358	19.1016	17.7004	20.3115	20.5540	23.9538	26.1474	28.3944 (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	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	16.9155	15.0242	12.2185	9.2502	6.9146	5.8376	6.3078	8.1991	11.0048	13.9731	16.3086	17.3856	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	185.5781	187.5038	182.6510	172.3201	159.2791	147.0225	138.8343	136.9086	141.7613	152.0923	165.1332	177.3899	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	(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)													
	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	(71)
Water heating gains (Table 5)													
	39.4080	38.1593	35.5663	32.0411	29.7525	26.5299	23.7909	27.3004	28.5473	32.1959	36.3158	38.1645	(72)
Total internal gains													
	296.7211	295.5068	285.2554	268.4310	250.7658	234.2096	223.7525	227.2275	236.1329	253.0808	272.5772	287.7595	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	4.5000	10.6334	0.6300	0.7000	0.7700	14.6237	(74)
East	7.1400	19.6403	0.6300	0.7000	0.7700	42.8566	(76)

Solar gains	57.4802	111.7831	185.5549	277.6402	349.5304	362.6207	343.2043	288.0690	217.6735	132.7458	71.4773	47.4342	(83)
Total gains	354.2013	407.2899	470.8102	546.0712	600.2962	596.8303	566.9567	515.2965	453.8064	385.8266	344.0545	335.1937	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.7186	68.8517	68.9827	69.6048	69.7224	70.2753	70.2753	70.3787	70.0613	69.7224	69.4849	69.2382	
alpha	5.5812	5.5901	5.5988	5.6403	5.6482	5.6850	5.6850	5.6919	5.6708	5.6482	5.6323	5.6159	
util living area													
	0.9988	0.9970	0.9900	0.9570	0.8514	0.6615	0.4943	0.5628	0.8418	0.9813	0.9973	0.9991	(86)
MIT	19.8975	20.0360	20.2829	20.6094	20.8637	20.9749	20.9959	20.9919	20.9062	20.5611	20.1676	19.8705	(87)
Th 2	20.0745	20.0762	20.0778	20.0853	20.0867	20.0932	20.0932	20.0944	20.0907	20.0867	20.0838	20.0809	(88)
util rest of house													
	0.9984	0.9960	0.9865	0.9416	0.8045	0.5794	0.3951	0.4574	0.7744	0.9720	0.9962	0.9988	(89)
MIT 2	19.0619	19.2014	19.4477	19.7703	19.9965	20.0820	20.0921	20.0921	20.0385	19.7304	19.3393	19.0401	(90)
Living area fraction										fLA = Living area / (4) =		0.3795	(91)
MIT	19.3790	19.5181	19.7647	20.0887	20.3256	20.4208	20.4351	20.4335	20.3678	20.0456	19.6536	19.3552	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3790	19.5181	19.7647	20.0887	20.3256	20.4208	20.4351	20.4335	20.3678	20.0456	19.6536	19.3552	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9979	0.9952	0.9849	0.9416	0.8179	0.6100	0.4329	0.4977	0.7970	0.9714	0.9955	0.9985	(94)
Useful gains	353.4736	405.3366	463.7156	514.1952	490.9713	364.0935	245.4420	256.4618	361.7010	374.8106	342.5195	334.6854	(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													
	991.8591	959.6846	869.1753	726.5973	559.1991	374.3982	246.6753	259.0585	404.3777	612.3636	816.6381	989.3918	(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													
	474.9588	372.5219	301.6620	152.9295	50.7615	0.0000	0.0000	0.0000	0.0000	176.7395	341.3653	487.1016	(98)
Space heating												2358.0401	(98)
Space heating per m2											(98) / (4) =	36.2274	(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	604.6120	475.9711	488.1174	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9343	0.9694	0.9523	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	564.9149	461.4061	464.8538	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	776.6781	740.1987	681.1184	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	152.4695	207.4216	160.9009	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												520.7920	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

```
Space cooling kWh
                0.0000     0.0000     0.0000     0.0000     0.0000    38.1174    51.8554    40.2252     0.0000     0.0000     0.0000     0.0000 (107)
Space cooling                                                                                                                    130.1980 (107)
Space cooling per m2                                                                                                               2.0003 (108)
Energy for space heating                                                                                                          36.2274 (99)
Energy for space cooling                                                                                                           2.0003 (108)
Total                                                                                                                             38.2277 (109)
Dwelling Fabric Energy Efficiency (DFEE)                                                                                             38.2 (109)


-------------------------------------------------------------------------------------------------------
```

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	65.0900 (1b)	x	2.4600 (2b)	=	160.1214	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.0900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	160.1214	(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) =	0.1249	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3749	(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) =	0.3187	(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	0.4063	0.3983	0.3904	0.3505	0.3426	0.3027	0.3027	0.2948	0.3187	0.3426	0.3585	0.3744	(22b)
Effective ac	0.5825	0.5793	0.5762	0.5614	0.5587	0.5458	0.5458	0.5434	0.5508	0.5587	0.5643	0.5701	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opening Type (Uw = 1.40)			11.6400	1.3258	15.4318			(27)
Heat Loss Floor 1			65.0900	0.1300	8.4617			(28a)
External Wall 1	45.9800	11.6400	34.3400	0.1800	6.1812			(29a)
Total net area of external elements Aum(A, m2)			111.0700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	30.0747			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.5715	(36)
Total fabric heat loss					(33) + (36) =		37.6462	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	30.7815	30.6122	30.4461	29.6664	29.5205	28.8414	28.8414	28.7156	29.1030	29.5205	29.8157	30.1242	(38)
Heat transfer coeff	68.4277	68.2584	68.0924	67.3126	67.1667	66.4876	66.4876	66.3619	66.7492	67.1667	67.4619	67.7704	(39)
Average = Sum(39)m / 12 =												67.3119	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0513	1.0487	1.0461	1.0341	1.0319	1.0215	1.0215	1.0195	1.0255	1.0319	1.0364	1.0412	(40)
HLP (average)												1.0341	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.1213 (42)
Average daily hot water use (litres/day)		84.5809 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	93.0390	89.6558	86.2726	82.8893	79.5061	76.1229	76.1229	79.5061	82.8893	86.2726	89.6558	93.0390	(44)
Energy conte	137.9742	120.6731	124.5239	108.5629	104.1687	89.8897	83.2960	95.5834	96.7249	112.7236	123.0466	133.6207	(45)
Energy content (annual)										Total = Sum(45)m =		1330.7876	(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)
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													

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

	29.3195	25.6430	26.4613	23.0696	22.1358	19.1016	17.7004	20.3115	20.5540	23.9538	26.1474	28.3944 (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	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	(66)

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

	16.9155	15.0242	12.2185	9.2502	6.9146	5.8376	6.3078	8.1991	11.0048	13.9731	16.3086	17.3856	(67)

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

	185.5781	187.5038	182.6510	172.3201	159.2791	147.0225	138.8343	136.9086	141.7613	152.0923	165.1332	177.3899	(68)

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

	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	(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)

	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	(71)

Water heating gains (Table 5)

	39.4080	38.1593	35.5663	32.0411	29.7525	26.5299	23.7909	27.3004	28.5473	32.1959	36.3158	38.1645	(72)

Total internal gains

	296.7211	295.5068	285.2554	268.4310	250.7658	234.2096	223.7525	227.2275	236.1329	253.0808	272.5772	287.7595	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	4.5000	10.6334	0.6300	0.7000	0.7700	14.6237	(74)
East	7.1400	19.6403	0.6300	0.7000	0.7700	42.8566	(76)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	57.4802	111.7831	185.5549	277.6402	349.5304	362.6207	343.2043	288.0690	217.6735	132.7458	71.4773	47.4342	(83)
Total gains	354.2013	407.2899	470.8102	546.0712	600.2962	596.8303	566.9567	515.2965	453.8064	385.8266	344.0545	335.1937	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	66.0571	66.2210	66.3825	67.1514	67.2973	67.9847	67.9847	68.1135	67.7182	67.2973	67.0029	66.6978	
alpha	5.4038	5.4147	5.4255	5.4768	5.4865	5.5323	5.5323	5.5409	5.5145	5.4865	5.4669	5.4465	
util living area	0.9988	0.9971	0.9905	0.9601	0.8621	0.6776	0.5095	0.5787	0.8527	0.9824	0.9974	0.9991	(86)
MIT	19.8408	19.9815	20.2338	20.5723	20.8421	20.9688	20.9945	20.9896	20.8913	20.5289	20.1240	19.8170	(87)
Th 2	20.0408	20.0430	20.0451	20.0550	20.0568	20.0655	20.0655	20.0671	20.0621	20.0568	20.0531	20.0492	(88)
util rest of house	0.9984	0.9961	0.9871	0.9454	0.8161	0.5929	0.4047	0.4683	0.7860	0.9735	0.9963	0.9988	(89)
MIT 2	18.9778	19.1199	19.3721	19.7092	19.9515	20.0514	20.0641	20.0641	20.0012	19.6740	19.2706	18.9609	(90)
Living area fraction									fLA = Living area / (4) =			0.3795	(91)
MIT	19.3053	19.4469	19.6991	20.0367	20.2895	20.3996	20.4172	20.4153	20.3390	19.9984	19.5945	19.2857	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3053	19.4469	19.6991	20.0367	20.2895	20.3996	20.4172	20.4153	20.3390	19.9984	19.5945	19.2857	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9979	0.9953	0.9855	0.9451	0.8286	0.6244	0.4447	0.5106	0.8079	0.9728	0.9956	0.9985	(94)
Useful gains	353.4630	405.3560	463.9868	516.0656	497.3775	372.6788	252.1434	263.0861	366.6408	375.3262	342.5314	334.6746	(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	1026.7772	992.9446	898.7569	749.6392	576.9256	385.5988	253.7948	266.4613	416.4460	631.2618	842.9000	1022.3666	(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	500.9458	394.8595	323.4690	168.1730	59.1838	0.0000	0.0000	0.0000	0.0000	190.4161	360.2654	511.6428	(98)
Space heating												2508.9554	(98)
Space heating per m2											(98) / (4) =	38.5459	(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	624.9836	492.0084	504.3501	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9226	0.9624	0.9429	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	576.5954	473.5010	475.5472	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	776.6781	740.1987	681.1184	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	144.0595	198.4231	152.9450	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												495.4276	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)

Space cooling kWh

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

	0.0000	0.0000	0.0000	0.0000	0.0000	36.0149	49.6058	38.2362	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												123.8569 (107)
Space cooling per m2												1.9029 (108)
Energy for space heating												38.5459 (99)
Energy for space cooling												1.9029 (108)
Total												40.4488 (109)
Target Fabric Energy Efficiency (TFEE)												46.5 (109)

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

Overheating Calculation Input Data

Dwelling type	MidTerrace Flat
Number of storeys	1
Cross ventilation possible	Yes
SAP Region	Thames Valley
Front of dwelling faces	South
Overshading	Average or unknown
Thermal mass parameter	250.0
Night ventilation	Yes
Ventilation rate during hot weather (ach)	3.00 (Windows half open)

Overheating Calculation

Summer ventilation heat loss coefficient	158.52 (P1)
Transmission heat loss coefficient	36.08 (37)
Summer heat loss coefficient	194.60 (P2)

Overhangs

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

Solar shading

Orientation	Z blinds	Solar access	Z overhangs	Z summer
North	0.850	0.90	1.000	0.765 (P8)
East	0.850	0.90	1.000	0.765 (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	4.5000	81.1852	0.6300	0.7000	0.7650	110.9256
East	7.1400	117.5071	0.6300	0.7000	0.7650	254.7445
total:						365.6701

	Jun	Jul	Aug	
Solar gains	390	366	314	(P3)
Internal gains	368	352	360	
Total summer gains	758	718	674	(P5)
Summer gain/loss ratio	3.90	3.69	3.46	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 250.0)	0.25	0.25	0.25	
Threshold temperature	20.15	21.84	21.51	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	

Assessment of likelihood of high internal temperature: Slight

BASIC COMPLIANCE REPORT
Calculation Type: New Build (As Designed)

Darren Evans

Property Reference	DE-21912 - Plot 05	**Issued on Date**	25/01/2023
Assessment Reference	Plot 05	**Prop Type Ref**	GF Flat
Property	Land at Tesco Extra Car Park, 05, 1 Bath, 2B3P		

SAP Rating	93 A	**DER**	12.75	**TER**	26.21
Environmental	93 A	**% DER<TER**	51.36		
CO_2 Emissions (t/year)	0.37	**DFEE**	38.23	**TFEE**	46.52
General Requirements Compliance	Pass	**% DFEE<TFEE**	17.82		

Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Electricity		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	26.21	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	12.75	$kgCO_2/m^2$	Pass
	-13.46 (-51.4%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	46.52	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	38.23	$kWh/m^2/yr$	
	-8.3 (-17.8%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	Pass
Openings	1.20 (max. 2.00)	1.20 (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	4.00 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system 1	Room heaters - Electric Panel, convector or radiant heaters	
Main heating system 2	Heat pump with warm air distribution - Electric Dimplex EDL200UK-630	

Secondary heating system	None		
5 Cylinder insulation			
Hot water storage	No cylinder		
6 Controls			
Space heating controls 1	Programmer and room thermostat		Pass
Hot water controls	No cylinder		
7 Low energy lights			
Percentage of fixed lights with low-energy fittings	100	%	
Minimum	75	%	Pass
8 Mechanical ventilation			
Continuous extract system (decentralised)			
Specific fan power	0.1200 0.1600		
Maximum	0.7		Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)	Slight	Pass

Based on:

Overshading	Average
Windows facing North Windows facing East	4.50 m², No overhang 7.14 m², No overhang
Air change rate	3.00 ach
Blinds/curtains	Dark-coloured curtain or roller blind, closed 100% of daylight hours

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value		
Solid Wall	0.00	W/m²K	Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals	4.00 (design value)		
Maximum	10.0		Pass

10 Key features

Party wall U-value	0.00	W/m²K
Floor U-value	0.11	W/m²K
Photovoltaic array	1.64	kW

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BLOCK COMPLIANCE
Calculation Type: New Build (As Designed)

Darren Evans

Block Reference	4 PV planel per falt	**Issued on Date**	25/01/2023
Block Name	335		
Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

Block Compliance Report - DER

Block Reference: 4 PV planel per falt		Block Name: 335			
Property-Assessment Reference	**Multiplier**	**Floor Area (m^2)**	**DER ($kgCO_2/m^2$)**	**TER ($kgCO_2/m^2$)**	**% DER/TER**
DE-21912-Plot 20-Plot 20	1	61.7	9.39	24.71	62.00 %
DE-21912-Plot 17-Plot 17	1	61.7	11.56	25.89	55.36 %
DE-21912- Plot 07-Plot 07	1	50.76	8.84	26.11	66.14 %
DE-21912 - Plot 05-Plot 05	1	65.09	12.75	26.21	51.36 %
DE-21912-Plot 40-Plot 40	1	61.7	6.66	21.38	68.85 %
DE-21912-Plot 27-Plot 27	1	62.48	6.76	20.78	67.47 %
DE-21912-Plot 25-Plot 25	1	65.09	9.65	22.66	57.41 %
DE-21912-Plot 67-Plot 67	1	62.48	13.70	25.47	46.21 %
DE-21912-Plot 80-Plot 80	1	61.7	15.75	27.54	42.81 %
DE-21912-Plot 65-Plot 65	1	65.09	17.89	28.43	37.07 %
DE-21912-Plot 77-Plot 77	1	61.7	20.17	30.69	34.27 %
DE-21912-Plot 37-Plot 37	1	61.7	11.61	24.84	53.25 %
Totals:	12	741.19	144.73	304.71	
Average DER = 12.12 $kgCO_2/m^2$		**% DER/TER**	PASS		
Average TER = 25.38 $kgCO_2/m^2$		52.25 %			

Block Compliance Report - DFEE

Block Reference: 4 PV planel per falt		Block Name: 335			
Property-Assessment Reference	**Multiplier**	**Floor Area (m^2)**	**DFEE ($kWh/m^2/yr$)**	**TFEE ($kWh/m^2/yr$)**	**% DFEE/TFEE**
DE-21912-Plot 20-Plot 20	1	61.7	32.22	39.28	17.99 %
DE-21912-Plot 17-Plot 17	1	61.7	36.71	43.81	16.22 %
DE-21912- Plot 07-Plot 07	1	50.76	34.10	38.48	11.38 %
DE-21912 - Plot 05-Plot 05	1	65.09	38.23	46.52	17.82 %
DE-21912-Plot 40-Plot 40	1	61.7	26.99	27.95	3.45 %
DE-21912-Plot 27-Plot 27	1	62.48	26.37	26.48	0.39 %
DE-21912-Plot 25-Plot 25	1	65.09	32.34	34.66	6.71 %
DE-21912-Plot 67-Plot 67	1	62.48	39.57	42.27	6.38 %
DE-21912-Plot 80-Plot 80	1	61.7	44.07	48.37	8.88 %
DE-21912-Plot 65-Plot 65	1	65.09	48.15	53.91	10.69 %
DE-21912-Plot 77-Plot 77	1	61.7	52.85	59.27	10.83 %
DE-21912-Plot 37-Plot 37	1	61.7	36.79	40.29	8.69 %
Totals:	12	741.19	448.37	501.28	
Average DFEE = 37.43 $kWh/m^2/yr$		**% DFEE/TFEE**	PASS		
Average TFEE = 41.85 $kWh/m^2/yr$		10.56 %			

PREDICTED ENERGY ASSESSMENT

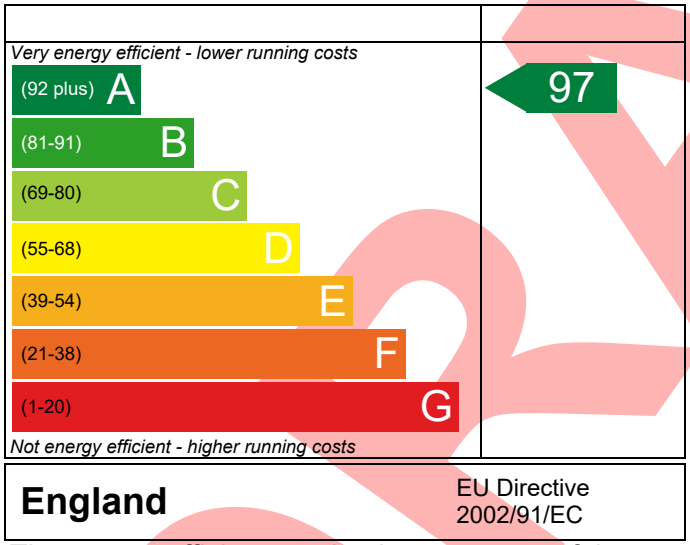
Land at Tesco Extra Car Park,
Plot 07,
1Bath,
1B2P,
RG1

Dwelling type:	Flat, Mid-Terrace
Date of assessment:	25/01/2023
Produced by:	Charles Sims
Total floor area:	50.76 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 (CO_2) emissions.

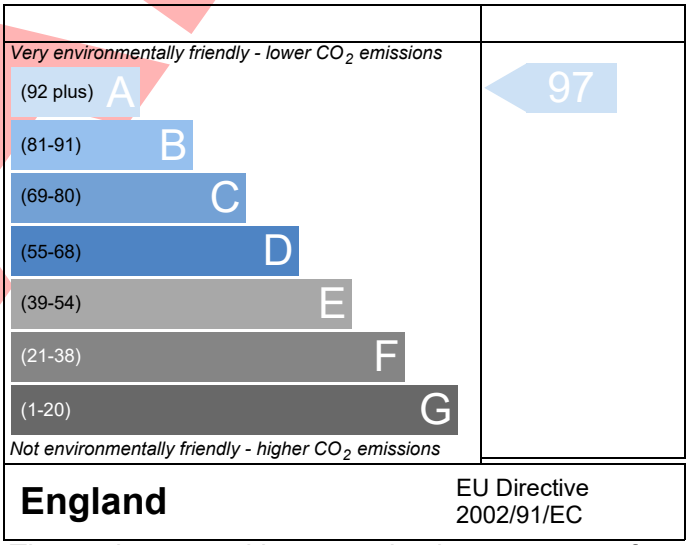
Energy Efficiency Rating



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 (CO_2) 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 (CO_2) emissions. The higher the rating the less impact it has on the environment.

DRAFT

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BUILDING REGULATION COMPLIANCE
Calculation Type: New Build (As Designed)

Darren Evans

Property Reference	DE-21912- Plot 07	**Issued on Date**	25/01/2023
Assessment Reference	Plot 07	**Prop Type Ref**	GF Flat
Property	Land at Tesco Extra Car Park, Plot 07, 1Bath, 1B2P, RG1		

SAP Rating	97 A	**DER**	8.84	**TER**	26.11
Environmental	97 A	**% DER<TER**	66.14		
CO_2 Emissions (t/year)	0.06	**DFEE**	34.10	**TFEE**	38.48
General Requirements Compliance	Pass	**% DFEE<TFEE**	11.38		

Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Electricity		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	26.11	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	8.84	$kgCO_2/m^2$	Pass
	-17.27 (-66.1%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	38.48	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	34.10	$kWh/m^2/yr$	
	-4.4 (-11.4%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	Pass
Openings	1.20 (max. 2.00)	1.20 (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	4.00 (design value)	$m^3/(h.m^2)$ @ 50 Pa	
Maximum	10.0	$m^3/(h.m^2)$ @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system 1	Room heaters - Electric Panel, convector or radiant heaters	

DRAFT

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

Main heating system 2	Heat pump with warm air distribution - Electric Dimplex EDL200UK-630		
Secondary heating system	None		
5 Cylinder insulation			
Hot water storage	No cylinder		
6 Controls			
Space heating controls 1	Programmer and room thermostat		Pass
Hot water controls	No cylinder		
7 Low energy lights			
Percentage of fixed lights with low-energy fittings	100	%	
Minimum	75	%	Pass
8 Mechanical ventilation			
Continuous extract system (decentralised)			
Specific fan power	0.1600 0.1600		
Maximum	0.7		Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)	Slight	Pass
Based on:		
Overshading	Average	
Windows facing East	6.39 m², No overhang	
Air change rate	3.00 ach	
Blinds/curtains	Dark-coloured curtain or roller blind, closed 100% of daylight hours	

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value		
Solid Wall	0.00	W/m²K	Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals	4.00 (design value)	m³/(h.m²) @ 50 Pa	
Maximum	10.0	m³/(h.m²) @ 50 Pa	Pass

10 Key features

Party wall U-value	0.00	W/m²K
Floor U-value	0.11	W/m²K
Photovoltaic array	1.64	kW

DRAFT

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

	Typical cost	Typical savings per year	Energy efficiency	Environmental impact	Result
Low energy lights			0	0	Already installed
Solar water heating			0	0	Not applicable
Photovoltaic			0	0	Not applicable
Wind turbine			0	0	Not applicable
Totals	**£0**	**£0**	**A 97**	**A 97**	

DRAFT

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

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

Darren Evans

Property Reference	DE-21912- Plot 07	**Issued on Date**	25/01/2023
Assessment Reference	Plot 07	**Prop Type Ref**	GF Flat
Property	Land at Tesco Extra Car Park, Plot 07, 1Bath, 1B2P, RG1		

SAP Rating	97 A	**DER**	8.84	**TER**	26.11
Environmental	97 A	**% DER<TER**	66.14		
CO_2 Emissions (t/year)	0.06	**DFEE**	34.10	**TFEE**	38.48
General Requirements Compliance	Pass	**% DFEE<TFEE**	11.38		

Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

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

Orientation	North
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	Flat, Mid-Terrace
2.0 Number of Storeys	1
3.0 Date Built	2023
4.0 Sheltered Sides	3
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	9.87 m	50.76 m²	2.46 m

7.0 Living Area	27.47	m²
8.0 Thermal Mass Parameter	Simple calculation - Medium	
Thermal Mass	250.00	kJ/m²K

9.0 External Walls

Description	Type	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Wall 1	Cavity Wall	0.18	24.28	17.89

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall 1	Solid Wall		0.00	45.83

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Heat Loss Floor 1	Ground Floor - Solid		0.11	50.76

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Windows	Manufacturer	Window	Double glazed			0.63		0.70	1.20

13.0 Openings

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

Darren Evans

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
Opening 1	Window	[1] External Wall 1	East	Dark-coloured curtain or roller blind	0.00					6.39	100

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	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	3.40	0.021	No	CBA-313
Independently assessed	E3 Sill	1.00	0.021	No	CBA-314
Independently assessed	E4 Jamb	6.90	0.017	No	CBA-315
Independently assessed	E5 Ground floor (normal)	9.87	0.057	No	CBA-301
Independently assessed	E7 Party floor between dwellings (in blocks of flats)	6.57	0.070	No	
Table K1 - Default	E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.30	1.000	No	
Independently assessed	E16 Corner (normal)	2.46	0.046	No	CBA-316
Table K1 - Approved	E18 Party wall between dwellings	2.46	0.060	No	
Table K1 - Default	E25 Staggered party wall between dwellings	2.46	0.120	No	
Table K1 - Default	P1 Party wall - Ground floor	18.63	0.160	No	

Y-value	0.108	W/m²K
18.0 Pressure Testing	Yes	
Designed AP_{50}	4.00	m³/(h.m²) @ 50 Pa
Property Tested ?		
As Built AP_{50}		m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Windows half open
Cross ventilation possible	Yes
Night Ventilation	Yes
Air change rate	3.00

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - decentralised
MV Reference Number	500661
Duct Type	Flexible

19.1 Mechanical extract ventilation - Decentralised

SFP	Fan/Room Type	Count
0.16	In Room Fan Other Wet Room	1
0.16	In Room Fan Kitchen	1

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				0
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	8	
Total number of L.E.L. fittings	8	
Percentage of L.E.L. fittings	100.00	%
External		
External lights fitted	No	
23.0 Electricity Tariff	Standard	
24.0 Main Heating 1	SAP table	
Percentage of Heat	100	%
Main Heating	REA	
SAP Code	691	
Efficiency (SAP Table)	100.0	%
Controls	CRD Programmer and room thermostat	
Sap Code	2605	
25.0 Main Heating 2	Database	
Percentage of Heat	0	%
Database Ref. No.	190006	
Fuel Type	Electricity	
Main Heating	PEH	
SAP Code	524	
In Summer	367.8	
Controls	CWD Time and temperature zone control	
Sap Code	0	
Community Heating	None	
28.0 Water Heating	HWP From main heating 1	
Water Heating	Main Heating 2	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
SAP Code	914	

Immersion Only Heating Hot Water	Yes	
29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	201.00	L
Loss	1.610	kWh/day
32.0 Photovoltaic Unit	One Dwelling	

PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
1.64	Horizontal	Horizontal	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

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

Property Reference	DE-21912- Plot 07	**Issued on Date**	25/01/2023
Assessment Reference	Plot 07	**Prop Type Ref**	GF Flat
Property	Land at Tesco Extra Car Park, Plot 07, 1Bath, 1B2P, RG1		

SAP Rating	97 A	**DER**	8.84	**TER**	26.11
Environmental	97 A	**% DER<TER**	66.14		
CO_2 Emissions (t/year)	0.06	**DFEE**	34.10	**TFEE**	38.48
General Requirements Compliance	Pass	**% DFEE<TFEE**	11.38		

Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

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

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

DWELLING AS DESIGNED

Ground-floor flat, total floor area 51 m²

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

1a TER and DER
Fuel for main heating:Electricity
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 26.11 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 8.84 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)38.5 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)34.1 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.20 (max. 2.00)	1.20 (max. 3.30)	OK

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

3 Air permeability
Air permeability at 50 pascals: 4.00 (design value)
Maximum 10.0 OK

4 Heating efficiency
Main heating system 1: Room heaters - Electric
Panel, convector or radiant heaters

Main heating system 2: Heat pump with warm air distribution - Electric
Dimplex EDL200UK-630

Secondary heating system: None

5 Cylinder insulation
Hot water storage No cylinder

6 Controls
Space heating controls 1: Programmer and room thermostat OK

Hot water controls: No cylinder

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

8 Mechanical ventilation
Continuous extract system (decentralised)
Specific fan power: 0.1600 0.1600
Maximum 0.7 OK

9 Summertime temperature
Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing East: 6.39 m², No overhang
Air change rate: 3.00 ach
Blinds/curtains: Dark-coloured curtain or roller blind, closed 100% of daylight hours

10 Key features
Party wall U-value 0.00 W/m²K
Floor U-value 0.11 W/m²K
Photovoltaic array 1.64 kW

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	50.7600 (1b)	x	2.4600 (2b)	=	124.8696	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	124.8696	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		4.0000	
Infiltration rate		0.2000	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1550	(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	0.1976	0.1938	0.1899	0.1705	0.1666	0.1473	0.1473	0.1434	0.1550	0.1666	0.1744	0.1821	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation:												0.5000	(23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(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	
Windows (Uw = 1.20)			6.3900	1.1450	7.3168			(27)
Heat Loss Floor 1			50.7600	0.1100	5.5836			(28a)
External Wall 1	24.2800	6.3900	17.8900	0.1800	3.2202			(29a)
Total net area of external elements Aum(A, m2)			75.0400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.1206			(33)
Party Wall 1			45.8300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.0690	(36)
Total fabric heat loss (33) + (36) =	24.1895	(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	20.6035	20.6035	20.6035	20.6035	20.6035	20.6035	20.6035	20.6035	20.6035	20.6035	20.6035	20.6035	(38)
Heat transfer coeff	44.7930	44.7930	44.7930	44.7930	44.7930	44.7930	44.7930	44.7930	44.7930	44.7930	44.7930	44.7930	(39)
Average = Sum(39)m / 12 =												44.7930	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8824	0.8824	0.8824	0.8824	0.8824	0.8824	0.8824	0.8824	0.8824	0.8824	0.8824	0.8824	(40)
HLP (average)												0.8824	(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	1.7125	(42)
Average daily hot water use (litres/day)	74.8717	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	82.3589	79.3640	76.3692	73.3743	70.3794	67.3846	67.3846	70.3794	73.3743	76.3692	79.3640	82.3589	(44)
Energy conte	122.1359	106.8208	110.2295	96.1008	92.2110	79.5711	73.7343	84.6112	85.6217	99.7838	108.9218	118.2821	(45)
Energy content (annual)										Total = Sum(45)m =		1178.0239	(45)
Distribution loss (46)m = 0.15 x (45)m	18.3204	16.0231	16.5344	14.4151	13.8316	11.9357	11.0601	12.6917	12.8433	14.9676	16.3383	17.7423	(46)

Water storage loss:		
Store volume	201.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.6100	(48)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)
Total storage loss
26.9514 24.3432 26.9514 26.0820 26.9514 26.0820 26.9514 26.9514 26.0820 26.9514 26.0820 26.9514 (56)
If cylinder contains dedicated solar storage
26.9514 24.3432 26.9514 26.0820 26.9514 26.0820 26.9514 26.9514 26.0820 26.9514 26.0820 26.9514 (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)
Total heat required for water heating calculated for each month
149.0873 131.1640 137.1809 122.1828 119.1624 105.6531 100.6857 111.5626 111.7037 126.7352 135.0038 145.2335 (62)
Solar input 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)
Output from w/h
149.0873 131.1640 137.1809 122.1828 119.1624 105.6531 100.6857 111.5626 111.7037 126.7352 135.0038 145.2335 (64)
Total per year (kWh/year) = Sum(64)m = 1495.3549 (64)
Heat gains from water heating, kWh/month
40.6102 35.5179 36.6513 31.9535 30.6601 26.4574 24.5166 28.1332 28.4692 33.1781 36.2165 39.3288 (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	85.6247	85.6247	85.6247	85.6247	85.6247	85.6247	85.6247	85.6247	85.6247	85.6247	85.6247	85.6247	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
14.6088 12.9754 10.5523 7.9888 5.9717 5.0415 5.4476 7.0810 9.5040 12.0676 14.0846 15.0148 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
149.2076 150.7560 146.8543 138.5480 128.0629 118.2084 111.6249 110.0766 113.9783 122.2845 132.7697 142.6242 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
31.5625 31.5625 31.5625 31.5625 31.5625 31.5625 31.5625 31.5625 31.5625 31.5625 31.5625 31.5625 (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)
-68.4998 -68.4998 -68.4998 -68.4998 -68.4998 -68.4998 -68.4998 -68.4998 -68.4998 -68.4998 -68.4998 -68.4998 (71)
Water heating gains (Table 5)
54.5836 52.8540 49.2625 44.3799 41.2099 36.7464 32.9525 37.8135 39.5406 44.5942 50.3007 52.8613 (72)
Total internal gains
267.0874 265.2728 255.3565 239.6041 223.9319 208.6837 198.7124 203.6585 211.7103 227.6338 245.8424 259.1877 (73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	6.3900	19.6403	0.6300	0.7000	0.7700	38.3548	(76)

Solar gains	38.3548	75.0302	123.5640	180.2107	220.8550	226.0844	215.2416	184.8893	143.7101	89.0296	47.8240	31.5411	(83)
Total gains	305.4422	340.3030	378.9205	419.8148	444.7869	434.7681	413.9540	388.5478	355.4204	316.6634	293.6664	290.7288	(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	78.6953	78.6953	78.6953	78.6953	78.6953	78.6953	78.6953	78.6953	78.6953	78.6953	78.6953	78.6953	
alpha	6.2464	6.2464	6.2464	6.2464	6.2464	6.2464	6.2464	6.2464	6.2464	6.2464	6.2464	6.2464	
util living area	0.9978	0.9951	0.9853	0.9458	0.8322	0.6419	0.4737	0.5255	0.7952	0.9694	0.9951	0.9984	(86)
MIT	20.1378	20.2560	20.4629	20.7181	20.9097	20.9852	20.9980	20.9964	20.9486	20.6910	20.3574	20.1009	(87)
Th 2	20.1824	20.1824	20.1824	20.1824	20.1824	20.1824	20.1824	20.1824	20.1824	20.1824	20.1824	20.1824	(88)
util rest of house	0.9971	0.9936	0.9805	0.9281	0.7859	0.5673	0.3870	0.4347	0.7268	0.9559	0.9933	0.9979	(89)
MIT 2	19.0234	19.1956	19.4949	19.8527	20.0958	20.1727	20.1817	20.1809	20.1421	19.8220	19.3441	18.9695	(90)
Living area fraction									fLA = Living area / (4) =			0.5412	(91)
MIT	19.6265	19.7694	20.0188	20.3210	20.5363	20.6124	20.6235	20.6222	20.5786	20.2923	19.8925	19.5818	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6265	19.7694	20.0188	20.3210	20.5363	20.6124	20.6235	20.6222	20.5786	20.2923	19.8925	19.5818	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9965	0.9926	0.9793	0.9315	0.8070	0.6072	0.4340	0.4840	0.7616	0.9580	0.9924	0.9974	(94)
Useful gains	304.3620	337.7742	371.0728	391.0426	358.9492	264.0029	179.6579	188.0392	270.6991	303.3746	291.4488	289.9604	(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	686.5205	666.0475	605.5459	511.5827	395.8035	269.3137	180.2239	189.1263	290.1941	434.1466	573.0129	688.9965	(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	284.3260	220.5997	174.4480	86.7889	27.4196	0.0000	0.0000	0.0000	0.0000	97.2944	202.7262	296.8828	(98)
Space heating												1390.4855	(98)
Space heating per m2											(98) / (4) =	27.3933	(99)

8c. Space cooling requirement

Not applicable

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	1390.4855	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	284.3260	220.5997	174.4480	86.7889	27.4196	0.0000	0.0000	0.0000	0.0000	97.2944	202.7262	296.8828	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	284.3260	220.5997	174.4480	86.7889	27.4196	0.0000	0.0000	0.0000	0.0000	97.2944	202.7262	296.8828	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
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)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	149.0873	131.1640	137.1809	122.1828	119.1624	105.6531	100.6857	111.5626	111.7037	126.7352	135.0038	145.2335	(64)
Efficiency of water heater												349.4100	(216)
(217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	(217)
Fuel for water heating, kWh/month	42.6683	37.5387	39.2607	34.9683	34.1039	30.2376	28.8159	31.9288	31.9692	36.2712	38.6377	41.5653	(219)
Water heating fuel used												427.9657	(219)
Annual totals kWh/year													
Space heating fuel - main system												1390.4855	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 4.8720, total flow = 21.0000, SFP = 0.2320)													
mechanical ventilation fans (SFP = 0.2320)												35.3431	(230a)
Total electricity for the above, kWh/year												35.3431	(231)
Electricity for lighting (calculated in Appendix L)												257.9952	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.64 * 951 * 1.00) =												-1247.2082	(233)
Total delivered energy for all uses												864.5812	(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	1390.4855	0.5190	721.6620	(261)
Space heating - main system 2	0.0000	0.5190	0.0000	(262)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	427.9657	0.5190	222.1142	(264)
Space and water heating			943.7761	(265)
Pumps and fans	35.3431	0.5190	18.3431	(267)
Energy for lighting	257.9952	0.5190	133.8995	(268)
Energy saving/generation technologies				
PV Unit	-1247.2082	0.5190	-647.3011	(269)
Total CO2, kg/year			448.7177	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			8.8400	(273)

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

DER		8.8400	ZC1
Total Floor Area	TFA	50.7600	
Assumed number of occupants	N	1.7125	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.4187	ZC2
CO2 emissions from cooking, equation (L16)		3.1541	ZC3
Total CO2 emissions		29.4128	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		29.4128	ZC8

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	50.7600 (1b)	x	2.4600 (2b)	=	124.8696	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	124.8696	(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) =	0.1602	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.4102	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3179	(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	0.4053	0.3973	0.3894	0.3497	0.3417	0.3020	0.3020	0.2940	0.3179	0.3417	0.3576	0.3735	(22b)
Effective ac	0.5821	0.5789	0.5758	0.5611	0.5584	0.5456	0.5456	0.5432	0.5505	0.5584	0.5639	0.5698	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opening Type (Uw = 1.40)			6.3900	1.3258	8.4716			(27)
Heat Loss Floor 1			50.7600	0.1300	6.5988			(28a)
External Wall 1	24.2800	6.3900	17.8900	0.1800	3.2202			(29a)
Total net area of external elements Aum(A, m2)			75.0400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		18.2906			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.6771	(36)
Total fabric heat loss					(33) + (36) =		22.9677	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	23.9879	23.8565	23.7277	23.1226	23.0094	22.4824	22.4824	22.3848	22.6854	23.0094	23.2384	23.4778	(38)
Heat transfer coeff	46.9556	46.8242	46.6954	46.0903	45.9771	45.4501	45.4501	45.3525	45.6531	45.9771	46.2061	46.4455	(39)
Average = Sum(39)m / 12 =												46.0898	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9251	0.9225	0.9199	0.9080	0.9058	0.8954	0.8954	0.8935	0.8994	0.9058	0.9103	0.9150	(40)
HLP (average)												0.9080	(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												1.7125	(42)
Average daily hot water use (litres/day)												74.8717	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	82.3589	79.3640	76.3692	73.3743	70.3794	67.3846	67.3846	70.3794	73.3743	76.3692	79.3640	82.3589	(44)
Energy conte	122.1359	106.8208	110.2295	96.1008	92.2110	79.5711	73.7343	84.6112	85.6217	99.7838	108.9218	118.2821	(45)
Energy content (annual)										Total = Sum(45)m =		1178.0239	(45)
Distribution loss (46)m = 0.15 x (45)m	18.3204	16.0231	16.5344	14.4151	13.8316	11.9357	11.0601	12.6917	12.8433	14.9676	16.3383	17.7423	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

```
If cylinder contains dedicated solar storage
              23.3325    21.0745    23.3325    22.5798    23.3325    22.5798    23.3325    23.3325    22.5798    23.3325    22.5798    23.3325 (57)
Primary loss  23.2624    21.0112    23.2624    22.5120    23.2624    22.5120    23.2624    23.2624    22.5120    23.2624    22.5120    23.2624 (59)
Total heat required for water heating calculated for each month
              168.7308   148.9065   156.8244   141.1926   138.8059   124.6629   120.3292   131.2061   130.7135   146.3787   154.0137   164.8770 (62)
Solar input     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (63)
                                                                                                  Solar input (sum of months) = Sum(63)m =      0.0000 (63)
Output from w/h
              168.7308   148.9065   156.8244   141.1926   138.8059   124.6629   120.3292   131.2061   130.7135   146.3787   154.0137   164.8770 (64)
                                                                                                  Total per year (kWh/year) = Sum(64)m =   1726.6413 (64)
Heat gains from water heating, kWh/month
              77.8861    69.1865    73.9272    68.0270    67.9361    62.5308    61.7926    65.4091    64.5427    70.4540    72.2900    76.6047 (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         85.6247    85.6247    85.6247    85.6247    85.6247    85.6247    85.6247    85.6247    85.6247    85.6247    85.6247    85.6247 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
              14.6088    12.9754    10.5523     7.9888     5.9717     5.0415     5.4476     7.0810     9.5040    12.0676    14.0846    15.0148 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
              149.2076   150.7560   146.8543   138.5480   128.0629   118.2084   111.6249   110.0766   113.9783   122.2845   132.7697   142.6242 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
              31.5625    31.5625    31.5625    31.5625    31.5625    31.5625    31.5625    31.5625    31.5625    31.5625    31.5625    31.5625 (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)
              -68.4998   -68.4998   -68.4998   -68.4998   -68.4998   -68.4998   -68.4998   -68.4998   -68.4998   -68.4998   -68.4998   -68.4998 (71)
Water heating gains (Table 5)
              104.6856   102.9561    99.3646    94.4819    91.3119    86.8484    83.0545    87.9155    89.6426    94.6963   100.4028   102.9633 (72)
Total internal gains
              320.1894   318.3748   308.4585   292.7061   277.0339   261.7857   251.8144   256.7605   264.8124   280.7358   298.9445   312.2897 (73)
```

---

6. Solar gains

```
[Jan]                                  Area          Solar flux              g                FF            Access            Gains
                                       m2              Table 6a      Specific data    Specific data      factor                W
                                                          W/m2        or Table 6b      or Table 6c     Table 6d
-----------------------------------------------------------------------------------------------------------------------------------
East                                 6.3900            19.6403            0.6300            0.7000          0.7700          38.3548 (76)
-----------------------------------------------------------------------------------------------------------------------------------

Solar gains    38.3548    75.0302   123.5640   180.2107   220.8550   226.0844   215.2416   184.8893   143.7101    89.0296    47.8240    31.5411 (83)
Total gains   358.5443   393.4050   432.0225   472.9168   497.8890   487.8702   467.0560   441.6498   408.5224   369.7654   346.7684   343.8309 (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           75.0709    75.2816    75.4893    76.4803    76.6686    77.5576    77.5576    77.7244    77.2127    76.6686    76.2886    75.8953
alpha          6.0047     6.0188     6.0326     6.0987     6.1112     6.1705     6.1705     6.1816     6.1475     6.1112     6.0859     6.0597
util living area
               0.9950     0.9904     0.9749     0.9194     0.7865     0.5861     0.4269     0.4699     0.7288     0.9439     0.9891     0.9961 (86)

MIT           20.1755    20.2969    20.5058    20.7621    20.9303    20.9904    20.9988    20.9979    20.9665    20.7499    20.4210    20.1538 (87)
Th 2          20.1463    20.1484    20.1506    20.1607    20.1626    20.1714    20.1714    20.1731    20.1680    20.1626    20.1588    20.1548 (88)
util rest of house
               0.9935     0.9874     0.9670     0.8958     0.7357     0.5146     0.3472     0.3868     0.6567     0.9221     0.9851     0.9949 (89)
MIT 2         19.0503    19.2281    19.5293    19.8903    20.0980    20.1653    20.1710    20.1722    20.1432    19.8826    19.4169    19.0253 (90)
Living area fraction                                                                                  fLA = Living area / (4) =      0.5412 (91)
MIT           19.6592    19.8065    20.0578    20.3621    20.5484    20.6118    20.6190    20.6191    20.5888    20.3520    19.9603    19.6360 (92)
Temperature adjustment                                                                                                         0.0000
adjusted MIT  19.6592    19.8065    20.0578    20.3621    20.5484    20.6118    20.6190    20.6191    20.5888    20.3520    19.9603    19.6360 (93)
```

---

8. Space heating requirement

```
                Jan        Feb        Mar        Apr        May        Jun        Jul        Aug        Sep        Oct        Nov        Dec
Utilisation    0.9924     0.9859     0.9660     0.9020     0.7600     0.5531     0.3904     0.4319     0.6944     0.9276     0.9839     0.9939 (94)
Useful gains 355.8107   387.8611   417.3387   426.5654   378.4163   269.8239   182.3236   190.7274   283.6809   343.0112   341.2005   341.7354 (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
              721.2009   697.9852   633.0852   528.2924   406.8230   273.2381   182.6631   191.3450   296.2319   448.3681   594.2243   716.9327 (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
              271.8503   208.4034   160.5154    73.2434    21.1346     0.0000     0.0000     0.0000     0.0000    78.3856   182.1771   279.1468 (98)
Space heating                                                                                                                 1274.8566 (98)
Space heating per m2                                                                                                (98) / (4) =     25.1154 (99)
```

8c. Space cooling requirement

Not applicable

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

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												93.5000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												1363.4830	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	271.8503	208.4034	160.5154	73.2434	21.1346	0.0000	0.0000	0.0000	0.0000	78.3856	182.1771	279.1468	(98)
Space heating efficiency (main heating system 1)													
	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)													
	290.7490	222.8914	171.6742	78.3352	22.6038	0.0000	0.0000	0.0000	0.0000	83.8348	194.8418	298.5527	(211)
Water heating requirement													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	168.7308	148.9065	156.8244	141.1926	138.8059	124.6629	120.3292	131.2061	130.7135	146.3787	154.0137	164.8770	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.0797	85.7106	84.8759	83.1582	81.0665	79.8000	79.8000	79.8000	79.8000	83.2319	85.2626	86.2078	(217)
Fuel for water heating, kWh/month													
	196.0169	173.7318	184.7691	169.7879	171.2247	156.2192	150.7884	164.4186	163.8014	175.8686	180.6345	191.2553	(219)
Water heating fuel used												2078.5163	(219)
Annual totals kWh/year													
Space heating fuel - main system												1363.4830	(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)												257.9952	(232)
Total delivered energy for all uses												3774.9945	(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	1363.4830	0.2160	294.5123	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2078.5163	0.2160	448.9595	(264)
Space and water heating			743.4718	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	257.9952	0.5190	133.8995	(268)
Total CO2, kg/m2/year			916.2964	(272)
Emissions per m2 for space and water heating			14.6468	(272a)
Fuel factor (electricity)			1.5500	
Emissions per m2 for lighting			2.6379	(272b)
Emissions per m2 for pumps and fans			0.7668	(272c)
Target Carbon Dioxide Emission Rate (TER) = (14.6468 * 1.55) + 2.6379 + 0.7668, rounded to 2 d.p.			26.1100	(273)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	50.7600 (1b)	x	2.4600 (2b)	=	124.8696	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	124.8696	(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) =	0.1602	(8)
Pressure test		Yes	
Measured/design AP50		4.0000	
Infiltration rate		0.3602	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2791	(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	0.3559	0.3489	0.3419	0.3070	0.3001	0.2652	0.2652	0.2582	0.2791	0.3001	0.3140	0.3280	(22b)
Effective ac	0.5633	0.5609	0.5585	0.5471	0.5450	0.5352	0.5352	0.5333	0.5390	0.5450	0.5493	0.5538	(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	
Windows (Uw = 1.20)			6.3900	1.1450	7.3168			(27)
Heat Loss Floor 1			50.7600	0.1100	5.5836			(28a)
External Wall 1	24.2800	6.3900	17.8900	0.1800	3.2202			(29a)
Total net area of external elements Aum(A, m2)			75.0400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.1206			(33)
Party Wall 1			45.8300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.0690	(36)
Total fabric heat loss (33) + (36) =	24.1895	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	23.2131	23.1117	23.0124	22.5459	22.4586	22.0523	22.0523	21.9770	22.2088	22.4586	22.6352	22.8198	(38)
Heat transfer coeff	47.4026	47.3013	47.2020	46.7354	46.6481	46.2418	46.2418	46.1665	46.3983	46.6481	46.8247	47.0093	(39)
Average = Sum(39)m / 12 =												46.7350	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9339	0.9319	0.9299	0.9207	0.9190	0.9110	0.9110	0.9095	0.9141	0.9190	0.9225	0.9261	(40)
HLP (average)												0.9207	(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	1.7125	(42)
Average daily hot water use (litres/day)	74.8717	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	82.3589	79.3640	76.3692	73.3743	70.3794	67.3846	67.3846	70.3794	73.3743	76.3692	79.3640	82.3589	(44)
Energy conte	122.1359	106.8208	110.2295	96.1008	92.2110	79.5711	73.7343	84.6112	85.6217	99.7838	108.9218	118.2821	(45)
Energy content (annual)										Total = Sum(45)m =		1178.0239	(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)
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)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Heat gains from water heating, kWh/month

	25.9539	22.6994	23.4238	20.4214	19.5948	16.9088	15.6685	17.9799	18.1946	21.2041	23.1459	25.1349 (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	85.6247	85.6247	85.6247	85.6247	85.6247	85.6247	85.6247	85.6247	85.6247	85.6247	85.6247	85.6247	(66)

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

	14.6088	12.9754	10.5523	7.9888	5.9717	5.0415	5.4476	7.0810	9.5040	12.0676	14.0846	15.0148	(67)

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

	149.2076	150.7560	146.8543	138.5480	128.0629	118.2084	111.6249	110.0766	113.9783	122.2845	132.7697	142.6242	(68)

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

	31.5625	31.5625	31.5625	31.5625	31.5625	31.5625	31.5625	31.5625	31.5625	31.5625	31.5625	31.5625	(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)

	-68.4998	-68.4998	-68.4998	-68.4998	-68.4998	-68.4998	-68.4998	-68.4998	-68.4998	-68.4998	-68.4998	-68.4998	(71)

Water heating gains (Table 5)

	34.8842	33.7789	31.4836	28.3631	26.3371	23.4845	21.0599	24.1665	25.2703	28.5001	32.1471	33.7835	(72)

Total internal gains

	247.3880	246.1976	237.5775	223.5873	209.0591	195.4218	186.8198	190.0115	197.4401	211.5396	227.6888	240.1099	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	6.3900	19.6403	0.6300	0.7000	0.7700	38.3548	(76)

Solar gains	38.3548	75.0302	123.5640	180.2107	220.8550	226.0844	215.2416	184.8893	143.7101	89.0296	47.8240	31.5411	(83)
Total gains	285.7429	321.2278	361.1415	403.7980	429.9142	421.5063	402.0614	374.9008	341.1501	300.5692	275.5128	271.6511	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	74.3630	74.5223	74.6791	75.4246	75.5657	76.2297	76.2297	76.3540	75.9726	75.5657	75.2808	74.9851	
alpha	5.9575	5.9682	5.9786	6.0283	6.0377	6.0820	6.0820	6.0903	6.0648	6.0377	6.0187	5.9990	
util living area	0.9985	0.9966	0.9895	0.9586	0.8618	0.6756	0.5020	0.5586	0.8298	0.9781	0.9967	0.9989	(86)
MIT	20.0248	20.1495	20.3696	20.6555	20.8777	20.9784	20.9969	20.9943	20.9283	20.6308	20.2738	20.0001	(87)
Th 2	20.1388	20.1405	20.1422	20.1499	20.1514	20.1582	20.1582	20.1594	20.1556	20.1514	20.1484	20.1454	(88)
util rest of house	0.9980	0.9955	0.9859	0.9440	0.8182	0.5977	0.4082	0.4607	0.7636	0.9678	0.9954	0.9986	(89)
MIT 2	19.2420	19.3677	19.5873	19.8707	20.0693	20.1483	20.1573	20.1578	20.1160	19.8526	19.4985	19.2227	(90)
Living area fraction									fLA = Living area / (4) =			0.5412	(91)
MIT	19.6657	19.7908	20.0106	20.2954	20.5068	20.5975	20.6117	20.6105	20.5556	20.2738	19.9180	19.6434	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6657	19.7908	20.0106	20.2954	20.5068	20.5975	20.6117	20.6105	20.5556	20.2738	19.9180	19.6434	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9977	0.9950	0.9852	0.9468	0.8377	0.6394	0.4591	0.5139	0.7971	0.9695	0.9950	0.9983	(94)
Useful gains	285.0832	319.6090	355.8119	382.3240	360.1387	269.4948	184.5990	192.6531	271.9165	291.4143	274.1327	271.1835	(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	728.3729	704.3538	637.7290	532.5701	410.8198	277.3361	185.5075	194.3833	299.5292	451.2629	600.2012	725.9847	(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	329.8075	258.5485	209.7463	108.1771	37.7067	0.0000	0.0000	0.0000	0.0000	118.9274	234.7693	338.3721	(98)
Space heating												1636.0549	(98)
Space heating per m2										(98) / (4) =		32.2312	(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	434.6729	342.1893	350.8658	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9417	0.9750	0.9636	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	409.3198	333.6246	338.0903	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	558.0106	534.1016	503.5041	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	107.0574	149.1548	123.0679	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												379.2802	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)

Space cooling kWh

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

	0.0000	0.0000	0.0000	0.0000	0.0000	26.7644	37.2887	30.7670	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												94.8200 (107)
Space cooling per m2												1.8680 (108)
Energy for space heating												32.2312 (99)
Energy for space cooling												1.8680 (108)
Total												34.0992 (109)
Dwelling Fabric Energy Efficiency (DFEE)												34.1 (109)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	50.7600 (1b)	x	2.4600 (2b)	=	124.8696	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.7600					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	124.8696	(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) =	0.1602	(8)
Pressure test			Yes	
Measured/design AP50			5.0000	
Infiltration rate			0.4102	(18)
Number of sides sheltered			3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.3179	(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	0.4053	0.3973	0.3894	0.3497	0.3417	0.3020	0.3020	0.2940	0.3179	0.3417	0.3576	0.3735	(22b)
Effective ac	0.5821	0.5789	0.5758	0.5611	0.5584	0.5456	0.5456	0.5432	0.5505	0.5584	0.5639	0.5698	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opening Type (Uw = 1.40)			6.3900	1.3258	8.4716			(27)
Heat Loss Floor 1			50.7600	0.1300	6.5988			(28a)
External Wall 1	24.2800	6.3900	17.8900	0.1800	3.2202			(29a)
Total net area of external elements Aum(A, m2)			75.0400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		18.2906			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.6771	(36)
Total fabric heat loss					(33) + (36) =		22.9677	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	23.9879	23.8565	23.7277	23.1226	23.0094	22.4824	22.4824	22.3848	22.6854	23.0094	23.2384	23.4778	(38)
Heat transfer coeff	46.9556	46.8242	46.6954	46.0903	45.9771	45.4501	45.4501	45.3525	45.6531	45.9771	46.2061	46.4455	(39)
Average = Sum(39)m / 12 =												46.0898	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9251	0.9225	0.9199	0.9080	0.9058	0.8954	0.8954	0.8935	0.8994	0.9058	0.9103	0.9150	(40)
HLP (average)												0.9080	(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	1.7125	(42)
Average daily hot water use (litres/day)	74.8717	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	82.3589	79.3640	76.3692	73.3743	70.3794	67.3846	67.3846	70.3794	73.3743	76.3692	79.3640	82.3589	(44)
Energy conte	122.1359	106.8208	110.2295	96.1008	92.2110	79.5711	73.7343	84.6112	85.6217	99.7838	108.9218	118.2821	(45)
Energy content (annual)										Total = Sum(45)m =		1178.0239	(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)
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													

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

	25.9539	22.6994	23.4238	20.4214	19.5948	16.9088	15.6685	17.9799	18.1946	21.2041	23.1459	25.1349	(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	85.6247	85.6247	85.6247	85.6247	85.6247	85.6247	85.6247	85.6247	85.6247	85.6247	85.6247	85.6247	(66)

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

	14.6088	12.9754	10.5523	7.9888	5.9717	5.0415	5.4476	7.0810	9.5040	12.0676	14.0846	15.0148	(67)

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

	149.2076	150.7560	146.8543	138.5480	128.0629	118.2084	111.6249	110.0766	113.9783	122.2845	132.7697	142.6242	(68)

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

	31.5625	31.5625	31.5625	31.5625	31.5625	31.5625	31.5625	31.5625	31.5625	31.5625	31.5625	31.5625	(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)

	-68.4998	-68.4998	-68.4998	-68.4998	-68.4998	-68.4998	-68.4998	-68.4998	-68.4998	-68.4998	-68.4998	-68.4998	(71)

Water heating gains (Table 5)

	34.8842	33.7789	31.4836	28.3631	26.3371	23.4845	21.0599	24.1665	25.2703	28.5001	32.1471	33.7835	(72)

Total internal gains

	247.3880	246.1976	237.5775	223.5873	209.0591	195.4218	186.8198	190.0115	197.4401	211.5396	227.6888	240.1099	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	6.3900	19.6403	0.6300	0.7000	0.7700	38.3548	(76)

Solar gains	38.3548	75.0302	123.5640	180.2107	220.8550	226.0844	215.2416	184.8893	143.7101	89.0296	47.8240	31.5411	(83)
Total gains	285.7429	321.2278	361.1415	403.7980	429.9142	421.5063	402.0614	374.9008	341.1501	300.5692	275.5128	271.6511	(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	75.0709	75.2816	75.4893	76.4803	76.6686	77.5576	77.5576	77.7244	77.2127	76.6686	76.2886	75.8953	
alpha	6.0047	6.0188	6.0326	6.0987	6.1112	6.1705	6.1705	6.1816	6.1475	6.1112	6.0859	6.0597	
util living area	0.9985	0.9966	0.9893	0.9572	0.8570	0.6668	0.4940	0.5498	0.8236	0.9774	0.9967	0.9989	(86)
MIT	20.0376	20.1628	20.3824	20.6687	20.8855	20.9809	20.9974	20.9951	20.9340	20.6430	20.2887	20.0163	(87)
Th 2	20.1463	20.1484	20.1506	20.1607	20.1626	20.1714	20.1714	20.1731	20.1680	20.1626	20.1588	20.1548	(88)
util rest of house	0.9980	0.9955	0.9857	0.9423	0.8131	0.5901	0.4028	0.4545	0.7572	0.9668	0.9954	0.9986	(89)
MIT 2	19.2609	19.3875	19.6071	19.8926	20.0861	20.1627	20.1707	20.1716	20.1318	19.8740	19.5220	19.2467	(90)
Living area fraction										fLA = Living area / (4) =		0.5412	(91)
MIT	19.6813	19.8071	20.0267	20.3126	20.5187	20.6055	20.6181	20.6173	20.5659	20.2901	19.9369	19.6632	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6813	19.8071	20.0267	20.3126	20.5187	20.6055	20.6181	20.6173	20.5659	20.2901	19.9369	19.6632	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9977	0.9949	0.9850	0.9453	0.8330	0.6312	0.4523	0.5062	0.7910	0.9687	0.9949	0.9983	(94)
Useful gains	285.0825	319.5974	355.7300	381.7117	358.1206	266.0593	181.8543	189.7912	269.8399	291.1717	274.1193	271.1839	(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	722.2365	698.0127	631.6335	526.0088	405.4583	272.9518	182.6221	191.2648	295.1892	445.5241	593.1430	718.1961	(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	325.2426	254.2951	205.2723	103.8939	35.2192	0.0000	0.0000	0.0000	0.0000	114.8382	229.6970	332.5771	(98)
Space heating												1601.0354	(98)
Space heating per m2											(98) / (4) =	31.5413	(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	427.2311	336.3308	344.6792	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9471	0.9779	0.9676	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	404.6295	328.8841	333.4989	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	558.0106	534.1016	503.5041	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	110.4345	152.6818	126.4839	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												389.6001	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	27.6086	38.1705	31.6210	0.0000	0.0000	0.0000	0.0000	(107)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling	97.4000 (107)
Space cooling per m2	1.9188 (108)
Energy for space heating	31.5413 (99)
Energy for space cooling	1.9188 (108)
Total	33.4601 (109)
Target Fabric Energy Efficiency (TFEE)	38.5 (109)

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

Overheating Calculation Input Data

Dwelling type	MidTerrace Flat
Number of storeys	1
Cross ventilation possible	Yes
SAP Region	Thames Valley
Front of dwelling faces	North
Overshading	Average or unknown
Thermal mass parameter	250.0
Night ventilation	Yes
Ventilation rate during hot weather (ach)	3.00 (Windows half open)

Overheating Calculation

Summer ventilation heat loss coefficient	123.62 (P1)
Transmission heat loss coefficient	24.19 (37)
Summer heat loss coefficient	147.81 (P2)

Overhangs

Orientation	Ratio	Z_overhangs	Overhang type
East	0.000	1.000	None

Solar shading

Orientation	Z blinds	Solar access	Z overhangs	Z summer
East	0.850	0.90	1.000	0.765 (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
East	6.3900	117.5071	0.6300	0.7000	0.7650	227.9856
total:						227.9856

	Jun	Jul	Aug	
Solar gains	242	228	201	(P3)
Internal gains	307	294	301	
Total summer gains	549	522	502	(P5)
Summer gain/loss ratio	3.71	3.53	3.39	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 250.0)	0.25	0.25	0.25	
Threshold temperature	19.96	21.68	21.44	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	

Assessment of likelihood of high internal temperature: Slight

BASIC COMPLIANCE REPORT
Calculation Type: New Build (As Designed)

Darren Evans

Property Reference	DE-21912- Plot 07	**Issued on Date**	25/01/2023
Assessment Reference	Plot 07	**Prop Type Ref**	GF Flat
Property	Land at Tesco Extra Car Park, Plot 07, 1Bath, 1B2P, RG1		

SAP Rating	97 A	**DER**	8.84	**TER**	26.11
Environmental	97 A	**% DER<TER**	66.14		
CO_2 Emissions (t/year)	0.06	**DFEE**	34.10	**TFEE**	38.48
General Requirements Compliance	Pass	**% DFEE<TFEE**	11.38		

Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Electricity		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	26.11	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	8.84	$kgCO_2/m^2$	Pass
	-17.27 (-66.1%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	38.48	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	34.10	$kWh/m^2/yr$	
	-4.4 (-11.4%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	Pass
Openings	1.20 (max. 2.00)	1.20 (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	4.00 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system 1	Room heaters - Electric Panel, convector or radiant heaters	
Main heating system 2	Heat pump with warm air distribution - Electric Dimplex EDL200UK-630	

Secondary heating system	None		
5 Cylinder insulation			
Hot water storage	No cylinder		
6 Controls			
Space heating controls 1	Programmer and room thermostat		Pass
Hot water controls	No cylinder		
7 Low energy lights			
Percentage of fixed lights with low-energy fittings	100	%	
Minimum	75	%	Pass
8 Mechanical ventilation			
Continuous extract system (decentralised)			
Specific fan power	0.1600 0.1600		
Maximum	0.7		Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)	Slight	Pass

Based on:

Overshading	Average
Windows facing East	6.39 m², No overhang
Air change rate	3.00 ach
Blinds/curtains	Dark-coloured curtain or roller blind, closed 100% of daylight hours

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value		
Solid Wall	0.00	W/m²K	Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals	4.00 (design value)		
Maximum	10.0		Pass

10 Key features

Party wall U-value	0.00	W/m²K
Floor U-value	0.11	W/m²K
Photovoltaic array	1.64	kW

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BLOCK COMPLIANCE
Calculation Type: New Build (As Designed)

Darren Evans

Block Reference	4 PV planel per falt	**Issued on Date**	25/01/2023
Block Name	335		
Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

Block Compliance Report - DER

Block Reference: 4 PV planel per falt		Block Name: 335			
Property-Assessment Reference	**Multiplier**	**Floor Area (m^2)**	**DER ($kgCO_2/m^2$)**	**TER ($kgCO_2/m^2$)**	**% DER/TER**
DE-21912-Plot 20-Plot 20	1	61.7	9.39	24.71	62.00 %
DE-21912-Plot 17-Plot 17	1	61.7	11.56	25.89	55.36 %
DE-21912- Plot 07-Plot 07	1	50.76	8.84	26.11	66.14 %
DE-21912 - Plot 05-Plot 05	1	65.09	12.75	26.21	51.36 %
DE-21912-Plot 40-Plot 40	1	61.7	6.66	21.38	68.85 %
DE-21912-Plot 27-Plot 27	1	62.48	6.76	20.78	67.47 %
DE-21912-Plot 25-Plot 25	1	65.09	9.65	22.66	57.41 %
DE-21912-Plot 67-Plot 67	1	62.48	13.70	25.47	46.21 %
DE-21912-Plot 80-Plot 80	1	61.7	15.75	27.54	42.81 %
DE-21912-Plot 65-Plot 65	1	65.09	17.89	28.43	37.07 %
DE-21912-Plot 77-Plot 77	1	61.7	20.17	30.69	34.27 %
DE-21912-Plot 37-Plot 37	1	61.7	11.61	24.84	53.25 %
Totals:	12	741.19	144.73	304.71	
Average DER = 12.12 $kgCO_2/m^2$		**% DER/TER**	PASS		
Average TER = 25.38 $kgCO_2/m^2$		52.25 %			

Block Compliance Report - DFEE

Block Reference: 4 PV planel per falt		Block Name: 335			
Property-Assessment Reference	**Multiplier**	**Floor Area (m^2)**	**DFEE ($kWh/m^2/yr$)**	**TFEE ($kWh/m^2/yr$)**	**% DFEE/TFEE**
DE-21912-Plot 20-Plot 20	1	61.7	32.22	39.28	17.99 %
DE-21912-Plot 17-Plot 17	1	61.7	36.71	43.81	16.22 %
DE-21912- Plot 07-Plot 07	1	50.76	34.10	38.48	11.38 %
DE-21912 - Plot 05-Plot 05	1	65.09	38.23	46.52	17.82 %
DE-21912-Plot 40-Plot 40	1	61.7	26.99	27.95	3.45 %
DE-21912-Plot 27-Plot 27	1	62.48	26.37	26.48	0.39 %
DE-21912-Plot 25-Plot 25	1	65.09	32.34	34.66	6.71 %
DE-21912-Plot 67-Plot 67	1	62.48	39.57	42.27	6.38 %
DE-21912-Plot 80-Plot 80	1	61.7	44.07	48.37	8.88 %
DE-21912-Plot 65-Plot 65	1	65.09	48.15	53.91	10.69 %
DE-21912-Plot 77-Plot 77	1	61.7	52.85	59.27	10.83 %
DE-21912-Plot 37-Plot 37	1	61.7	36.79	40.29	8.69 %
Totals:	12	741.19	448.37	501.28	
Average DFEE = 37.43 $kWh/m^2/yr$		**% DFEE/TFEE**	PASS		
Average TFEE = 41.85 $kWh/m^2/yr$		10.56 %			

PREDICTED ENERGY ASSESSMENT

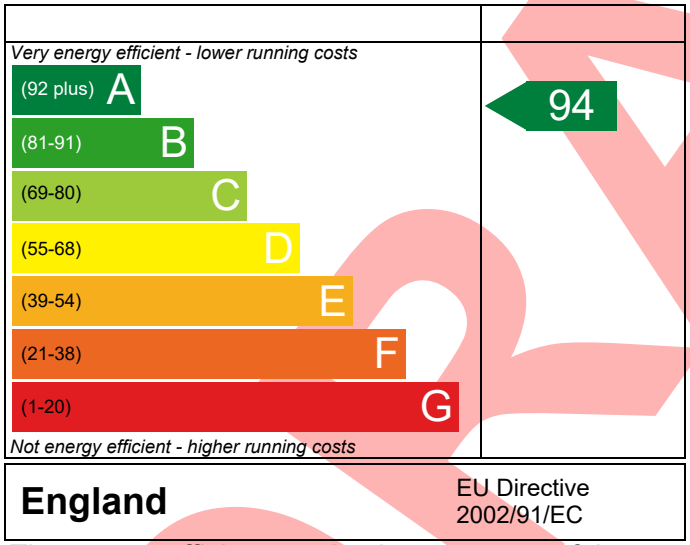
Land at Tesco Extra Car Park,
Plot 17,
1Bath,
2B3P,
RG1

Dwelling type:	Flat, Mid-Terrace
Date of assessment:	25/01/2023
Produced by:	Charles Sims
Total floor area:	61.7 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 (CO_2) emissions.

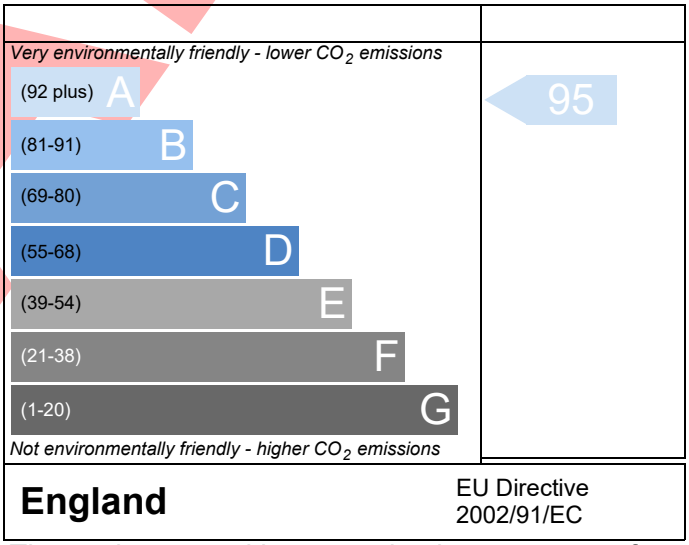
Energy Efficiency Rating



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 (CO_2) 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 (CO_2) emissions. The higher the rating the less impact it has on the environment.

DRAFT

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BUILDING REGULATION COMPLIANCE
Calculation Type: New Build (As Designed)

Darren Evans

Property Reference	DE-21912-Plot 17	**Issued on Date**	25/01/2023
Assessment Reference	Plot 17	**Prop Type Ref**	GF Flat
Property	Land at Tesco Extra Car Park, Plot 17, 1Bath, 2B3P, RG1		

SAP Rating	94 A	**DER**	11.56	**TER**	25.89
Environmental	95 A	**% DER<TER**	55.36		
CO_2 Emissions (t/year)	0.25	**DFEE**	36.71	**TFEE**	43.81
General Requirements Compliance	Pass	**% DFEE<TFEE**	16.22		

Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Electricity		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	25.89	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	11.56	$kgCO_2/m^2$	Pass
	-14.33 (-55.3%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	43.81	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	36.71	$kWh/m^2/yr$	
	-7.1 (-16.2%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	Pass
Openings	1.20 (max. 2.00)	1.20 (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	4.00 (design value)	$m^3/(h.m^2)$ @ 50 Pa	
Maximum	10.0	$m^3/(h.m^2)$ @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system 1	Room heaters - Electric Panel, convector or radiant heaters	

DRAFT

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

Main heating system 2	Heat pump with warm air distribution - Electric Dimplex EDL200UK-630		
Secondary heating system	None		
5 Cylinder insulation			
Hot water storage	No cylinder		
6 Controls			
Space heating controls 1	Programmer and room thermostat		Pass
Hot water controls	No cylinder		
7 Low energy lights			
Percentage of fixed lights with low-energy fittings	100	%	
Minimum	75	%	Pass
8 Mechanical ventilation			
Continuous extract system (decentralised)			
Specific fan power	0.1600 0.1200		
Maximum	0.7		Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)	Slight		Pass
Based on:			
Overshading	Average		
Windows facing West	9.60 m², No overhang		
Air change rate	3.00 ach		
Blinds/curtains	Dark-coloured curtain or roller blind, closed 100% of daylight hours		

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value		
Solid Wall	0.00	W/m²K	Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals	4.00 (design value)	m³/(h.m²) @ 50 Pa	
Maximum	10.0	m³/(h.m²) @ 50 Pa	Pass

10 Key features

Party wall U-value	0.00	W/m²K
Floor U-value	0.11	W/m²K
Photovoltaic array	1.64	kW

DRAFT

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

	Typical cost	Typical savings per year	Energy efficiency	Environmental impact	Result
Low energy lights			0	0	Already installed
Solar water heating			0	0	Not applicable
Photovoltaic			0	0	Not applicable
Wind turbine			0	0	Not applicable
Totals	**£0**	**£0**	**A 94**	**A 95**	

DRAFT

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

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

Darren Evans

Property Reference	DE-21912-Plot 17	**Issued on Date**	25/01/2023
Assessment Reference	Plot 17	**Prop Type Ref**	GF Flat
Property	Land at Tesco Extra Car Park, Plot 17, 1Bath, 2B3P, RG1		

SAP Rating	94 A	**DER**	11.56	**TER**	25.89
Environmental	95 A	**% DER<TER**	55.36		
CO_2 Emissions (t/year)	0.25	**DFEE**	36.71	**TFEE**	43.81
General Requirements Compliance	Pass	**% DFEE<TFEE**	16.22		

Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

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

Orientation	East
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	Flat, Mid-Terrace
2.0 Number of Storeys	1
3.0 Date Built	2023
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	17.02 m	61.70 m²	2.46 m

7.0 Living Area	27.08	m²
8.0 Thermal Mass Parameter	Simple calculation - Medium	
Thermal Mass	250.00	kJ/m²K

9.0 External Walls

Description	Type	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Wall 1	Cavity Wall	0.18	41.87	32.27

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall 1	Solid Wall		0.00	48.39

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Heat Loss Floor 1	Ground Floor - Solid		0.11	61.70

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Windows	Manufacturer	Window	Double glazed			0.63		0.70	1.20

13.0 Openings

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

Darren Evans

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
Windows	Window	[1] External Wall 1	West	Dark-coloured curtain or roller blind	0.00					9.60	100

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	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	5.00	0.021	No	CBA-313
Independently assessed	E3 Sill	1.00	0.021	No	CBA-314
Independently assessed	E4 Jamb	15.00	0.017	No	CBA-315
Independently assessed	E5 Ground floor (normal)	17.02	0.057	No	CBA-301
Table K1 - Approved	E7 Party floor between dwellings (in blocks of flats)	13.77	0.070	No	
Table K1 - Default	E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.25	1.000	No	
Independently assessed	E16 Corner (normal)	7.38	0.046	No	CBA-316
Independently assessed	E17 Corner (inverted – internal area greater than external area)	4.92	-0.040	No	
Table K1 - Approved	E18 Party wall between dwellings	2.46	0.060	No	
Table K1 - Default	E25 Staggered party wall between dwellings	2.46	0.120	No	
Table K1 - Default	P1 Party wall - Ground floor	19.67	0.160	No	

Y-value	0.090	W/m²K
18.0 Pressure Testing	Yes	
Designed AP_{50}	4.00	m³/(h.m²) @ 50 Pa
Property Tested ?		
As Built AP_{50}		m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Windows half open
Cross ventilation possible	Yes
Night Ventilation	Yes
Air change rate	3.00

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - decentralised
MV Reference Number	500661
Duct Type	Flexible

19.1 Mechanical extract ventilation - Decentralised

SFP	Fan/Room Type	Count
0.16	In Room Fan Other Wet Room	1

0.12	Through Wall Fan Kitchen	1

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				0
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	10	
Total number of L.E.L. fittings	10	
Percentage of L.E.L. fittings	100.00	%
External		
External lights fitted	No	
23.0 Electricity Tariff	Standard	
24.0 Main Heating 1	SAP table	
Percentage of Heat	100	%
Main Heating	REA	
SAP Code	691	
Efficiency (SAP Table)	100.0	%
Controls	CRD Programmer and room thermostat	
Sap Code	2605	
25.0 Main Heating 2	Database	
Percentage of Heat	0	%
Database Ref. No.	190006	
Fuel Type	Electricity	
Main Heating	PEH	
SAP Code	524	
In Summer	367.8	
Controls	CWD Time and temperature zone control	
Sap Code	0	
Community Heating	None	
28.0 Water Heating	HWP From main heating 1	
Water Heating	Main Heating 2	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	

Water use <= 125 litres/person/day	Yes	
SAP Code	914	
Immersion Only Heating Hot Water	No	
29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	201.00	L
Loss	1.610	kWh/day
32.0 Photovoltaic Unit	One Dwelling	

PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
1.64	Horizontal	Horizontal	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

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

Property Reference	DE-21912-Plot 17	**Issued on Date**	25/01/2023
Assessment Reference	Plot 17	**Prop Type Ref**	GF Flat
Property	Land at Tesco Extra Car Park, Plot 17, 1Bath, 2B3P, RG1		

SAP Rating	94 A	**DER**	11.56	**TER**	25.89
Environmental	95 A	**% DER<TER**	55.36		
CO_2 Emissions (t/year)	0.25	**DFEE**	36.71	**TFEE**	43.81
General Requirements Compliance	Pass	**% DFEE<TFEE**	16.22		

Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

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

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

DWELLING AS DESIGNED

Ground-floor flat, total floor area 62 m²

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

1a TER and DER
Fuel for main heating:Electricity
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 25.89 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 11.56 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)43.8 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)36.7 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.20 (max. 2.00)	1.20 (max. 3.30)	OK

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

3 Air permeability
Air permeability at 50 pascals: 4.00 (design value)
Maximum 10.0 OK

4 Heating efficiency
Main heating system 1: Room heaters - Electric
Panel, convector or radiant heaters

Main heating system 2: Heat pump with warm air distribution - Electric
Dimplex EDL200UK-630

Secondary heating system: None

5 Cylinder insulation
Hot water storage No cylinder

6 Controls
Space heating controls 1: Programmer and room thermostat OK

Hot water controls: No cylinder

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

8 Mechanical ventilation
Continuous extract system (decentralised)
Specific fan power: 0.1600 0.1200
Maximum 0.7 OK

9 Summertime temperature
Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing West: 9.60 m², No overhang
Air change rate: 3.00 ach
Blinds/curtains: Dark-coloured curtain or roller blind, closed 100% of daylight hours

10 Key features
Party wall U-value 0.00 W/m²K
Floor U-value 0.11 W/m²K
Photovoltaic array 1.64 kW

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	61.7000 (1b)	x	2.4600 (2b)	=	151.7820	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	151.7820	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		4.0000	
Infiltration rate		0.2000	(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) =	0.1700	(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	0.2168	0.2125	0.2083	0.1870	0.1828	0.1615	0.1615	0.1573	0.1700	0.1828	0.1913	0.1998	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation:												0.5000	(23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(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	
Windows (Uw = 1.20)			9.6000	1.1450	10.9924			(27)
Heat Loss Floor 1			61.7000	0.1100	6.7870			(28a)
External Wall 1	41.8700	9.6000	32.2700	0.1800	5.8086			(29a)
Total net area of external elements Aum(A, m2)			103.5700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.5880			(33)
Party Wall 1			48.3900	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.2977	(36)
Total fabric heat loss					(33) + (36) =		32.8857	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	25.0440	25.0440	25.0440	25.0440	25.0440	25.0440	25.0440	25.0440	25.0440	25.0440	25.0440	25.0440	(38)
Heat transfer coeff	57.9297	57.9297	57.9297	57.9297	57.9297	57.9297	57.9297	57.9297	57.9297	57.9297	57.9297	57.9297	(39)
Average = Sum(39)m / 12 =												57.9297	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9389	0.9389	0.9389	0.9389	0.9389	0.9389	0.9389	0.9389	0.9389	0.9389	0.9389	0.9389	(40)
HLP (average)												0.9389	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.0293 (42)
Average daily hot water use (litres/day)		82.3952 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	90.6347	87.3389	84.0431	80.7472	77.4514	74.1556	74.1556	77.4514	80.7472	84.0431	87.3389	90.6347	(44)
Energy conte	134.4086	117.5546	121.3058	105.7574	101.4767	87.5667	81.1434	93.1132	94.2253	109.8105	119.8668	130.1675	(45)
Energy content (annual)										Total = Sum(45)m =		1296.3965	(45)
Distribution loss (46)m = 0.15 x (45)m	20.1613	17.6332	18.1959	15.8636	15.2215	13.1350	12.1715	13.9670	14.1338	16.4716	17.9800	19.5251	(46)
Water storage loss:													
Store volume												201.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

```
  Temperature factor from Table 2b                                                                                0.5400 (49)
Enter (49) or (54) in (55)                                                                                        0.8694 (55)
Total storage loss
              26.9514    24.3432    26.9514    26.0820    26.9514    26.0820    26.9514    26.9514    26.0820    26.9514    26.0820    26.9514 (56)
If cylinder contains dedicated solar storage
              26.9514    24.3432    26.9514    26.0820    26.9514    26.0820    26.9514    26.9514    26.0820    26.9514    26.0820    26.9514 (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)
Total heat required for water heating calculated for each month
             161.3600   141.8978   148.2572   131.8394   128.4281   113.6487   108.0948   120.0646   120.3073   136.7619   145.9488   157.1189 (62)
Solar input      0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (63)
                                                                                  Solar input (sum of months) = Sum(63)m =      0.0000 (63)
Output from w/h
             161.3600   141.8978   148.2572   131.8394   128.4281   113.6487   108.0948   120.0646   120.3073   136.7619   145.9488   157.1189 (64)
                                                                                    Total per year (kWh/year) = Sum(64)m =   1613.7275 (64)
Heat gains from water heating, kWh/month
              44.6909    39.0869    40.3342    35.1643    33.7410    29.1159    26.9802    30.9602    31.3299    36.5120    39.8557    43.2807 (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        101.4635   101.4635   101.4635   101.4635   101.4635   101.4635   101.4635   101.4635   101.4635   101.4635   101.4635   101.4635 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
              16.5750    14.7217    11.9725     9.0640     6.7754     5.7201     6.1808     8.0340    10.7832    13.6918    15.9803    17.0356 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
             177.2131   179.0520   174.4180   164.5527   152.0996   140.3954   132.5763   130.7374   135.3714   145.2367   157.6898   169.3940 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
              33.1463    33.1463    33.1463    33.1463    33.1463    33.1463    33.1463    33.1463    33.1463    33.1463    33.1463    33.1463 (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)
             -81.1708   -81.1708   -81.1708   -81.1708   -81.1708   -81.1708   -81.1708   -81.1708   -81.1708   -81.1708   -81.1708   -81.1708 (71)
Water heating gains (Table 5)
              60.0684    58.1650    54.2126    48.8393    45.3508    40.4388    36.2637    41.6131    43.5138    49.0753    55.3551    58.1730 (72)
Total internal gains
             307.2955   305.3778   294.0422   275.8951   257.6649   239.9934   228.4598   233.8236   243.1074   261.4428   282.4643   298.0417 (73)


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

[Jan]                                    Area          Solar flux              g              FF           Access              Gains
                                           m2           Table 6a      Specific data  Specific data        factor                  W
                                                           W/m2        or Table 6b    or Table 6c      Table 6d
-------------------------------------------------------------------------------------------------------------
West                                   9.6000            19.6403            0.6300          0.7000        0.7700           57.6223 (80)
-------------------------------------------------------------------------------------------------------------

Solar gains     57.6223   112.7214   185.6361   270.7391   331.8010   339.6573   323.3676   277.7680   215.9024   133.7534    71.8482    47.3858 (83)
Total gains    364.9177   418.0992   479.6783   546.6342   589.4659   579.6507   551.8275   511.5916   459.0099   395.1962   354.3125   345.4274 (84)


-------------------------------------------------------------------------------------------------------------
7. Mean internal temperature (heating season)
-------------------------------------------------------------------------------------------------------------
Temperature during heating periods in the living area from Table 9, Th1 (C)                                     21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)
                Jan        Feb        Mar        Apr        May        Jun        Jul        Aug        Sep        Oct        Nov        Dec
tau          73.9641    73.9641    73.9641    73.9641    73.9641    73.9641    73.9641    73.9641    73.9641    73.9641    73.9641    73.9641
alpha         5.9309     5.9309     5.9309     5.9309     5.9309     5.9309     5.9309     5.9309     5.9309     5.9309     5.9309     5.9309
util living area
                0.9981     0.9952     0.9842     0.9387     0.8146     0.6226     0.4593     0.5156     0.7905     0.9702     0.9957     0.9986 (86)

MIT          20.0451    20.1823    20.4176    20.7027    20.9072    20.9844    20.9978    20.9957    20.9416    20.6532    20.2838    20.0054 (87)
Th 2         20.1346    20.1346    20.1346    20.1346    20.1346    20.1346    20.1346    20.1346    20.1346    20.1346    20.1346    20.1346 (88)
util rest of house
                0.9975     0.9937     0.9789     0.9189     0.7649     0.5456     0.3704     0.4214     0.7190     0.9567     0.9940     0.9982 (89)
MIT 2        18.8517    19.0516    19.3920    19.7902    20.0470    20.1245    20.1337    20.1328    20.0893    19.7305    19.2004    18.7938 (90)
Living area fraction                                                                                 fLA = Living area / (4) =      0.4389 (91)
MIT          19.3755    19.5479    19.8422    20.1907    20.4246    20.5019    20.5130    20.5115    20.4634    20.1355    19.6759    19.3256 (92)
Temperature adjustment                                                                                            0.0000
adjusted MIT 19.3755    19.5479    19.8422    20.1907    20.4246    20.5019    20.5130    20.5115    20.4634    20.1355    19.6759    19.3256 (93)


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

                Jan        Feb        Mar        Apr        May        Jun        Jul        Aug        Sep        Oct        Nov        Dec
Utilisation      0.9967     0.9923     0.9767     0.9204     0.7825     0.5790     0.4095     0.4629     0.7480     0.9567     0.9928     0.9976 (94)
Useful gains   363.7139   414.8885   468.5228   503.1064   461.2789   335.6084   225.9926   236.8070   343.3222   378.0831   351.7639   344.5885 (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
              873.3189   848.5477   772.9076   654.0671   505.4124   341.8945   226.6763   238.1804   368.6288   552.3892   728.5186   876.2199 (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
              379.1461   291.4189   226.4623   108.6917    32.8353     0.0000     0.0000     0.0000     0.0000   129.6837   271.2634   395.5338 (98)
Space heating                                                                                                  1835.0352 (98)
Space heating per m2                                                                                  (98) / (4) =     29.7413 (99)


-------------------------------------------------------------------------------------------------------------
8c. Space cooling requirement
-------------------------------------------------------------------------------------------------------------
Not applicable
```

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	1835.0352	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	379.1461	291.4189	226.4623	108.6917	32.8353	0.0000	0.0000	0.0000	0.0000	129.6837	271.2634	395.5338	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	379.1461	291.4189	226.4623	108.6917	32.8353	0.0000	0.0000	0.0000	0.0000	129.6837	271.2634	395.5338	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
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)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	161.3600	141.8978	148.2572	131.8394	128.4281	113.6487	108.0948	120.0646	120.3073	136.7619	145.9488	157.1189	(64)
Efficiency of water heater												349.4100	(216)
(217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	(217)
Fuel for water heating, kWh/month	46.1807	40.6107	42.4307	37.7320	36.7557	32.5259	30.9364	34.3621	34.4316	39.1408	41.7701	44.9669	(219)
Water heating fuel used												461.8436	(219)
Annual totals kWh/year													
Space heating fuel - main system												1835.0352	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.6500, total flow = 21.0000, SFP = 0.1738)													
mechanical ventilation fans (SFP = 0.1738)												32.1850	(230a)
Total electricity for the above, kWh/year												32.1850	(231)
Electricity for lighting (calculated in Appendix L)												292.7191	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.64 * 951 * 1.00) =												-1247.2082	(233)
Total delivered energy for all uses												1374.5747	(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	1835.0352	0.5190	952.3833	(261)
Space heating - main system 2	0.0000	0.5190	0.0000	(262)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	461.8436	0.5190	239.6968	(264)
Space and water heating			1192.0801	(265)
Pumps and fans	32.1850	0.5190	16.7040	(267)
Energy for lighting	292.7191	0.5190	151.9212	(268)
Energy saving/generation technologies				
PV Unit	-1247.2082	0.5190	-647.3011	(269)
Total CO2, kg/year			713.4042	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			11.5600	(273)

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

DER		11.5600	ZC1
Total Floor Area	TFA	61.7000	
Assumed number of occupants	N	2.0293	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.0199	ZC2
CO2 emissions from cooking, equation (L16)		2.7180	ZC3
Total CO2 emissions		31.2979	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		31.2979	ZC8

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	61.7000 (1b)	x	2.4600 (2b)	=	151.7820	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	151.7820	(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) =	0.1318	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3818	(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) =	0.3245	(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	0.4137	0.4056	0.3975	0.3570	0.3488	0.3083	0.3083	0.3002	0.3245	0.3488	0.3651	0.3813	(22b)
Effective ac	0.5856	0.5823	0.5790	0.5637	0.5608	0.5475	0.5475	0.5450	0.5527	0.5608	0.5666	0.5727	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opening Type (Uw = 1.40)			9.6000	1.3258	12.7273			(27)
Heat Loss Floor 1			61.7000	0.1300	8.0210			(28a)
External Wall 1	41.8700	9.6000	32.2700	0.1800	5.8086			(29a)
Total net area of external elements Aum(A, m2)			103.5700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.5569			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.8923	(36)
Total fabric heat loss					(33) + (36) =		33.4492	(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	29.3311	29.1646	29.0015	28.2350	28.0916	27.4241	27.4241	27.3005	27.6812	28.0916	28.3817	28.6850	(38)
Heat transfer coeff	62.7803	62.6138	62.4506	61.6842	61.5408	60.8733	60.8733	60.7496	61.1304	61.5408	61.8309	62.1342	(39)
Average = Sum(39)m / 12 =												61.6835	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0175	1.0148	1.0122	0.9997	0.9974	0.9866	0.9866	0.9846	0.9908	0.9974	1.0021	1.0070	(40)
HLP (average)												0.9997	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.0293	(42)
Average daily hot water use (litres/day)	82.3952	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	90.6347	87.3389	84.0431	80.7472	77.4514	74.1556	74.1556	77.4514	80.7472	84.0431	87.3389	90.6347	(44)
Energy conte	134.4086	117.5546	121.3058	105.7574	101.4767	87.5667	81.1434	93.1132	94.2253	109.8105	119.8668	130.1675	(45)
Energy content (annual)										Total = Sum(45)m =		1296.3965	(45)
Distribution loss (46)m = 0.15 x (45)m	20.1613	17.6332	18.1959	15.8636	15.2215	13.1350	12.1715	13.9670	14.1338	16.4716	17.9800	19.5251	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage

	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
	181.0035	159.6403	167.9007	150.8492	148.0716	132.6585	127.7383	139.7081	139.3171	156.4054	164.9586	176.7624 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
									Solar input (sum of months) = Sum(63)m =			0.0000 (63)
Output from w/h												
	181.0035	159.6403	167.9007	150.8492	148.0716	132.6585	127.7383	139.7081	139.3171	156.4054	164.9586	176.7624 (64)
									Total per year (kWh/year) = Sum(64)m =			1845.0139 (64)
Heat gains from water heating, kWh/month												
	81.9668	72.7555	77.6101	71.2378	71.0169	65.1894	64.2561	68.2361	67.4034	73.7879	75.9292	80.5566 (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	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	16.5750	14.7217	11.9725	9.0640	6.7754	5.7201	6.1808	8.0340	10.7832	13.6918	15.9803	17.0356	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	177.2131	179.0520	174.4180	164.5527	152.0996	140.3954	132.5763	130.7374	135.3714	145.2367	157.6898	169.3940	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	(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)													
	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	(71)
Water heating gains (Table 5)													
	110.1704	108.2671	104.3147	98.9414	95.4529	90.5408	86.3657	91.7152	93.6158	99.1773	105.4572	108.2750	(72)
Total internal gains													
	360.3975	358.4799	347.1442	328.9971	310.7669	293.0954	281.5619	286.9256	296.2095	314.5448	335.5663	351.1437	(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	
West	9.6000	19.6403	0.6300	0.7000	0.7700	57.6223	(80)

Solar gains	57.6223	112.7214	185.6361	270.7391	331.8010	339.6573	323.3676	277.7680	215.9024	133.7534	71.8482	47.3858	(83)
Total gains	418.0198	471.2013	532.7803	599.7363	642.5679	632.7527	604.9295	564.6936	512.1119	448.2982	407.4145	398.5295	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.2495	68.4309	68.6097	69.4622	69.6241	70.3876	70.3876	70.5308	70.0915	69.6241	69.2974	68.9592	
alpha	5.5500	5.5621	5.5740	5.6308	5.6416	5.6925	5.6925	5.7021	5.6728	5.6416	5.6198	5.5973	
util living area													
	0.9963	0.9922	0.9779	0.9251	0.7962	0.6001	0.4404	0.4903	0.7571	0.9556	0.9920	0.9972	(86)
MIT	20.0143	20.1564	20.3996	20.7002	20.9050	20.9845	20.9977	20.9960	20.9466	20.6687	20.2878	19.9897	(87)
Th 2	20.0688	20.0710	20.0732	20.0835	20.0855	20.0945	20.0945	20.0962	20.0910	20.0855	20.0816	20.0775	(88)
util rest of house													
	0.9952	0.9897	0.9707	0.9018	0.7433	0.5219	0.3511	0.3964	0.6811	0.9367	0.9890	0.9963	(89)
MIT 2	18.7575	18.9657	19.3175	19.7420	19.9973	20.0848	20.0937	20.0946	20.0510	19.7098	19.1657	18.7281	(90)
Living area fraction									fLA = Living area / (4) =			0.4389	(91)
MIT	19.3091	19.4883	19.7924	20.1626	20.3957	20.4797	20.4905	20.4902	20.4441	20.1307	19.6582	19.2818	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3091	19.4883	19.7924	20.1626	20.3957	20.4797	20.4905	20.4902	20.4441	20.1307	19.6582	19.2818	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9939	0.9876	0.9680	0.9041	0.7623	0.5558	0.3903	0.4377	0.7123	0.9378	0.9871	0.9952	(94)
Useful gains	415.4515	465.3811	515.7452	542.1982	489.8195	351.7108	236.1319	247.1821	364.7652	420.4268	402.1781	396.6105	(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													
	942.2766	913.4301	830.1202	694.7219	535.1389	357.9150	236.8254	248.4772	387.8151	586.5253	776.4850	937.0967	(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													
	391.9579	301.0890	233.8950	109.8170	33.7177	0.0000	0.0000	0.0000	0.0000	123.5773	269.5009	402.1217	(98)
Space heating												1865.6765	(98)
Space heating per m2											(98) / (4) =	30.2379	(99)

8c. Space cooling requirement

Not applicable

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

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												93.5000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												1995.3760	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	391.9579	301.0890	233.8950	109.8170	33.7177	0.0000	0.0000	0.0000	0.0000	123.5773	269.5009	402.1217	(98)
Space heating efficiency (main heating system 1)													
	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)													
	419.2063	322.0203	250.1551	117.4514	36.0617	0.0000	0.0000	0.0000	0.0000	132.1682	288.2363	430.0767	(211)
Water heating requirement													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	181.0035	159.6403	167.9007	150.8492	148.0716	132.6585	127.7383	139.7081	139.3171	156.4054	164.9586	176.7624	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.8223	86.4821	85.6982	83.9832	81.5892	79.8000	79.8000	79.8000	79.8000	84.1936	86.1158	86.9404	(217)
Fuel for water heating, kWh/month													
	208.4758	184.5936	195.9209	179.6182	181.4843	166.2388	160.0731	175.0729	174.5829	185.7687	191.5544	203.3145	(219)
Water heating fuel used												2206.6980	(219)
Annual totals kWh/year													
Space heating fuel - main system												1995.3760	(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)												292.7191	(232)
Total delivered energy for all uses												4569.7930	(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	1995.3760	0.2160	431.0012	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2206.6980	0.2160	476.6468	(264)
Space and water heating			907.6480	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	292.7191	0.5190	151.9212	(268)
Total CO2, kg/m2/year			1098.4942	(272)
Emissions per m2 for space and water heating			14.7107	(272a)
Fuel factor (electricity)			1.5500	
Emissions per m2 for lighting			2.4623	(272b)
Emissions per m2 for pumps and fans			0.6309	(272c)
Target Carbon Dioxide Emission Rate (TER) = (14.7107 * 1.55) + 2.4623 + 0.6309, rounded to 2 d.p.			25.8900	(273)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	61.7000 (1b)	x	2.4600 (2b)	=	151.7820	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	151.7820	(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) =	0.1318	(8)
Pressure test		Yes	
Measured/design AP50		4.0000	
Infiltration rate		0.3318	(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) =	0.2820	(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	0.3596	0.3525	0.3455	0.3102	0.3032	0.2679	0.2679	0.2609	0.2820	0.3032	0.3173	0.3314	(22b)
Effective ac	0.5646	0.5621	0.5597	0.5481	0.5460	0.5359	0.5359	0.5340	0.5398	0.5460	0.5503	0.5549	(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	
Windows (Uw = 1.20)			9.6000	1.1450	10.9924			(27)
Heat Loss Floor 1			61.7000	0.1100	6.7870			(28a)
External Wall 1	41.8700	9.6000	32.2700	0.1800	5.8086			(29a)
Total net area of external elements Aum(A, m2)			103.5700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.5880			(33)
Party Wall 1			48.3900	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.2977	(36)
Total fabric heat loss					(33) + (36) =		32.8857	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.2817	28.1560	28.0327	27.4539	27.3456	26.8415	26.8415	26.7481	27.0357	27.3456	27.5647	27.7937	(38)
Heat transfer coeff	61.1674	61.0417	60.9184	60.3396	60.2313	59.7272	59.7272	59.6338	59.9214	60.2313	60.4504	60.6794	(39)
Average = Sum(39)m / 12 =												60.3391	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9914	0.9893	0.9873	0.9780	0.9762	0.9680	0.9680	0.9665	0.9712	0.9762	0.9797	0.9835	(40)
HLP (average)												0.9779	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.0293	(42)
Average daily hot water use (litres/day)	82.3952	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	90.6347	87.3389	84.0431	80.7472	77.4514	74.1556	74.1556	77.4514	80.7472	84.0431	87.3389	90.6347	(44)
Energy conte	134.4086	117.5546	121.3058	105.7574	101.4767	87.5667	81.1434	93.1132	94.2253	109.8105	119.8668	130.1675	(45)
Energy content (annual)										Total = Sum(45)m =		1296.3965	(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)
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)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Heat gains from water heating, kWh/month

	28.5618	24.9804	25.7775	22.4734	21.5638	18.6079	17.2430	19.7866	20.0229	23.3347	25.4717	27.6606 (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	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	16.5750	14.7217	11.9725	9.0640	6.7754	5.7201	6.1808	8.0340	10.7832	13.6918	15.9803	17.0356	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	177.2131	179.0520	174.4180	164.5527	152.0996	140.3954	132.5763	130.7374	135.3714	145.2367	157.6898	169.3940	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	(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)													
	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	(71)
Water heating gains (Table 5)													
	38.3896	37.1731	34.6472	31.2131	28.9836	25.8443	23.1760	26.5948	27.8096	31.3639	35.3773	37.1782	(72)
Total internal gains													
	285.6167	284.3860	274.4767	258.2689	241.2977	225.3989	215.3722	218.8053	227.4032	243.7314	262.4865	277.0469	(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	
West	9.6000	19.6403	0.6300	0.7000	0.7700	57.6223	(80)

Solar gains	57.6223	112.7214	185.6361	270.7391	331.8010	339.6573	323.3676	277.7680	215.9024	133.7534	71.8482	47.3858	(83)
Total gains	343.2389	397.1073	460.1128	529.0080	573.0987	565.0563	538.7398	496.5733	443.3057	377.4848	334.3347	324.4327	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.0491	70.1934	70.3354	71.0101	71.1378	71.7382	71.7382	71.8505	71.5058	71.1378	70.8800	70.6124	
alpha	5.6699	5.6796	5.6890	5.7340	5.7425	5.7825	5.7825	5.7900	5.7671	5.7425	5.7253	5.7075	
util living area													
	0.9986	0.9965	0.9881	0.9510	0.8418	0.6519	0.4838	0.5443	0.8210	0.9776	0.9969	0.9990	(86)
MIT	19.9361	20.0795	20.3276	20.6432	20.8778	20.9781	20.9966	20.9937	20.9221	20.5954	20.2036	19.9085	(87)
Th 2	20.0905	20.0922	20.0939	20.1017	20.1032	20.1101	20.1101	20.1113	20.1074	20.1032	20.1002	20.0971	(88)
util rest of house													
	0.9982	0.9954	0.9840	0.9340	0.7940	0.5715	0.3881	0.4434	0.7512	0.9668	0.9957	0.9987	(89)
MIT 2	19.1136	19.2579	19.5051	19.8161	20.0229	20.1003	20.1092	20.1095	20.0650	19.7772	19.3887	19.0915	(90)
Living area fraction									fLA = Living area / (4) =			0.4389	(91)
MIT	19.4746	19.6185	19.8661	20.1791	20.3981	20.4856	20.4987	20.4976	20.4412	20.1363	19.7464	19.4501	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4746	19.6185	19.8661	20.1791	20.3981	20.4856	20.4987	20.4976	20.4412	20.1363	19.7464	19.4501	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9978	0.9946	0.9827	0.9357	0.8109	0.6064	0.4303	0.4879	0.7794	0.9673	0.9950	0.9984	(94)
Useful gains	342.4698	394.9519	452.1571	494.9864	464.7388	342.6359	231.8200	242.2923	345.5208	365.1403	332.6764	323.9005	(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													
	928.1922	898.4413	814.2405	680.5768	523.9007	351.5298	232.8581	244.3540	379.9724	574.3830	764.4778	925.3677	(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													
	435.7775	338.3449	269.3900	133.6251	44.0165	0.0000	0.0000	0.0000	0.0000	155.6766	310.8970	447.4916	(98)
Space heating												2135.2191	(98)
Space heating per m2											(98) / (4) =	34.6065	(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	561.4354	441.9811	453.2170	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9412	0.9737	0.9605	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	528.4138	430.3586	435.3267	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	736.4824	704.2555	656.2645	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	149.8093	203.7793	164.3777	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												517.9664	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling kWh													

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

	0.0000	0.0000	0.0000	0.0000	0.0000	37.4523	50.9448	41.0944	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												129.4916 (107)
Space cooling per m2												2.0987 (108)
Energy for space heating												34.6065 (99)
Energy for space cooling												2.0987 (108)
Total												36.7052 (109)
Dwelling Fabric Energy Efficiency (DFEE)												36.7 (109)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	61.7000 (1b)	x	2.4600 (2b)	=	151.7820	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	151.7820	(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) =	0.1318	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3818	(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) =	0.3245	(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	0.4137	0.4056	0.3975	0.3570	0.3488	0.3083	0.3083	0.3002	0.3245	0.3488	0.3651	0.3813	(22b)
Effective ac	0.5856	0.5823	0.5790	0.5637	0.5608	0.5475	0.5475	0.5450	0.5527	0.5608	0.5666	0.5727	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opening Type (Uw = 1.40)			9.6000	1.3258	12.7273			(27)
Heat Loss Floor 1			61.7000	0.1300	8.0210			(28a)
External Wall 1	41.8700	9.6000	32.2700	0.1800	5.8086			(29a)
Total net area of external elements Aum(A, m2)			103.5700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.5569			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.8923	(36)
Total fabric heat loss					(33) + (36) =		33.4492	(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	29.3311	29.1646	29.0015	28.2350	28.0916	27.4241	27.4241	27.3005	27.6812	28.0916	28.3817	28.6850	(38)
Heat transfer coeff	62.7803	62.6138	62.4506	61.6842	61.5408	60.8733	60.8733	60.7496	61.1304	61.5408	61.8309	62.1342	(39)
Average = Sum(39)m / 12 =												61.6835	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0175	1.0148	1.0122	0.9997	0.9974	0.9866	0.9866	0.9846	0.9908	0.9974	1.0021	1.0070	(40)
HLP (average)												0.9997	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0293	(42)
Average daily hot water use (litres/day)												82.3952	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	90.6347	87.3389	84.0431	80.7472	77.4514	74.1556	74.1556	77.4514	80.7472	84.0431	87.3389	90.6347	(44)
Energy conte	134.4086	117.5546	121.3058	105.7574	101.4767	87.5667	81.1434	93.1132	94.2253	109.8105	119.8668	130.1675	(45)
Energy content (annual)										Total = Sum(45)m =		1296.3965	(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)
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													

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

	28.5618	24.9804	25.7775	22.4734	21.5638	18.6079	17.2430	19.7866	20.0229	23.3347	25.4717	27.6606 (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	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	(66)

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

	16.5750	14.7217	11.9725	9.0640	6.7754	5.7201	6.1808	8.0340	10.7832	13.6918	15.9803	17.0356	(67)

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

	177.2131	179.0520	174.4180	164.5527	152.0996	140.3954	132.5763	130.7374	135.3714	145.2367	157.6898	169.3940	(68)

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

	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	(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)

	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	(71)

Water heating gains (Table 5)

	38.3896	37.1731	34.6472	31.2131	28.9836	25.8443	23.1760	26.5948	27.8096	31.3639	35.3773	37.1782	(72)

Total internal gains

	285.6167	284.3860	274.4767	258.2689	241.2977	225.3989	215.3722	218.8053	227.4032	243.7314	262.4865	277.0469	(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	
West	9.6000	19.6403	0.6300	0.7000	0.7700	57.6223	(80)

Solar gains	57.6223	112.7214	185.6361	270.7391	331.8010	339.6573	323.3676	277.7680	215.9024	133.7534	71.8482	47.3858	(83)
Total gains	343.2389	397.1073	460.1128	529.0080	573.0987	565.0563	538.7398	496.5733	443.3057	377.4848	334.3347	324.4327	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.2495	68.4309	68.6097	69.4622	69.6241	70.3876	70.3876	70.5308	70.0915	69.6241	69.2974	68.9592	
alpha	5.5500	5.5621	5.5740	5.6308	5.6416	5.6925	5.6925	5.7021	5.6728	5.6416	5.6198	5.5973	
util living area	0.9986	0.9966	0.9886	0.9533	0.8489	0.6613	0.4924	0.5533	0.8282	0.9785	0.9970	0.9990	(86)
MIT	19.8993	20.0444	20.2963	20.6212	20.8656	20.9751	20.9960	20.9926	20.9143	20.5762	20.1770	19.8752	(87)
Th 2	20.0688	20.0710	20.0732	20.0835	20.0855	20.0945	20.0945	20.0962	20.0910	20.0855	20.0816	20.0775	(88)
util rest of house	0.9982	0.9954	0.9846	0.9368	0.8016	0.5793	0.3936	0.4495	0.7587	0.9680	0.9957	0.9987	(89)
MIT 2	19.0590	19.2055	19.4570	19.7795	19.9967	20.0834	20.0935	20.0941	20.0441	19.7437	19.3467	19.0420	(90)
Living area fraction									fLA = Living area / (4) =			0.4389	(91)
MIT	19.4278	19.5737	19.8254	20.1489	20.3781	20.4747	20.4896	20.4884	20.4261	20.1091	19.7111	19.4077	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4278	19.5737	19.8254	20.1489	20.3781	20.4747	20.4896	20.4884	20.4261	20.1091	19.7111	19.4077	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9977	0.9946	0.9832	0.9382	0.8179	0.6149	0.4372	0.4953	0.7865	0.9684	0.9951	0.9983	(94)
Useful gains	342.4658	394.9763	452.3912	496.3154	468.7429	347.4264	235.5365	245.9593	348.6728	365.5403	332.6913	323.8954	(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	949.7297	918.7758	832.1794	693.8816	534.0560	357.6140	236.7730	248.3719	386.7149	585.1962	779.7579	944.9176	(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	451.8044	351.9932	282.5625	142.2476	48.5930	0.0000	0.0000	0.0000	0.0000	163.4240	321.8879	462.0405	(98)
Space heating												2224.5531	(98)
Space heating per m2										(98) / (4) =		36.0543	(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	572.2087	450.4622	461.6973	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9350	0.9702	0.9559	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	534.9957	437.0331	441.3391	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	736.4824	704.2555	656.2645	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	145.0704	198.8135	159.9045	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												503.7884	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	36.2676	49.7034	39.9761	0.0000	0.0000	0.0000	0.0000	(107)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling	125.9471 (107)
Space cooling per m2	2.0413 (108)
Energy for space heating	36.0543 (99)
Energy for space cooling	2.0413 (108)
Total	38.0956 (109)
Target Fabric Energy Efficiency (TFEE)	43.8 (109)

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

Overheating Calculation Input Data

Dwelling type	MidTerrace Flat
Number of storeys	1
Cross ventilation possible	Yes
SAP Region	Thames Valley
Front of dwelling faces	East
Overshading	Average or unknown
Thermal mass parameter	250.0
Night ventilation	Yes
Ventilation rate during hot weather (ach)	3.00 (Windows half open)

Overheating Calculation

Summer ventilation heat loss coefficient	150.26 (P1)
Transmission heat loss coefficient	32.89 (37)
Summer heat loss coefficient	183.15 (P2)

Overhangs

Orientation	Ratio	Z_overhangs	Overhang type
West	0.000	1.000	None

Solar shading

Orientation	Z blinds	Solar access	Z overhangs	Z summer
West	0.850	0.90	1.000	0.765 (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
West	9.6000	117.5071	0.6300	0.7000	0.7650	342.5136
total:						342.5136

	Jun	Jul	Aug	
Solar gains	364	343	301	(P3)
Internal gains	354	339	347	
Total summer gains	718	682	648	(P5)
Summer gain/loss ratio	3.92	3.72	3.54	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 250.0)	0.25	0.25	0.25	
Threshold temperature	20.17	21.87	21.59	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	

Assessment of likelihood of high internal temperature: Slight

BASIC COMPLIANCE REPORT
Calculation Type: New Build (As Designed)

Darren Evans

Property Reference	DE-21912-Plot 17	**Issued on Date**	25/01/2023
Assessment Reference	Plot 17	**Prop Type Ref**	GF Flat
Property	Land at Tesco Extra Car Park, Plot 17, 1Bath, 2B3P, RG1		

SAP Rating	94 A	**DER**	11.56	**TER**	25.89
Environmental	95 A	**% DER<TER**	55.36		
CO_2 Emissions (t/year)	0.25	**DFEE**	36.71	**TFEE**	43.81
General Requirements Compliance	Pass	**% DFEE<TFEE**	16.22		

Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Electricity		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	25.89	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	11.56	$kgCO_2/m^2$	Pass
	-14.33 (-55.3%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	43.81	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	36.71	$kWh/m^2/yr$	
	-7.1 (-16.2%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	Pass
Openings	1.20 (max. 2.00)	1.20 (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	4.00 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system 1	Room heaters - Electric Panel, convector or radiant heaters	
Main heating system 2	Heat pump with warm air distribution - Electric Dimplex EDL200UK-630	

Secondary heating system	None		
5 Cylinder insulation			
Hot water storage	No cylinder		
6 Controls			
Space heating controls 1	Programmer and room thermostat		Pass
Hot water controls	No cylinder		
7 Low energy lights			
Percentage of fixed lights with low-energy fittings	100	%	
Minimum	75	%	Pass
8 Mechanical ventilation			
Continuous extract system (decentralised)			
Specific fan power	0.1600 0.1200		
Maximum	0.7		Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)	Slight	Pass

Based on:

Overshading	Average
Windows facing West	9.60 m², No overhang
Air change rate	3.00 ach
Blinds/curtains	Dark-coloured curtain or roller blind, closed 100% of daylight hours

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value		
Solid Wall	0.00	W/m²K	Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals	4.00 (design value)		
Maximum	10.0		Pass

10 Key features

Party wall U-value	0.00	W/m²K
Floor U-value	0.11	W/m²K
Photovoltaic array	1.64	kW

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BLOCK COMPLIANCE
Calculation Type: New Build (As Designed)

Darren Evans

Block Reference	4 PV planel per falt	**Issued on Date**	25/01/2023
Block Name	335		
Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

Block Compliance Report - DER

Block Reference: 4 PV planel per falt		Block Name: 335			
Property-Assessment Reference	**Multiplier**	**Floor Area (m^2)**	**DER ($kgCO_2/m^2$)**	**TER ($kgCO_2/m^2$)**	**% DER/TER**
DE-21912-Plot 20-Plot 20	1	61.7	9.39	24.71	62.00 %
DE-21912-Plot 17-Plot 17	1	61.7	11.56	25.89	55.36 %
DE-21912- Plot 07-Plot 07	1	50.76	8.84	26.11	66.14 %
DE-21912 - Plot 05-Plot 05	1	65.09	12.75	26.21	51.36 %
DE-21912-Plot 40-Plot 40	1	61.7	6.66	21.38	68.85 %
DE-21912-Plot 27-Plot 27	1	62.48	6.76	20.78	67.47 %
DE-21912-Plot 25-Plot 25	1	65.09	9.65	22.66	57.41 %
DE-21912-Plot 67-Plot 67	1	62.48	13.70	25.47	46.21 %
DE-21912-Plot 80-Plot 80	1	61.7	15.75	27.54	42.81 %
DE-21912-Plot 65-Plot 65	1	65.09	17.89	28.43	37.07 %
DE-21912-Plot 77-Plot 77	1	61.7	20.17	30.69	34.27 %
DE-21912-Plot 37-Plot 37	1	61.7	11.61	24.84	53.25 %
Totals:	12	741.19	144.73	304.71	
Average DER = 12.12 $kgCO_2/m^2$		**% DER/TER**	PASS		
Average TER = 25.38 $kgCO_2/m^2$		52.25 %			

Block Compliance Report - DFEE

Block Reference: 4 PV planel per falt		Block Name: 335			
Property-Assessment Reference	**Multiplier**	**Floor Area (m^2)**	**DFEE ($kWh/m^2/yr$)**	**TFEE ($kWh/m^2/yr$)**	**% DFEE/TFEE**
DE-21912-Plot 20-Plot 20	1	61.7	32.22	39.28	17.99 %
DE-21912-Plot 17-Plot 17	1	61.7	36.71	43.81	16.22 %
DE-21912- Plot 07-Plot 07	1	50.76	34.10	38.48	11.38 %
DE-21912 - Plot 05-Plot 05	1	65.09	38.23	46.52	17.82 %
DE-21912-Plot 40-Plot 40	1	61.7	26.99	27.95	3.45 %
DE-21912-Plot 27-Plot 27	1	62.48	26.37	26.48	0.39 %
DE-21912-Plot 25-Plot 25	1	65.09	32.34	34.66	6.71 %
DE-21912-Plot 67-Plot 67	1	62.48	39.57	42.27	6.38 %
DE-21912-Plot 80-Plot 80	1	61.7	44.07	48.37	8.88 %
DE-21912-Plot 65-Plot 65	1	65.09	48.15	53.91	10.69 %
DE-21912-Plot 77-Plot 77	1	61.7	52.85	59.27	10.83 %
DE-21912-Plot 37-Plot 37	1	61.7	36.79	40.29	8.69 %
Totals:	12	741.19	448.37	501.28	
Average DFEE = 37.43 $kWh/m^2/yr$		**% DFEE/TFEE**	PASS		
Average TFEE = 41.85 $kWh/m^2/yr$		10.56 %			

PREDICTED ENERGY ASSESSMENT

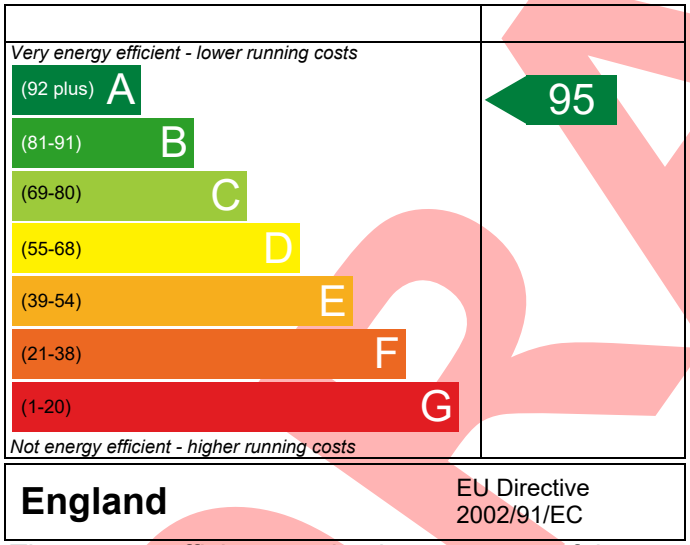
Land at Tesco Extra Car Park,
Plot 20,
1Bath,
2B3P,
RG1

Dwelling type:	Flat, Mid-Terrace
Date of assessment:	25/01/2023
Produced by:	Charles Sims
Total floor area:	61.7 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 (CO_2) emissions.

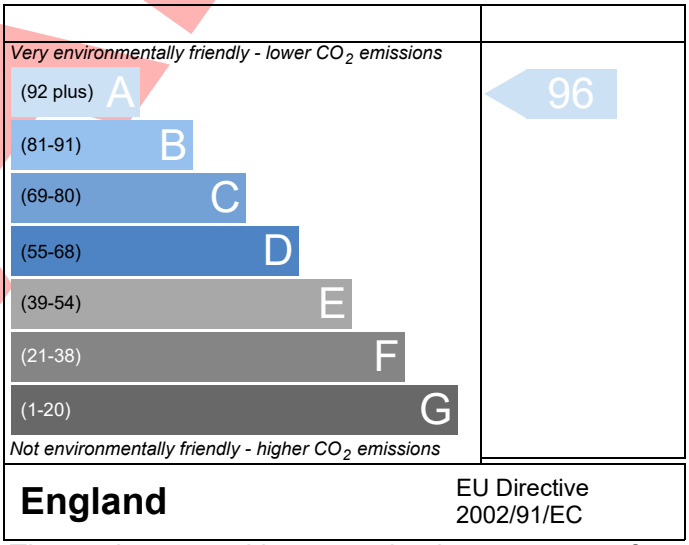
Energy Efficiency Rating



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 (CO_2) 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 (CO_2) emissions. The higher the rating the less impact it has on the environment.

DRAFT

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BUILDING REGULATION COMPLIANCE
Calculation Type: New Build (As Designed)

Darren Evans

Property Reference	DE-21912-Plot 20	**Issued on Date**	25/01/2023
Assessment Reference	Plot 20	**Prop Type Ref**	GF Flat
Property	Land at Tesco Extra Car Park, Plot 20, 1Bath, 2B3P, RG1		

SAP Rating	95 A	**DER**	9.39	**TER**	24.71
Environmental	96 A	**% DER<TER**	62.00		
CO_2 Emissions (t/year)	0.15	**DFEE**	32.22	**TFEE**	39.28
General Requirements Compliance	Pass	**% DFEE<TFEE**	17.99		

Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Electricity		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	24.71	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	9.39	$kgCO_2/m^2$	Pass
	-15.32 (-62.0%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	39.28	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	32.22	$kWh/m^2/yr$	
	-7.1 (-18.1%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	Pass
Openings	1.20 (max. 2.00)	1.20 (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	4.00 (design value)	$m^3/(h.m^2)$ @ 50 Pa	
Maximum	10.0	$m^3/(h.m^2)$ @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system 1	Room heaters - Electric Panel, convector or radiant heaters	

DRAFT

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

Main heating system 2	Heat pump with warm air distribution - Electric Dimplex EDL200UK-630		
Secondary heating system	None		
5 Cylinder insulation			
Hot water storage	No cylinder		
6 Controls			
Space heating controls 1	Programmer and room thermostat		Pass
Hot water controls	No cylinder		
7 Low energy lights			
Percentage of fixed lights with low-energy fittings	100	%	
Minimum	75	%	Pass
8 Mechanical ventilation			
Continuous extract system (decentralised)			
Specific fan power	0.1600 0.1200		
Maximum	0.7		Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)	Slight		Pass
Based on:			
Overshading	Average		
Windows facing South	9.60 m², No overhang		
Air change rate	3.00 ach		
Blinds/curtains	Dark-coloured curtain or roller blind, closed 100% of daylight hours		

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value		
Filled Cavity with Edge Sealing	0.00	W/m²K	Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals	4.00 (design value)	m³/(h.m²) @ 50 Pa	
Maximum	10.0	m³/(h.m²) @ 50 Pa	Pass

10 Key features

Party wall U-value	0.00	W/m²K
Floor U-value	0.11	W/m²K
Photovoltaic array	1.64	kW

DRAFT

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

	Typical cost	Typical savings per year	Energy efficiency	Environmental impact	Result
Low energy lights			0	0	Already installed
Solar water heating			0	0	Not applicable
Photovoltaic			0	0	Not applicable
Wind turbine			0	0	Not applicable
Totals	**£0**	**£0**	**A 95**	**A 96**	

DRAFT

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

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

Darren Evans

Property Reference	DE-21912-Plot 20	**Issued on Date**	25/01/2023
Assessment Reference	Plot 20	**Prop Type Ref**	GF Flat
Property	Land at Tesco Extra Car Park, Plot 20, 1Bath, 2B3P, RG1		

SAP Rating	95 A	**DER**	9.39	**TER**	24.71
Environmental	96 A	**% DER<TER**	62.00		
CO_2 Emissions (t/year)	0.15	**DFEE**	32.22	**TFEE**	39.28
General Requirements Compliance	Pass	**% DFEE<TFEE**	17.99		

Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

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

Orientation	North
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	Flat, Mid-Terrace
2.0 Number of Storeys	1
3.0 Date Built	2023
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	20.33 m	61.70 m²	2.46 m

7.0 Living Area	27.08	m²
8.0 Thermal Mass Parameter	Simple calculation - Medium	
Thermal Mass	250.00	kJ/m²K

9.0 External Walls

Description	Type	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Wall 1	Cavity Wall	0.18	50.02	40.42

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall 1	Filled Cavity with Edge Sealing		0.00	40.23

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Heat Loss Floor 1	Ground Floor - Solid		0.11	61.70

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Windows	Manufacturer	Window	Double glazed			0.63		0.70	1.20

13.0 Openings

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

Darren Evans

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
S Windows	Window	[1] External Wall 1	South	Dark-coloured curtain or roller blind	0.00					9.60	100

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	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	5.00	0.021	No	CBA-313
Independently assessed	E3 Sill	1.00	0.021	No	CBA-314
Independently assessed	E4 Jamb	15.00	0.017	No	CBA-315
Independently assessed	E5 Ground floor (normal)	20.33	0.057	No	CBA-301
Table K1 - Approved	E7 Party floor between dwellings (in blocks of flats)	17.09	0.070	No	
Table K1 - Default	E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.24	1.000	No	
Independently assessed	E16 Corner (normal)	7.38	0.046	No	CBA-316
Independently assessed	E17 Corner (inverted – internal area greater than external area)	4.92	-0.040	No	
Table K1 - Approved	E18 Party wall between dwellings	2.46	0.060	No	
Table K1 - Default	E25 Staggered party wall between dwellings	2.46	0.120	No	
Table K1 - Default	P1 Party wall - Ground floor	16.36	0.160	No	

Y-value	0.082	W/m²K
18.0 Pressure Testing	Yes	
Designed AP_{50}	4.00	m³/(h.m²) @ 50 Pa
Property Tested ?		
As Built AP_{50}		m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Windows half open
Cross ventilation possible	Yes
Night Ventilation	No
Air change rate	3.00

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - decentralised
MV Reference Number	500661
Duct Type	Flexible

19.1 Mechanical extract ventilation - Decentralised

SFP	Fan/Room Type	Count
0.16	In Room Fan Other Wet Room	1

0.12	Through Wall Fan Kitchen	1

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				0
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	10	
Total number of L.E.L. fittings	10	
Percentage of L.E.L. fittings	100.00	%
External		
External lights fitted	No	
23.0 Electricity Tariff	Standard	
24.0 Main Heating 1	SAP table	
Percentage of Heat	100	%
Main Heating	REA	
SAP Code	691	
Efficiency (SAP Table)	100.0	%
Controls	CRD Programmer and room thermostat	
Sap Code	2605	
25.0 Main Heating 2	Database	
Percentage of Heat	0	%
Database Ref. No.	190006	
Fuel Type	Electricity	
Main Heating	PEH	
SAP Code	524	
In Summer	367.8	
Controls	CWD Time and temperature zone control	
Sap Code	0	
Community Heating	None	
28.0 Water Heating	HWP From main heating 1	
Water Heating	Main Heating 2	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	

Water use <= 125 litres/person/day	Yes	
SAP Code	914	
Immersion Only Heating Hot Water	Yes	
29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	201.00	L
Loss	1.610	kWh/day
32.0 Photovoltaic Unit	One Dwelling	

PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
1.64	Horizontal	Horizontal	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

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

Darren Evans

Property Reference	DE-21912-Plot 20	**Issued on Date**	25/01/2023
Assessment Reference	Plot 20	**Prop Type Ref**	GF Flat
Property	Land at Tesco Extra Car Park, Plot 20, 1Bath, 2B3P, RG1		

SAP Rating	95 A	**DER**	9.39	**TER**	24.71
Environmental	96 A	**% DER<TER**	62.00		
CO_2 Emissions (t/year)	0.15	**DFEE**	32.22	**TFEE**	39.28
General Requirements Compliance	Pass	**% DFEE<TFEE**	17.99		

Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

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

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

DWELLING AS DESIGNED

Ground-floor flat, total floor area 62 m²

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

1a TER and DER
Fuel for main heating:Electricity
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 24.71 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 9.39 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)39.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)32.2 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.20 (max. 2.00)	1.20 (max. 3.30)	OK

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

3 Air permeability
Air permeability at 50 pascals: 4.00 (design value)
Maximum 10.0 OK

4 Heating efficiency
Main heating system 1: Room heaters - Electric
Panel, convector or radiant heaters

Main heating system 2: Heat pump with warm air distribution - Electric
Dimplex EDL200UK-630

Secondary heating system: None

5 Cylinder insulation
Hot water storage No cylinder

6 Controls
Space heating controls 1: Programmer and room thermostat OK

Hot water controls: No cylinder

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

8 Mechanical ventilation
Continuous extract system (decentralised)
Specific fan power: 0.1600 0.1200
Maximum 0.7 OK

9 Summertime temperature
Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing South: 9.60 m², No overhang
Air change rate: 3.00 ach
Blinds/curtains: Dark-coloured curtain or roller blind, closed 100% of daylight hours

10 Key features
Party wall U-value 0.00 W/m²K
Floor U-value 0.11 W/m²K
Photovoltaic array 1.64 kW

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	61.7000 (1b)	x	2.4600 (2b)	=	151.7820	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	151.7820	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		4.0000	
Infiltration rate		0.2000	(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) =	0.1700	(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	0.2168	0.2125	0.2083	0.1870	0.1828	0.1615	0.1615	0.1573	0.1700	0.1828	0.1913	0.1998	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation:												0.5000	(23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(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	
Windows (Uw = 1.20)			9.6000	1.1450	10.9924			(27)
Heat Loss Floor 1			61.7000	0.1100	6.7870			(28a)
External Wall 1	50.0200	9.6000	40.4200	0.1800	7.2756			(29a)
Total net area of external elements Aum(A, m2)			111.7200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.0550			(33)
Party Wall 1			40.2300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	9.1792	(36)
Total fabric heat loss (33) + (36) =	34.2342	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	25.0440	25.0440	25.0440	25.0440	25.0440	25.0440	25.0440	25.0440	25.0440	25.0440	25.0440	25.0440	(38)
Heat transfer coeff	59.2782	59.2782	59.2782	59.2782	59.2782	59.2782	59.2782	59.2782	59.2782	59.2782	59.2782	59.2782	(39)
Average = Sum(39)m / 12 =												59.2782	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9607	0.9607	0.9607	0.9607	0.9607	0.9607	0.9607	0.9607	0.9607	0.9607	0.9607	0.9607	(40)
HLP (average)												0.9607	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.0293	(42)
Average daily hot water use (litres/day)	82.3952	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	90.6347	87.3389	84.0431	80.7472	77.4514	74.1556	74.1556	77.4514	80.7472	84.0431	87.3389	90.6347	(44)
Energy conte	134.4086	117.5546	121.3058	105.7574	101.4767	87.5667	81.1434	93.1132	94.2253	109.8105	119.8668	130.1675	(45)
Energy content (annual)										Total = Sum(45)m =		1296.3965	(45)
Distribution loss (46)m = 0.15 x (45)m	20.1613	17.6332	18.1959	15.8636	15.2215	13.1350	12.1715	13.9670	14.1338	16.4716	17.9800	19.5251	(46)
Water storage loss:													
Store volume												201.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)
Total storage loss
26.9514 24.3432 26.9514 26.0820 26.9514 26.0820 26.9514 26.9514 26.0820 26.9514 26.0820 26.9514 (56)
If cylinder contains dedicated solar storage
26.9514 24.3432 26.9514 26.0820 26.9514 26.0820 26.9514 26.9514 26.0820 26.9514 26.0820 26.9514 (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)
Total heat required for water heating calculated for each month
161.3600 141.8978 148.2572 131.8394 128.4281 113.6487 108.0948 120.0646 120.3073 136.7619 145.9488 157.1189 (62)
Solar input 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)
Output from w/h
161.3600 141.8978 148.2572 131.8394 128.4281 113.6487 108.0948 120.0646 120.3073 136.7619 145.9488 157.1189 (64)
Total per year (kWh/year) = Sum(64)m = 1613.7275 (64)
Heat gains from water heating, kWh/month
44.6909 39.0869 40.3342 35.1643 33.7410 29.1159 26.9802 30.9602 31.3299 36.5120 39.8557 43.2807 (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	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
16.5750 14.7217 11.9725 9.0640 6.7754 5.7201 6.1808 8.0340 10.7832 13.6918 15.9803 17.0356 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
177.2131 179.0520 174.4180 164.5527 152.0996 140.3954 132.5763 130.7374 135.3714 145.2367 157.6898 169.3940 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
33.1463 33.1463 33.1463 33.1463 33.1463 33.1463 33.1463 33.1463 33.1463 33.1463 33.1463 33.1463 (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)
-81.1708 -81.1708 -81.1708 -81.1708 -81.1708 -81.1708 -81.1708 -81.1708 -81.1708 -81.1708 -81.1708 -81.1708 (71)
Water heating gains (Table 5)
60.0684 58.1650 54.2126 48.8393 45.3508 40.4388 36.2637 41.6131 43.5138 49.0753 55.3551 58.1730 (72)
Total internal gains
307.2955 305.3778 294.0422 275.8951 257.6649 239.9934 228.4598 233.8236 243.1074 261.4428 282.4643 298.0417 (73)

---
6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	9.6000	46.7521	0.6300	0.7000	0.7700	137.1652	(78)

Solar gains	137.1652	224.6412	286.1531	323.4151	337.0185	324.3345	316.8945	307.7485	298.9206	242.2966	162.5875	118.5233	(83)
Total gains	444.4606	530.0191	580.1952	599.3102	594.6834	564.3278	545.3543	541.5720	542.0281	503.7394	445.0518	416.5650	(84)

---
7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	72.2816	72.2816	72.2816	72.2816	72.2816	72.2816	72.2816	72.2816	72.2816	72.2816	72.2816	72.2816	
alpha	5.8188	5.8188	5.8188	5.8188	5.8188	5.8188	5.8188	5.8188	5.8188	5.8188	5.8188	5.8188	
util living area	0.9948	0.9852	0.9646	0.9181	0.8191	0.6489	0.4748	0.4988	0.7124	0.9245	0.9870	0.9963	(86)
MIT	20.1364	20.3187	20.5272	20.7367	20.8989	20.9792	20.9970	20.9960	20.9640	20.7623	20.3936	20.0843	(87)
Th 2	20.1162	20.1162	20.1162	20.1162	20.1162	20.1162	20.1162	20.1162	20.1162	20.1162	20.1162	20.1162	(88)
util rest of house	0.9931	0.9808	0.9540	0.8938	0.7693	0.5690	0.3813	0.4055	0.6371	0.8970	0.9824	0.9952	(89)
MIT 2	18.9706	19.2338	19.5305	19.8178	20.0205	20.1026	20.1151	20.1146	20.0900	19.8570	19.3441	18.8949	(90)
Living area fraction									fLA = Living area / (4) =			0.4389	(91)
MIT	19.4822	19.7099	19.9680	20.2211	20.4060	20.4873	20.5022	20.5014	20.4736	20.2543	19.8047	19.4169	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4822	19.7099	19.9680	20.2211	20.4060	20.4873	20.5022	20.5014	20.4736	20.2543	19.8047	19.4169	(93)

---
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9916	0.9783	0.9519	0.8970	0.7867	0.6035	0.4225	0.4466	0.6688	0.9019	0.9803	0.9940	(94)
Useful gains	440.7213	518.5058	552.2805	537.5769	467.8317	340.5437	230.4046	241.8521	362.4914	454.3116	436.2801	414.0506	(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	899.9757	877.9064	798.3557	671.0938	516.0771	348.9890	231.3133	243.1255	377.8150	572.2910	753.1121	902.0323	(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	341.6853	241.5172	183.0799	96.1321	35.8946	0.0000	0.0000	0.0000	0.0000	87.7767	228.1191	363.0584	(98)
Space heating												1577.2633	(98)
Space heating per m2											(98) / (4) =	25.5634	(99)

8c. Space cooling requirement

Not applicable

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	1577.2633	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	341.6853	241.5172	183.0799	96.1321	35.8946	0.0000	0.0000	0.0000	0.0000	87.7767	228.1191	363.0584	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	341.6853	241.5172	183.0799	96.1321	35.8946	0.0000	0.0000	0.0000	0.0000	87.7767	228.1191	363.0584	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
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)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	161.3600	141.8978	148.2572	131.8394	128.4281	113.6487	108.0948	120.0646	120.3073	136.7619	145.9488	157.1189	(64)
Efficiency of water heater												349.4100	(216)
(217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	(217)
Fuel for water heating, kWh/month	46.1807	40.6107	42.4307	37.7320	36.7557	32.5259	30.9364	34.3621	34.4316	39.1408	41.7701	44.9669	(219)
Water heating fuel used												461.8436	(219)
Annual totals kWh/year													
Space heating fuel - main system												1577.2633	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.6500, total flow = 21.0000, SFP = 0.1738)													
mechanical ventilation fans (SFP = 0.1738)												32.1850	(230a)
Total electricity for the above, kWh/year												32.1850	(231)
Electricity for lighting (calculated in Appendix L)												292.7191	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.64 * 951 * 1.00) =												-1247.2082	(233)
Total delivered energy for all uses												1116.8027	(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	1577.2633	0.5190	818.5997	(261)
Space heating - main system 2	0.0000	0.5190	0.0000	(262)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	461.8436	0.5190	239.6968	(264)
Space and water heating			1058.2965	(265)
Pumps and fans	32.1850	0.5190	16.7040	(267)
Energy for lighting	292.7191	0.5190	151.9212	(268)
Energy saving/generation technologies				
PV Unit	-1247.2082	0.5190	-647.3011	(269)
Total CO2, kg/year			579.6206	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			9.3900	(273)

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

DER		9.3900	ZC1
Total Floor Area	TFA	61.7000	
Assumed number of occupants	N	2.0293	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.0199	ZC2
CO2 emissions from cooking, equation (L16)		2.7180	ZC3
Total CO2 emissions		29.1279	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		29.1279	ZC8

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	61.7000 (1b)	x	2.4600 (2b)	=	151.7820	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	151.7820	(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) =	0.1318	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3818	(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) =	0.3245	(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	0.4137	0.4056	0.3975	0.3570	0.3488	0.3083	0.3083	0.3002	0.3245	0.3488	0.3651	0.3813	(22b)
Effective ac	0.5856	0.5823	0.5790	0.5637	0.5608	0.5475	0.5475	0.5450	0.5527	0.5608	0.5666	0.5727	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opening Type (Uw = 1.40)			9.6000	1.3258	12.7273			(27)
Heat Loss Floor 1			61.7000	0.1300	8.0210			(28a)
External Wall 1	50.0200	9.6000	40.4200	0.1800	7.2756			(29a)
Total net area of external elements Aum(A, m2)			111.7200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.0239			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	7.3893	(36)
Total fabric heat loss (33) + (36) =	35.4132	(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	29.3311	29.1646	29.0015	28.2350	28.0916	27.4241	27.4241	27.3005	27.6812	28.0916	28.3817	28.6850	(38)
Heat transfer coeff	64.7443	64.5778	64.4146	63.6482	63.5048	62.8373	62.8373	62.7136	63.0944	63.5048	63.7949	64.0982	(39)
Average = Sum(39)m / 12 =												63.6475	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0493	1.0466	1.0440	1.0316	1.0293	1.0184	1.0184	1.0164	1.0226	1.0293	1.0340	1.0389	(40)
HLP (average)												1.0316	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.0293	(42)
Average daily hot water use (litres/day)	82.3952	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	90.6347	87.3389	84.0431	80.7472	77.4514	74.1556	74.1556	77.4514	80.7472	84.0431	87.3389	90.6347	(44)
Energy conte	134.4086	117.5546	121.3058	105.7574	101.4767	87.5667	81.1434	93.1132	94.2253	109.8105	119.8668	130.1675	(45)
Energy content (annual)										Total = Sum(45)m =		1296.3965	(45)
Distribution loss (46)m = 0.15 x (45)m	20.1613	17.6332	18.1959	15.8636	15.2215	13.1350	12.1715	13.9670	14.1338	16.4716	17.9800	19.5251	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage

	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
	181.0035	159.6403	167.9007	150.8492	148.0716	132.6585	127.7383	139.7081	139.3171	156.4054	164.9586	176.7624 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
								Solar input (sum of months) = Sum(63)m =				0.0000 (63)
Output from w/h												
	181.0035	159.6403	167.9007	150.8492	148.0716	132.6585	127.7383	139.7081	139.3171	156.4054	164.9586	176.7624 (64)
									Total per year (kWh/year) = Sum(64)m =			1845.0139 (64)
Heat gains from water heating, kWh/month												
	81.9668	72.7555	77.6101	71.2378	71.0169	65.1894	64.2561	68.2361	67.4034	73.7879	75.9292	80.5566 (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	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	16.5750	14.7217	11.9725	9.0640	6.7754	5.7201	6.1808	8.0340	10.7832	13.6918	15.9803	17.0356	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	177.2131	179.0520	174.4180	164.5527	152.0996	140.3954	132.5763	130.7374	135.3714	145.2367	157.6898	169.3940	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	(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)													
	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	(71)
Water heating gains (Table 5)													
	110.1704	108.2671	104.3147	98.9414	95.4529	90.5408	86.3657	91.7152	93.6158	99.1773	105.4572	108.2750	(72)
Total internal gains													
	360.3975	358.4799	347.1442	328.9971	310.7669	293.0954	281.5619	286.9256	296.2095	314.5448	335.5663	351.1437	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	9.6000	46.7521	0.6300	0.7000	0.7700	137.1652	(78)

Solar gains	137.1652	224.6412	286.1531	323.4151	337.0185	324.3345	316.8945	307.7485	298.9206	242.2966	162.5875	118.5233	(83)
Total gains	497.5627	583.1211	633.2973	652.4122	647.7855	617.4299	598.4564	594.6741	595.1301	556.8414	498.1539	469.6670	(84)

---

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	66.1792	66.3498	66.5178	67.3188	67.4708	68.1876	68.1876	68.3220	67.9097	67.4708	67.1640	66.8462	
alpha	5.4119	5.4233	5.4345	5.4879	5.4981	5.5458	5.5458	5.5548	5.5273	5.4981	5.4776	5.4564	
util living area													
	0.9919	0.9804	0.9575	0.9067	0.8045	0.6289	0.4585	0.4806	0.6914	0.9084	0.9809	0.9939	(86)
MIT	20.0887	20.2740	20.4915	20.7221	20.8919	20.9784	20.9968	20.9958	20.9628	20.7593	20.3810	20.0522	(87)
Th 2	20.0424	20.0446	20.0468	20.0571	20.0590	20.0680	20.0680	20.0697	20.0645	20.0590	20.0551	20.0511	(88)
util rest of house													
	0.9893	0.9746	0.9450	0.8793	0.7513	0.5467	0.3633	0.3858	0.6129	0.8763	0.9742	0.9920	(89)
MIT 2	18.8456	19.1138	19.4236	19.7462	19.9583	20.0542	20.0668	20.0680	20.0381	19.8020	19.2781	18.7993	(90)
Living area fraction									fLA = Living area / (4) =			0.4389	(91)
MIT	19.3912	19.6230	19.8923	20.1746	20.3680	20.4598	20.4750	20.4752	20.4440	20.2222	19.7622	19.3492	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3912	19.6230	19.8923	20.1746	20.3680	20.4598	20.4750	20.4752	20.4440	20.2222	19.7622	19.3492	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9871	0.9715	0.9426	0.8831	0.7699	0.5822	0.4052	0.4275	0.6460	0.8825	0.9716	0.9901	(94)
Useful gains	491.1451	566.4927	596.9289	576.1704	498.7027	359.4641	242.5049	254.2288	384.4485	491.4368	484.0159	465.0163	(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													
	977.0698	950.7794	862.6594	717.6053	550.4625	368.2164	243.4933	255.5715	400.2695	611.0553	807.7808	971.0352	(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													
	361.5279	258.2407	197.7035	101.8331	38.5093	0.0000	0.0000	0.0000	0.0000	88.9961	233.1107	376.4781	(98)
Space heating												1656.3994	(98)
Space heating per m2											(98) / (4) =	26.8460	(99)

8c. Space cooling requirement

Not applicable

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

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												93.5000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												1771.5502	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	361.5279	258.2407	197.7035	101.8331	38.5093	0.0000	0.0000	0.0000	0.0000	88.9961	233.1107	376.4781	(98)
Space heating efficiency (main heating system 1)													
	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)													
	386.6609	276.1932	211.4476	108.9124	41.1864	0.0000	0.0000	0.0000	0.0000	95.1830	249.3163	402.6503	(211)
Water heating requirement													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	181.0035	159.6403	167.9007	150.8492	148.0716	132.6585	127.7383	139.7081	139.3171	156.4054	164.9586	176.7624	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.6249	86.0901	85.2505	83.7926	81.7960	79.8000	79.8000	79.8000	79.8000	83.3749	85.7361	86.7822	(217)
Fuel for water heating, kWh/month													
	208.9509	185.4339	196.9499	180.0269	181.0254	166.2388	160.0731	175.0729	174.5829	187.5929	192.4027	203.6852	(219)
Water heating fuel used												2212.0354	(219)
Annual totals kWh/year													
Space heating fuel - main system												1771.5502	(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)												292.7191	(232)
Total delivered energy for all uses												4351.3047	(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	1771.5502	0.2160	382.6548	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2212.0354	0.2160	477.7997	(264)
Space and water heating			860.4545	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	292.7191	0.5190	151.9212	(268)
Total CO2, kg/m2/year			1051.3007	(272)
Emissions per m2 for space and water heating			13.9458	(272a)
Fuel factor (electricity)			1.5500	
Emissions per m2 for lighting			2.4623	(272b)
Emissions per m2 for pumps and fans			0.6309	(272c)
Target Carbon Dioxide Emission Rate (TER) = (13.9458 * 1.55) + 2.4623 + 0.6309, rounded to 2 d.p.			24.7100	(273)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	61.7000 (1b)	x	2.4600 (2b)	=	151.7820	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	151.7820	(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) =	0.1318	(8)
Pressure test		Yes	
Measured/design AP50		4.0000	
Infiltration rate		0.3318	(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) =	0.2820	(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	0.3596	0.3525	0.3455	0.3102	0.3032	0.2679	0.2679	0.2609	0.2820	0.3032	0.3173	0.3314	(22b)
Effective ac	0.5646	0.5621	0.5597	0.5481	0.5460	0.5359	0.5359	0.5340	0.5398	0.5460	0.5503	0.5549	(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	
Windows (Uw = 1.20)			9.6000	1.1450	10.9924			(27)
Heat Loss Floor 1			61.7000	0.1100	6.7870			(28a)
External Wall 1	50.0200	9.6000	40.4200	0.1800	7.2756			(29a)
Total net area of external elements Aum(A, m2)			111.7200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		25.0550			(33)
Party Wall 1			40.2300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	9.1792	(36)
Total fabric heat loss (33) + (36) =	34.2342	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.2817	28.1560	28.0327	27.4539	27.3456	26.8415	26.8415	26.7481	27.0357	27.3456	27.5647	27.7937	(38)
Heat transfer coeff	62.5158	62.3901	62.2669	61.6881	61.5798	61.0756	61.0756	60.9823	61.2698	61.5798	61.7989	62.0279	(39)
Average = Sum(39)m / 12 =												61.6876	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0132	1.0112	1.0092	0.9998	0.9981	0.9899	0.9899	0.9884	0.9930	0.9981	1.0016	1.0053	(40)
HLP (average)												0.9998	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.0293 (42)
Average daily hot water use (litres/day)	82.3952 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	90.6347	87.3389	84.0431	80.7472	77.4514	74.1556	74.1556	77.4514	80.7472	84.0431	87.3389	90.6347	(44)
Energy conte	134.4086	117.5546	121.3058	105.7574	101.4767	87.5667	81.1434	93.1132	94.2253	109.8105	119.8668	130.1675	(45)
Energy content (annual)										Total = Sum(45)m =		1296.3965	(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)
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)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Heat gains from water heating, kWh/month

	28.5618	24.9804	25.7775	22.4734	21.5638	18.6079	17.2430	19.7866	20.0229	23.3347	25.4717	27.6606 (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	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	16.5750	14.7217	11.9725	9.0640	6.7754	5.7201	6.1808	8.0340	10.7832	13.6918	15.9803	17.0356	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	177.2131	179.0520	174.4180	164.5527	152.0996	140.3954	132.5763	130.7374	135.3714	145.2367	157.6898	169.3940	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	(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)													
	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	(71)
Water heating gains (Table 5)													
	38.3896	37.1731	34.6472	31.2131	28.9836	25.8443	23.1760	26.5948	27.8096	31.3639	35.3773	37.1782	(72)
Total internal gains													
	285.6167	284.3860	274.4767	258.2689	241.2977	225.3989	215.3722	218.8053	227.4032	243.7314	262.4865	277.0469	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	9.6000	46.7521	0.6300	0.7000	0.7700	137.1652	(78)

Solar gains	137.1652	224.6412	286.1531	323.4151	337.0185	324.3345	316.8945	307.7485	298.9206	242.2966	162.5875	118.5233	(83)
Total gains	422.7818	509.0272	560.6298	581.6839	578.3162	549.7334	532.2667	526.5538	526.3239	486.0280	425.0740	395.5702	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	68.5382	68.6763	68.8122	69.4579	69.5800	70.1544	70.1544	70.2618	69.9320	69.5800	69.3334	69.0773	
alpha	5.5692	5.5784	5.5875	5.6305	5.6387	5.6770	5.6770	5.6841	5.6621	5.6387	5.6222	5.6052	
util living area													
	0.9961	0.9887	0.9724	0.9330	0.8452	0.6780	0.4997	0.5257	0.7437	0.9394	0.9902	0.9973	(86)
MIT	20.0277	20.2173	20.4411	20.6812	20.8686	20.9715	20.9956	20.9942	20.9509	20.7122	20.3147	19.9876	(87)
Th 2	20.0723	20.0740	20.0757	20.0835	20.0850	20.0918	20.0918	20.0930	20.0891	20.0850	20.0820	20.0789	(88)
util rest of house													
	0.9949	0.9852	0.9636	0.9114	0.7974	0.5952	0.3993	0.4257	0.6671	0.9155	0.9866	0.9964	(89)
MIT 2	19.1897	19.3788	19.5991	19.8335	19.9985	20.0789	20.0907	20.0914	20.0643	19.8672	19.4830	19.1553	(90)
Living area fraction									fLA = Living area / (4) =			0.4389	(91)
MIT	19.5575	19.7468	19.9687	20.2055	20.3804	20.4707	20.4879	20.4876	20.4534	20.2380	19.8480	19.5206	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5575	19.7468	19.9687	20.2055	20.3804	20.4707	20.4879	20.4876	20.4534	20.2380	19.8480	19.5206	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9940	0.9837	0.9624	0.9146	0.8140	0.6310	0.4436	0.4698	0.6993	0.9201	0.9854	0.9957	(94)
Useful gains	420.2354	500.7380	539.5622	532.0257	470.7563	346.8596	236.1014	247.3894	368.0578	447.1858	418.8728	393.8672	(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													
	953.8350	926.2957	838.6514	697.4168	534.5378	358.5548	237.4533	249.2734	389.2737	593.5083	787.8116	950.3047	(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													
	396.9981	285.9748	222.5224	119.0816	47.4534	0.0000	0.0000	0.0000	0.0000	108.8639	265.6359	413.9895	(98)
Space heating												1860.5197	(98)
Space heating per m2											(98) / (4) =	30.1543	(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	574.1110	451.9597	463.4654	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9276	0.9681	0.9635	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	532.5445	437.5495	446.5611	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	718.5725	696.6895	691.3066	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	133.9402	192.8002	182.0906	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												508.8309	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling kWh													

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

	0.0000	0.0000	0.0000	0.0000	0.0000	33.4850	48.2000	45.5226	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												127.2077 (107)
Space cooling per m2												2.0617 (108)
Energy for space heating												30.1543 (99)
Energy for space cooling												2.0617 (108)
Total												32.2160 (109)
Dwelling Fabric Energy Efficiency (DFEE)												32.2 (109)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	61.7000 (1b)	x	2.4600 (2b)	=	151.7820	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	151.7820	(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) =	0.1318	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3818	(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) =	0.3245	(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	0.4137	0.4056	0.3975	0.3570	0.3488	0.3083	0.3083	0.3002	0.3245	0.3488	0.3651	0.3813	(22b)
Effective ac	0.5856	0.5823	0.5790	0.5637	0.5608	0.5475	0.5475	0.5450	0.5527	0.5608	0.5666	0.5727	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opening Type (Uw = 1.40)			9.6000	1.3258	12.7273			(27)
Heat Loss Floor 1			61.7000	0.1300	8.0210			(28a)
External Wall 1	50.0200	9.6000	40.4200	0.1800	7.2756			(29a)
Total net area of external elements Aum(A, m2)			111.7200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.0239			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.3893	(36)
Total fabric heat loss					(33) + (36) =		35.4132	(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	29.3311	29.1646	29.0015	28.2350	28.0916	27.4241	27.4241	27.3005	27.6812	28.0916	28.3817	28.6850	(38)
Heat transfer coeff	64.7443	64.5778	64.4146	63.6482	63.5048	62.8373	62.8373	62.7136	63.0944	63.5048	63.7949	64.0982	(39)
Average = Sum(39)m / 12 =												63.6475	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0493	1.0466	1.0440	1.0316	1.0293	1.0184	1.0184	1.0164	1.0226	1.0293	1.0340	1.0389	(40)
HLP (average)												1.0316	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.0293 (42)
Average daily hot water use (litres/day)		82.3952 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	90.6347	87.3389	84.0431	80.7472	77.4514	74.1556	74.1556	77.4514	80.7472	84.0431	87.3389	90.6347	(44)
Energy conte	134.4086	117.5546	121.3058	105.7574	101.4767	87.5667	81.1434	93.1132	94.2253	109.8105	119.8668	130.1675	(45)
Energy content (annual)										Total = Sum(45)m =		1296.3965	(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)
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													

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

	28.5618	24.9804	25.7775	22.4734	21.5638	18.6079	17.2430	19.7866	20.0229	23.3347	25.4717	27.6606 (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	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	(66)

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

	16.5750	14.7217	11.9725	9.0640	6.7754	5.7201	6.1808	8.0340	10.7832	13.6918	15.9803	17.0356	(67)

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

	177.2131	179.0520	174.4180	164.5527	152.0996	140.3954	132.5763	130.7374	135.3714	145.2367	157.6898	169.3940	(68)

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

	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	(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)

	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	(71)

Water heating gains (Table 5)

	38.3896	37.1731	34.6472	31.2131	28.9836	25.8443	23.1760	26.5948	27.8096	31.3639	35.3773	37.1782	(72)

Total internal gains

	285.6167	284.3860	274.4767	258.2689	241.2977	225.3989	215.3722	218.8053	227.4032	243.7314	262.4865	277.0469	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	9.6000	46.7521	0.6300	0.7000	0.7700	137.1652	(78)

Solar gains	137.1652	224.6412	286.1531	323.4151	337.0185	324.3345	316.8945	307.7485	298.9206	242.2966	162.5875	118.5233	(83)
Total gains	422.7818	509.0272	560.6298	581.6839	578.3162	549.7334	532.2667	526.5538	526.3239	486.0280	425.0740	395.5702	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	66.1792	66.3498	66.5178	67.3188	67.4708	68.1876	68.1876	68.3220	67.9097	67.4708	67.1640	66.8462	
alpha	5.4119	5.4233	5.4345	5.4879	5.4981	5.5458	5.5458	5.5548	5.5273	5.4981	5.4776	5.4564	
util living area	0.9962	0.9893	0.9741	0.9374	0.8549	0.6917	0.5128	0.5389	0.7566	0.9434	0.9906	0.9973	(86)
MIT	19.9765	20.1683	20.3979	20.6502	20.8502	20.9658	20.9944	20.9927	20.9422	20.6857	20.2759	19.9399	(87)
Th 2	20.0424	20.0446	20.0468	20.0571	20.0590	20.0680	20.0680	20.0697	20.0645	20.0590	20.0551	20.0511	(88)
util rest of house	0.9950	0.9859	0.9657	0.9166	0.8077	0.6069	0.4077	0.4346	0.6791	0.9203	0.9871	0.9964	(89)
MIT 2	19.1143	19.3060	19.5328	19.7819	19.9598	20.0525	20.0666	20.0676	20.0351	19.8203	19.4224	19.0850	(90)
Living area fraction									fLA = Living area / (4) =			0.4389	(91)
MIT	19.4927	19.6844	19.9125	20.1630	20.3506	20.4533	20.4738	20.4736	20.4332	20.2001	19.7970	19.4602	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4927	19.6844	19.9125	20.1630	20.3506	20.4533	20.4738	20.4736	20.4332	20.2001	19.7970	19.4602	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9941	0.9843	0.9643	0.9193	0.8236	0.6434	0.4541	0.4806	0.7114	0.9243	0.9859	0.9957	(94)
Useful gains	420.2734	501.0424	540.6248	534.7391	476.2812	353.6854	241.6856	253.0835	374.4353	449.2416	419.0730	393.8795	(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	983.6427	954.7458	863.9599	716.8671	549.3563	367.8079	243.4200	255.4716	399.5889	609.6530	810.0052	978.1507	(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	419.1467	304.8887	240.5613	131.1321	54.3679	0.0000	0.0000	0.0000	0.0000	119.3461	281.4711	434.6978	(98)
Space heating												1985.6117	(98)
Space heating per m2											(98) / (4) =	32.1817	(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	590.6703	464.9958	476.6237	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9170	0.9620	0.9569	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	541.6204	447.3165	456.0676	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	718.5725	696.6895	691.3066	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	127.4055	185.5335	175.0178	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												487.9569	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	31.8514	46.3834	43.7545	0.0000	0.0000	0.0000	0.0000	(107)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling	121.9892 (107)
Space cooling per m2	1.9771 (108)
Energy for space heating	32.1817 (99)
Energy for space cooling	1.9771 (108)
Total	34.1588 (109)
Target Fabric Energy Efficiency (TFEE)	39.3 (109)

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

Overheating Calculation Input Data

Dwelling type	MidTerrace Flat
Number of storeys	1
Cross ventilation possible	Yes
SAP Region	Thames Valley
Front of dwelling faces	North
Overshading	Average or unknown
Thermal mass parameter	250.0
Night ventilation	No
Ventilation rate during hot weather (ach)	3.00 (Windows half open)

Overheating Calculation

Summer ventilation heat loss coefficient	150.26 (P1)
Transmission heat loss coefficient	34.23 (37)
Summer heat loss coefficient	184.50 (P2)

Overhangs

Orientation	Ratio	Z_overhangs	Overhang type
South	0.000	1.000	None

Solar shading

Orientation	Z blinds	Solar access	Z overhangs	Z summer
South	0.850	0.90	1.000	0.765 (P8)

[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Shading	Gains W
South	9.6000	112.2060	0.6300	0.7000	0.7650	327.0618
total:						327.0618

	Jun	Jul	Aug	
Solar gains	339	327	323	(P3)
Internal gains	354	339	347	
Total summer gains	693	666	669	(P5)
Summer gain/loss ratio	3.76	3.61	3.63	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 250.0)	0.25	0.25	0.25	
Threshold temperature	20.01	21.76	21.68	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	

Assessment of likelihood of high internal temperature: Slight

BASIC COMPLIANCE REPORT
Calculation Type: New Build (As Designed)

Darren Evans

Property Reference	DE-21912-Plot 20	**Issued on Date**	25/01/2023
Assessment Reference	Plot 20	**Prop Type Ref**	GF Flat
Property	Land at Tesco Extra Car Park, Plot 20, 1Bath, 2B3P, RG1		

SAP Rating	95 A	**DER**	9.39	**TER**	24.71
Environmental	96 A	**% DER<TER**	62.00		
CO_2 Emissions (t/year)	0.15	**DFEE**	32.22	**TFEE**	39.28
General Requirements Compliance	Pass	**% DFEE<TFEE**	17.99		

Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Electricity		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	24.71	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	9.39	$kgCO_2/m^2$	Pass
	-15.32 (-62.0%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	39.28	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	32.22	$kWh/m^2/yr$	
	-7.1 (-18.1%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	Pass
Openings	1.20 (max. 2.00)	1.20 (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	4.00 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system 1	Room heaters - Electric Panel, convector or radiant heaters	
Main heating system 2	Heat pump with warm air distribution - Electric Dimplex EDL200UK-630	

Secondary heating system	None		
5 Cylinder insulation			
Hot water storage	No cylinder		
6 Controls			
Space heating controls 1	Programmer and room thermostat		Pass
Hot water controls	No cylinder		
7 Low energy lights			
Percentage of fixed lights with low-energy fittings	100	%	
Minimum	75	%	Pass
8 Mechanical ventilation			
Continuous extract system (decentralised)			
Specific fan power	0.1600 0.1200		
Maximum	0.7		Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)	Slight	Pass

Based on:

Overshading	Average
Windows facing South	9.60 m², No overhang
Air change rate	3.00 ach
Blinds/curtains	Dark-coloured curtain or roller blind, closed 100% of daylight hours

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value		
Filled Cavity with Edge Sealing	0.00	W/m²K	Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals	4.00 (design value)		
Maximum	10.0		Pass

10 Key features

Party wall U-value	0.00	W/m²K
Floor U-value	0.11	W/m²K
Photovoltaic array	1.64	kW

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BLOCK COMPLIANCE
Calculation Type: New Build (As Designed)

Darren Evans

Block Reference	4 PV planel per falt	**Issued on Date**	25/01/2023
Block Name	335		
Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

Block Compliance Report - DER

Block Reference: 4 PV planel per falt		Block Name: 335			
Property-Assessment Reference	**Multiplier**	**Floor Area (m^2)**	**DER ($kgCO_2/m^2$)**	**TER ($kgCO_2/m^2$)**	**% DER/TER**
DE-21912-Plot 20-Plot 20	1	61.7	9.39	24.71	62.00 %
DE-21912-Plot 17-Plot 17	1	61.7	11.56	25.89	55.36 %
DE-21912- Plot 07-Plot 07	1	50.76	8.84	26.11	66.14 %
DE-21912 - Plot 05-Plot 05	1	65.09	12.75	26.21	51.36 %
DE-21912-Plot 40-Plot 40	1	61.7	6.66	21.38	68.85 %
DE-21912-Plot 27-Plot 27	1	62.48	6.76	20.78	67.47 %
DE-21912-Plot 25-Plot 25	1	65.09	9.65	22.66	57.41 %
DE-21912-Plot 67-Plot 67	1	62.48	13.70	25.47	46.21 %
DE-21912-Plot 80-Plot 80	1	61.7	15.75	27.54	42.81 %
DE-21912-Plot 65-Plot 65	1	65.09	17.89	28.43	37.07 %
DE-21912-Plot 77-Plot 77	1	61.7	20.17	30.69	34.27 %
DE-21912-Plot 37-Plot 37	1	61.7	11.61	24.84	53.25 %
Totals:	12	741.19	144.73	304.71	
Average DER = 12.12 $kgCO_2/m^2$		**% DER/TER**	PASS		
Average TER = 25.38 $kgCO_2/m^2$		52.25 %			

Block Compliance Report - DFEE

Block Reference: 4 PV planel per falt		Block Name: 335			
Property-Assessment Reference	**Multiplier**	**Floor Area (m^2)**	**DFEE ($kWh/m^2/yr$)**	**TFEE ($kWh/m^2/yr$)**	**% DFEE/TFEE**
DE-21912-Plot 20-Plot 20	1	61.7	32.22	39.28	17.99 %
DE-21912-Plot 17-Plot 17	1	61.7	36.71	43.81	16.22 %
DE-21912- Plot 07-Plot 07	1	50.76	34.10	38.48	11.38 %
DE-21912 - Plot 05-Plot 05	1	65.09	38.23	46.52	17.82 %
DE-21912-Plot 40-Plot 40	1	61.7	26.99	27.95	3.45 %
DE-21912-Plot 27-Plot 27	1	62.48	26.37	26.48	0.39 %
DE-21912-Plot 25-Plot 25	1	65.09	32.34	34.66	6.71 %
DE-21912-Plot 67-Plot 67	1	62.48	39.57	42.27	6.38 %
DE-21912-Plot 80-Plot 80	1	61.7	44.07	48.37	8.88 %
DE-21912-Plot 65-Plot 65	1	65.09	48.15	53.91	10.69 %
DE-21912-Plot 77-Plot 77	1	61.7	52.85	59.27	10.83 %
DE-21912-Plot 37-Plot 37	1	61.7	36.79	40.29	8.69 %
Totals:	12	741.19	448.37	501.28	
Average DFEE = 37.43 $kWh/m^2/yr$		**% DFEE/TFEE**	PASS		
Average TFEE = 41.85 $kWh/m^2/yr$		10.56 %			

PREDICTED ENERGY ASSESSMENT

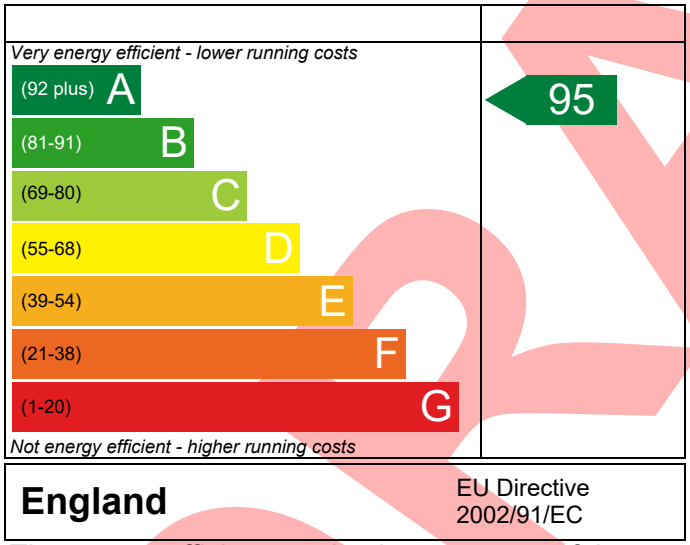
Land at Tesco Extra Car Park,
Plot 25,
1Bath,
2B3P,
RG1

Dwelling type:	Flat, Mid-Terrace
Date of assessment:	25/01/2023
Produced by:	Charles Sims
Total floor area:	65.09 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 (CO_2) emissions.

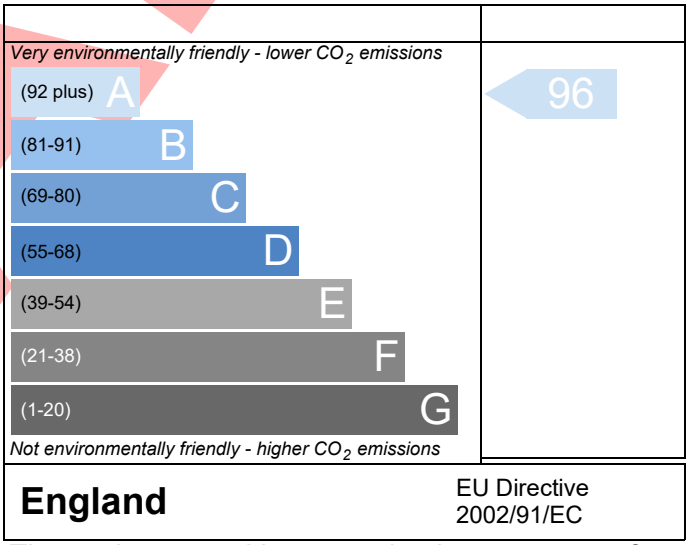
Energy Efficiency Rating



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 (CO_2) 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 (CO_2) emissions. The higher the rating the less impact it has on the environment.

DRAFT

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BUILDING REGULATION COMPLIANCE
Calculation Type: New Build (As Designed)

Darren Evans

Property Reference	DE-21912-Plot 25	**Issued on Date**	25/01/2023
Assessment Reference	Plot 25	**Prop Type Ref**	FF Flat
Property	Land at Tesco Extra Car Park, Plot 25, 1Bath, 2B3P, RG1		

SAP Rating	95 A	**DER**	9.65	**TER**	22.66
Environmental	96 A	**% DER<TER**	57.41		
CO_2 Emissions (t/year)	0.18	**DFEE**	32.34	**TFEE**	34.66
General Requirements Compliance	Pass	**% DFEE<TFEE**	6.71		

Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Electricity		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	22.66	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	9.65	$kgCO_2/m^2$	Pass
	-13.01 (-57.4%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	34.66	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	32.34	$kWh/m^2/yr$	
	-2.4 (-6.9%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Openings	1.20 (max. 2.00)	1.20 (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	4.00 (design value)	$m^3/(h.m^2)$ @ 50 Pa	
Maximum	10.0	$m^3/(h.m^2)$ @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system 1	Room heaters - Electric Panel, convector or radiant heaters	
Main heating system 2	Heat pump with warm air distribution - Electric Dimplex EDL200UK-630	

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

DRAFT

Secondary heating system	None		
5 Cylinder insulation			
Hot water storage	No cylinder		
6 Controls			
Space heating controls 1	Programmer and room thermostat		Pass
Hot water controls	No cylinder		
7 Low energy lights			
Percentage of fixed lights with low-energy fittings	100	%	
Minimum	75	%	Pass
8 Mechanical ventilation			
Continuous extract system (decentralised)			
Specific fan power	0.1200 0.1600		
Maximum	0.7		Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)	Slight	Pass
Based on:		
Overshading	Average	
Windows facing North	4.50 m², No overhang	
Windows facing East	7.14 m², No overhang	
Air change rate	3.00 ach	
Blinds/curtains	Dark-coloured curtain or roller blind, closed 100% of daylight hours	

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value		
Solid Wall	0.00	W/m²K	Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals	4.00 (design value)	m³/(h.m²) @ 50 Pa	
Maximum	10.0	m³/(h.m²) @ 50 Pa	Pass

10 Key features

Party wall U-value	0.00	W/m²K
Photovoltaic array	1.64	kW

DRAFT

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

	Typical cost	Typical savings per year	Energy efficiency	Environmental impact	Result
Low energy lights			0	0	Already installed
Solar water heating			0	0	Not applicable
Photovoltaic			0	0	Not applicable
Wind turbine			0	0	Not applicable
Totals	**£0**	**£0**	**A 95**	**A 96**	

DRAFT

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

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

Darren Evans

Property Reference	DE-21912-Plot 25	**Issued on Date**	25/01/2023
Assessment Reference	Plot 25	**Prop Type Ref**	FF Flat
Property	Land at Tesco Extra Car Park, Plot 25, 1Bath, 2B3P, RG1		

SAP Rating	95 A	**DER**	9.65	**TER**	22.66
Environmental	96 A	**% DER<TER**	57.41		
CO_2 Emissions (t/year)	0.18	**DFEE**	32.34	**TFEE**	34.66
General Requirements Compliance	Pass	**% DFEE<TFEE**	6.71		

Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

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

Orientation	South
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	Flat, Mid-Terrace
2.0 Number of Storeys	1
3.0 Date Built	2023
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	18.69 m	65.09 m²	2.46 m

7.0 Living Area	24.70	m²
8.0 Thermal Mass Parameter	Simple calculation - Medium	
Thermal Mass	250.00	kJ/m²K

9.0 External Walls

Description	Type	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Wall 1	Cavity Wall	0.18	45.98	34.34

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall 1	Solid Wall		0.00	43.32

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Windowss	Manufacturer	Window	Double glazed			0.63		0.70	1.20

13.0 Openings

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

Darren Evans

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
E Windows	Window	[1] External Wall 1	East	Dark-coloured curtain or roller blind	0.00					7.14	100
N Windows	Window	[1] External Wall 1	North	Dark-coloured curtain or roller blind	0.00					4.50	100

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	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	6.40	0.021	No	CBA-313
Independently assessed	E3 Sill	2.00	0.021	No	CBA-314
Independently assessed	E4 Jamb	17.40	0.017	No	CBA-315
Table K1 - Approved	E7 Party floor between dwellings (in blocks of flats)	30.82	0.070	No	
Table K1 - Default	E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.56	1.000	No	
Independently assessed	E16 Corner (normal)	9.84	0.046	No	CBA-316
Independently assessed	E17 Corner (inverted – internal area greater than external area)	4.92	-0.040	No	
Table K1 - Approved	E18 Party wall between dwellings	2.46	0.060	No	
Table K1 - Default	E25 Staggered party wall between dwellings	2.46	0.120	No	

Y-value	0.215	W/m²K
18.0 Pressure Testing	Yes	
Designed AP_{50}	4.00	m³/(h.m²) @ 50 Pa
Property Tested ?		
As Built AP_{50}		m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Windows half open
Cross ventilation possible	Yes
Night Ventilation	Yes
Air change rate	3.00

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - decentralised
MV Reference Number	500661
Duct Type	Flexible

19.1 Mechanical extract ventilation - Decentralised

SFP	Fan/Room Type	Count
0.12	Through Wall Fan Kitchen	1
0.16	In Room Fan Other Wet Room	1

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				0
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	10	
Total number of L.E.L. fittings	10	
Percentage of L.E.L. fittings	100.00	%
External		
External lights fitted	No	
23.0 Electricity Tariff	Standard	
24.0 Main Heating 1	SAP table	
Percentage of Heat	100	%
Main Heating	REA	
SAP Code	691	
Efficiency (SAP Table)	100.0	%
Controls	CRD Programmer and room thermostat	
Sap Code	2605	
25.0 Main Heating 2	Database	
Percentage of Heat	0	%
Database Ref. No.	190006	
Fuel Type	Electricity	
Main Heating	PEH	
SAP Code	524	
In Summer	367.8	
Controls	CWD Time and temperature zone control	
Sap Code	0	
Community Heating	None	
28.0 Water Heating	HWP From main heating 1	
Water Heating	Main Heating 2	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery	No	

Instantaneous System 2		
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
SAP Code	914	
Immersion Only Heating Hot Water	Yes	

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	201.00	L
Loss	1.610	kWh/day

32.0 Photovoltaic Unit One Dwelling

PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
1.64	Horizontal	Horizontal	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

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

Property Reference	DE-21912-Plot 25	**Issued on Date**	25/01/2023
Assessment Reference	Plot 25	**Prop Type Ref**	FF Flat
Property	Land at Tesco Extra Car Park, Plot 25, 1Bath, 2B3P, RG1		

SAP Rating	95 A	**DER**	9.65	**TER**	22.66
Environmental	96 A	**% DER<TER**	57.41		
CO_2 Emissions (t/year)	0.18	**DFEE**	32.34	**TFEE**	34.66
General Requirements Compliance	Pass	**% DFEE<TFEE**	6.71		

Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

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

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

DWELLING AS DESIGNED

Mid-floor flat, total floor area 65 m²

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

1a TER and DER
Fuel for main heating:Electricity
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 22.66 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 9.65 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)34.7 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)32.3 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.20 (max. 2.00)	1.20 (max. 3.30)	OK

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

3 Air permeability
Air permeability at 50 pascals: 4.00 (design value)
Maximum 10.0 OK

4 Heating efficiency
Main heating system 1: Room heaters - Electric
Panel, convector or radiant heaters

Main heating system 2: Heat pump with warm air distribution - Electric
Dimplex EDL200UK-630

Secondary heating system: None

5 Cylinder insulation
Hot water storage No cylinder

6 Controls
Space heating controls 1: Programmer and room thermostat OK

Hot water controls: No cylinder

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

8 Mechanical ventilation
Continuous extract system (decentralised)
Specific fan power: 0.1200 0.1600
Maximum 0.7 OK

9 Summertime temperature
Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing North: 4.50 m², No overhang
Windows facing East: 7.14 m², No overhang
Air change rate: 3.00 ach
Blinds/curtains: Dark-coloured curtain or roller blind, closed 100% of daylight hours

10 Key features
Party wall U-value 0.00 W/m²K
Photovoltaic array 1.64 kW

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	65.0900 (1b)	x	2.4600 (2b)	=	160.1214	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.0900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	160.1214	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		4.0000	
Infiltration rate		0.2000	(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) =	0.1700	(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	0.2168	0.2125	0.2083	0.1870	0.1828	0.1615	0.1615	0.1573	0.1700	0.1828	0.1913	0.1998	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation: 0.5000 (23a)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(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	
Windowss (Uw = 1.20)			11.6400	1.1450	13.3282			(27)
External Wall 1	45.9800	11.6400	34.3400	0.1800	6.1812			(29a)
Total net area of external elements Aum(A, m2)			45.9800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.5094			(33)
Party Wall 1			43.3200	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	9.8882	(36)
Total fabric heat loss (33) + (36) =	29.3977	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	26.4200	26.4200	26.4200	26.4200	26.4200	26.4200	26.4200	26.4200	26.4200	26.4200	26.4200	26.4200	(38)
Heat transfer coeff	55.8177	55.8177	55.8177	55.8177	55.8177	55.8177	55.8177	55.8177	55.8177	55.8177	55.8177	55.8177	(39)
Average = Sum(39)m / 12 =												55.8177	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8575	0.8575	0.8575	0.8575	0.8575	0.8575	0.8575	0.8575	0.8575	0.8575	0.8575	0.8575	(40)
HLP (average)												0.8575	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.1213 (42)
Average daily hot water use (litres/day)	84.5809 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	93.0390	89.6558	86.2726	82.8893	79.5061	76.1229	76.1229	79.5061	82.8893	86.2726	89.6558	93.0390	(44)
Energy conte	137.9742	120.6731	124.5239	108.5629	104.1687	89.8897	83.2960	95.5834	96.7249	112.7236	123.0466	133.6207	(45)
Energy content (annual)											Total = Sum(45)m =	1330.7876	(45)
Distribution loss (46)m = 0.15 x (45)m	20.6961	18.1010	18.6786	16.2844	15.6253	13.4835	12.4944	14.3375	14.5087	16.9085	18.4570	20.0431	(46)

Water storage loss:	
Store volume	201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	1.6100 (48)
Temperature factor from Table 2b	0.5400 (49)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(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)
Total heat required for water heating calculated for each month													
	164.9256	145.0163	151.4753	134.6449	131.1201	115.9717	110.2474	122.5348	122.8069	139.6750	149.1286	160.5721	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)
Output from w/h													
	164.9256	145.0163	151.4753	134.6449	131.1201	115.9717	110.2474	122.5348	122.8069	139.6750	149.1286	160.5721	(64)
									Total per year (kWh/year) = Sum(64)m =			1648.1186	(64)
Heat gains from water heating, kWh/month													
	45.8764	40.1238	41.4042	36.0972	34.6361	29.8883	27.6959	31.7815	32.1610	37.4806	40.9130	44.4289	(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	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	16.9155	15.0242	12.2185	9.2502	6.9146	5.8376	6.3078	8.1991	11.0048	13.9731	16.3086	17.3856	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	185.5781	187.5038	182.6510	172.3201	159.2791	147.0225	138.8343	136.9086	141.7613	152.0923	165.1332	177.3899	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	(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)													
	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	(71)
Water heating gains (Table 5)													
	61.6619	59.7081	55.6508	50.1350	46.5539	41.5115	37.2257	42.7170	44.6681	50.3771	56.8236	59.7162	(72)
Total internal gains													
	318.9750	317.0556	305.3398	286.5248	267.5672	249.1912	237.1873	242.6442	252.2537	271.2620	293.0850	309.3113	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	4.5000	10.6334	0.6300	0.7000	0.7700	14.6237	(74)
East	7.1400	19.6403	0.6300	0.7000	0.7700	42.8566	(76)

Solar gains	57.4802	111.7831	185.5549	277.6402	349.5304	362.6207	343.2043	288.0690	217.6735	132.7458	71.4773	47.4342	(83)
Total gains	376.4552	428.8387	490.8947	564.1650	617.0976	611.8119	580.3916	530.7132	469.9272	404.0079	364.5623	356.7454	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	80.9804	80.9804	80.9804	80.9804	80.9804	80.9804	80.9804	80.9804	80.9804	80.9804	80.9804	80.9804	
alpha	6.3987	6.3987	6.3987	6.3987	6.3987	6.3987	6.3987	6.3987	6.3987	6.3987	6.3987	6.3987	
util living area													
	0.9982	0.9954	0.9835	0.9292	0.7800	0.5760	0.4222	0.4814	0.7659	0.9679	0.9958	0.9987	(86)
MIT	20.1521	20.2809	20.5023	20.7696	20.9424	20.9926	20.9991	20.9981	20.9615	20.7112	20.3708	20.1138	(87)
Th 2	20.2037	20.2037	20.2037	20.2037	20.2037	20.2037	20.2037	20.2037	20.2037	20.2037	20.2037	20.2037	(88)
util rest of house													
	0.9976	0.9939	0.9782	0.9081	0.7305	0.5078	0.3463	0.3994	0.6969	0.9540	0.9941	0.9983	(89)
MIT 2	19.0605	19.2484	19.5682	19.9389	20.1505	20.1990	20.2034	20.2029	20.1743	19.8675	19.3801	19.0047	(90)
Living area fraction									fLA = Living area / (4) =			0.3795	(91)
MIT	19.4747	19.6402	19.9227	20.2542	20.4510	20.5002	20.5054	20.5047	20.4730	20.1877	19.7560	19.4256	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4747	19.6402	19.9227	20.2542	20.4510	20.5002	20.5054	20.5047	20.4730	20.1877	19.7560	19.4256	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9969	0.9925	0.9759	0.9096	0.7466	0.5335	0.3751	0.4306	0.7215	0.9537	0.9929	0.9978	(94)
Useful gains	375.2856	425.6380	479.0629	513.1688	460.7273	326.4149	217.7293	228.5083	339.0443	385.2842	361.9830	355.9429	(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													
	847.0185	822.7647	749.2235	633.7637	488.4612	329.3347	217.9881	229.1125	355.7278	535.1619	706.4305	849.8583	(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													
	350.9693	266.8691	200.9995	86.8284	20.6340	0.0000	0.0000	0.0000	0.0000	111.5090	248.0022	367.4730	(98)
Space heating												1653.2845	(98)
Space heating per m2											(98) / (4) =	25.4000	(99)

8c. Space cooling requirement

Not applicable

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	1653.2845	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	350.9693	266.8691	200.9995	86.8284	20.6340	0.0000	0.0000	0.0000	0.0000	111.5090	248.0022	367.4730	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	350.9693	266.8691	200.9995	86.8284	20.6340	0.0000	0.0000	0.0000	0.0000	111.5090	248.0022	367.4730	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
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)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	164.9256	145.0163	151.4753	134.6449	131.1201	115.9717	110.2474	122.5348	122.8069	139.6750	149.1286	160.5721	(64)
Efficiency of water heater												349.4100	(216)
(217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	(217)
Fuel for water heating, kWh/month	47.2012	41.5032	43.3517	38.5349	37.5261	33.1907	31.5524	35.0691	35.1469	39.9745	42.6801	45.9552	(219)
Water heating fuel used												471.6862	(219)
Annual totals kWh/year													
Space heating fuel - main system												1653.2845	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.6500, total flow = 21.0000, SFP = 0.1738)													
mechanical ventilation fans (SFP = 0.1738)												33.9534	(230a)
Total electricity for the above, kWh/year												33.9534	(231)
Electricity for lighting (calculated in Appendix L)												298.7330	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.64 * 951 * 1.00) =												-1247.2082	(233)
Total delivered energy for all uses												1210.4489	(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	1653.2845	0.5190	858.0547	(261)
Space heating - main system 2	0.0000	0.5190	0.0000	(262)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	471.6862	0.5190	244.8051	(264)
Space and water heating			1102.8598	(265)
Pumps and fans	33.9534	0.5190	17.6218	(267)
Energy for lighting	298.7330	0.5190	155.0424	(268)
Energy saving/generation technologies				
PV Unit	-1247.2082	0.5190	-647.3011	(269)
Total CO2, kg/year			628.2230	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			9.6500	(273)

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

DER		9.6500	ZC1
Total Floor Area	TFA	65.0900	
Assumed number of occupants	N	2.1213	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.8950	ZC2
CO2 emissions from cooking, equation (L16)		2.6104	ZC3
Total CO2 emissions		29.1554	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		29.1554	ZC8

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	65.0900 (1b)	x	2.4600 (2b)	=	160.1214	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.0900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	160.1214	(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) =	0.1249	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3749	(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) =	0.3187	(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	0.4063	0.3983	0.3904	0.3505	0.3426	0.3027	0.3027	0.2948	0.3187	0.3426	0.3585	0.3744	(22b)
Effective ac	0.5825	0.5793	0.5762	0.5614	0.5587	0.5458	0.5458	0.5434	0.5508	0.5587	0.5643	0.5701	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opening Type (Uw = 1.40)			11.6400	1.3258	15.4318			(27)
External Wall 1	45.9800	11.6400	34.3400	0.1800	6.1812			(29a)
Total net area of external elements Aum(A, m2)			45.9800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.6130			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.3166	(36)
Total fabric heat loss					(33) + (36) =		25.9296	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	30.7815	30.6122	30.4461	29.6664	29.5205	28.8414	28.8414	28.7156	29.1030	29.5205	29.8157	30.1242	(38)
Heat transfer coeff	56.7111	56.5418	56.3758	55.5960	55.4501	54.7710	54.7710	54.6453	55.0326	55.4501	55.7453	56.0538	(39)
Average = Sum(39)m / 12 =												55.5953	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8713	0.8687	0.8661	0.8541	0.8519	0.8415	0.8415	0.8395	0.8455	0.8519	0.8564	0.8612	(40)
HLP (average)												0.8541	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1213	(42)
Average daily hot water use (litres/day)												84.5809	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	93.0390	89.6558	86.2726	82.8893	79.5061	76.1229	76.1229	79.5061	82.8893	86.2726	89.6558	93.0390	(44)
Energy conte	137.9742	120.6731	124.5239	108.5629	104.1687	89.8897	83.2960	95.5834	96.7249	112.7236	123.0466	133.6207	(45)
Energy content (annual)										Total = Sum(45)m =		1330.7876	(45)
Distribution loss (46)m = 0.15 x (45)m	20.6961	18.1010	18.6786	16.2844	15.6253	13.4835	12.4944	14.3375	14.5087	16.9085	18.4570	20.0431	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	184.5691	162.7588	171.1188	153.6548	150.7636	134.9815	129.8909	142.1783	141.8168	159.3185	168.1385	180.2156	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)
Output from w/h													
	184.5691	162.7588	171.1188	153.6548	150.7636	134.9815	129.8909	142.1783	141.8168	159.3185	168.1385	180.2156	(64)
								Total per year (kWh/year) = Sum(64)m =				1879.4050	(64)
Heat gains from water heating, kWh/month													
	83.1523	73.7924	78.6801	72.1706	71.9120	65.9618	64.9718	69.0574	68.2345	74.7565	76.9865	81.7048	(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	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	16.9155	15.0242	12.2185	9.2502	6.9146	5.8376	6.3078	8.1991	11.0048	13.9731	16.3086	17.3856	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	185.5781	187.5038	182.6510	172.3201	159.2791	147.0225	138.8343	136.9086	141.7613	152.0923	165.1332	177.3899	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	(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)													
	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	(71)
Water heating gains (Table 5)													
	111.7639	109.8101	105.7528	100.2370	96.6559	91.6136	87.3277	92.8191	94.7702	100.4792	106.9257	109.8183	(72)
Total internal gains													
	372.0770	370.1576	358.4419	339.6268	320.6692	302.2932	290.2893	295.7463	305.3558	324.3641	346.1870	362.4133	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	4.5000	10.6334	0.6300	0.7000	0.7700	14.6237	(74)
East	7.1400	19.6403	0.6300	0.7000	0.7700	42.8566	(76)

Solar gains	57.4802	111.7831	185.5549	277.6402	349.5304	362.6207	343.2043	288.0690	217.6735	132.7458	71.4773	47.4342	(83)
Total gains	429.5572	481.9407	543.9968	617.2670	670.1997	664.9140	633.4936	583.8153	523.0292	457.1099	417.6643	409.8475	(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	79.7046	79.9434	80.1788	81.3033	81.5172	82.5279	82.5279	82.7179	82.1356	81.5172	81.0856	80.6393	
alpha	6.3136	6.3296	6.3453	6.4202	6.4345	6.5019	6.5019	6.5145	6.4757	6.4345	6.4057	6.3760	
util living area													
	0.9963	0.9915	0.9734	0.8994	0.7311	0.5233	0.3800	0.4295	0.6985	0.9435	0.9911	0.9972	(86)
MIT	20.2109	20.3423	20.5619	20.8208	20.9608	20.9960	20.9996	20.9991	20.9780	20.7781	20.4498	20.1882	(87)
Th 2	20.1920	20.1942	20.1964	20.2067	20.2086	20.2175	20.2175	20.2192	20.2141	20.2086	20.2047	20.2006	(88)
util rest of house													
	0.9951	0.9889	0.9653	0.8730	0.6805	0.4611	0.3127	0.3572	0.6296	0.9220	0.9879	0.9963	(89)
MIT 2	19.1372	19.3296	19.6459	20.0062	20.1734	20.2151	20.2174	20.2188	20.1981	19.9598	19.4949	19.1108	(90)
Living area fraction									fLA = Living area / (4) =			0.3795	(91)
MIT	19.5446	19.7139	19.9935	20.3153	20.4722	20.5114	20.5142	20.5149	20.4940	20.2703	19.8573	19.5197	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5446	19.7139	19.9935	20.3153	20.4722	20.5114	20.5142	20.5149	20.4940	20.2703	19.8573	19.5197	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9939	0.9869	0.9629	0.8769	0.6979	0.4846	0.3382	0.3847	0.6549	0.9240	0.9861	0.9953	(94)
Useful gains	426.9302	475.6422	523.8168	541.3054	467.7330	322.2241	214.2611	224.5845	342.5560	422.3557	411.8517	407.9217	(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													
	864.5406	837.6039	760.7084	634.6458	486.4193	323.7744	214.3849	224.8609	351.8802	536.2222	711.1571	858.7261	(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													
	325.5821	243.2383	176.2474	67.2050	13.9026	0.0000	0.0000	0.0000	0.0000	84.7166	215.4999	335.3984	(98)
Space heating												1461.7904	(98)
Space heating per m2											(98) / (4) =	22.4580	(99)

8c. Space cooling requirement

Not applicable

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

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												93.5000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												1563.4122	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	325.5821	243.2383	176.2474	67.2050	13.9026	0.0000	0.0000	0.0000	0.0000	84.7166	215.4999	335.3984	(98)
Space heating efficiency (main heating system 1)													
	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)													
	348.2162	260.1479	188.4998	71.8770	14.8691	0.0000	0.0000	0.0000	0.0000	90.6060	230.4812	358.7149	(211)
Water heating requirement													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	184.5691	162.7588	171.1188	153.6548	150.7636	134.9815	129.8909	142.1783	141.8168	159.3185	168.1385	180.2156	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.3129	85.8835	84.8926	82.7781	80.6046	79.8000	79.8000	79.8000	79.8000	83.2155	85.4769	86.4486	(217)
Fuel for water heating, kWh/month													
	213.8373	189.5112	201.5709	185.6225	187.0409	169.1498	162.7705	178.1683	177.7153	191.4529	196.7064	208.4656	(219)
Water heating fuel used												2262.0114	(219)
Annual totals kWh/year													
Space heating fuel - main system												1563.4122	(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)												298.7330	(232)
Total delivered energy for all uses												4199.1567	(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	1563.4122	0.2160	337.6970	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2262.0114	0.2160	488.5945	(264)
Space and water heating			826.2915	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	298.7330	0.5190	155.0424	(268)
Total CO2, kg/m2/year			1020.2590	(272)
Emissions per m2 for space and water heating			12.6946	(272a)
Fuel factor (electricity)			1.5500	
Emissions per m2 for lighting			2.3820	(272b)
Emissions per m2 for pumps and fans			0.5980	(272c)
Target Carbon Dioxide Emission Rate (TER) = (12.6946 * 1.55) + 2.3820 + 0.5980, rounded to 2 d.p.			22.6600	(273)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	65.0900 (1b)	x	2.4600 (2b)	=	160.1214	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.0900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	160.1214	(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) =	0.1249	(8)
Pressure test		Yes	
Measured/design AP50		4.0000	
Infiltration rate		0.3249	(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) =	0.2762	(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	0.3521	0.3452	0.3383	0.3038	0.2969	0.2624	0.2624	0.2555	0.2762	0.2969	0.3107	0.3245	(22b)
Effective ac	0.5620	0.5596	0.5572	0.5461	0.5441	0.5344	0.5344	0.5326	0.5381	0.5441	0.5483	0.5526	(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	
Windowss (Uw = 1.20)			11.6400	1.1450	13.3282			(27)
External Wall 1	45.9800	11.6400	34.3400	0.1800	6.1812			(29a)
Total net area of external elements Aum(A, m2)			45.9800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		19.5094			(33)
Party Wall 1			43.3200	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.8882	(36)
Total fabric heat loss					(33) + (36) =		29.3977	(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	29.6957	29.5685	29.4439	28.8582	28.7487	28.2386	28.2386	28.1442	28.4351	28.7487	28.9703	29.2021	(38)
Heat transfer coeff	59.0934	58.9662	58.8415	58.2559	58.1464	57.6363	57.6363	57.5418	57.8328	58.1464	58.3680	58.5997	(39)
Average = Sum(39)m / 12 =												58.2554	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9079	0.9059	0.9040	0.8950	0.8933	0.8855	0.8855	0.8840	0.8885	0.8933	0.8967	0.9003	(40)
HLP (average)												0.8950	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.1213 (42)
Average daily hot water use (litres/day)		84.5809 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	93.0390	89.6558	86.2726	82.8893	79.5061	76.1229	76.1229	79.5061	82.8893	86.2726	89.6558	93.0390	(44)
Energy conte	137.9742	120.6731	124.5239	108.5629	104.1687	89.8897	83.2960	95.5834	96.7249	112.7236	123.0466	133.6207	(45)
Energy content (annual)										Total = Sum(45)m =		1330.7876	(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)
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													

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

	29.3195	25.6430	26.4613	23.0696	22.1358	19.1016	17.7004	20.3115	20.5540	23.9538	26.1474	28.3944	(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	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	16.9155	15.0242	12.2185	9.2502	6.9146	5.8376	6.3078	8.1991	11.0048	13.9731	16.3086	17.3856	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	185.5781	187.5038	182.6510	172.3201	159.2791	147.0225	138.8343	136.9086	141.7613	152.0923	165.1332	177.3899	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	(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)													
	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	(71)
Water heating gains (Table 5)													
	39.4080	38.1593	35.5663	32.0411	29.7525	26.5299	23.7909	27.3004	28.5473	32.1959	36.3158	38.1645	(72)
Total internal gains													
	296.7211	295.5068	285.2554	268.4310	250.7658	234.2096	223.7525	227.2275	236.1329	253.0808	272.5772	287.7595	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	4.5000	10.6334	0.6300	0.7000	0.7700	14.6237	(74)
East	7.1400	19.6403	0.6300	0.7000	0.7700	42.8566	(76)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	57.4802	111.7831	185.5549	277.6402	349.5304	362.6207	343.2043	288.0690	217.6735	132.7458	71.4773	47.4342	(83)
Total gains	354.2013	407.2899	470.8102	546.0712	600.2962	596.8303	566.9567	515.2965	453.8064	385.8266	344.0545	335.1937	(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	76.4914	76.6564	76.8188	77.5911	77.7373	78.4252	78.4252	78.5540	78.1588	77.7373	77.4421	77.1358	
alpha	6.0994	6.1104	6.1213	6.1727	6.1825	6.2283	6.2283	6.2369	6.2106	6.1825	6.1628	6.1424	
util living area													
	0.9988	0.9967	0.9881	0.9445	0.8121	0.6059	0.4456	0.5097	0.8003	0.9766	0.9971	0.9991	(86)
MIT	20.0444	20.1795	20.4139	20.7138	20.9194	20.9890	20.9986	20.9969	20.9457	20.6550	20.2917	20.0181	(87)
Th 2	20.1608	20.1625	20.1641	20.1717	20.1732	20.1799	20.1799	20.1811	20.1773	20.1732	20.1703	20.1673	(88)
util rest of house													
	0.9984	0.9957	0.9840	0.9265	0.7635	0.5335	0.3635	0.4211	0.7320	0.9657	0.9959	0.9988	(89)
MIT 2	19.2798	19.4159	19.6494	19.9437	20.1212	20.1750	20.1795	20.1802	20.1481	19.8946	19.5346	19.2590	(90)
Living area fraction									fLA = Living area / (4) =			0.3795	(91)
MIT	19.5700	19.7056	19.9395	20.2359	20.4241	20.4839	20.4903	20.4901	20.4508	20.1831	19.8219	19.5470	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5700	19.7056	19.9395	20.2359	20.4241	20.4839	20.4903	20.4901	20.4508	20.1831	19.8219	19.5470	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9980	0.9949	0.9826	0.9280	0.7791	0.5608	0.3947	0.4549	0.7563	0.9659	0.9953	0.9985	(94)
Useful gains	353.4832	405.2216	462.6401	506.7780	467.7101	334.7208	223.8030	234.3861	343.2254	372.6576	342.4361	334.7035	(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													
	902.3541	873.0327	790.8005	660.3844	507.2728	339.1263	224.2232	235.3535	367.2823	557.2251	742.5523	899.3319	(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													
	408.3600	314.3691	244.1514	110.5966	29.4346	0.0000	0.0000	0.0000	0.0000	137.3182	288.0837	420.0835	(98)
Space heating												1952.3972	(98)
Space heating per m2											(98) / (4) =	29.9953	(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	541.7812	426.5086	437.3180	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9653	0.9861	0.9765	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	523.0036	420.5651	427.0279	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	776.6781	740.1987	681.1184	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	182.6457	237.8073	189.0433	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												609.4964	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling kWh													

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

	0.0000	0.0000	0.0000	0.0000	0.0000	45.6614	59.4518	47.2608	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												152.3741 (107)
Space cooling per m2												2.3410 (108)
Energy for space heating												29.9953 (99)
Energy for space cooling												2.3410 (108)
Total												32.3363 (109)
Dwelling Fabric Energy Efficiency (DFEE)												32.3 (109)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	65.0900 (1b)	x	2.4600 (2b)	=	160.1214	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.0900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	160.1214	(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) =	0.1249	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3749	(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) =	0.3187	(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	0.4063	0.3983	0.3904	0.3505	0.3426	0.3027	0.3027	0.2948	0.3187	0.3426	0.3585	0.3744	(22b)
Effective ac	0.5825	0.5793	0.5762	0.5614	0.5587	0.5458	0.5458	0.5434	0.5508	0.5587	0.5643	0.5701	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opening Type (Uw = 1.40)			11.6400	1.3258	15.4318			(27)
External Wall 1	45.9800	11.6400	34.3400	0.1800	6.1812			(29a)
Total net area of external elements Aum(A, m2)			45.9800					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.6130			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.3166	(36)
Total fabric heat loss					(33) + (36) =		25.9296	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	30.7815	30.6122	30.4461	29.6664	29.5205	28.8414	28.8414	28.7156	29.1030	29.5205	29.8157	30.1242	(38)
Heat transfer coeff	56.7111	56.5418	56.3758	55.5960	55.4501	54.7710	54.7710	54.6453	55.0326	55.4501	55.7453	56.0538	(39)
Average = Sum(39)m / 12 =												55.5953	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8713	0.8687	0.8661	0.8541	0.8519	0.8415	0.8415	0.8395	0.8455	0.8519	0.8564	0.8612	(40)
HLP (average)												0.8541	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.1213	(42)
Average daily hot water use (litres/day)	84.5809	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	93.0390	89.6558	86.2726	82.8893	79.5061	76.1229	76.1229	79.5061	82.8893	86.2726	89.6558	93.0390	(44)
Energy conte	137.9742	120.6731	124.5239	108.5629	104.1687	89.8897	83.2960	95.5834	96.7249	112.7236	123.0466	133.6207	(45)
Energy content (annual)										Total = Sum(45)m =		1330.7876	(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)
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	29.3195	25.6430	26.4613	23.0696	22.1358	19.1016	17.7004	20.3115	20.5540	23.9538	26.1474	28.3944	(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	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	16.9155	15.0242	12.2185	9.2502	6.9146	5.8376	6.3078	8.1991	11.0048	13.9731	16.3086	17.3856	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	185.5781	187.5038	182.6510	172.3201	159.2791	147.0225	138.8343	136.9086	141.7613	152.0923	165.1332	177.3899	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	(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)													
	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	(71)
Water heating gains (Table 5)													
	39.4080	38.1593	35.5663	32.0411	29.7525	26.5299	23.7909	27.3004	28.5473	32.1959	36.3158	38.1645	(72)
Total internal gains													
	296.7211	295.5068	285.2554	268.4310	250.7658	234.2096	223.7525	227.2275	236.1329	253.0808	272.5772	287.7595	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	4.5000	10.6334	0.6300	0.7000	0.7700	14.6237	(74)
East	7.1400	19.6403	0.6300	0.7000	0.7700	42.8566	(76)

Solar gains	57.4802	111.7831	185.5549	277.6402	349.5304	362.6207	343.2043	288.0690	217.6735	132.7458	71.4773	47.4342	(83)
Total gains	354.2013	407.2899	470.8102	546.0712	600.2962	596.8303	566.9567	515.2965	453.8064	385.8266	344.0545	335.1937	(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	79.7046	79.9434	80.1788	81.3033	81.5172	82.5279	82.5279	82.7179	82.1356	81.5172	81.0856	80.6393	
alpha	6.3136	6.3296	6.3453	6.4202	6.4345	6.5019	6.5019	6.5145	6.4757	6.4345	6.4057	6.3760	
util living area													
	0.9987	0.9966	0.9870	0.9373	0.7917	0.5796	0.4241	0.4855	0.7782	0.9738	0.9969	0.9991	(86)
MIT	20.0981	20.2329	20.4633	20.7547	20.9384	20.9929	20.9992	20.9982	20.9594	20.6934	20.3417	20.0758	(87)
Th 2	20.1920	20.1942	20.1964	20.2067	20.2086	20.2175	20.2175	20.2192	20.2141	20.2086	20.2047	20.2006	(88)
util rest of house													
	0.9983	0.9955	0.9826	0.9179	0.7431	0.5121	0.3492	0.4043	0.7105	0.9620	0.9957	0.9988	(89)
MIT 2	19.3596	19.4957	19.7255	20.0124	20.1693	20.2145	20.2173	20.2187	20.1926	19.9620	19.6133	19.3446	(90)
Living area fraction									fLA = Living area / (4) =			0.3795	(91)
MIT	19.6398	19.7754	20.0054	20.2941	20.4611	20.5099	20.5140	20.5145	20.4836	20.2395	19.8897	19.6221	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6398	19.7754	20.0054	20.2941	20.4611	20.5099	20.5140	20.5145	20.4836	20.2395	19.8897	19.6221	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9980	0.9947	0.9814	0.9203	0.7594	0.5377	0.3777	0.4352	0.7351	0.9625	0.9951	0.9985	(94)
Useful gains	353.4786	405.1466	462.0443	502.5682	455.8530	320.8875	214.1357	224.2643	333.5713	371.3687	342.3741	334.7048	(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													
	869.9389	841.0835	761.3792	633.4669	485.8069	323.6890	214.3750	224.8362	351.3074	534.5121	712.9663	864.4655	(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													
	384.2465	292.9496	222.7052	94.2471	22.2858	0.0000	0.0000	0.0000	0.0000	121.3787	266.8264	394.1419	(98)
Space heating												1798.7811	(98)
Space heating per m2											(98) / (4) =	27.6353	(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	514.8476	405.3056	415.3040	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9756	0.9909	0.9841	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	502.2928	401.6120	408.6861	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	776.6781	740.1987	681.1184	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	197.5575	251.9084	202.6896	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												652.1555	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	49.3894	62.9771	50.6724	0.0000	0.0000	0.0000	0.0000	(107)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling	163.0389 (107)
Space cooling per m2	2.5048 (108)
Energy for space heating	27.6353 (99)
Energy for space cooling	2.5048 (108)
Total	30.1401 (109)
Target Fabric Energy Efficiency (TFEE)	34.7 (109)

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

Overheating Calculation Input Data

Dwelling type	MidTerrace Flat
Number of storeys	1
Cross ventilation possible	Yes
SAP Region	Thames Valley
Front of dwelling faces	South
Overshading	Average or unknown
Thermal mass parameter	250.0
Night ventilation	Yes
Ventilation rate during hot weather (ach)	3.00 (Windows half open)

Overheating Calculation

Summer ventilation heat loss coefficient	158.52 (P1)
Transmission heat loss coefficient	29.40 (37)
Summer heat loss coefficient	187.92 (P2)

Overhangs

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

Solar shading

Orientation	Z blinds	Solar access	Z overhangs	Z summer
North	0.850	0.90	1.000	0.765 (P8)
East	0.850	0.90	1.000	0.765 (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	4.5000	81.1852	0.6300	0.7000	0.7650	110.9256
East	7.1400	117.5071	0.6300	0.7000	0.7650	254.7445
total:						365.6701

	Jun	Jul	Aug	
Solar gains	390	366	314	(P3)
Internal gains	368	352	360	
Total summer gains	758	718	674	(P5)
Summer gain/loss ratio	4.03	3.82	3.59	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 250.0)	0.25	0.25	0.25	
Threshold temperature	20.28	21.97	21.64	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	

Assessment of likelihood of high internal temperature: Slight

BASIC COMPLIANCE REPORT
Calculation Type: New Build (As Designed)

Darren Evans

Property Reference	DE-21912-Plot 25	**Issued on Date**	25/01/2023
Assessment Reference	Plot 25	**Prop Type Ref**	FF Flat
Property	Land at Tesco Extra Car Park, Plot 25, 1Bath, 2B3P, RG1		

SAP Rating	95 A	**DER**	9.65	**TER**	22.66
Environmental	96 A	**% DER<TER**	57.41		
CO_2 Emissions (t/year)	0.18	**DFEE**	32.34	**TFEE**	34.66
General Requirements Compliance	Pass	**% DFEE<TFEE**	6.71		

Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Electricity		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	22.66	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	9.65	$kgCO_2/m^2$	Pass
	-13.01 (-57.4%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	34.66	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	32.34	$kWh/m^2/yr$	
	-2.4 (-6.9%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Openings	1.20 (max. 2.00)	1.20 (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	4.00 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system 1	Room heaters - Electric Panel, convector or radiant heaters	
Main heating system 2	Heat pump with warm air distribution - Electric Dimplex EDL200UK-630	
Secondary heating system	None	

5 Cylinder insulation

Hot water storage	No cylinder	

6 Controls

Space heating controls 1	Programmer and room thermostat	Pass
Hot water controls	No cylinder	

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power	0.1200 0.1600	
Maximum	0.7	Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)	Slight	Pass

Based on:

Overshading	Average
Windows facing North Windows facing East	4.50 m², No overhang 7.14 m², No overhang
Air change rate	3.00 ach
Blinds/curtains	Dark-coloured curtain or roller blind, closed 100% of daylight hours

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value		
Solid Wall	0.00	W/m²K	Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals	4.00 (design value)	
Maximum	10.0	Pass

10 Key features

Party wall U-value	0.00	W/m²K
Photovoltaic array	1.64	kW

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BLOCK COMPLIANCE
Calculation Type: New Build (As Designed)

Darren Evans

Block Reference	4 PV planel per falt	**Issued on Date**	25/01/2023
Block Name	335		
Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

Block Compliance Report - DER

Block Reference: 4 PV planel per falt		Block Name: 335			
Property-Assessment Reference	**Multiplier**	**Floor Area (m^2)**	**DER ($kgCO_2/m^2$)**	**TER ($kgCO_2/m^2$)**	**% DER/TER**
DE-21912-Plot 20-Plot 20	1	61.7	9.39	24.71	62.00 %
DE-21912-Plot 17-Plot 17	1	61.7	11.56	25.89	55.36 %
DE-21912- Plot 07-Plot 07	1	50.76	8.84	26.11	66.14 %
DE-21912 - Plot 05-Plot 05	1	65.09	12.75	26.21	51.36 %
DE-21912-Plot 40-Plot 40	1	61.7	6.66	21.38	68.85 %
DE-21912-Plot 27-Plot 27	1	62.48	6.76	20.78	67.47 %
DE-21912-Plot 25-Plot 25	1	65.09	9.65	22.66	57.41 %
DE-21912-Plot 67-Plot 67	1	62.48	13.70	25.47	46.21 %
DE-21912-Plot 80-Plot 80	1	61.7	15.75	27.54	42.81 %
DE-21912-Plot 65-Plot 65	1	65.09	17.89	28.43	37.07 %
DE-21912-Plot 77-Plot 77	1	61.7	20.17	30.69	34.27 %
DE-21912-Plot 37-Plot 37	1	61.7	11.61	24.84	53.25 %
Totals:	12	741.19	144.73	304.71	
Average DER = 12.12 $kgCO_2/m^2$		**% DER/TER**	PASS		
Average TER = 25.38 $kgCO_2/m^2$		52.25 %			

Block Compliance Report - DFEE

Block Reference: 4 PV planel per falt		Block Name: 335			
Property-Assessment Reference	**Multiplier**	**Floor Area (m^2)**	**DFEE ($kWh/m^2/yr$)**	**TFEE ($kWh/m^2/yr$)**	**% DFEE/TFEE**
DE-21912-Plot 20-Plot 20	1	61.7	32.22	39.28	17.99 %
DE-21912-Plot 17-Plot 17	1	61.7	36.71	43.81	16.22 %
DE-21912- Plot 07-Plot 07	1	50.76	34.10	38.48	11.38 %
DE-21912 - Plot 05-Plot 05	1	65.09	38.23	46.52	17.82 %
DE-21912-Plot 40-Plot 40	1	61.7	26.99	27.95	3.45 %
DE-21912-Plot 27-Plot 27	1	62.48	26.37	26.48	0.39 %
DE-21912-Plot 25-Plot 25	1	65.09	32.34	34.66	6.71 %
DE-21912-Plot 67-Plot 67	1	62.48	39.57	42.27	6.38 %
DE-21912-Plot 80-Plot 80	1	61.7	44.07	48.37	8.88 %
DE-21912-Plot 65-Plot 65	1	65.09	48.15	53.91	10.69 %
DE-21912-Plot 77-Plot 77	1	61.7	52.85	59.27	10.83 %
DE-21912-Plot 37-Plot 37	1	61.7	36.79	40.29	8.69 %
Totals:	12	741.19	448.37	501.28	
Average DFEE = 37.43 $kWh/m^2/yr$		**% DFEE/TFEE**	PASS		
Average TFEE = 41.85 $kWh/m^2/yr$		10.56 %			

PREDICTED ENERGY ASSESSMENT

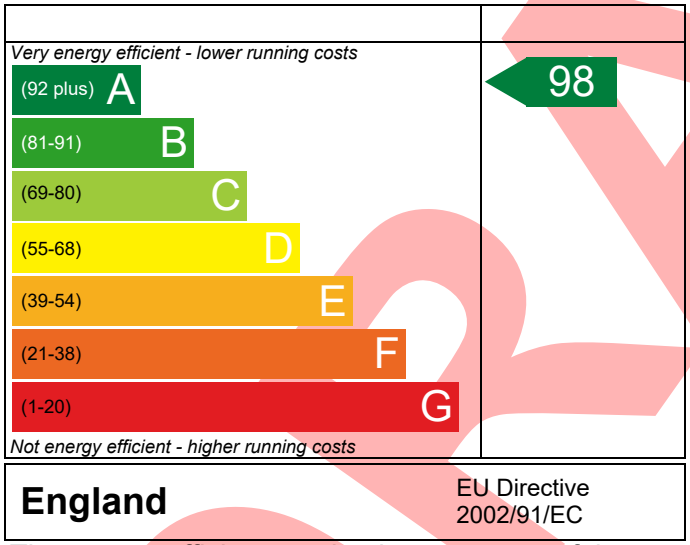
Land at Tesco Extra Car Park,
Plot 27,
1Bath,
1B2P,
RG1

Dwelling type:	Flat, Mid-Terrace
Date of assessment:	25/01/2023
Produced by:	Charles Sims
Total floor area:	62.48 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 (CO_2) emissions.

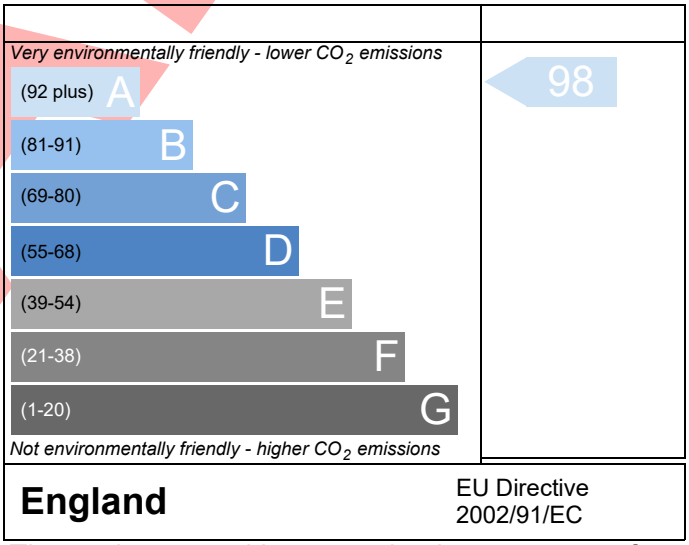
Energy Efficiency Rating



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 (CO_2) 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 (CO_2) emissions. The higher the rating the less impact it has on the environment.

DRAFT

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BUILDING REGULATION COMPLIANCE
Calculation Type: New Build (As Designed)

Darren Evans

Property Reference	DE-21912-Plot 27	**Issued on Date**	25/01/2023
Assessment Reference	Plot 27	**Prop Type Ref**	FF Flat
Property	Land at Tesco Extra Car Park, Plot 27, 1Bath, 1B2P, RG1		

SAP Rating	98 A	**DER**	6.76	**TER**	20.78
Environmental	98 A	**% DER<TER**	67.47		
CO_2 Emissions (t/year)	0.02	**DFEE**	26.37	**TFEE**	26.48
General Requirements Compliance	Pass	**% DFEE<TFEE**	0.39		

Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Electricity		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	20.78	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	6.76	$kgCO_2/m^2$	Pass
	-14.02 (-67.5%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	26.48	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	26.37	$kWh/m^2/yr$	
	-0.1 (-0.4%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Openings	1.20 (max. 2.00)	1.20 (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	4.00 (design value)	$m^3/(h.m^2)$ @ 50 Pa	
Maximum	10.0	$m^3/(h.m^2)$ @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system 1	Room heaters - Electric Panel, convector or radiant heaters	
Main heating system 2	Heat pump with warm air distribution - Electric Dimplex EDL200UK-630	

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

DRAFT

Secondary heating system	None		
5 Cylinder insulation			
Hot water storage	No cylinder		
6 Controls			
Space heating controls 1	Programmer and room thermostat		Pass
Hot water controls	No cylinder		
7 Low energy lights			
Percentage of fixed lights with low-energy fittings	100	%	
Minimum	75	%	Pass
8 Mechanical ventilation			
Continuous extract system (decentralised)			
Specific fan power	0.1600 0.1600		
Maximum	0.7		Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)	Slight	Pass
Based on:		
Overshading	Average	
Windows facing East	8.44 m², No overhang	
Air change rate	3.00 ach	
Blinds/curtains	Dark-coloured curtain or roller blind, closed 100% of daylight hours	

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value		
Solid Wall	0.00	W/m²K	Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals	4.00 (design value)	m³/(h.m²) @ 50 Pa	
Maximum	10.0	m³/(h.m²) @ 50 Pa	Pass

10 Key features

Party wall U-value	0.00	W/m²K
Photovoltaic array	1.64	kW

DRAFT

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

	Typical cost	Typical savings per year	Energy efficiency	Environmental impact	Result
Low energy lights			0	0	Already installed
Solar water heating			0	0	Not applicable
Photovoltaic			0	0	Not applicable
Wind turbine			0	0	Not applicable
Totals	**£0**	**£0**	**A 98**	**A 98**	

DRAFT

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

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

Darren Evans

Property Reference	DE-21912-Plot 27	**Issued on Date**	25/01/2023
Assessment Reference	Plot 27	**Prop Type Ref**	FF Flat
Property	Land at Tesco Extra Car Park, Plot 27, 1Bath, 1B2P, RG1		

SAP Rating	98 A	**DER**	6.76	**TER**	20.78
Environmental	98 A	**% DER<TER**	67.47		
CO_2 Emissions (t/year)	0.02	**DFEE**	26.37	**TFEE**	26.48
General Requirements Compliance	Pass	**% DFEE<TFEE**	0.39		

Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

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

Orientation	North
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	Flat, Mid-Terrace
2.0 Number of Storeys	1
3.0 Date Built	2023
4.0 Sheltered Sides	3
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	11.52 m	62.48 m²	2.46 m

7.0 Living Area	25.82	m²
8.0 Thermal Mass Parameter	Simple calculation - Medium	
Thermal Mass	250.00	kJ/m²K

9.0 External Walls

Description	Type	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Wall 1	Cavity Wall	0.18	28.34	19.90

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall 1	Solid Wall		0.00	49.89

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Windows	Manufacturer	Window	Double glazed			0.63		0.70	1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
Opening 1	Window	[1] External Wall 1	East	Dark-coloured curtain or roller blind	0.00					8.44	100

14.0 Conservatory	None

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

Darren Evans

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	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	4.40	0.021	No	CBA-313
Independently assessed	E3 Sill	1.00	0.021	No	CBA-314
Independently assessed	E4 Jamb	11.00	0.017	No	CBA-315
Table K1 - Approved	E7 Party floor between dwellings (in blocks of flats)	16.44	0.070	No	
Table K1 - Default	E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.60	1.000	No	
Independently assessed	E16 Corner (normal)	2.46	0.046	No	CBA-316
Table K1 - Approved	E18 Party wall between dwellings	2.46	0.060	No	
Table K1 - Default	E25 Staggered party wall between dwellings	2.46	0.120	No	

Y-value	0.304	W/m²K
18.0 Pressure Testing	Yes	
Designed AP_{50}	4.00	m³/(h.m²) @ 50 Pa
Property Tested ?		
As Built AP_{50}		m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Windows half open
Cross ventilation possible	Yes
Night Ventilation	Yes
Air change rate	3.00

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - decentralised
MV Reference Number	500661
Duct Type	Flexible

19.1 Mechanical extract ventilation - Decentralised

SFP	Fan/Room Type	Count
0.16	In Room Fan Other Wet Room	1
0.16	In Room Fan Kitchen	1

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				0
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	8	
Total number of L.E.L. fittings	8	
Percentage of L.E.L. fittings	100.00	%
External		
External lights fitted	No	
23.0 Electricity Tariff	Standard	
24.0 Main Heating 1	SAP table	
Percentage of Heat	100	%
Main Heating	REA	
SAP Code	691	
Efficiency (SAP Table)	100.0	%
Controls	CRD Programmer and room thermostat	
Sap Code	2605	
25.0 Main Heating 2	Database	
Percentage of Heat	0	%
Database Ref. No.	190006	
Fuel Type	Electricity	
Main Heating	PEH	
SAP Code	524	
In Summer	367.8	
Controls	CWD Time and temperature zone control	
Sap Code	0	
Community Heating	None	
28.0 Water Heating	HWP From main heating 1	
Water Heating	Main Heating 2	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
SAP Code	914	
Immersion Only Heating Hot Water	Yes	
29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	201.00	L
Loss	1.610	kWh/day
32.0 Photovoltaic Unit	One Dwelling	

PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
1.64	Horizontal	Horizontal	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

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

Darren Evans

Property Reference	DE-21912-Plot 27	**Issued on Date**	25/01/2023
Assessment Reference	Plot 27	**Prop Type Ref**	FF Flat
Property	Land at Tesco Extra Car Park, Plot 27, 1Bath, 1B2P, RG1		

SAP Rating	98 A	**DER**	6.76	**TER**	20.78
Environmental	98 A	**% DER<TER**	67.47		
CO_2 Emissions (t/year)	0.02	**DFEE**	26.37	**TFEE**	26.48
General Requirements Compliance	Pass	**% DFEE<TFEE**	0.39		

Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

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

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

DWELLING AS DESIGNED

Mid-floor flat, total floor area 62 m²

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

1a TER and DER
Fuel for main heating:Electricity
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 20.78 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 6.76 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)26.5 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)26.4 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.20 (max. 2.00)	1.20 (max. 3.30)	OK

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

3 Air permeability
Air permeability at 50 pascals: 4.00 (design value)
Maximum 10.0 OK

4 Heating efficiency
Main heating system 1: Room heaters - Electric
Panel, convector or radiant heaters

Main heating system 2: Heat pump with warm air distribution - Electric
Dimplex EDL200UK-630

Secondary heating system: None

5 Cylinder insulation
Hot water storage No cylinder

6 Controls
Space heating controls 1: Programmer and room thermostat OK

Hot water controls: No cylinder

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

8 Mechanical ventilation
Continuous extract system (decentralised)
Specific fan power: 0.1600 0.1600
Maximum 0.7 OK

9 Summertime temperature
Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing East: 8.44 m², No overhang
Air change rate: 3.00 ach
Blinds/curtains: Dark-coloured curtain or roller blind, closed 100% of daylight hours

10 Key features
Party wall U-value 0.00 W/m²K
Photovoltaic array 1.64 kW

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	62.4800 (1b)	x	2.4600 (2b)	=	153.7008	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.4800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	153.7008	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		4.0000	
Infiltration rate		0.2000	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1550	(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	0.1976	0.1938	0.1899	0.1705	0.1666	0.1473	0.1473	0.1434	0.1550	0.1666	0.1744	0.1821	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation: 0.5000 (23a)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(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	
Windows (Uw = 1.20)			8.4400	1.1450	9.6641			(27)
External Wall 1	28.3400	8.4400	19.9000	0.1800	3.5820			(29a)
Total net area of external elements Aum(A, m2)			28.3400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		13.2461			(33)
Party Wall 1			49.8900	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.6072	(36)
Total fabric heat loss (33) + (36) =	21.8533	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	25.3606	25.3606	25.3606	25.3606	25.3606	25.3606	25.3606	25.3606	25.3606	25.3606	25.3606	25.3606	(38)
Heat transfer coeff	47.2139	47.2139	47.2139	47.2139	47.2139	47.2139	47.2139	47.2139	47.2139	47.2139	47.2139	47.2139	(39)
Average = Sum(39)m / 12 =												47.2139	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7557	0.7557	0.7557	0.7557	0.7557	0.7557	0.7557	0.7557	0.7557	0.7557	0.7557	0.7557	(40)
HLP (average)												0.7557	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.0508 (42)
Average daily hot water use (litres/day)	82.9069 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	91.1975	87.8813	84.5650	81.2487	77.9324	74.6162	74.6162	77.9324	81.2487	84.5650	87.8813	91.1975	(44)
Energy conte	135.2433	118.2847	122.0592	106.4142	102.1069	88.1105	81.6473	93.6915	94.8105	110.4925	120.6112	130.9759	(45)
Energy content (annual)											Total = Sum(45)m =	1304.4477	(45)
Distribution loss (46)m = 0.15 x (45)m	20.2865	17.7427	18.3089	15.9621	15.3160	13.2166	12.2471	14.0537	14.2216	16.5739	18.0917	19.6464	(46)

Water storage loss:	
Store volume	201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	1.6100 (48)
Temperature factor from Table 2b	0.5400 (49)

Enter (49) or (54) in (55) 0.8694 (55)
Total storage loss
26.9514 24.3432 26.9514 26.0820 26.9514 26.0820 26.9514 26.9514 26.0820 26.9514 26.0820 26.9514 (56)
If cylinder contains dedicated solar storage
26.9514 24.3432 26.9514 26.0820 26.9514 26.0820 26.9514 26.9514 26.0820 26.9514 26.0820 26.9514 (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)
Total heat required for water heating calculated for each month
162.1947 142.6279 149.0106 132.4962 129.0583 114.1925 108.5987 120.6429 120.8925 137.4439 146.6932 157.9273 (62)
Solar input 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)
Output from w/h
162.1947 142.6279 149.0106 132.4962 129.0583 114.1925 108.5987 120.6429 120.8925 137.4439 146.6932 157.9273 (64)
Total per year (kWh/year) = Sum(64)m = 1621.7787 (64)
Heat gains from water heating, kWh/month
44.9684 39.3297 40.5847 35.3827 33.9506 29.2967 27.1477 31.1524 31.5245 36.7388 40.1032 43.5495 (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	102.5408	102.5408	102.5408	102.5408	102.5408	102.5408	102.5408	102.5408	102.5408	102.5408	102.5408	102.5408	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.2694	15.3386	12.4742	9.4437	7.0593	5.9598	6.4397	8.3706	11.2350	14.2654	16.6499	17.7494	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	179.1554	181.0145	176.3297	166.3563	153.7667	141.9342	134.0294	132.1703	136.8551	146.8285	159.4181	171.2506	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.2541	33.2541	33.2541	33.2541	33.2541	33.2541	33.2541	33.2541	33.2541	33.2541	33.2541	33.2541	(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)													
	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	(71)
Water heating gains (Table 5)													
	60.4414	58.5263	54.5493	49.1427	45.6325	40.6899	36.4889	41.8715	43.7840	49.3800	55.6989	58.5343	(72)
Total internal gains													
	310.6285	308.6415	297.1154	278.7049	260.2207	242.3461	230.7203	236.1747	245.6364	264.2362	285.5291	301.2965	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	8.4400	19.6403	0.6300	0.7000	0.7700	50.6596	(76)

Solar gains	50.6596	99.1009	163.2050	238.0248	291.7084	298.6154	284.2940	244.2044	189.8142	117.5916	63.1665	41.6600	(83)
Total gains	361.2881	407.7424	460.3204	516.7297	551.9290	540.9615	515.0143	480.3791	435.4506	381.8278	348.6957	342.9565	(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	91.8985	91.8985	91.8985	91.8985	91.8985	91.8985	91.8985	91.8985	91.8985	91.8985	91.8985	91.8985	
alpha	7.1266	7.1266	7.1266	7.1266	7.1266	7.1266	7.1266	7.1266	7.1266	7.1266	7.1266	7.1266	
util living area													
	0.9979	0.9945	0.9798	0.9163	0.7578	0.5547	0.4030	0.4512	0.7218	0.9575	0.9948	0.9986	(86)
MIT	20.3070	20.4257	20.6218	20.8416	20.9663	20.9966	20.9997	20.9993	20.9814	20.7969	20.4990	20.2701	(87)
Th 2	20.2919	20.2919	20.2919	20.2919	20.2919	20.2919	20.2919	20.2919	20.2919	20.2919	20.2919	20.2919	(88)
util rest of house													
	0.9973	0.9928	0.9737	0.8938	0.7113	0.4951	0.3384	0.3823	0.6579	0.9408	0.9929	0.9981	(89)
MIT 2	19.3556	19.5284	19.8105	20.1116	20.2610	20.2897	20.2918	20.2916	20.2781	20.0586	19.6358	19.3017	(90)
Living area fraction									fLA = Living area / (4) =			0.4133	(91)
MIT	19.7488	19.8992	20.1458	20.4133	20.5524	20.5818	20.5843	20.5841	20.5687	20.3637	19.9925	19.7019	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7488	19.8992	20.1458	20.4133	20.5524	20.5818	20.5843	20.5841	20.5687	20.3637	19.9925	19.7019	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9966	0.9916	0.9722	0.8980	0.7290	0.5196	0.3651	0.4108	0.6837	0.9428	0.9919	0.9976	(94)
Useful gains	360.0637	404.3203	447.5153	464.0156	402.3405	281.1044	188.0249	197.3404	297.7017	359.9778	345.8551	342.1335	(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													
	729.3970	708.1701	644.2696	543.5867	417.9579	282.4254	188.1161	197.5473	305.4142	460.9824	608.7049	731.9055	(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													
	274.7840	204.1871	146.3853	57.2912	11.6194	0.0000	0.0000	0.0000	0.0000	75.1474	189.2518	289.9904	(98)
Space heating												1248.6566	(98)
Space heating per m2											(98) / (4) =	19.9849	(99)

8c. Space cooling requirement

Not applicable

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	1248.6566	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	274.7840	204.1871	146.3853	57.2912	11.6194	0.0000	0.0000	0.0000	0.0000	75.1474	189.2518	289.9904	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	274.7840	204.1871	146.3853	57.2912	11.6194	0.0000	0.0000	0.0000	0.0000	75.1474	189.2518	289.9904	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
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)
Space heating fuel used, main system 2												0.0000	(213)

Water heating													
Water heating requirement													
	162.1947	142.6279	149.0106	132.4962	129.0583	114.1925	108.5987	120.6429	120.8925	137.4439	146.6932	157.9273	(64)
Efficiency of water heater												349.4100	(216)
(217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	(217)
Fuel for water heating, kWh/month													
	46.4196	40.8196	42.6463	37.9200	36.9361	32.6815	31.0806	34.5276	34.5990	39.3360	41.9831	45.1983	(219)
Water heating fuel used												464.1478	(219)
Annual totals kWh/year													
Space heating fuel - main system												1248.6566	(211)
Space heating fuel - secondary												0.0000	(215)

Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 4.8720, total flow = 21.0000, SFP = 0.2320)		
mechanical ventilation fans (SFP = 0.2320)	43.5035	(230a)
Total electricity for the above, kWh/year	43.5035	(231)
Electricity for lighting (calculated in Appendix L)	304.9836	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV Unit 0 (0.80 * 1.64 * 951 * 1.00) = -1247.2082	-1247.2082	(233)
Total delivered energy for all uses	814.0832	(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	1248.6566	0.5190	648.0528	(261)
Space heating - main system 2	0.0000	0.5190	0.0000	(262)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	464.1478	0.5190	240.8927	(264)
Space and water heating			888.9455	(265)
Pumps and fans	43.5035	0.5190	22.5783	(267)
Energy for lighting	304.9836	0.5190	158.2865	(268)
Energy saving/generation technologies				
PV Unit	-1247.2082	0.5190	-647.3011	(269)
Total CO2, kg/year			422.5092	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			6.7600	(273)

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

DER		6.7600	ZC1
Total Floor Area	TFA	62.4800	
Assumed number of occupants	N	2.0508	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.9916	ZC2
CO2 emissions from cooking, equation (L16)		2.6924	ZC3
Total CO2 emissions		26.4440	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		26.4440	ZC8

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	62.4800 (1b)	x	2.4600 (2b)	=	153.7008	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.4800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	153.7008	(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) =	0.1301	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3801	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2946	(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	0.3756	0.3682	0.3609	0.3241	0.3167	0.2799	0.2799	0.2725	0.2946	0.3167	0.3314	0.3461	(22b)
Effective ac	0.5705	0.5678	0.5651	0.5525	0.5501	0.5392	0.5392	0.5371	0.5434	0.5501	0.5549	0.5599	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opening Type (Uw = 1.40)			8.4400	1.3258	11.1894			(27)
External Wall 1	28.3400	8.4400	19.9000	0.1800	3.5820			(29a)
Total net area of external elements Aum(A, m2)			28.3400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		14.7714			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							2.6194	(36)
Total fabric heat loss					(33) + (36) =		17.3908	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9386	28.7996	28.6634	28.0238	27.9041	27.3470	27.3470	27.2438	27.5616	27.9041	28.1462	28.3993	(38)
Heat transfer coeff	46.3294	46.1904	46.0542	45.4146	45.2949	44.7378	44.7378	44.6346	44.9524	45.2949	45.5370	45.7901	(39)
Average = Sum(39)m / 12 =												45.4140	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7415	0.7393	0.7371	0.7269	0.7250	0.7160	0.7160	0.7144	0.7195	0.7250	0.7288	0.7329	(40)
HLP (average)												0.7269	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.0508	(42)
Average daily hot water use (litres/day)	82.9069	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	91.1975	87.8813	84.5650	81.2487	77.9324	74.6162	74.6162	77.9324	81.2487	84.5650	87.8813	91.1975	(44)
Energy conte	135.2433	118.2847	122.0592	106.4142	102.1069	88.1105	81.6473	93.6915	94.8105	110.4925	120.6112	130.9759	(45)
Energy content (annual)										Total = Sum(45)m =		1304.4477	(45)
Distribution loss (46)m = 0.15 x (45)m	20.2865	17.7427	18.3089	15.9621	15.3160	13.2166	12.2471	14.0537	14.2216	16.5739	18.0917	19.6464	(46)

Water storage loss:		
Store volume	150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	1.3938	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	0.7527	(55)
Total storage loss		

	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

If cylinder contains dedicated solar storage

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	181.8382	160.3704	168.6541	151.5060	148.7018	133.2024	128.2422	140.2864	139.9023	157.0874	165.7030	177.5708	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)
Output from w/h													
	181.8382	160.3704	168.6541	151.5060	148.7018	133.2024	128.2422	140.2864	139.9023	157.0874	165.7030	177.5708	(64)
								Total per year (kWh/year) = Sum(64)m =				1853.0651	(64)
Heat gains from water heating, kWh/month													
	82.2443	72.9982	77.8606	71.4562	71.2265	65.3702	64.4237	68.4284	67.5980	74.0147	76.1767	80.8254	(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	102.5408	102.5408	102.5408	102.5408	102.5408	102.5408	102.5408	102.5408	102.5408	102.5408	102.5408	102.5408	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.2694	15.3386	12.4742	9.4437	7.0593	5.9598	6.4397	8.3706	11.2350	14.2654	16.6499	17.7494	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	179.1554	181.0145	176.3297	166.3563	153.7667	141.9342	134.0294	132.1703	136.8551	146.8285	159.4181	171.2506	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.2541	33.2541	33.2541	33.2541	33.2541	33.2541	33.2541	33.2541	33.2541	33.2541	33.2541	33.2541	(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)													
	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	(71)
Water heating gains (Table 5)													
	110.5435	108.6283	104.6513	99.2447	95.7345	90.7920	86.5909	91.9736	93.8861	99.4821	105.8010	108.6363	(72)
Total internal gains													
	363.7305	361.7436	350.2174	331.8070	313.3227	295.4482	283.8223	289.2768	298.7384	317.3383	338.6312	354.3986	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	8.4400	19.6403	0.6300	0.7000	0.7700	50.6596	(76)

Solar gains	50.6596	99.1009	163.2050	238.0248	291.7084	298.6154	284.2940	244.2044	189.8142	117.5916	63.1665	41.6600	(83)
Total gains	414.3901	460.8445	513.4225	569.8318	605.0311	594.0636	568.1164	533.4811	488.5527	434.9298	401.7977	396.0585	(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	93.6531	93.9348	94.2126	95.5395	95.7920	96.9849	96.9849	97.2090	96.5219	95.7920	95.2827	94.7560	
alpha	7.2435	7.2623	7.2808	7.3693	7.3861	7.4657	7.4657	7.4806	7.4348	7.3861	7.3522	7.3171	
util living area													
	0.9949	0.9880	0.9615	0.8639	0.6809	0.4809	0.3464	0.3847	0.6268	0.9128	0.9868	0.9962	(86)
MIT	20.4131	20.5315	20.7170	20.9068	20.9849	20.9990	20.9999	20.9998	20.9936	20.8793	20.6150	20.3904	(87)
Th 2	20.3043	20.3063	20.3082	20.3172	20.3188	20.3267	20.3267	20.3281	20.3237	20.3188	20.3154	20.3119	(88)
util rest of house													
	0.9934	0.9846	0.9511	0.8351	0.6360	0.4308	0.2934	0.3286	0.5687	0.8860	0.9823	0.9951	(89)
MIT 2	19.5199	19.6926	19.9568	20.2154	20.3055	20.3260	20.3267	20.3281	20.3191	20.1879	19.8216	19.4931	(90)
Living area fraction									fLA = Living area / (4) =			0.4133	(91)
MIT	19.8890	20.0393	20.2710	20.5011	20.5863	20.6041	20.6049	20.6057	20.5978	20.4737	20.1495	19.8639	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8890	20.0393	20.2710	20.5011	20.5863	20.6041	20.6049	20.6057	20.5978	20.4737	20.1495	19.8639	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9923	0.9830	0.9505	0.8433	0.6539	0.4515	0.3153	0.3518	0.5926	0.8927	0.9810	0.9942	(94)
Useful gains	411.1991	452.9897	488.0056	480.5280	395.6394	268.2178	179.1476	187.6699	289.4940	388.2459	394.1825	393.7422	(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													
	722.2277	699.2894	634.2113	526.8608	402.5028	268.6112	179.1699	187.7191	292.0925	447.2261	594.2353	717.2533	(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													
	231.4053	165.5135	108.7770	33.3596	5.1064	0.0000	0.0000	0.0000	0.0000	43.8813	144.0380	240.6923	(98)
Space heating												972.7733	(98)
Space heating per m2											(98) / (4) =	15.5694	(99)

8c. Space cooling requirement

Not applicable

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

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	93.5000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	1040.3993	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	231.4053	165.5135	108.7770	33.3596	5.1064	0.0000	0.0000	0.0000	0.0000	43.8813	144.0380	240.6923	(98)
Space heating efficiency (main heating system 1)													
	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)													
	247.4923	177.0197	116.3391	35.6787	5.4614	0.0000	0.0000	0.0000	0.0000	46.9319	154.0514	257.4249	(211)
Water heating requirement													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	181.8382	160.3704	168.6541	151.5060	148.7018	133.2024	128.2422	140.2864	139.9023	157.0874	165.7030	177.5708	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.4579	84.8980	83.6791	81.5397	80.1145	79.8000	79.8000	79.8000	79.8000	81.9147	84.4428	85.6258	(217)
Fuel for water heating, kWh/month													
	212.7811	188.8976	201.5486	185.8065	185.6117	166.9202	160.7046	175.7975	175.3162	191.7695	196.2312	207.3802	(219)
Water heating fuel used												2248.7648	(219)
Annual totals kWh/year													
Space heating fuel - main system												1040.3993	(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)												304.9836	(232)
Total delivered energy for all uses												3669.1477	(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	1040.3993	0.2160	224.7262	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2248.7648	0.2160	485.7332	(264)
Space and water heating			710.4595	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	304.9836	0.5190	158.2865	(268)
Total CO2, kg/m2/year			907.6709	(272)
Emissions per m2 for space and water heating			11.3710	(272a)
Fuel factor (electricity)			1.5500	
Emissions per m2 for lighting			2.5334	(272b)
Emissions per m2 for pumps and fans			0.6230	(272c)
Target Carbon Dioxide Emission Rate (TER) = (11.3710 * 1.55) + 2.5334 + 0.6230, rounded to 2 d.p.			20.7800	(273)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	62.4800 (1b)	x	2.4600 (2b)	=	153.7008	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.4800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	153.7008	(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) =	0.1301	(8)
Pressure test		Yes	
Measured/design AP50		4.0000	
Infiltration rate		0.3301	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2558	(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	0.3262	0.3198	0.3134	0.2814	0.2750	0.2431	0.2431	0.2367	0.2558	0.2750	0.2878	0.3006	(22b)
Effective ac	0.5532	0.5511	0.5491	0.5396	0.5378	0.5295	0.5295	0.5280	0.5327	0.5378	0.5414	0.5452	(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	
Windows (Uw = 1.20)			8.4400	1.1450	9.6641			(27)
External Wall 1	28.3400	8.4400	19.9000	0.1800	3.5820			(29a)
Total net area of external elements Aum(A, m2)			28.3400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		13.2461			(33)
Party Wall 1			49.8900	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	8.6072	(36)
Total fabric heat loss (33) + (36) =	21.8533	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.0592	27.9544	27.8517	27.3693	27.2790	26.8588	26.8588	26.7810	27.0207	27.2790	27.4616	27.6525	(38)
Heat transfer coeff	49.9125	49.8077	49.7050	49.2225	49.1323	48.7121	48.7121	48.6343	48.8739	49.1323	49.3149	49.5058	(39)
Average = Sum(39)m / 12 =												49.2221	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7989	0.7972	0.7955	0.7878	0.7864	0.7796	0.7796	0.7784	0.7822	0.7864	0.7893	0.7923	(40)
HLP (average)												0.7878	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.0508 (42)
Average daily hot water use (litres/day)	82.9069 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	91.1975	87.8813	84.5650	81.2487	77.9324	74.6162	74.6162	77.9324	81.2487	84.5650	87.8813	91.1975	(44)
Energy conte	135.2433	118.2847	122.0592	106.4142	102.1069	88.1105	81.6473	93.6915	94.8105	110.4925	120.6112	130.9759	(45)
Energy content (annual)										Total = Sum(45)m =		1304.4477	(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)
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													

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

	28.7392	25.1355	25.9376	22.6130	21.6977	18.7235	17.3501	19.9094	20.1472	23.4797	25.6299	27.8324	(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	102.5408	102.5408	102.5408	102.5408	102.5408	102.5408	102.5408	102.5408	102.5408	102.5408	102.5408	102.5408	(66)

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

	17.2694	15.3386	12.4742	9.4437	7.0593	5.9598	6.4397	8.3706	11.2350	14.2654	16.6499	17.7494	(67)

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

	179.1554	181.0145	176.3297	166.3563	153.7667	141.9342	134.0294	132.1703	136.8551	146.8285	159.4181	171.2506	(68)

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

	33.2541	33.2541	33.2541	33.2541	33.2541	33.2541	33.2541	33.2541	33.2541	33.2541	33.2541	33.2541	(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)

	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	(71)

Water heating gains (Table 5)

	38.6280	37.4040	34.8623	31.4070	29.1636	26.0048	23.3200	26.7600	27.9823	31.5587	35.5971	37.4091	(72)

Total internal gains

	288.8150	287.5193	277.4284	260.9692	243.7518	227.6610	217.5513	221.0632	229.8346	246.4149	265.4273	280.1714	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	8.4400	19.6403	0.6300	0.7000	0.7700	50.6596	(76)

Solar gains	50.6596	99.1009	163.2050	238.0248	291.7084	298.6154	284.2940	244.2044	189.8142	117.5916	63.1665	41.6600	(83)
Total gains	339.4746	386.6202	440.6334	498.9940	535.4602	526.2765	501.8454	465.2676	419.6489	364.0064	328.5938	321.8313	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	86.9299	87.1128	87.2928	88.1484	88.3103	89.0721	89.0721	89.2146	88.7771	88.3103	87.9834	87.6441	
alpha	6.7953	6.8075	6.8195	6.8766	6.8874	6.9381	6.9381	6.9476	6.9185	6.8874	6.8656	6.8429	
util living area	0.9987	0.9964	0.9861	0.9361	0.7945	0.5859	0.4264	0.4793	0.7614	0.9701	0.9966	0.9991	(86)
MIT	20.2059	20.3307	20.5401	20.7932	20.9493	20.9945	20.9995	20.9988	20.9714	20.7459	20.4241	20.1797	(87)
Th 2	20.2543	20.2558	20.2572	20.2639	20.2652	20.2710	20.2710	20.2721	20.2688	20.2652	20.2626	20.2600	(88)
util rest of house	0.9982	0.9952	0.9816	0.9170	0.7483	0.5220	0.3562	0.4043	0.6963	0.9574	0.9954	0.9988	(89)
MIT 2	19.5197	19.6453	19.8535	20.1001	20.2327	20.2686	20.2709	20.2718	20.2538	20.0617	19.7445	19.4984	(90)
Living area fraction									fLA = Living area / (4) =			0.4133	(91)
MIT	19.8033	19.9285	20.1372	20.3866	20.5288	20.5686	20.5720	20.5722	20.5504	20.3445	20.0253	19.7800	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8033	19.9285	20.1372	20.3866	20.5288	20.5686	20.5720	20.5722	20.5504	20.3445	20.0253	19.7800	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9979	0.9946	0.9808	0.9206	0.7656	0.5484	0.3852	0.4353	0.7224	0.9590	0.9948	0.9985	(94)
Useful gains	338.7681	384.5265	432.1666	459.3572	409.9377	288.6021	193.3226	202.5541	303.1591	349.0713	326.9007	321.3571	(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	773.8083	748.5350	677.8383	565.3983	433.7813	290.7413	193.4824	202.9132	315.2543	478.7673	637.4115	771.2992	(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	323.6699	244.6138	182.7798	76.3495	17.7397	0.0000	0.0000	0.0000	0.0000	96.4939	223.5678	334.7570	(98)
Space heating												1499.9713	(98)
Space heating per m2										(98) / (4) =		24.0072	(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	457.8936	360.4694	369.6205	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9800	0.9932	0.9888	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	448.7321	358.0330	365.4760	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	692.1494	662.1269	620.7614	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	175.2605	226.2459	189.9323	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												591.4387	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	43.8151	56.5615	47.4831	0.0000	0.0000	0.0000	0.0000	(107)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling	147.8597 (107)
Space cooling per m2	2.3665 (108)
Energy for space heating	24.0072 (99)
Energy for space cooling	2.3665 (108)
Total	26.3737 (109)
Dwelling Fabric Energy Efficiency (DFEE)	26.4 (109)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	62.4800 (1b)	x	2.4600 (2b)	=	153.7008	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.4800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	153.7008	(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) =	0.1301	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3801	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2946	(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	0.3756	0.3682	0.3609	0.3241	0.3167	0.2799	0.2799	0.2725	0.2946	0.3167	0.3314	0.3461	(22b)
Effective ac	0.5705	0.5678	0.5651	0.5525	0.5501	0.5392	0.5392	0.5371	0.5434	0.5501	0.5549	0.5599	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opening Type (Uw = 1.40)			8.4400	1.3258	11.1894			(27)
External Wall 1	28.3400	8.4400	19.9000	0.1800	3.5820			(29a)
Total net area of external elements Aum(A, m2)			28.3400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		14.7714			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							2.6194	(36)
Total fabric heat loss					(33) + (36) =		17.3908	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.9386	28.7996	28.6634	28.0238	27.9041	27.3470	27.3470	27.2438	27.5616	27.9041	28.1462	28.3993	(38)
Heat transfer coeff	46.3294	46.1904	46.0542	45.4146	45.2949	44.7378	44.7378	44.6346	44.9524	45.2949	45.5370	45.7901	(39)
Average = Sum(39)m / 12 =												45.4140	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7415	0.7393	0.7371	0.7269	0.7250	0.7160	0.7160	0.7144	0.7195	0.7250	0.7288	0.7329	(40)
HLP (average)												0.7269	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.0508 (42)
Average daily hot water use (litres/day)		82.9069 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	91.1975	87.8813	84.5650	81.2487	77.9324	74.6162	74.6162	77.9324	81.2487	84.5650	87.8813	91.1975	(44)
Energy conte	135.2433	118.2847	122.0592	106.4142	102.1069	88.1105	81.6473	93.6915	94.8105	110.4925	120.6112	130.9759	(45)
Energy content (annual)										Total = Sum(45)m =		1304.4477	(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)
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	28.7392	25.1355	25.9376	22.6130	21.6977	18.7235	17.3501	19.9094	20.1472	23.4797	25.6299	27.8324	(65)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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	102.5408	102.5408	102.5408	102.5408	102.5408	102.5408	102.5408	102.5408	102.5408	102.5408	102.5408	102.5408	(66)

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

	17.2694	15.3386	12.4742	9.4437	7.0593	5.9598	6.4397	8.3706	11.2350	14.2654	16.6499	17.7494	(67)

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

	179.1554	181.0145	176.3297	166.3563	153.7667	141.9342	134.0294	132.1703	136.8551	146.8285	159.4181	171.2506	(68)

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

	33.2541	33.2541	33.2541	33.2541	33.2541	33.2541	33.2541	33.2541	33.2541	33.2541	33.2541	33.2541	(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)

	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	(71)

Water heating gains (Table 5)

	38.6280	37.4040	34.8623	31.4070	29.1636	26.0048	23.3200	26.7600	27.9823	31.5587	35.5971	37.4091	(72)

Total internal gains

	288.8150	287.5193	277.4284	260.9692	243.7518	227.6610	217.5513	221.0632	229.8346	246.4149	265.4273	280.1714	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	8.4400	19.6403	0.6300	0.7000	0.7700	50.6596	(76)

Solar gains	50.6596	99.1009	163.2050	238.0248	291.7084	298.6154	284.2940	244.2044	189.8142	117.5916	63.1665	41.6600	(83)
Total gains	339.4746	386.6202	440.6334	498.9940	535.4602	526.2765	501.8454	465.2676	419.6489	364.0064	328.5938	321.8313	(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	93.6531	93.9348	94.2126	95.5395	95.7920	96.9849	96.9849	97.2090	96.5219	95.7920	95.2827	94.7560	
alpha	7.2435	7.2623	7.2808	7.3693	7.3861	7.4657	7.4657	7.4806	7.4348	7.3861	7.3522	7.3171	
util living area	0.9986	0.9958	0.9830	0.9185	0.7538	0.5414	0.3920	0.4408	0.7170	0.9618	0.9961	0.9990	(86)
MIT	20.2940	20.4173	20.6186	20.8514	20.9713	20.9977	20.9998	20.9996	20.9849	20.8029	20.5024	20.2716	(87)
Th 2	20.3043	20.3063	20.3082	20.3172	20.3188	20.3267	20.3267	20.3281	20.3237	20.3188	20.3154	20.3119	(88)
util rest of house	0.9981	0.9945	0.9777	0.8967	0.7085	0.4857	0.3322	0.3767	0.6554	0.9466	0.9947	0.9987	(89)
MIT 2	19.6504	19.7748	19.9748	20.2014	20.3009	20.3257	20.3266	20.3280	20.3160	20.1630	19.8678	19.6346	(90)
Living area fraction									fLA = Living area / (4) =			0.4133	(91)
MIT	19.9164	20.0403	20.2408	20.4701	20.5779	20.6034	20.6048	20.6056	20.5924	20.4275	20.1301	19.8978	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.9164	20.0403	20.2408	20.4701	20.5779	20.6034	20.6048	20.6056	20.5924	20.4275	20.1301	19.8978	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9978	0.9939	0.9771	0.9020	0.7262	0.5087	0.3569	0.4032	0.6805	0.9494	0.9942	0.9985	(94)
Useful gains	338.7228	384.2669	430.5368	450.0826	388.8436	267.7096	179.1147	187.5871	285.5834	345.5892	326.6779	321.3338	(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	723.4983	699.3375	632.8236	525.4491	402.1245	268.5794	179.1675	187.7131	291.8482	445.1338	593.3496	718.8061	(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	286.2730	211.7274	150.5014	54.2639	9.8810	0.0000	0.0000	0.0000	0.0000	74.0612	192.0036	295.7193	(98)
Space heating												1274.4309	(98)
Space heating per m2										(98) / (4) =		20.3974	(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	420.5352	331.0596	339.2231	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9903	0.9972	0.9950	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	416.4760	330.1206	337.5386	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	692.1494	662.1269	620.7614	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	198.4849	247.0127	210.7178	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												656.2154	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	49.6212	61.7532	52.6794	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling												164.0538	(107)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling per m2	2.6257 (108)
Energy for space heating	20.3974 (99)
Energy for space cooling	2.6257 (108)
Total	23.0231 (109)
Target Fabric Energy Efficiency (TFEE)	26.5 (109)

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

Overheating Calculation Input Data

Dwelling type	MidTerrace Flat
Number of storeys	1
Cross ventilation possible	Yes
SAP Region	Thames Valley
Front of dwelling faces	North
Overshading	Average or unknown
Thermal mass parameter	250.0
Night ventilation	Yes
Ventilation rate during hot weather (ach)	3.00 (Windows half open)

Overheating Calculation

Summer ventilation heat loss coefficient	152.16 (P1)
Transmission heat loss coefficient	21.85 (37)
Summer heat loss coefficient	174.02 (P2)

Overhangs

Orientation	Ratio	Z_overhangs	Overhang type
East	0.000	1.000	None

Solar shading

Orientation	Z blinds	Solar access	Z overhangs	Z summer
East	0.850	0.90	1.000	0.765 (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
East	8.4400	117.5071	0.6300	0.7000	0.7650	301.1265
total:						301.1265

	Jun	Jul	Aug	
Solar gains	320	301	265	(P3)
Internal gains	358	343	350	
Total summer gains	677	644	615	(P5)
Summer gain/loss ratio	3.89	3.70	3.54	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 250.0)	0.25	0.25	0.25	
Threshold temperature	20.14	21.85	21.59	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	

Assessment of likelihood of high internal temperature: Slight

BASIC COMPLIANCE REPORT
Calculation Type: New Build (As Designed)

Darren Evans

Property Reference	DE-21912-Plot 27	**Issued on Date**	25/01/2023
Assessment Reference	Plot 27	**Prop Type Ref**	FF Flat
Property	Land at Tesco Extra Car Park, Plot 27, 1Bath, 1B2P, RG1		

SAP Rating	98 A	**DER**	6.76	**TER**	20.78
Environmental	98 A	**% DER<TER**	67.47		
CO_2 Emissions (t/year)	0.02	**DFEE**	26.37	**TFEE**	26.48
General Requirements Compliance	Pass	**% DFEE<TFEE**	0.39		

Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Electricity		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	20.78	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	6.76	$kgCO_2/m^2$	Pass
	-14.02 (-67.5%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	26.48	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	26.37	$kWh/m^2/yr$	
	-0.1 (-0.4%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Openings	1.20 (max. 2.00)	1.20 (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	4.00 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system 1	Room heaters - Electric Panel, convector or radiant heaters	
Main heating system 2	Heat pump with warm air distribution - Electric Dimplex EDL200UK-630	
Secondary heating system	None	

5 Cylinder insulation

Hot water storage	No cylinder	

6 Controls

Space heating controls 1	Programmer and room thermostat	Pass
Hot water controls	No cylinder	

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power	0.1600 0.1600	
Maximum	0.7	Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)	Slight	Pass

Based on:

Overshading	Average
Windows facing East	8.44 m², No overhang
Air change rate	3.00 ach
Blinds/curtains	Dark-coloured curtain or roller blind, closed 100% of daylight hours

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value		
Solid Wall	0.00	W/m²K	Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals	4.00 (design value)		
Maximum	10.0		Pass

10 Key features

Party wall U-value	0.00	W/m²K
Photovoltaic array	1.64	kW

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BLOCK COMPLIANCE
Calculation Type: New Build (As Designed)

Darren Evans

Block Reference	4 PV planel per falt	**Issued on Date**	25/01/2023
Block Name	335		
Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

Block Compliance Report - DER

Block Reference: 4 PV planel per falt		Block Name: 335			
Property-Assessment Reference	**Multiplier**	**Floor Area (m^2)**	**DER ($kgCO_2/m^2$)**	**TER ($kgCO_2/m^2$)**	**% DER/TER**
DE-21912-Plot 20-Plot 20	1	61.7	9.39	24.71	62.00 %
DE-21912-Plot 17-Plot 17	1	61.7	11.56	25.89	55.36 %
DE-21912- Plot 07-Plot 07	1	50.76	8.84	26.11	66.14 %
DE-21912 - Plot 05-Plot 05	1	65.09	12.75	26.21	51.36 %
DE-21912-Plot 40-Plot 40	1	61.7	6.66	21.38	68.85 %
DE-21912-Plot 27-Plot 27	1	62.48	6.76	20.78	67.47 %
DE-21912-Plot 25-Plot 25	1	65.09	9.65	22.66	57.41 %
DE-21912-Plot 67-Plot 67	1	62.48	13.70	25.47	46.21 %
DE-21912-Plot 80-Plot 80	1	61.7	15.75	27.54	42.81 %
DE-21912-Plot 65-Plot 65	1	65.09	17.89	28.43	37.07 %
DE-21912-Plot 77-Plot 77	1	61.7	20.17	30.69	34.27 %
DE-21912-Plot 37-Plot 37	1	61.7	11.61	24.84	53.25 %
Totals:	12	741.19	144.73	304.71	
Average DER = 12.12 $kgCO_2/m^2$		**% DER/TER**	PASS		
Average TER = 25.38 $kgCO_2/m^2$		52.25 %			

Block Compliance Report - DFEE

Block Reference: 4 PV planel per falt		Block Name: 335			
Property-Assessment Reference	**Multiplier**	**Floor Area (m^2)**	**DFEE ($kWh/m^2/yr$)**	**TFEE ($kWh/m^2/yr$)**	**% DFEE/TFEE**
DE-21912-Plot 20-Plot 20	1	61.7	32.22	39.28	17.99 %
DE-21912-Plot 17-Plot 17	1	61.7	36.71	43.81	16.22 %
DE-21912- Plot 07-Plot 07	1	50.76	34.10	38.48	11.38 %
DE-21912 - Plot 05-Plot 05	1	65.09	38.23	46.52	17.82 %
DE-21912-Plot 40-Plot 40	1	61.7	26.99	27.95	3.45 %
DE-21912-Plot 27-Plot 27	1	62.48	26.37	26.48	0.39 %
DE-21912-Plot 25-Plot 25	1	65.09	32.34	34.66	6.71 %
DE-21912-Plot 67-Plot 67	1	62.48	39.57	42.27	6.38 %
DE-21912-Plot 80-Plot 80	1	61.7	44.07	48.37	8.88 %
DE-21912-Plot 65-Plot 65	1	65.09	48.15	53.91	10.69 %
DE-21912-Plot 77-Plot 77	1	61.7	52.85	59.27	10.83 %
DE-21912-Plot 37-Plot 37	1	61.7	36.79	40.29	8.69 %
Totals:	12	741.19	448.37	501.28	
Average DFEE = 37.43 $kWh/m^2/yr$		**% DFEE/TFEE**	PASS		
Average TFEE = 41.85 $kWh/m^2/yr$		10.56 %			

PREDICTED ENERGY ASSESSMENT

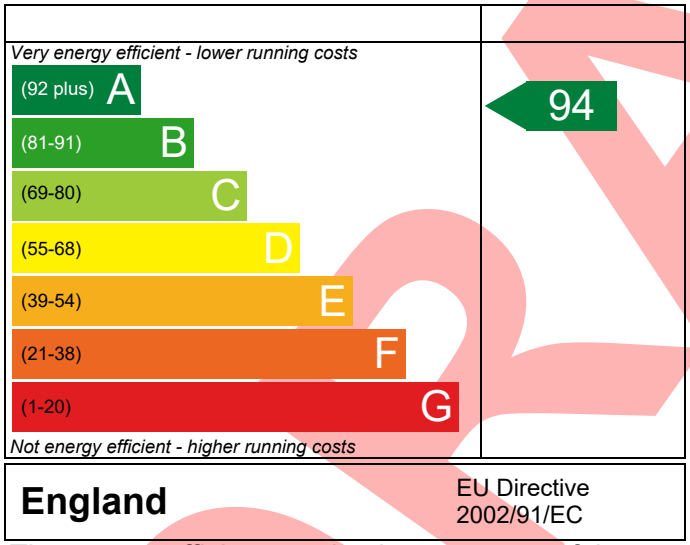
Land at Tesco Extra Car Park,
Plot 37,
1Bath,
2B3P,
RG1

Dwelling type:	Flat, Mid-Terrace
Date of assessment:	25/01/2023
Produced by:	Charles Sims
Total floor area:	61.7 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 (CO_2) emissions.

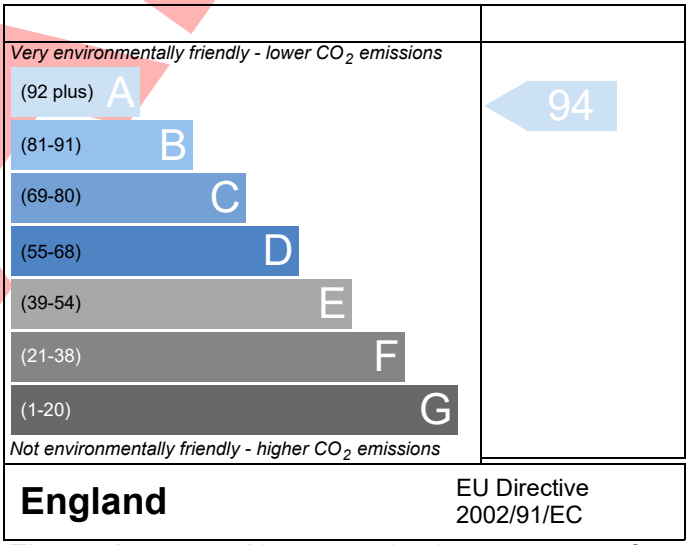
Energy Efficiency Rating



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 (CO_2) 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 (CO_2) emissions. The higher the rating the less impact it has on the environment.

DRAFT

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BUILDING REGULATION COMPLIANCE
Calculation Type: New Build (As Designed)

Darren Evans

Property Reference	DE-21912-Plot 37	**Issued on Date**	25/01/2023
Assessment Reference	Plot 37	**Prop Type Ref**	FF -Flat
Property	Land at Tesco Extra Car Park, Plot 37, 1Bath, 2B3P, RG1		

SAP Rating	94 A	**DER**	11.61	**TER**	24.84
Environmental	94 A	**% DER<TER**	53.25		
CO_2 Emissions (t/year)	0.26	**DFEE**	36.79	**TFEE**	40.29
General Requirements Compliance	Pass	**% DFEE<TFEE**	8.69		

Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Electricity		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	24.84	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	11.61	$kgCO_2/m^2$	Pass
	-13.23 (-53.3%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	40.29	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	36.79	$kWh/m^2/yr$	
	-3.5 (-8.7%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	Pass
Openings	1.20 (max. 2.00)	1.20 (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	4.00 (design value)	$m^3/(h.m^2)$ @ 50 Pa	
Maximum	10.0	$m^3/(h.m^2)$ @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system 1	Room heaters - Electric Panel, convector or radiant heaters	

DRAFT

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

Main heating system 2	Heat pump with warm air distribution - Electric Dimplex EDL200UK-630		
Secondary heating system	None		
5 Cylinder insulation			
Hot water storage	No cylinder		
6 Controls			
Space heating controls 1	Programmer and room thermostat		Pass
Hot water controls	No cylinder		
7 Low energy lights			
Percentage of fixed lights with low-energy fittings	100	%	
Minimum	75	%	Pass
8 Mechanical ventilation			
Continuous extract system (decentralised)			
Specific fan power	0.1200 0.1600		
Maximum	0.7		Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)	Slight		Pass
Based on:			
Overshading	Average		
Windows facing West	9.60 m², No overhang		
Air change rate	3.00 ach		
Blinds/curtains	Dark-coloured curtain or roller blind, closed 100% of daylight hours		

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value		
Solid Wall	0.00	W/m²K	Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals	4.00 (design value)	m³/(h.m²) @ 50 Pa	
Maximum	10.0	m³/(h.m²) @ 50 Pa	Pass

10 Key features

Party wall U-value	0.00	W/m²K
Floor U-value	0.11	W/m²K
Photovoltaic array	1.64	kW

DRAFT

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

	Typical cost	Typical savings per year	Energy efficiency	Environmental impact	Result
Low energy lights			0	0	Already installed
Solar water heating			0	0	Not applicable
Photovoltaic			0	0	Not applicable
Wind turbine			0	0	Not applicable
Totals	**£0**	**£0**	**A 94**	**A 94**	

DRAFT

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

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

Darren Evans

Property Reference	DE-21912-Plot 37	**Issued on Date**	25/01/2023
Assessment Reference	Plot 37	**Prop Type Ref**	FF -Flat
Property	Land at Tesco Extra Car Park, Plot 37, 1Bath, 2B3P, RG1		

SAP Rating	94 A	**DER**	11.61	**TER**	24.84
Environmental	94 A	**% DER<TER**	53.25		
CO_2 Emissions (t/year)	0.26	**DFEE**	36.79	**TFEE**	40.29
General Requirements Compliance	Pass	**% DFEE<TFEE**	8.69		

Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

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

Orientation	East
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	Flat, Mid-Terrace
2.0 Number of Storeys	1
3.0 Date Built	2023
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	17.02 m	61.70 m²	2.46 m

7.0 Living Area	27.08	m²
8.0 Thermal Mass Parameter	Simple calculation - Medium	
Thermal Mass	250.00	kJ/m²K

9.0 External Walls

Description	Type	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Wall 1	Cavity Wall	0.18	41.87	32.27

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall 1	Solid Wall		0.00	48.39

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Heat Loss Floor 1	Ground Floor - Solid		0.11	61.70

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Windows	Manufacturer	Window	Double glazed			0.63		0.70	1.20

13.0 Openings

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

Darren Evans

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
Windows	Window	[1] External Wall 1	West	Dark-coloured curtain or roller blind	0.00					9.60	100

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	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	5.00	0.021	No	CBA-313
Independently assessed	E3 Sill	1.00	0.021	No	CBA-314
Independently assessed	E4 Jamb	15.00	0.017	No	CBA-315
Table K1 - Approved	E7 Party floor between dwellings (in blocks of flats)	27.55	0.070	No	
Table K1 - Default	E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.49	1.000	No	
Independently assessed	E16 Corner (normal)	7.38	0.046	No	CBA-316
Independently assessed	E17 Corner (inverted – internal area greater than external area)	4.92	-0.040	No	
Table K1 - Approved	E18 Party wall between dwellings	2.46	0.060	No	
Table K1 - Default	E25 Staggered party wall between dwellings	2.46	0.120	No	

Y-value	0.091	W/m²K
18.0 Pressure Testing	Yes	
Designed AP_{50}	4.00	m³/(h.m²) @ 50 Pa
Property Tested ?		
As Built AP_{50}		m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Windows half open
Cross ventilation possible	Yes
Night Ventilation	Yes
Air change rate	3.00

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - decentralised
MV Reference Number	500661
Duct Type	Flexible

19.1 Mechanical extract ventilation - Decentralised

SFP	Fan/Room Type	Count
0.12	Through Wall Fan Kitchen	1
0.16	In Room Fan Other Wet Room	1

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				0
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	10	
Total number of L.E.L. fittings	10	
Percentage of L.E.L. fittings	100.00	%
External		
External lights fitted	No	
23.0 Electricity Tariff	Standard	
24.0 Main Heating 1	SAP table	
Percentage of Heat	100	%
Main Heating	REA	
SAP Code	691	
Efficiency (SAP Table)	100.0	%
Controls	CRD Programmer and room thermostat	
Sap Code	2605	
25.0 Main Heating 2	Database	
Percentage of Heat	0	%
Database Ref. No.	190006	
Fuel Type	Electricity	
Main Heating	PEH	
SAP Code	524	
In Summer	367.8	
Controls	CWD Time and temperature zone control	
Sap Code	0	
Community Heating	None	
28.0 Water Heating	HWP From main heating 1	
Water Heating	Main Heating 2	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
SAP Code	914	

Immersion Only Heating Hot Water	No	
29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	201.00	L
Loss	1.610	kWh/day
32.0 Photovoltaic Unit	One Dwelling	

PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
1.64	Horizontal	Horizontal	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

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

Darren Evans

Property Reference	DE-21912-Plot 37	**Issued on Date**	25/01/2023
Assessment Reference	Plot 37	**Prop Type Ref**	FF -Flat
Property	Land at Tesco Extra Car Park, Plot 37, 1Bath, 2B3P, RG1		

SAP Rating	94 A	**DER**	11.61	**TER**	24.84
Environmental	94 A	**% DER<TER**	53.25		
CO_2 Emissions (t/year)	0.26	**DFEE**	36.79	**TFEE**	40.29
General Requirements Compliance	Pass	**% DFEE<TFEE**	8.69		

Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

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

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

DWELLING AS DESIGNED

Mid-floor flat, total floor area 62 m²

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

1a TER and DER
Fuel for main heating:Electricity
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 24.84 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 11.61 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)40.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)36.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.20 (max. 2.00)	1.20 (max. 3.30)	OK

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

3 Air permeability
Air permeability at 50 pascals: 4.00 (design value)
Maximum 10.0 OK

4 Heating efficiency
Main heating system 1: Room heaters - Electric
Panel, convector or radiant heaters

Main heating system 2: Heat pump with warm air distribution - Electric
Dimplex EDL200UK-630

Secondary heating system: None

5 Cylinder insulation
Hot water storage No cylinder

6 Controls
Space heating controls 1: Programmer and room thermostat OK

Hot water controls: No cylinder

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

8 Mechanical ventilation
Continuous extract system (decentralised)
Specific fan power: 0.1200 0.1600
Maximum 0.7 OK

9 Summertime temperature
Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing West: 9.60 m², No overhang
Air change rate: 3.00 ach
Blinds/curtains: Dark-coloured curtain or roller blind, closed 100% of daylight hours

10 Key features
Party wall U-value 0.00 W/m²K
Floor U-value 0.11 W/m²K
Photovoltaic array 1.64 kW

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	61.7000 (1b)	x	2.4600 (2b)	=	151.7820	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	151.7820	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		4.0000	
Infiltration rate		0.2000	(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) =	0.1700	(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	0.2168	0.2125	0.2083	0.1870	0.1828	0.1615	0.1615	0.1573	0.1700	0.1828	0.1913	0.1998	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation: 0.5000 (23a)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(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	
Windows (Uw = 1.20)			9.6000	1.1450	10.9924			(27)
Heat Loss Floor 1			61.7000	0.1100	6.7870			(28a)
External Wall 1	41.8700	9.6000	32.2700	0.1800	5.8086			(29a)
Total net area of external elements Aum(A, m2)			103.5700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		23.5880			(33)
Party Wall 1			48.3900	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	9.3850	(36)
Total fabric heat loss (33) + (36) =	32.9729	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	25.0440	25.0440	25.0440	25.0440	25.0440	25.0440	25.0440	25.0440	25.0440	25.0440	25.0440	25.0440	(38)
Heat transfer coeff	58.0170	58.0170	58.0170	58.0170	58.0170	58.0170	58.0170	58.0170	58.0170	58.0170	58.0170	58.0170	(39)

Average = Sum(39)m / 12 = 58.0170 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9403	0.9403	0.9403	0.9403	0.9403	0.9403	0.9403	0.9403	0.9403	0.9403	0.9403	0.9403	(40)
HLP (average)												0.9403	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.0293 (42)
Average daily hot water use (litres/day)	82.3952 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	90.6347	87.3389	84.0431	80.7472	77.4514	74.1556	74.1556	77.4514	80.7472	84.0431	87.3389	90.6347	(44)
Energy conte	134.4086	117.5546	121.3058	105.7574	101.4767	87.5667	81.1434	93.1132	94.2253	109.8105	119.8668	130.1675	(45)
Energy content (annual)										Total = Sum(45)m =		1296.3965	(45)
Distribution loss (46)m = 0.15 x (45)m	20.1613	17.6332	18.1959	15.8636	15.2215	13.1350	12.1715	13.9670	14.1338	16.4716	17.9800	19.5251	(46)

Water storage loss:	
Store volume	201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	1.6100 (48)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

```
  Temperature factor from Table 2b                                                                                0.5400 (49)
Enter (49) or (54) in (55)                                                                                        0.8694 (55)
Total storage loss
              26.9514    24.3432    26.9514    26.0820    26.9514    26.0820    26.9514    26.9514    26.0820    26.9514    26.0820    26.9514 (56)
If cylinder contains dedicated solar storage
              26.9514    24.3432    26.9514    26.0820    26.9514    26.0820    26.9514    26.9514    26.0820    26.9514    26.0820    26.9514 (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)
Total heat required for water heating calculated for each month
             161.3600   141.8978   148.2572   131.8394   128.4281   113.6487   108.0948   120.0646   120.3073   136.7619   145.9488   157.1189 (62)
Solar input      0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (63)
                                                                                  Solar input (sum of months) = Sum(63)m =      0.0000 (63)
Output from w/h
             161.3600   141.8978   148.2572   131.8394   128.4281   113.6487   108.0948   120.0646   120.3073   136.7619   145.9488   157.1189 (64)
                                                                                  Total per year (kWh/year) = Sum(64)m =   1613.7275 (64)
Heat gains from water heating, kWh/month
              44.6909    39.0869    40.3342    35.1643    33.7410    29.1159    26.9802    30.9602    31.3299    36.5120    39.8557    43.2807 (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       101.4635   101.4635   101.4635   101.4635   101.4635   101.4635   101.4635   101.4635   101.4635   101.4635   101.4635   101.4635 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
              16.5750    14.7217    11.9725     9.0640     6.7754     5.7201     6.1808     8.0340    10.7832    13.6918    15.9803    17.0356 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
             177.2131   179.0520   174.4180   164.5527   152.0996   140.3954   132.5763   130.7374   135.3714   145.2367   157.6898   169.3940 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
              33.1463    33.1463    33.1463    33.1463    33.1463    33.1463    33.1463    33.1463    33.1463    33.1463    33.1463    33.1463 (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)
             -81.1708   -81.1708   -81.1708   -81.1708   -81.1708   -81.1708   -81.1708   -81.1708   -81.1708   -81.1708   -81.1708   -81.1708 (71)
Water heating gains (Table 5)
              60.0684    58.1650    54.2126    48.8393    45.3508    40.4388    36.2637    41.6131    43.5138    49.0753    55.3551    58.1730 (72)
Total internal gains
             307.2955   305.3778   294.0422   275.8951   257.6649   239.9934   228.4598   233.8236   243.1074   261.4428   282.4643   298.0417 (73)
```

---

6. Solar gains

```
[Jan]                                  Area          Solar flux              g                FF            Access              Gains
                                       m2             Table 6a       Specific data    Specific data        factor                W
                                                         W/m2         or Table 6b      or Table 6c       Table 6d
-------------------------------------------------------------------------------------------------------------------------------------
West                                 9.6000            19.6403            0.6300            0.7000            0.7700           57.6223 (80)
-------------------------------------------------------------------------------------------------------------------------------------

Solar gains     57.6223   112.7214   185.6361   270.7391   331.8010   339.6573   323.3676   277.7680   215.9024   133.7534    71.8482    47.3858 (83)
Total gains    364.9177   418.0992   479.6783   546.6342   589.4659   579.6507   551.8275   511.5916   459.0099   395.1962   354.3125   345.4274 (84)
```

---

7. Mean internal temperature (heating season)

```
Temperature during heating periods in the living area from Table 9, Th1 (C)                                      21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)
                Jan        Feb        Mar        Apr        May        Jun        Jul        Aug        Sep        Oct        Nov        Dec
tau          73.8529    73.8529    73.8529    73.8529    73.8529    73.8529    73.8529    73.8529    73.8529    73.8529    73.8529    73.8529
alpha         5.9235     5.9235     5.9235     5.9235     5.9235     5.9235     5.9235     5.9235     5.9235     5.9235     5.9235     5.9235
util living area
              0.9981     0.9953     0.9843     0.9389     0.8151     0.6233     0.4600     0.5163     0.7911     0.9703     0.9957     0.9986 (86)

MIT          20.0431    20.1803    20.4158    20.7013    20.9065    20.9842    20.9977    20.9957    20.9412    20.6519    20.2821    20.0034 (87)
Th 2          20.1334    20.1334    20.1334    20.1334    20.1334    20.1334    20.1334    20.1334    20.1334    20.1334    20.1334    20.1334 (88)
util rest of house
              0.9975     0.9937     0.9790     0.9192     0.7655     0.5462     0.3708     0.4219     0.7197     0.9568     0.9940     0.9982 (89)
MIT 2         18.8478    19.0478    19.3885    19.7874    20.0451    20.1232    20.1325    20.1316    20.0877    19.7278    19.1970    18.7899 (90)
Living area fraction                                                                                fLA = Living area / (4) =      0.4389 (91)
MIT           19.3724    19.5449    19.8394    20.1885    20.4232    20.5011    20.5123    20.5108    20.4623    20.1334    19.6732    19.3225 (92)
Temperature adjustment                                                                                                         0.0000
adjusted MIT  19.3724    19.5449    19.8394    20.1885    20.4232    20.5011    20.5123    20.5108    20.4623    20.1334    19.6732    19.3225 (93)
```

---

8. Space heating requirement

```
                Jan        Feb        Mar        Apr        May        Jun        Jul        Aug        Sep        Oct        Nov        Dec
Utilisation   0.9967     0.9923     0.9768     0.9206     0.7831     0.5797     0.4101     0.4635     0.7486     0.9568     0.9928     0.9976 (94)
Useful gains  363.7143   414.8924   468.5477   503.2325   461.6116   336.0018   226.2837   237.1056   343.5988   378.1275   351.7668   344.5884 (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
             874.4555   849.6508   773.9109   654.9229   506.0938   342.3622   226.9777   238.4981   369.1204   553.0996   729.4611   877.3606 (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
             379.9915   292.1576   227.1902   109.2171    33.0948     0.0000     0.0000     0.0000     0.0000   130.1792   271.9399   396.3825 (98)
Space heating                                                                                                                 1840.1528 (98)
Space heating per m2                                                                                        (98) / (4) =      29.8242 (99)
```

8c. Space cooling requirement

Not applicable

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	1840.1528	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	379.9915	292.1576	227.1902	109.2171	33.0948	0.0000	0.0000	0.0000	0.0000	130.1792	271.9399	396.3825	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	379.9915	292.1576	227.1902	109.2171	33.0948	0.0000	0.0000	0.0000	0.0000	130.1792	271.9399	396.3825	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
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)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	161.3600	141.8978	148.2572	131.8394	128.4281	113.6487	108.0948	120.0646	120.3073	136.7619	145.9488	157.1189	(64)
Efficiency of water heater												349.4100	(216)
(217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	(217)
Fuel for water heating, kWh/month	46.1807	40.6107	42.4307	37.7320	36.7557	32.5259	30.9364	34.3621	34.4316	39.1408	41.7701	44.9669	(219)
Water heating fuel used												461.8436	(219)
Annual totals kWh/year													
Space heating fuel - main system												1840.1528	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.6500, total flow = 21.0000, SFP = 0.1738)													
mechanical ventilation fans (SFP = 0.1738)												32.1850	(230a)
Total electricity for the above, kWh/year												32.1850	(231)
Electricity for lighting (calculated in Appendix L)												292.7191	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.64 * 951 * 1.00) =												-1247.2082	(233)
Total delivered energy for all uses												1379.6922	(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	1840.1528	0.5190		955.0393	(261)
Space heating - main system 2	0.0000	0.5190		0.0000	(262)
Space heating - secondary	0.0000	0.0000		0.0000	(263)
Water heating (other fuel)	461.8436	0.5190		239.6968	(264)
Space and water heating				1194.7361	(265)
Pumps and fans	32.1850	0.5190		16.7040	(267)
Energy for lighting	292.7191	0.5190		151.9212	(268)
Energy saving/generation technologies					
PV Unit	-1247.2082	0.5190		-647.3011	(269)
Total CO2, kg/year				716.0603	(272)
Dwelling Carbon Dioxide Emission Rate (DER)				11.6100	(273)

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

DER		11.6100	ZC1
Total Floor Area	TFA	61.7000	
Assumed number of occupants	N	2.0293	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.0199	ZC2
CO2 emissions from cooking, equation (L16)		2.7180	ZC3
Total CO2 emissions		31.3479	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		31.3479	ZC8

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	61.7000 (1b)	x	2.4600 (2b)	=	151.7820	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	151.7820	(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) =	0.1318	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3818	(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) =	0.3245	(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	0.4137	0.4056	0.3975	0.3570	0.3488	0.3083	0.3083	0.3002	0.3245	0.3488	0.3651	0.3813	(22b)
Effective ac	0.5856	0.5823	0.5790	0.5637	0.5608	0.5475	0.5475	0.5450	0.5527	0.5608	0.5666	0.5727	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opening Type (Uw = 1.40)			9.6000	1.3258	12.7273			(27)
Heat Loss Floor 1			61.7000	0.1300	8.0210			(28a)
External Wall 1	41.8700	9.6000	32.2700	0.1800	5.8086			(29a)
Total net area of external elements Aum(A, m2)			103.5700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.5569			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.6249	(36)
Total fabric heat loss					(33) + (36) =		30.1818	(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	29.3311	29.1646	29.0015	28.2350	28.0916	27.4241	27.4241	27.3005	27.6812	28.0916	28.3817	28.6850	(38)
Heat transfer coeff	59.5129	59.3464	59.1832	58.4168	58.2734	57.6059	57.6059	57.4822	57.8630	58.2734	58.5635	58.8668	(39)
Average = Sum(39)m / 12 =												58.4161	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9646	0.9619	0.9592	0.9468	0.9445	0.9336	0.9336	0.9316	0.9378	0.9445	0.9492	0.9541	(40)
HLP (average)												0.9468	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0293	(42)
Average daily hot water use (litres/day)												82.3952	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	90.6347	87.3389	84.0431	80.7472	77.4514	74.1556	74.1556	77.4514	80.7472	84.0431	87.3389	90.6347	(44)
Energy conte	134.4086	117.5546	121.3058	105.7574	101.4767	87.5667	81.1434	93.1132	94.2253	109.8105	119.8668	130.1675	(45)
Energy content (annual)										Total = Sum(45)m =		1296.3965	(45)
Distribution loss (46)m = 0.15 x (45)m	20.1613	17.6332	18.1959	15.8636	15.2215	13.1350	12.1715	13.9670	14.1338	16.4716	17.9800	19.5251	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage

	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
	181.0035	159.6403	167.9007	150.8492	148.0716	132.6585	127.7383	139.7081	139.3171	156.4054	164.9586	176.7624 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
									Solar input (sum of months) = Sum(63)m =			0.0000 (63)
Output from w/h												
	181.0035	159.6403	167.9007	150.8492	148.0716	132.6585	127.7383	139.7081	139.3171	156.4054	164.9586	176.7624 (64)
									Total per year (kWh/year) = Sum(64)m =			1845.0139 (64)
Heat gains from water heating, kWh/month												
	81.9668	72.7555	77.6101	71.2378	71.0169	65.1894	64.2561	68.2361	67.4034	73.7879	75.9292	80.5566 (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	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	16.5750	14.7217	11.9725	9.0640	6.7754	5.7201	6.1808	8.0340	10.7832	13.6918	15.9803	17.0356	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	177.2131	179.0520	174.4180	164.5527	152.0996	140.3954	132.5763	130.7374	135.3714	145.2367	157.6898	169.3940	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	(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)													
	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	(71)
Water heating gains (Table 5)													
	110.1704	108.2671	104.3147	98.9414	95.4529	90.5408	86.3657	91.7152	93.6158	99.1773	105.4572	108.2750	(72)
Total internal gains													
	360.3975	358.4799	347.1442	328.9971	310.7669	293.0954	281.5619	286.9256	296.2095	314.5448	335.5663	351.1437	(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	
West	9.6000	19.6403	0.6300	0.7000	0.7700	57.6223	(80)

Solar gains	57.6223	112.7214	185.6361	270.7391	331.8010	339.6573	323.3676	277.7680	215.9024	133.7534	71.8482	47.3858	(83)
Total gains	418.0198	471.2013	532.7803	599.7363	642.5679	632.7527	604.9295	564.6936	512.1119	448.2982	407.4145	398.5295	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	71.9966	72.1985	72.3976	73.3474	73.5279	74.3800	74.3800	74.5399	74.0494	73.5279	73.1637	72.7868	
alpha	5.7998	5.8132	5.8265	5.8898	5.9019	5.9587	5.9587	5.9693	5.9366	5.9019	5.8776	5.8525	
util living area													
	0.9962	0.9916	0.9755	0.9150	0.7735	0.5727	0.4176	0.4656	0.7320	0.9498	0.9914	0.9971	(86)
MIT	20.0903	20.2305	20.4663	20.7502	20.9290	20.9900	20.9987	20.9976	20.9613	20.7150	20.3520	20.0662	(87)
Th 2	20.1130	20.1152	20.1175	20.1279	20.1299	20.1390	20.1390	20.1407	20.1355	20.1299	20.1259	20.1218	(88)
util rest of house													
	0.9950	0.9890	0.9677	0.8902	0.7207	0.5000	0.3367	0.3800	0.6579	0.9294	0.9882	0.9961	(89)
MIT 2	18.9012	19.1065	19.4468	19.8454	20.0647	20.1327	20.1385	20.1397	20.1069	19.8087	19.2923	18.8727	(90)
Living area fraction									fLA = Living area / (4) =			0.4389	(91)
MIT	19.4231	19.5998	19.8943	20.2425	20.4440	20.5090	20.5160	20.5162	20.4819	20.2065	19.7574	19.3965	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4231	19.5998	19.8943	20.2425	20.4440	20.5090	20.5160	20.5162	20.4819	20.2065	19.7574	19.3965	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9937	0.9870	0.9653	0.8938	0.7407	0.5317	0.3723	0.4177	0.6889	0.9315	0.9864	0.9951	(94)
Useful gains	415.3852	465.0723	514.3028	536.0635	475.9329	336.4287	225.1904	235.8445	352.7886	417.6008	401.8815	396.5753	(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													
	900.0211	872.3810	792.7162	662.5942	509.5452	340.3925	225.5871	236.6103	369.2776	559.8006	741.2614	894.5704	(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													
	360.5691	273.7114	207.1396	91.1021	25.0075	0.0000	0.0000	0.0000	0.0000	105.7966	244.3535	370.5083	(98)
Space heating												1678.1881	(98)
Space heating per m2											(98) / (4) =	27.1992	(99)

8c. Space cooling requirement

Not applicable

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

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												93.5000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												1794.8536	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	360.5691	273.7114	207.1396	91.1021	25.0075	0.0000	0.0000	0.0000	0.0000	105.7966	244.3535	370.5083	(98)
Space heating efficiency (main heating system 1)													
	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)													
	385.6354	292.7395	221.5396	97.4354	26.7460	0.0000	0.0000	0.0000	0.0000	113.1515	261.3407	396.2656	(211)
Water heating requirement													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	181.0035	159.6403	167.9007	150.8492	148.0716	132.6585	127.7383	139.7081	139.3171	156.4054	164.9586	176.7624	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.6183	86.2402	85.3751	83.5181	81.1869	79.8000	79.8000	79.8000	79.8000	83.7976	85.8603	86.7433	(217)
Fuel for water heating, kWh/month													
	208.9668	185.1113	196.6624	180.6187	182.3836	166.2388	160.0731	175.0729	174.5829	186.6466	192.1245	203.7764	(219)
Water heating fuel used												2212.2579	(219)
Annual totals kWh/year													
Space heating fuel - main system												1794.8536	(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)												292.7191	(232)
Total delivered energy for all uses												4374.8306	(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	1794.8536	0.2160	387.6884	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2212.2579	0.2160	477.8477	(264)
Space and water heating			865.5361	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	292.7191	0.5190	151.9212	(268)
Total CO2, kg/m2/year			1056.3823	(272)
Emissions per m2 for space and water heating			14.0281	(272a)
Fuel factor (electricity)			1.5500	
Emissions per m2 for lighting			2.4623	(272b)
Emissions per m2 for pumps and fans			0.6309	(272c)
Target Carbon Dioxide Emission Rate (TER) = (14.0281 * 1.55) + 2.4623 + 0.6309, rounded to 2 d.p.			24.8400	(273)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	61.7000 (1b)	x	2.4600 (2b)	=	151.7820	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	151.7820	(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) =	0.1318	(8)
Pressure test		Yes	
Measured/design AP50		4.0000	
Infiltration rate		0.3318	(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) =	0.2820	(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	0.3596	0.3525	0.3455	0.3102	0.3032	0.2679	0.2679	0.2609	0.2820	0.3032	0.3173	0.3314	(22b)
Effective ac	0.5646	0.5621	0.5597	0.5481	0.5460	0.5359	0.5359	0.5340	0.5398	0.5460	0.5503	0.5549	(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	
Windows (Uw = 1.20)			9.6000	1.1450	10.9924			(27)
Heat Loss Floor 1			61.7000	0.1100	6.7870			(28a)
External Wall 1	41.8700	9.6000	32.2700	0.1800	5.8086			(29a)
Total net area of external elements Aum(A, m2)			103.5700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	23.5880			(33)
Party Wall 1			48.3900	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	9.3850	(36)
Total fabric heat loss (33) + (36) =	32.9729	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.2817	28.1560	28.0327	27.4539	27.3456	26.8415	26.8415	26.7481	27.0357	27.3456	27.5647	27.7937	(38)
Heat transfer coeff	61.2546	61.1289	61.0057	60.4269	60.3186	59.8144	59.8144	59.7211	60.0086	60.3186	60.5376	60.7667	(39)
Average = Sum(39)m / 12 =												60.4263	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9928	0.9907	0.9887	0.9794	0.9776	0.9694	0.9694	0.9679	0.9726	0.9776	0.9812	0.9849	(40)
HLP (average)												0.9794	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.0293	(42)
Average daily hot water use (litres/day)	82.3952	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	90.6347	87.3389	84.0431	80.7472	77.4514	74.1556	74.1556	77.4514	80.7472	84.0431	87.3389	90.6347	(44)
Energy conte	134.4086	117.5546	121.3058	105.7574	101.4767	87.5667	81.1434	93.1132	94.2253	109.8105	119.8668	130.1675	(45)
Energy content (annual)										Total = Sum(45)m =		1296.3965	(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)
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)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Heat gains from water heating, kWh/month

	28.5618	24.9804	25.7775	22.4734	21.5638	18.6079	17.2430	19.7866	20.0229	23.3347	25.4717	27.6606 (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	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	16.5750	14.7217	11.9725	9.0640	6.7754	5.7201	6.1808	8.0340	10.7832	13.6918	15.9803	17.0356	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	177.2131	179.0520	174.4180	164.5527	152.0996	140.3954	132.5763	130.7374	135.3714	145.2367	157.6898	169.3940	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	(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)													
	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	(71)
Water heating gains (Table 5)													
	38.3896	37.1731	34.6472	31.2131	28.9836	25.8443	23.1760	26.5948	27.8096	31.3639	35.3773	37.1782	(72)
Total internal gains													
	285.6167	284.3860	274.4767	258.2689	241.2977	225.3989	215.3722	218.8053	227.4032	243.7314	262.4865	277.0469	(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	
West	9.6000	19.6403	0.6300	0.7000	0.7700	57.6223	(80)

Solar gains	57.6223	112.7214	185.6361	270.7391	331.8010	339.6573	323.3676	277.7680	215.9024	133.7534	71.8482	47.3858	(83)
Total gains	343.2389	397.1073	460.1128	529.0080	573.0987	565.0563	538.7398	496.5733	443.3057	377.4848	334.3347	324.4327	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	69.9494	70.0932	70.2348	70.9076	71.0349	71.6336	71.6336	71.7456	71.4018	71.0349	70.7778	70.5110	
alpha	5.6633	5.6729	5.6823	5.7272	5.7357	5.7756	5.7756	5.7830	5.7601	5.7357	5.7185	5.7007	
util living area													
	0.9986	0.9965	0.9882	0.9511	0.8423	0.6526	0.4845	0.5450	0.8215	0.9776	0.9969	0.9990	(86)
MIT	19.9341	20.0775	20.3258	20.6418	20.8770	20.9779	20.9966	20.9936	20.9215	20.5941	20.2020	19.9065	(87)
Th 2	20.0894	20.0911	20.0927	20.1006	20.1020	20.1089	20.1089	20.1101	20.1062	20.1020	20.0991	20.0960	(88)
util rest of house													
	0.9982	0.9954	0.9840	0.9342	0.7946	0.5721	0.3885	0.4439	0.7518	0.9669	0.9957	0.9987	(89)
MIT 2	19.1107	19.2550	19.5023	19.8137	20.0212	20.0990	20.1080	20.1083	20.0635	19.7749	19.3860	19.0885	(90)
Living area fraction									fLA = Living area / (4) =			0.4389	(91)
MIT	19.4721	19.6160	19.8638	20.1771	20.3968	20.4848	20.4980	20.4969	20.4401	20.1345	19.7441	19.4476	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4721	19.6160	19.8638	20.1771	20.3968	20.4848	20.4980	20.4969	20.4401	20.1345	19.7441	19.4476	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9978	0.9946	0.9827	0.9359	0.8114	0.6070	0.4308	0.4885	0.7799	0.9674	0.9950	0.9984	(94)
Useful gains	342.4696	394.9534	452.1714	495.0768	465.0146	343.0056	232.1046	242.5813	345.7548	365.1683	332.6775	323.9002	(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													
	929.3606	899.5730	815.2650	681.4426	524.5796	351.9942	233.1569	244.6690	380.4606	575.1055	765.4460	926.5432	(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													
	436.6469	339.1043	270.1417	134.1834	44.3164	0.0000	0.0000	0.0000	0.0000	156.1933	311.5933	448.3664	(98)
Space heating												2140.5456	(98)
Space heating per m2											(98) / (4) =	34.6928	(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	562.2557	442.6268	453.8802	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9407	0.9734	0.9602	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	528.9246	430.8727	435.8038	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	736.4824	704.2555	656.2645	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	149.4416	203.3968	164.0228	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												516.8611	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling kWh													

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

	0.0000	0.0000	0.0000	0.0000	0.0000	37.3604	50.8492	41.0057	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												129.2153 (107)
Space cooling per m2												2.0943 (108)
Energy for space heating												34.6928 (99)
Energy for space cooling												2.0943 (108)
Total												36.7870 (109)
Dwelling Fabric Energy Efficiency (DFEE)												36.8 (109)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	61.7000 (1b)	x	2.4600 (2b)	=	151.7820	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	151.7820	(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) =	0.1318	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3818	(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) =	0.3245	(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	0.4137	0.4056	0.3975	0.3570	0.3488	0.3083	0.3083	0.3002	0.3245	0.3488	0.3651	0.3813	(22b)
Effective ac	0.5856	0.5823	0.5790	0.5637	0.5608	0.5475	0.5475	0.5450	0.5527	0.5608	0.5666	0.5727	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opening Type (Uw = 1.40)			9.6000	1.3258	12.7273			(27)
Heat Loss Floor 1			61.7000	0.1300	8.0210			(28a)
External Wall 1	41.8700	9.6000	32.2700	0.1800	5.8086			(29a)
Total net area of external elements Aum(A, m2)			103.5700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.5569			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.6249	(36)
Total fabric heat loss					(33) + (36) =		30.1818	(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	29.3311	29.1646	29.0015	28.2350	28.0916	27.4241	27.4241	27.3005	27.6812	28.0916	28.3817	28.6850	(38)
Heat transfer coeff	59.5129	59.3464	59.1832	58.4168	58.2734	57.6059	57.6059	57.4822	57.8630	58.2734	58.5635	58.8668	(39)
Average = Sum(39)m / 12 =												58.4161	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9646	0.9619	0.9592	0.9468	0.9445	0.9336	0.9336	0.9316	0.9378	0.9445	0.9492	0.9541	(40)
HLP (average)												0.9468	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.0293	(42)
Average daily hot water use (litres/day)	82.3952	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	90.6347	87.3389	84.0431	80.7472	77.4514	74.1556	74.1556	77.4514	80.7472	84.0431	87.3389	90.6347	(44)
Energy conte	134.4086	117.5546	121.3058	105.7574	101.4767	87.5667	81.1434	93.1132	94.2253	109.8105	119.8668	130.1675	(45)
Energy content (annual)										Total = Sum(45)m =		1296.3965	(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)
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													

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

	28.5618	24.9804	25.7775	22.4734	21.5638	18.6079	17.2430	19.7866	20.0229	23.3347	25.4717	27.6606 (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	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	(66)

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

	16.5750	14.7217	11.9725	9.0640	6.7754	5.7201	6.1808	8.0340	10.7832	13.6918	15.9803	17.0356	(67)

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

	177.2131	179.0520	174.4180	164.5527	152.0996	140.3954	132.5763	130.7374	135.3714	145.2367	157.6898	169.3940	(68)

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

	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	(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)

	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	(71)

Water heating gains (Table 5)

	38.3896	37.1731	34.6472	31.2131	28.9836	25.8443	23.1760	26.5948	27.8096	31.3639	35.3773	37.1782	(72)

Total internal gains

	285.6167	284.3860	274.4767	258.2689	241.2977	225.3989	215.3722	218.8053	227.4032	243.7314	262.4865	277.0469	(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	
West	9.6000	19.6403	0.6300	0.7000	0.7700	57.6223	(80)

Solar gains	57.6223	112.7214	185.6361	270.7391	331.8010	339.6573	323.3676	277.7680	215.9024	133.7534	71.8482	47.3858	(83)
Total gains	343.2389	397.1073	460.1128	529.0080	573.0987	565.0563	538.7398	496.5733	443.3057	377.4848	334.3347	324.4327	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	71.9966	72.1985	72.3976	73.3474	73.5279	74.3800	74.3800	74.5399	74.0494	73.5279	73.1637	72.7868	
alpha	5.7998	5.8132	5.8265	5.8898	5.9019	5.9587	5.9587	5.9693	5.9366	5.9019	5.8776	5.8525	
util living area	0.9986	0.9964	0.9875	0.9472	0.8302	0.6337	0.4677	0.5266	0.8075	0.9760	0.9968	0.9990	(86)
MIT	19.9743	20.1177	20.3633	20.6747	20.8953	20.9832	20.9976	20.9954	20.9346	20.6243	20.2404	19.9506	(87)
Th 2	20.1130	20.1152	20.1175	20.1279	20.1299	20.1390	20.1390	20.1407	20.1355	20.1299	20.1259	20.1218	(88)
util rest of house	0.9982	0.9953	0.9833	0.9294	0.7819	0.5564	0.3777	0.4313	0.7376	0.9647	0.9956	0.9987	(89)
MIT 2	19.1702	19.3150	19.5600	19.8683	20.0616	20.1316	20.1384	20.1394	20.1003	19.8276	19.4466	19.1538	(90)
Living area fraction										fLA = Living area / (4) =		0.4389	(91)
MIT	19.5231	19.6673	19.9126	20.2223	20.4276	20.5053	20.5155	20.5151	20.4665	20.1772	19.7950	19.5035	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5231	19.6673	19.9126	20.2223	20.4276	20.5053	20.5155	20.5151	20.4665	20.1772	19.7950	19.5035	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9978	0.9945	0.9820	0.9316	0.7995	0.5900	0.4173	0.4734	0.7663	0.9655	0.9950	0.9984	(94)
Useful gains	342.4722	394.9182	451.8499	492.8312	458.1908	333.4011	224.8217	235.0550	339.6972	364.4533	332.6498	323.9056	(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	905.9708	876.3849	793.7981	661.4104	508.5843	340.1820	225.5554	236.5440	368.3827	558.0981	743.4631	900.8663	(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	419.2430	323.5456	254.4094	121.3770	37.4928	0.0000	0.0000	0.0000	0.0000	144.0717	295.7856	429.2587	(98)
Space heating												2025.1839	(98)
Space heating per m2											(98) / (4) =	32.8231	(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	541.4951	426.2834	436.8651	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9520	0.9796	0.9687	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	515.4992	417.5698	423.1945	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	736.4824	704.2555	656.2645	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	159.1079	213.2942	173.4041	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												545.8061	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	39.7770	53.3235	43.3510	0.0000	0.0000	0.0000	0.0000	(107)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling	136.4515 (107)
Space cooling per m2	2.2115 (108)
Energy for space heating	32.8231 (99)
Energy for space cooling	2.2115 (108)
Total	35.0346 (109)
Target Fabric Energy Efficiency (TFEE)	40.3 (109)

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

Overheating Calculation Input Data

Dwelling type	MidTerrace Flat
Number of storeys	1
Cross ventilation possible	Yes
SAP Region	Thames Valley
Front of dwelling faces	East
Overshading	Average or unknown
Thermal mass parameter	250.0
Night ventilation	Yes
Ventilation rate during hot weather (ach)	3.00 (Windows half open)

Overheating Calculation

Summer ventilation heat loss coefficient	150.26 (P1)
Transmission heat loss coefficient	32.97 (37)
Summer heat loss coefficient	183.24 (P2)

Overhangs

Orientation	Ratio	Z_overhangs	Overhang type
West	0.000	1.000	None

Solar shading

Orientation	Z blinds	Solar access	Z overhangs	Z summer
West	0.850	0.90	1.000	0.765 (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
West	9.6000	117.5071	0.6300	0.7000	0.7650	342.5136
total:						342.5136

	Jun	Jul	Aug	
Solar gains	364	343	301	(P3)
Internal gains	354	339	347	
Total summer gains	718	682	648	(P5)
Summer gain/loss ratio	3.92	3.72	3.54	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 250.0)	0.25	0.25	0.25	
Threshold temperature	20.17	21.87	21.59	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	

Assessment of likelihood of high internal temperature: Slight

BASIC COMPLIANCE REPORT
Calculation Type: New Build (As Designed)

Darren Evans

Property Reference	DE-21912-Plot 37	**Issued on Date**	25/01/2023
Assessment Reference	Plot 37	**Prop Type Ref**	FF -Flat
Property	Land at Tesco Extra Car Park, Plot 37, 1Bath, 2B3P, RG1		

SAP Rating	94 A	**DER**	11.61	**TER**	24.84
Environmental	94 A	**% DER<TER**	53.25		
CO_2 Emissions (t/year)	0.26	**DFEE**	36.79	**TFEE**	40.29
General Requirements Compliance	Pass	**% DFEE<TFEE**	8.69		

Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Electricity		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	24.84	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	11.61	$kgCO_2/m^2$	Pass
	-13.23 (-53.3%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	40.29	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	36.79	$kWh/m^2/yr$	
	-3.5 (-8.7%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	Pass
Openings	1.20 (max. 2.00)	1.20 (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	4.00 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system 1	Room heaters - Electric Panel, convector or radiant heaters	
Main heating system 2	Heat pump with warm air distribution - Electric Dimplex EDL200UK-630	

Secondary heating system	None		
5 Cylinder insulation			
Hot water storage	No cylinder		
6 Controls			
Space heating controls 1	Programmer and room thermostat		Pass
Hot water controls	No cylinder		
7 Low energy lights			
Percentage of fixed lights with low-energy fittings	100	%	
Minimum	75	%	Pass
8 Mechanical ventilation			
Continuous extract system (decentralised)			
Specific fan power	0.1200 0.1600		
Maximum	0.7		Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)	Slight	Pass

Based on:

Overshading	Average
Windows facing West	9.60 m², No overhang
Air change rate	3.00 ach
Blinds/curtains	Dark-coloured curtain or roller blind, closed 100% of daylight hours

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value		
Solid Wall	0.00	W/m²K	Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals	4.00 (design value)		
Maximum	10.0		Pass

10 Key features

Party wall U-value	0.00	W/m²K
Floor U-value	0.11	W/m²K
Photovoltaic array	1.64	kW

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BLOCK COMPLIANCE
Calculation Type: New Build (As Designed)

Darren Evans

Block Reference	4 PV planel per falt	**Issued on Date**	25/01/2023
Block Name	335		
Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

Block Compliance Report - DER

Block Reference: 4 PV planel per falt		Block Name: 335			
Property-Assessment Reference	**Multiplier**	**Floor Area (m^2)**	**DER ($kgCO_2/m^2$)**	**TER ($kgCO_2/m^2$)**	**% DER/TER**
DE-21912-Plot 20-Plot 20	1	61.7	9.39	24.71	62.00 %
DE-21912-Plot 17-Plot 17	1	61.7	11.56	25.89	55.36 %
DE-21912- Plot 07-Plot 07	1	50.76	8.84	26.11	66.14 %
DE-21912 - Plot 05-Plot 05	1	65.09	12.75	26.21	51.36 %
DE-21912-Plot 40-Plot 40	1	61.7	6.66	21.38	68.85 %
DE-21912-Plot 27-Plot 27	1	62.48	6.76	20.78	67.47 %
DE-21912-Plot 25-Plot 25	1	65.09	9.65	22.66	57.41 %
DE-21912-Plot 67-Plot 67	1	62.48	13.70	25.47	46.21 %
DE-21912-Plot 80-Plot 80	1	61.7	15.75	27.54	42.81 %
DE-21912-Plot 65-Plot 65	1	65.09	17.89	28.43	37.07 %
DE-21912-Plot 77-Plot 77	1	61.7	20.17	30.69	34.27 %
DE-21912-Plot 37-Plot 37	1	61.7	11.61	24.84	53.25 %
Totals:	12	741.19	144.73	304.71	
Average DER = 12.12 $kgCO_2/m^2$		**% DER/TER**	PASS		
Average TER = 25.38 $kgCO_2/m^2$		52.25 %			

Block Compliance Report - DFEE

Block Reference: 4 PV planel per falt		Block Name: 335			
Property-Assessment Reference	**Multiplier**	**Floor Area (m^2)**	**DFEE ($kWh/m^2/yr$)**	**TFEE ($kWh/m^2/yr$)**	**% DFEE/TFEE**
DE-21912-Plot 20-Plot 20	1	61.7	32.22	39.28	17.99 %
DE-21912-Plot 17-Plot 17	1	61.7	36.71	43.81	16.22 %
DE-21912- Plot 07-Plot 07	1	50.76	34.10	38.48	11.38 %
DE-21912 - Plot 05-Plot 05	1	65.09	38.23	46.52	17.82 %
DE-21912-Plot 40-Plot 40	1	61.7	26.99	27.95	3.45 %
DE-21912-Plot 27-Plot 27	1	62.48	26.37	26.48	0.39 %
DE-21912-Plot 25-Plot 25	1	65.09	32.34	34.66	6.71 %
DE-21912-Plot 67-Plot 67	1	62.48	39.57	42.27	6.38 %
DE-21912-Plot 80-Plot 80	1	61.7	44.07	48.37	8.88 %
DE-21912-Plot 65-Plot 65	1	65.09	48.15	53.91	10.69 %
DE-21912-Plot 77-Plot 77	1	61.7	52.85	59.27	10.83 %
DE-21912-Plot 37-Plot 37	1	61.7	36.79	40.29	8.69 %
Totals:	12	741.19	448.37	501.28	
Average DFEE = 37.43 $kWh/m^2/yr$		**% DFEE/TFEE**	PASS		
Average TFEE = 41.85 $kWh/m^2/yr$		10.56 %			

PREDICTED ENERGY ASSESSMENT

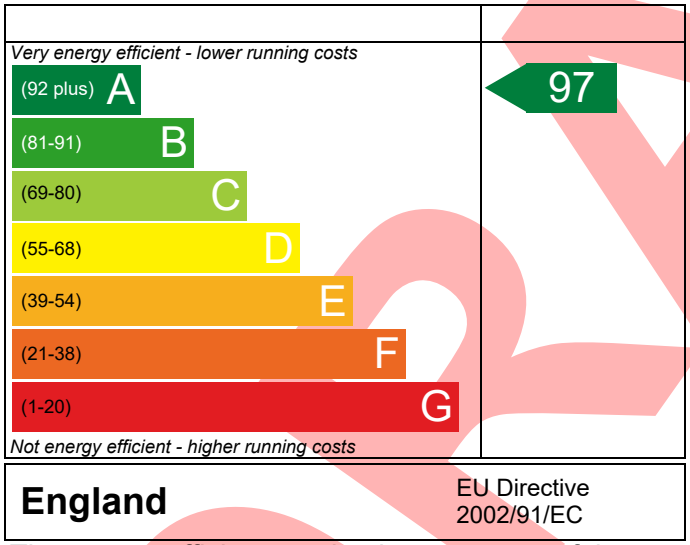
Land at Tesco Extra Car Park,
Plot 40,
1Bath,
2B3P,
RG1

Dwelling type:	Flat, Mid-Terrace
Date of assessment:	25/01/2023
Produced by:	Charles Sims
Total floor area:	61.7 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 (CO_2) emissions.

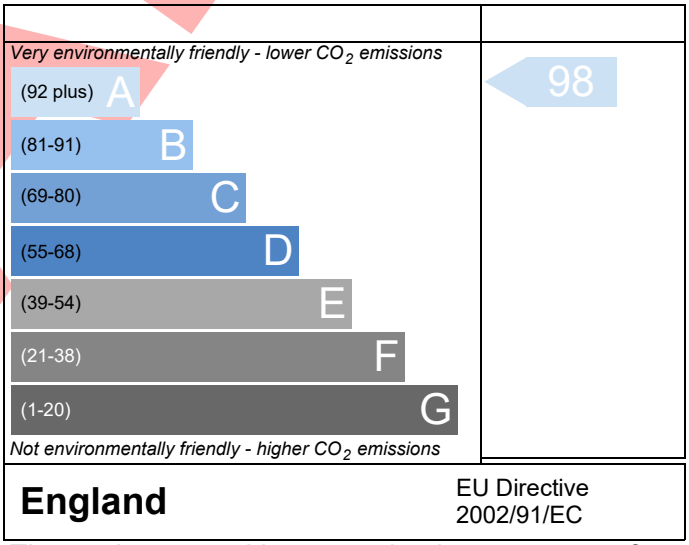
Energy Efficiency Rating



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 (CO_2) 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 (CO_2) emissions. The higher the rating the less impact it has on the environment.

DRAFT

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BUILDING REGULATION COMPLIANCE
Calculation Type: New Build (As Designed)

Darren Evans

Property Reference	DE-21912-Plot 40	Issued on Date	25/01/2023
Assessment Reference	Plot 40	Prop Type Ref	FF-Flat
Property	Land at Tesco Extra Car Park, Plot 40, 1Bath, 2B3P, RG1		

SAP Rating	97 A	DER	6.66	TER	21.38
Environmental	98 A	% DER<TER	68.85		
CO_2 Emissions (t/year)	0.03	DFEE	26.99	TFEE	27.95
General Requirements Compliance	Pass	% DFEE<TFEE	3.45		

Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	Assessor ID	P081-0001
Client			

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Electricity		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	21.38	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	6.66	$kgCO_2/m^2$	Pass
	-14.72 (-68.8%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	27.95	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	26.99	$kWh/m^2/yr$	
	-1.0 (-3.6%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Openings	1.20 (max. 2.00)	1.20 (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	4.00 (design value)	$m^3/(h.m^2)$ @ 50 Pa	
Maximum	10.0	$m^3/(h.m^2)$ @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system 1	Room heaters - Electric Panel, convector or radiant heaters	
Main heating system 2	Heat pump with warm air distribution - Electric Dimplex EDL200UK-630	

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

DRAFT

Secondary heating system	None		
5 Cylinder insulation			
Hot water storage	No cylinder		
6 Controls			
Space heating controls 1	Programmer and room thermostat		Pass
Hot water controls	No cylinder		
7 Low energy lights			
Percentage of fixed lights with low-energy fittings	100	%	
Minimum	75	%	Pass
8 Mechanical ventilation			
Continuous extract system (decentralised)			
Specific fan power	0.1600 0.1200		
Maximum	0.7		Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)	Slight	Pass
Based on:		
Overshading	Average	
Windows facing South	9.60 m², No overhang	
Air change rate	3.00 ach	
Blinds/curtains	Dark-coloured curtain or roller blind, closed 100% of daylight hours	

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value		
Filled Cavity with Edge Sealing	0.00	W/m²K	Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals	4.00 (design value)	m³/(h.m²) @ 50 Pa	
Maximum	10.0	m³/(h.m²) @ 50 Pa	Pass

10 Key features

Party wall U-value	0.00	W/m²K
Photovoltaic array	1.64	kW

DRAFT

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

	Typical cost	Typical savings per year	Energy efficiency	Environmental impact	Result
Low energy lights			0	0	Already installed
Solar water heating			0	0	Not applicable
Photovoltaic			0	0	Not applicable
Wind turbine			0	0	Not applicable
Totals	**£0**	**£0**	**A 97**	**A 98**	

DRAFT

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

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

Darren Evans

Property Reference	DE-21912-Plot 40	**Issued on Date**	25/01/2023
Assessment Reference	Plot 40	**Prop Type Ref**	FF-Flat
Property	Land at Tesco Extra Car Park, Plot 40, 1Bath, 2B3P, RG1		

SAP Rating	97 A	**DER**	6.66	**TER**	21.38
Environmental	98 A	**% DER<TER**	68.85		
CO_2 Emissions (t/year)	0.03	**DFEE**	26.99	**TFEE**	27.95
General Requirements Compliance	Pass	**% DFEE<TFEE**	3.45		

Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

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

Orientation	North
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	Flat, Mid-Terrace
2.0 Number of Storeys	1
3.0 Date Built	2023
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	20.33 m	61.70 m²	2.46 m

7.0 Living Area	27.08	m²
8.0 Thermal Mass Parameter	Simple calculation - Medium	
Thermal Mass	250.00	kJ/m²K

9.0 External Walls

Description	Type	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Wall 1	Cavity Wall	0.18	50.02	40.42

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall 1	Filled Cavity with Edge Sealing		0.00	40.23

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Windows	Manufacturer	Window	Double glazed			0.63		0.70	1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
S Windows	Window	[1] External Wall 1	South	Dark-coloured curtain or roller blind	0.00					9.60	100

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	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	5.00	0.021	No	CBA-313
Independently assessed	E3 Sill	1.00	0.021	No	CBA-314
Independently assessed	E4 Jamb	15.00	0.017	No	CBA-315
Table K1 - Approved	E7 Party floor between dwellings (in blocks of flats)	34.18	0.070	No	
Table K1 - Default	E23 Balcony within or between dwellings, balcony support penetrates wall insulation	6.49	1.000	No	
Independently assessed	E16 Corner (normal)	9.84	0.046	No	CBA-316
Independently assessed	E17 Corner (inverted – internal area greater than external area)	4.92	-0.040	No	
Table K1 - Approved	E18 Party wall between dwellings	7.38	0.060	No	
Table K1 - Default	E25 Staggered party wall between dwellings	2.46	0.120	No	

Y-value	0.205	W/m²K
18.0 Pressure Testing	Yes	
Designed AP_{50}	4.00	m³/(h.m²) @ 50 Pa
Property Tested ?		
As Built AP_{50}		m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Windows half open
Cross ventilation possible	Yes
Night Ventilation	No
Air change rate	3.00

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - decentralised
MV Reference Number	500661
Duct Type	Flexible

19.1 Mechanical extract ventilation - Decentralised

SFP	Fan/Room Type	Count
0.16	In Room Fan Other Wet Room	1
0.12	Through Wall Fan Kitchen	1

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				0
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	10	
Total number of L.E.L. fittings	10	
Percentage of L.E.L. fittings	100.00	%
External		
External lights fitted	No	
23.0 Electricity Tariff	Standard	
24.0 Main Heating 1	SAP table	
Percentage of Heat	100	%
Main Heating	REA	
SAP Code	691	
Efficiency (SAP Table)	100.0	%
Controls	CRD Programmer and room thermostat	
Sap Code	2605	
25.0 Main Heating 2	Database	
Percentage of Heat	0	%
Database Ref. No.	190006	
Fuel Type	Electricity	
Main Heating	PEH	
SAP Code	524	
In Summer	367.8	
Controls	CWD Time and temperature zone control	
Sap Code	0	
Community Heating	None	
28.0 Water Heating	HWP From main heating 1	
Water Heating	Main Heating 2	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
SAP Code	914	
Immersion Only Heating Hot Water	Yes	
29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	201.00	L
Loss	1.610	kWh/day

32.0 Photovoltaic Unit One Dwelling

PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
1.64	Horizontal	Horizontal	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

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

Property Reference	DE-21912-Plot 40	**Issued on Date**	25/01/2023
Assessment Reference	Plot 40	**Prop Type Ref**	FF-Flat
Property	Land at Tesco Extra Car Park, Plot 40, 1Bath, 2B3P, RG1		

SAP Rating	97 A	**DER**	6.66	**TER**	21.38
Environmental	98 A	**% DER<TER**	68.85		
CO_2 Emissions (t/year)	0.03	**DFEE**	26.99	**TFEE**	27.95
General Requirements Compliance	Pass	**% DFEE<TFEE**	3.45		

Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

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

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

DWELLING AS DESIGNED

Mid-floor flat, total floor area 62 m²

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

1a TER and DER
Fuel for main heating:Electricity
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 21.38 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 6.66 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)28.0 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)27.0 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.20 (max. 2.00)	1.20 (max. 3.30)	OK

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

3 Air permeability
Air permeability at 50 pascals: 4.00 (design value)
Maximum 10.0 OK

4 Heating efficiency
Main heating system 1: Room heaters - Electric
Panel, convector or radiant heaters

Main heating system 2: Heat pump with warm air distribution - Electric
Dimplex EDL200UK-630

Secondary heating system: None

5 Cylinder insulation
Hot water storage No cylinder

6 Controls
Space heating controls 1: Programmer and room thermostat OK

Hot water controls: No cylinder

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

8 Mechanical ventilation
Continuous extract system (decentralised)
Specific fan power: 0.1600 0.1200
Maximum 0.7 OK

9 Summertime temperature
Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing South: 9.60 m², No overhang
Air change rate: 3.00 ach
Blinds/curtains: Dark-coloured curtain or roller blind, closed 100% of daylight hours

10 Key features
Party wall U-value 0.00 W/m²K
Photovoltaic array 1.64 kW

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	61.7000 (1b)	x	2.4600 (2b)	=	151.7820	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	151.7820	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		4.0000	
Infiltration rate		0.2000	(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) =	0.1700	(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	0.2168	0.2125	0.2083	0.1870	0.1828	0.1615	0.1615	0.1573	0.1700	0.1828	0.1913	0.1998	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation:												0.5000	(23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(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	
Windows (Uw = 1.20)			9.6000	1.1450	10.9924			(27)
External Wall 1	50.0200	9.6000	40.4200	0.1800	7.2756			(29a)
Total net area of external elements Aum(A, m2)			50.0200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		18.2680			(33)
Party Wall 1			40.2300	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.2574	(36)
Total fabric heat loss						(33) + (36) =	28.5254	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	25.0440	25.0440	25.0440	25.0440	25.0440	25.0440	25.0440	25.0440	25.0440	25.0440	25.0440	25.0440	(38)
Heat transfer coeff	53.5694	53.5694	53.5694	53.5694	53.5694	53.5694	53.5694	53.5694	53.5694	53.5694	53.5694	53.5694	(39)
Average = Sum(39)m / 12 =												53.5694	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8682	0.8682	0.8682	0.8682	0.8682	0.8682	0.8682	0.8682	0.8682	0.8682	0.8682	0.8682	(40)
HLP (average)												0.8682	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0293	(42)
Average daily hot water use (litres/day)												82.3952	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	90.6347	87.3389	84.0431	80.7472	77.4514	74.1556	74.1556	77.4514	80.7472	84.0431	87.3389	90.6347	(44)
Energy conte	134.4086	117.5546	121.3058	105.7574	101.4767	87.5667	81.1434	93.1132	94.2253	109.8105	119.8668	130.1675	(45)
Energy content (annual)										Total = Sum(45)m =		1296.3965	(45)
Distribution loss (46)m = 0.15 x (45)m	20.1613	17.6332	18.1959	15.8636	15.2215	13.1350	12.1715	13.9670	14.1338	16.4716	17.9800	19.5251	(46)
Water storage loss:													
Store volume												201.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)
Temperature factor from Table 2b												0.5400	(49)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Enter (49) or (54) in (55) 0.8694 (55)
Total storage loss
26.9514 24.3432 26.9514 26.0820 26.9514 26.0820 26.9514 26.9514 26.0820 26.9514 26.0820 26.9514 (56)
If cylinder contains dedicated solar storage
26.9514 24.3432 26.9514 26.0820 26.9514 26.0820 26.9514 26.9514 26.0820 26.9514 26.0820 26.9514 (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)
Total heat required for water heating calculated for each month
161.3600 141.8978 148.2572 131.8394 128.4281 113.6487 108.0948 120.0646 120.3073 136.7619 145.9488 157.1189 (62)
Solar input 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)
Output from w/h
161.3600 141.8978 148.2572 131.8394 128.4281 113.6487 108.0948 120.0646 120.3073 136.7619 145.9488 157.1189 (64)
Total per year (kWh/year) = Sum(64)m = 1613.7275 (64)
Heat gains from water heating, kWh/month
44.6909 39.0869 40.3342 35.1643 33.7410 29.1159 26.9802 30.9602 31.3299 36.5120 39.8557 43.2807 (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	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	16.5750	14.7217	11.9725	9.0640	6.7754	5.7201	6.1808	8.0340	10.7832	13.6918	15.9803	17.0356	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	177.2131	179.0520	174.4180	164.5527	152.0996	140.3954	132.5763	130.7374	135.3714	145.2367	157.6898	169.3940	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	(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)													
	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	(71)
Water heating gains (Table 5)													
	60.0684	58.1650	54.2126	48.8393	45.3508	40.4388	36.2637	41.6131	43.5138	49.0753	55.3551	58.1730	(72)
Total internal gains													
	307.2955	305.3778	294.0422	275.8951	257.6649	239.9934	228.4598	233.8236	243.1074	261.4428	282.4643	298.0417	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	9.6000	46.7521	0.6300	0.7000	0.7700	137.1652	(78)

Solar gains	137.1652	224.6412	286.1531	323.4151	337.0185	324.3345	316.8945	307.7485	298.9206	242.2966	162.5875	118.5233	(83)
Total gains	444.4606	530.0191	580.1952	599.3102	594.6834	564.3278	545.3543	541.5720	542.0281	503.7394	445.0518	416.5650	(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	79.9845	79.9845	79.9845	79.9845	79.9845	79.9845	79.9845	79.9845	79.9845	79.9845	79.9845	79.9845	
alpha	6.3323	6.3323	6.3323	6.3323	6.3323	6.3323	6.3323	6.3323	6.3323	6.3323	6.3323	6.3323	
util living area													
	0.9940	0.9818	0.9548	0.8950	0.7768	0.5971	0.4310	0.4533	0.6615	0.9030	0.9842	0.9959	(86)
MIT	20.2734	20.4511	20.6425	20.8206	20.9418	20.9906	20.9989	20.9985	20.9822	20.8360	20.5081	20.2216	(87)
Th 2	20.1946	20.1946	20.1946	20.1946	20.1946	20.1946	20.1946	20.1946	20.1946	20.1946	20.1946	20.1946	(88)
util rest of house													
	0.9921	0.9767	0.9423	0.8677	0.7268	0.5265	0.3528	0.3749	0.5924	0.8721	0.9787	0.9946	(89)
MIT 2	19.2299	19.4856	19.7554	19.9948	20.1409	20.1885	20.1942	20.1940	20.1820	20.0192	19.5698	19.1547	(90)
Living area fraction										fLA = Living area / (4) =		0.4389	(91)
MIT	19.6879	19.9094	20.1448	20.3572	20.4925	20.5405	20.5474	20.5471	20.5332	20.3777	19.9816	19.6230	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.6879	19.9094	20.1448	20.3572	20.4925	20.5405	20.5474	20.5471	20.5332	20.3777	19.9816	19.6230	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9907	0.9745	0.9415	0.8737	0.7461	0.5573	0.3872	0.4094	0.6222	0.8799	0.9770	0.9935	(94)
Useful gains	440.3173	516.4773	546.2335	523.6069	443.6847	314.4861	211.1382	221.6928	337.2228	443.2252	434.8109	413.8447	(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													
	824.3223	804.0450	730.9436	613.7580	471.0069	318.2313	211.4596	222.1577	344.6230	523.7844	690.0594	826.2014	(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													
	285.6997	193.2455	137.4243	64.9088	20.3277	0.0000	0.0000	0.0000	0.0000	59.9361	183.7789	306.7934	(98)
Space heating												1252.1145	(98)
Space heating per m2											(98) / (4) =	20.2936	(99)

8c. Space cooling requirement

Not applicable

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	1252.1145	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	285.6997	193.2455	137.4243	64.9088	20.3277	0.0000	0.0000	0.0000	0.0000	59.9361	183.7789	306.7934	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	285.6997	193.2455	137.4243	64.9088	20.3277	0.0000	0.0000	0.0000	0.0000	59.9361	183.7789	306.7934	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
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)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement													
	161.3600	141.8978	148.2572	131.8394	128.4281	113.6487	108.0948	120.0646	120.3073	136.7619	145.9488	157.1189	(64)
Efficiency of water heater												349.4100	(216)
(217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	(217)
Fuel for water heating, kWh/month													
	46.1807	40.6107	42.4307	37.7320	36.7557	32.5259	30.9364	34.3621	34.4316	39.1408	41.7701	44.9669	(219)
Water heating fuel used												461.8436	(219)
Annual totals kWh/year													
Space heating fuel - main system												1252.1145	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.6500, total flow = 21.0000, SFP = 0.1738)													
mechanical ventilation fans (SFP = 0.1738)												32.1850	(230a)
Total electricity for the above, kWh/year												32.1850	(231)
Electricity for lighting (calculated in Appendix L)												292.7191	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.64 * 951 * 1.00) =										-1247.2082		-1247.2082	(233)
Total delivered energy for all uses												791.6539	(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	1252.1145	0.5190	649.8474	(261)
Space heating - main system 2	0.0000	0.5190	0.0000	(262)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	461.8436	0.5190	239.6968	(264)
Space and water heating			889.5442	(265)
Pumps and fans	32.1850	0.5190	16.7040	(267)
Energy for lighting	292.7191	0.5190	151.9212	(268)
Energy saving/generation technologies				
PV Unit	-1247.2082	0.5190	-647.3011	(269)
Total CO2, kg/year			410.8684	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			6.6600	(273)

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

DER		6.6600	ZC1
Total Floor Area	TFA	61.7000	
Assumed number of occupants	N	2.0293	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.0199	ZC2
CO2 emissions from cooking, equation (L16)		2.7180	ZC3
Total CO2 emissions		26.3979	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		26.3979	ZC8

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	61.7000 (1b)	x	2.4600 (2b)	=	151.7820	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	151.7820	(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) =	0.1318	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3818	(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) =	0.3245	(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	0.4137	0.4056	0.3975	0.3570	0.3488	0.3083	0.3083	0.3002	0.3245	0.3488	0.3651	0.3813	(22b)
Effective ac	0.5856	0.5823	0.5790	0.5637	0.5608	0.5475	0.5475	0.5450	0.5527	0.5608	0.5666	0.5727	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opening Type (Uw = 1.40)			9.6000	1.3258	12.7273			(27)
External Wall 1	50.0200	9.6000	40.4200	0.1800	7.2756			(29a)
Total net area of external elements Aum(A, m2)			50.0200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.0029			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.6056	(36)
Total fabric heat loss						(33) + (36) =	24.6085	(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	29.3311	29.1646	29.0015	28.2350	28.0916	27.4241	27.4241	27.3005	27.6812	28.0916	28.3817	28.6850	(38)
Heat transfer coeff	53.9396	53.7731	53.6099	52.8435	52.7001	52.0326	52.0326	51.9089	52.2897	52.7001	52.9902	53.2935	(39)
Average = Sum(39)m / 12 =												52.8428	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8742	0.8715	0.8689	0.8565	0.8541	0.8433	0.8433	0.8413	0.8475	0.8541	0.8588	0.8638	(40)
HLP (average)												0.8564	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0293	(42)
Average daily hot water use (litres/day)												82.3952	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	90.6347	87.3389	84.0431	80.7472	77.4514	74.1556	74.1556	77.4514	80.7472	84.0431	87.3389	90.6347	(44)
Energy conte	134.4086	117.5546	121.3058	105.7574	101.4767	87.5667	81.1434	93.1132	94.2253	109.8105	119.8668	130.1675	(45)
Energy content (annual)										Total = Sum(45)m =		1296.3965	(45)
Distribution loss (46)m = 0.15 x (45)m	20.1613	17.6332	18.1959	15.8636	15.2215	13.1350	12.1715	13.9670	14.1338	16.4716	17.9800	19.5251	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	181.0035	159.6403	167.9007	150.8492	148.0716	132.6585	127.7383	139.7081	139.3171	156.4054	164.9586	176.7624	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)
Output from w/h													
	181.0035	159.6403	167.9007	150.8492	148.0716	132.6585	127.7383	139.7081	139.3171	156.4054	164.9586	176.7624	(64)
								Total per year (kWh/year) = Sum(64)m =				1845.0139	(64)
Heat gains from water heating, kWh/month													
	81.9668	72.7555	77.6101	71.2378	71.0169	65.1894	64.2561	68.2361	67.4034	73.7879	75.9292	80.5566	(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	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	16.5750	14.7217	11.9725	9.0640	6.7754	5.7201	6.1808	8.0340	10.7832	13.6918	15.9803	17.0356	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	177.2131	179.0520	174.4180	164.5527	152.0996	140.3954	132.5763	130.7374	135.3714	145.2367	157.6898	169.3940	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	(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)													
	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	(71)
Water heating gains (Table 5)													
	110.1704	108.2671	104.3147	98.9414	95.4529	90.5408	86.3657	91.7152	93.6158	99.1773	105.4572	108.2750	(72)
Total internal gains													
	360.3975	358.4799	347.1442	328.9971	310.7669	293.0954	281.5619	286.9256	296.2095	314.5448	335.5663	351.1437	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	9.6000	46.7521	0.6300	0.7000	0.7700	137.1652	(78)

Solar gains	137.1652	224.6412	286.1531	323.4151	337.0185	324.3345	316.8945	307.7485	298.9206	242.2966	162.5875	118.5233	(83)
Total gains	497.5627	583.1211	633.2973	652.4122	647.7855	617.4299	598.4564	594.6741	595.1301	556.8414	498.1539	469.6670	(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	79.4356	79.6815	79.9240	81.0832	81.3039	82.3469	82.3469	82.5430	81.9420	81.3039	80.8588	80.3986	
alpha	6.2957	6.3121	6.3283	6.4055	6.4203	6.4898	6.4898	6.5029	6.4628	6.4203	6.3906	6.3599	
util living area													
	0.9892	0.9715	0.9348	0.8561	0.7214	0.5348	0.3821	0.4009	0.5966	0.8583	0.9718	0.9921	(86)
MIT	20.3452	20.5201	20.7027	20.8699	20.9634	20.9955	20.9996	20.9994	20.9908	20.8871	20.5942	20.3105	(87)
Th 2	20.1895	20.1918	20.1940	20.2047	20.2067	20.2159	20.2159	20.2177	20.2124	20.2067	20.2026	20.1984	(88)
util rest of house													
	0.9861	0.9638	0.9185	0.8240	0.6706	0.4713	0.3143	0.3331	0.5325	0.8207	0.9630	0.9897	(89)
MIT 2	19.3293	19.5806	19.8358	20.0639	20.1739	20.2131	20.2158	20.2174	20.2060	20.0906	19.6974	19.2864	(90)
Living area fraction									fLA = Living area / (4) =			0.4389	(91)
MIT	19.7752	19.9929	20.2163	20.4176	20.5204	20.5565	20.5598	20.5606	20.5504	20.4402	20.0910	19.7359	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7752	19.9929	20.2163	20.4176	20.5204	20.5565	20.5598	20.5606	20.5504	20.4402	20.0910	19.7359	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9841	0.9617	0.9190	0.8331	0.6913	0.4991	0.3441	0.3629	0.5604	0.8326	0.9615	0.9881	(94)
Useful gains	489.6448	560.7589	581.9792	543.5464	447.7939	308.1588	205.9039	215.7841	333.5136	463.5994	478.9748	464.0587	(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													
	834.7238	811.5947	735.3276	608.6329	464.8358	309.9309	206.0374	215.9738	337.2919	518.5796	688.3965	827.9599	(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													
	256.7388	168.5617	114.0912	46.8622	12.6792	0.0000	0.0000	0.0000	0.0000	40.9052	150.7837	270.7425	(98)
Space heating												1061.3645	(98)
Space heating per m2											(98) / (4) =	17.2020	(99)

8c. Space cooling requirement

Not applicable

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

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Efficiency of main space heating system 1 (in %)	93.5000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	1135.1492	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	256.7388	168.5617	114.0912	46.8622	12.6792	0.0000	0.0000	0.0000	0.0000	40.9052	150.7837	270.7425	(98)
Space heating efficiency (main heating system 1)													
	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)													
	274.5869	180.2798	122.0227	50.1200	13.5606	0.0000	0.0000	0.0000	0.0000	43.7489	161.2660	289.5642	(211)
Water heating requirement													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	181.0035	159.6403	167.9007	150.8492	148.0716	132.6585	127.7383	139.7081	139.3171	156.4054	164.9586	176.7624	(64)
Efficiency of water heater												79.8000	(216)
(217)m	85.7460	84.9590	83.8091	82.1008	80.5512	79.8000	79.8000	79.8000	79.8000	81.8051	84.5753	85.9479	(217)
Fuel for water heating, kWh/month													
	211.0927	187.9029	200.3372	183.7366	183.8230	166.2388	160.0731	175.0729	174.5829	191.1927	195.0435	205.6622	(219)
Water heating fuel used												2234.7585	(219)
Annual totals kWh/year													
Space heating fuel - main system												1135.1492	(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)												292.7191	(232)
Total delivered energy for all uses												3737.6267	(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	1135.1492	0.2160	245.1922	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2234.7585	0.2160	482.7078	(264)
Space and water heating			727.9000	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	292.7191	0.5190	151.9212	(268)
Total CO2, kg/m2/year			918.7462	(272)
Emissions per m2 for space and water heating			11.7974	(272a)
Fuel factor (electricity)			1.5500	
Emissions per m2 for lighting			2.4623	(272b)
Emissions per m2 for pumps and fans			0.6309	(272c)
Target Carbon Dioxide Emission Rate (TER) = (11.7974 * 1.55) + 2.4623 + 0.6309, rounded to 2 d.p.			21.3800	(273)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	61.7000 (1b)	x	2.4600 (2b)	=	151.7820	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	151.7820	(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) =	0.1318	(8)
Pressure test		Yes	
Measured/design AP50		4.0000	
Infiltration rate		0.3318	(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) =	0.2820	(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	0.3596	0.3525	0.3455	0.3102	0.3032	0.2679	0.2679	0.2609	0.2820	0.3032	0.3173	0.3314	(22b)
Effective ac	0.5646	0.5621	0.5597	0.5481	0.5460	0.5359	0.5359	0.5340	0.5398	0.5460	0.5503	0.5549	(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	
Windows (Uw = 1.20)			9.6000	1.1450	10.9924			(27)
External Wall 1	50.0200	9.6000	40.4200	0.1800	7.2756			(29a)
Total net area of external elements Aum(A, m2)			50.0200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	18.2680			(33)
Party Wall 1			40.2300	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	10.2574	(36)
Total fabric heat loss (33) + (36) =	28.5254	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.2817	28.1560	28.0327	27.4539	27.3456	26.8415	26.8415	26.7481	27.0357	27.3456	27.5647	27.7937	(38)
Heat transfer coeff	56.8071	56.6814	56.5581	55.9793	55.8710	55.3669	55.3669	55.2735	55.5611	55.8710	56.0901	56.3191	(39)
Average = Sum(39)m / 12 =												55.9788	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9207	0.9187	0.9167	0.9073	0.9055	0.8974	0.8974	0.8958	0.9005	0.9055	0.9091	0.9128	(40)
HLP (average)												0.9073	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.0293 (42)
Average daily hot water use (litres/day)	82.3952 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	90.6347	87.3389	84.0431	80.7472	77.4514	74.1556	74.1556	77.4514	80.7472	84.0431	87.3389	90.6347	(44)
Energy conte	134.4086	117.5546	121.3058	105.7574	101.4767	87.5667	81.1434	93.1132	94.2253	109.8105	119.8668	130.1675	(45)
Energy content (annual)										Total = Sum(45)m =		1296.3965	(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)
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													

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

	28.5618	24.9804	25.7775	22.4734	21.5638	18.6079	17.2430	19.7866	20.0229	23.3347	25.4717	27.6606	(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	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	(66)

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

	16.5750	14.7217	11.9725	9.0640	6.7754	5.7201	6.1808	8.0340	10.7832	13.6918	15.9803	17.0356	(67)

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

	177.2131	179.0520	174.4180	164.5527	152.0996	140.3954	132.5763	130.7374	135.3714	145.2367	157.6898	169.3940	(68)

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

	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	(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)

	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	(71)

Water heating gains (Table 5)

	38.3896	37.1731	34.6472	31.2131	28.9836	25.8443	23.1760	26.5948	27.8096	31.3639	35.3773	37.1782	(72)

Total internal gains

	285.6167	284.3860	274.4767	258.2689	241.2977	225.3989	215.3722	218.8053	227.4032	243.7314	262.4865	277.0469	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	9.6000	46.7521	0.6300	0.7000	0.7700	137.1652	(78)

Solar gains	137.1652	224.6412	286.1531	323.4151	337.0185	324.3345	316.8945	307.7485	298.9206	242.2966	162.5875	118.5233	(83)
Total gains	422.7818	509.0272	560.6298	581.6839	578.3162	549.7334	532.2667	526.5538	526.3239	486.0280	425.0740	395.5702	(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	75.4258	75.5931	75.7578	76.5412	76.6895	77.3878	77.3878	77.5185	77.1173	76.6895	76.3900	76.0793	
alpha	6.0284	6.0395	6.0505	6.1027	6.1126	6.1592	6.1592	6.1679	6.1412	6.1126	6.0927	6.0720	
util living area	0.9957	0.9868	0.9660	0.9156	0.8095	0.6286	0.4557	0.4801	0.6969	0.9237	0.9886	0.9971	(86)
MIT	20.1618	20.3480	20.5572	20.7695	20.9181	20.9860	20.9983	20.9976	20.9735	20.7895	20.4278	20.1222	(87)
Th 2	20.1499	20.1517	20.1534	20.1613	20.1628	20.1697	20.1697	20.1710	20.1671	20.1628	20.1598	20.1566	(88)
util rest of house	0.9944	0.9828	0.9559	0.8913	0.7604	0.5538	0.3708	0.3951	0.6249	0.8966	0.9844	0.9961	(89)
MIT 2	19.3875	19.5729	19.7777	19.9830	20.1101	20.1635	20.1693	20.1704	20.1540	20.0059	19.6598	19.3539	(90)
Living area fraction									fLA = Living area / (4) =			0.4389	(91)
MIT	19.7273	19.9131	20.1198	20.3282	20.4647	20.5245	20.5331	20.5335	20.5137	20.3498	19.9969	19.6911	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7273	19.9131	20.1198	20.3282	20.4647	20.5245	20.5331	20.5335	20.5137	20.3498	19.9969	19.6911	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9936	0.9815	0.9554	0.8966	0.7791	0.5864	0.4081	0.4325	0.6558	0.9034	0.9835	0.9955	(94)
Useful gains	420.0639	499.5919	535.6534	521.5507	450.5587	322.3805	217.2415	227.7186	345.1697	439.0741	418.0424	393.7891	(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	876.3819	850.9632	770.3129	639.7432	489.6934	328.0200	217.7658	228.4707	356.3517	544.7329	723.3860	872.4455	(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	339.5006	236.1215	174.5867	85.0986	29.1162	0.0000	0.0000	0.0000	0.0000	78.6101	219.8474	356.1204	(98)
Space heating												1519.0014	(98)
Space heating per m2										(98) / (4) =		24.6191	(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	520.4488	409.7150	420.0789	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9580	0.9840	0.9813	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	498.6004	403.1527	412.2260	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	718.5725	696.6895	691.3066	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	158.3799	218.3914	207.6359	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												584.4073	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	39.5950	54.5979	51.9090	0.0000	0.0000	0.0000	0.0000	(107)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling	146.1018 (107)
Space cooling per m2	2.3679 (108)
Energy for space heating	24.6191 (99)
Energy for space cooling	2.3679 (108)
Total	26.9871 (109)
Dwelling Fabric Energy Efficiency (DFEE)	27.0 (109)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	61.7000 (1b)	x	2.4600 (2b)	=	151.7820	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	151.7820	(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) =	0.1318	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3818	(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) =	0.3245	(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	0.4137	0.4056	0.3975	0.3570	0.3488	0.3083	0.3083	0.3002	0.3245	0.3488	0.3651	0.3813	(22b)
Effective ac	0.5856	0.5823	0.5790	0.5637	0.5608	0.5475	0.5475	0.5450	0.5527	0.5608	0.5666	0.5727	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opening Type (Uw = 1.40)			9.6000	1.3258	12.7273			(27)
External Wall 1	50.0200	9.6000	40.4200	0.1800	7.2756			(29a)
Total net area of external elements Aum(A, m2)			50.0200					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.0029			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							4.6056	(36)
Total fabric heat loss					(33) + (36) =		24.6085	(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	29.3311	29.1646	29.0015	28.2350	28.0916	27.4241	27.4241	27.3005	27.6812	28.0916	28.3817	28.6850	(38)
Heat transfer coeff	53.9396	53.7731	53.6099	52.8435	52.7001	52.0326	52.0326	51.9089	52.2897	52.7001	52.9902	53.2935	(39)
Average = Sum(39)m / 12 =												52.8428	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8742	0.8715	0.8689	0.8565	0.8541	0.8433	0.8433	0.8413	0.8475	0.8541	0.8588	0.8638	(40)
HLP (average)												0.8564	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.0293	(42)
Average daily hot water use (litres/day)	82.3952	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	90.6347	87.3389	84.0431	80.7472	77.4514	74.1556	74.1556	77.4514	80.7472	84.0431	87.3389	90.6347	(44)
Energy conte	134.4086	117.5546	121.3058	105.7574	101.4767	87.5667	81.1434	93.1132	94.2253	109.8105	119.8668	130.1675	(45)
Energy content (annual)										Total = Sum(45)m =		1296.3965	(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)
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	28.5618	24.9804	25.7775	22.4734	21.5638	18.6079	17.2430	19.7866	20.0229	23.3347	25.4717	27.6606	(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	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	16.5750	14.7217	11.9725	9.0640	6.7754	5.7201	6.1808	8.0340	10.7832	13.6918	15.9803	17.0356	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	177.2131	179.0520	174.4180	164.5527	152.0996	140.3954	132.5763	130.7374	135.3714	145.2367	157.6898	169.3940	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	(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)													
	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	(71)
Water heating gains (Table 5)													
	38.3896	37.1731	34.6472	31.2131	28.9836	25.8443	23.1760	26.5948	27.8096	31.3639	35.3773	37.1782	(72)
Total internal gains													
	285.6167	284.3860	274.4767	258.2689	241.2977	225.3989	215.3722	218.8053	227.4032	243.7314	262.4865	277.0469	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	9.6000	46.7521	0.6300	0.7000	0.7700	137.1652	(78)

Solar gains	137.1652	224.6412	286.1531	323.4151	337.0185	324.3345	316.8945	307.7485	298.9206	242.2966	162.5875	118.5233	(83)
Total gains	422.7818	509.0272	560.6298	581.6839	578.3162	549.7334	532.2667	526.5538	526.3239	486.0280	425.0740	395.5702	(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	79.4356	79.6815	79.9240	81.0832	81.3039	82.3469	82.3469	82.5430	81.9420	81.3039	80.8588	80.3986	
alpha	6.2957	6.3121	6.3283	6.4055	6.4203	6.4898	6.4898	6.5029	6.4628	6.4203	6.3906	6.3599	
util living area													
	0.9954	0.9853	0.9612	0.9022	0.7843	0.5963	0.4291	0.4520	0.6655	0.9113	0.9872	0.9969	(86)
MIT	20.2308	20.4160	20.6175	20.8157	20.9412	20.9916	20.9991	20.9988	20.9831	20.8308	20.4906	20.1955	(87)
Th 2	20.1895	20.1918	20.1940	20.2047	20.2067	20.2159	20.2159	20.2177	20.2124	20.2067	20.2026	20.1984	(88)
util rest of house													
	0.9940	0.9810	0.9502	0.8762	0.7352	0.5274	0.3532	0.3759	0.5975	0.8822	0.9827	0.9959	(89)
MIT 2	19.4894	19.6739	19.8709	20.0636	20.1694	20.2123	20.2157	20.2173	20.2041	20.0820	19.7580	19.4619	(90)
Living area fraction										fLA = Living area / (4) =		0.4389	(91)
MIT	19.8148	19.9996	20.1985	20.3937	20.5082	20.5543	20.5596	20.5603	20.5460	20.4106	20.0795	19.7839	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.8148	19.9996	20.1985	20.3937	20.5082	20.5543	20.5596	20.5603	20.5460	20.4106	20.0795	19.7839	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9932	0.9798	0.9503	0.8829	0.7546	0.5575	0.3866	0.4094	0.6270	0.8904	0.9818	0.9953	(94)
Useful gains	419.9202	498.7223	532.7449	513.5738	436.4218	306.5018	205.7586	215.5689	330.0030	432.7772	417.3561	393.7104	(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													
	836.8632	811.9537	734.3783	607.3685	464.1910	309.8187	206.0256	215.9567	337.0591	517.0218	687.7880	830.5181	(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													
	310.2056	210.4915	150.0153	67.5322	20.6603	0.0000	0.0000	0.0000	0.0000	62.6780	194.7109	324.9849	(98)
Space heating												1341.2787	(98)
Space heating per m2											(98) / (4) =	21.7387	(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	489.1061	385.0410	394.5080	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9721	0.9904	0.9886	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	475.4767	381.3261	390.0293	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	718.5725	696.6895	691.3066	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	175.0290	234.6304	224.1503	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												633.8097	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	43.7572	58.6576	56.0376	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling												158.4524	(107)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling per m2	2.5681 (108)
Energy for space heating	21.7387 (99)
Energy for space cooling	2.5681 (108)
Total	24.3068 (109)
Target Fabric Energy Efficiency (TFEE)	28.0 (109)

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

Overheating Calculation Input Data

Dwelling type	MidTerrace Flat
Number of storeys	1
Cross ventilation possible	Yes
SAP Region	Thames Valley
Front of dwelling faces	North
Overshading	Average or unknown
Thermal mass parameter	250.0
Night ventilation	No
Ventilation rate during hot weather (ach)	3.00 (Windows half open)

Overheating Calculation

Summer ventilation heat loss coefficient	150.26 (P1)
Transmission heat loss coefficient	28.53 (37)
Summer heat loss coefficient	178.79 (P2)

Overhangs

Orientation	Ratio	Z_overhangs	Overhang type
South	0.000	1.000	None

Solar shading

Orientation	Z blinds	Solar access	Z overhangs	Z summer
South	0.850	0.90	1.000	0.765 (P8)

[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Shading	Gains W
South	9.6000	112.2060	0.6300	0.7000	0.7650	327.0618
total:						327.0618

	Jun	Jul	Aug	
Solar gains	339	327	323	(P3)
Internal gains	354	339	347	
Total summer gains	693	666	669	(P5)
Summer gain/loss ratio	3.88	3.73	3.74	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 250.0)	0.25	0.25	0.25	
Threshold temperature	20.13	21.88	21.79	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	

Assessment of likelihood of high internal temperature: Slight

BASIC COMPLIANCE REPORT
Calculation Type: New Build (As Designed)

Darren Evans

Property Reference	DE-21912-Plot 40	**Issued on Date**	25/01/2023
Assessment Reference	Plot 40	**Prop Type Ref**	FF-Flat
Property	Land at Tesco Extra Car Park, Plot 40, 1Bath, 2B3P, RG1		

SAP Rating	97 A	**DER**	6.66	**TER**	21.38
Environmental	98 A	**% DER<TER**	68.85		
CO_2 Emissions (t/year)	0.03	**DFEE**	26.99	**TFEE**	27.95
General Requirements Compliance	Pass	**% DFEE<TFEE**	3.45		

Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Electricity		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	21.38	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	6.66	$kgCO_2/m^2$	Pass
	-14.72 (-68.8%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	27.95	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	26.99	$kWh/m^2/yr$	
	-1.0 (-3.6%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Openings	1.20 (max. 2.00)	1.20 (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	4.00 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system 1	Room heaters - Electric Panel, convector or radiant heaters	
Main heating system 2	Heat pump with warm air distribution - Electric Dimplex EDL200UK-630	
Secondary heating system	None	

5 Cylinder insulation

Hot water storage	No cylinder	

6 Controls

Space heating controls 1	Programmer and room thermostat	Pass
Hot water controls	No cylinder	

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power	0.1600 0.1200	
Maximum	0.7	Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)	Slight	Pass

Based on:

Overshading	Average
Windows facing South	9.60 m², No overhang
Air change rate	3.00 ach
Blinds/curtains	Dark-coloured curtain or roller blind, closed 100% of daylight hours

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value		
Filled Cavity with Edge Sealing	0.00	W/m²K	Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals	4.00 (design value)		
Maximum	10.0		Pass

10 Key features

Party wall U-value	0.00	W/m²K
Photovoltaic array	1.64	kW

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BLOCK COMPLIANCE
Calculation Type: New Build (As Designed)

Darren Evans

Block Reference	4 PV planel per falt	**Issued on Date**	25/01/2023
Block Name	335		
Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

Block Compliance Report - DER

Block Reference: 4 PV planel per falt		Block Name: 335			
Property-Assessment Reference	**Multiplier**	**Floor Area (m^2)**	**DER ($kgCO_2/m^2$)**	**TER ($kgCO_2/m^2$)**	**% DER/TER**
DE-21912-Plot 20-Plot 20	1	61.7	9.39	24.71	62.00 %
DE-21912-Plot 17-Plot 17	1	61.7	11.56	25.89	55.36 %
DE-21912- Plot 07-Plot 07	1	50.76	8.84	26.11	66.14 %
DE-21912 - Plot 05-Plot 05	1	65.09	12.75	26.21	51.36 %
DE-21912-Plot 40-Plot 40	1	61.7	6.66	21.38	68.85 %
DE-21912-Plot 27-Plot 27	1	62.48	6.76	20.78	67.47 %
DE-21912-Plot 25-Plot 25	1	65.09	9.65	22.66	57.41 %
DE-21912-Plot 67-Plot 67	1	62.48	13.70	25.47	46.21 %
DE-21912-Plot 80-Plot 80	1	61.7	15.75	27.54	42.81 %
DE-21912-Plot 65-Plot 65	1	65.09	17.89	28.43	37.07 %
DE-21912-Plot 77-Plot 77	1	61.7	20.17	30.69	34.27 %
DE-21912-Plot 37-Plot 37	1	61.7	11.61	24.84	53.25 %
Totals:	12	741.19	144.73	304.71	
Average DER = 12.12 $kgCO_2/m^2$		**% DER/TER**	PASS		
Average TER = 25.38 $kgCO_2/m^2$		52.25 %			

Block Compliance Report - DFEE

Block Reference: 4 PV planel per falt		Block Name: 335			
Property-Assessment Reference	**Multiplier**	**Floor Area (m^2)**	**DFEE ($kWh/m^2/yr$)**	**TFEE ($kWh/m^2/yr$)**	**% DFEE/TFEE**
DE-21912-Plot 20-Plot 20	1	61.7	32.22	39.28	17.99 %
DE-21912-Plot 17-Plot 17	1	61.7	36.71	43.81	16.22 %
DE-21912- Plot 07-Plot 07	1	50.76	34.10	38.48	11.38 %
DE-21912 - Plot 05-Plot 05	1	65.09	38.23	46.52	17.82 %
DE-21912-Plot 40-Plot 40	1	61.7	26.99	27.95	3.45 %
DE-21912-Plot 27-Plot 27	1	62.48	26.37	26.48	0.39 %
DE-21912-Plot 25-Plot 25	1	65.09	32.34	34.66	6.71 %
DE-21912-Plot 67-Plot 67	1	62.48	39.57	42.27	6.38 %
DE-21912-Plot 80-Plot 80	1	61.7	44.07	48.37	8.88 %
DE-21912-Plot 65-Plot 65	1	65.09	48.15	53.91	10.69 %
DE-21912-Plot 77-Plot 77	1	61.7	52.85	59.27	10.83 %
DE-21912-Plot 37-Plot 37	1	61.7	36.79	40.29	8.69 %
Totals:	12	741.19	448.37	501.28	
Average DFEE = 37.43 $kWh/m^2/yr$		**% DFEE/TFEE**	PASS		
Average TFEE = 41.85 $kWh/m^2/yr$		10.56 %			

PREDICTED ENERGY ASSESSMENT

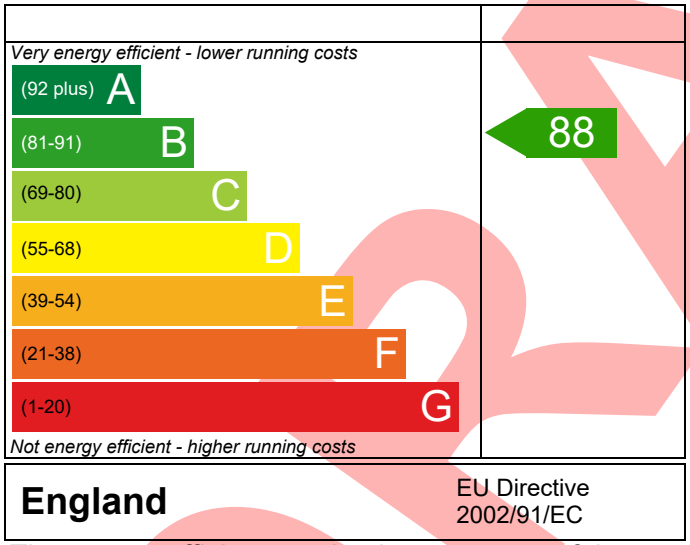
Land at Tesco Extra Car Park,
Plot 65,
1Bath,
2B3P,
RG1

Dwelling type:	Flat, Mid-Terrace
Date of assessment:	25/01/2023
Produced by:	Charles Sims
Total floor area:	65.09 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 (CO_2) emissions.

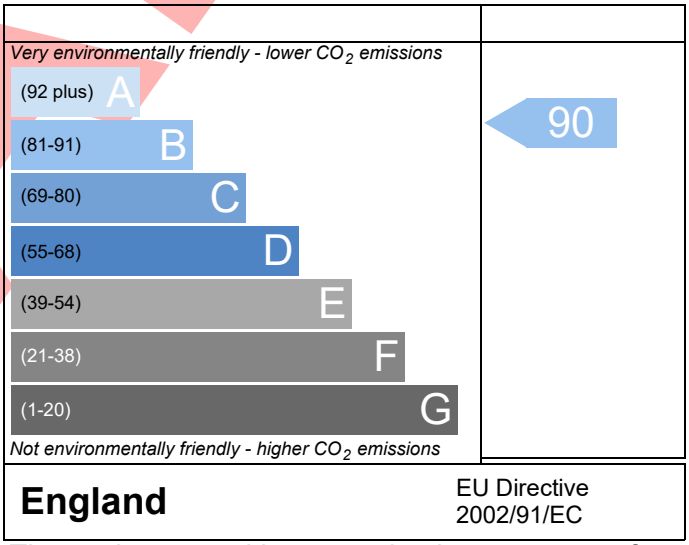
Energy Efficiency Rating



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 (CO_2) 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 (CO_2) emissions. The higher the rating the less impact it has on the environment.

DRAFT

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BUILDING REGULATION COMPLIANCE
Calculation Type: New Build (As Designed)

Darren Evans

Property Reference	DE-21912-Plot 65	**Issued on Date**	25/01/2023
Assessment Reference	Plot 65	**Prop Type Ref**	TF- Flat
Property	Land at Tesco Extra Car Park, Plot 65, 1Bath, 2B3P, RG1		

SAP Rating	88 B	**DER**	17.89	**TER**	28.43
Environmental	90 B	**% DER<TER**	37.07		
CO_2 Emissions (t/year)	0.63	**DFEE**	48.15	**TFEE**	53.91
General Requirements Compliance	Pass	**% DFEE<TFEE**	10.69		

Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Electricity		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	28.43	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	17.89	$kgCO_2/m^2$	Pass
	-10.54 (-37.1%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	53.91	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	48.15	$kWh/m^2/yr$	
	-5.8 (-10.8%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	Pass
Openings	1.20 (max. 2.00)	1.20 (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	4.00 (design value)	$m^3/(h.m^2)$ @ 50 Pa	
Maximum	10.0	$m^3/(h.m^2)$ @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system 1	Room heaters - Electric Panel, convector or radiant heaters	

DRAFT

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

Main heating system 2	Heat pump with warm air distribution - Electric Dimplex EDL200UK-630		
Secondary heating system	None		
5 Cylinder insulation			
Hot water storage	No cylinder		
6 Controls			
Space heating controls 1	Programmer and room thermostat		Pass
Hot water controls	No cylinder		
7 Low energy lights			
Percentage of fixed lights with low-energy fittings	100	%	
Minimum	75	%	Pass
8 Mechanical ventilation			
Continuous extract system (decentralised)			
Specific fan power	0.1200 0.1600		
Maximum	0.7		Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)	Slight	Pass
Based on:		
Overshading	Average	
Windows facing North Windows facing East	4.50 m², No overhang 7.14 m², No overhang	
Air change rate	3.00 ach	
Blinds/curtains	Dark-coloured curtain or roller blind, closed 100% of daylight hours	

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value		
Solid Wall	0.00	W/m²K	Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals	4.00 (design value)	m³/(h.m²) @ 50 Pa	
Maximum	10.0	m³/(h.m²) @ 50 Pa	Pass

10 Key features

Party wall U-value	0.00	W/m²K
Photovoltaic array	1.64	kW

DRAFT

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

	Typical cost	Typical savings per year	Energy efficiency	Environmental impact	Result
Low energy lights			0	0	Already installed
Solar water heating			0	0	Not applicable
Photovoltaic			0	0	Not applicable
Wind turbine			0	0	Not applicable
Totals	**£0**	**£0**	**B 88**	**B 90**	

DRAFT

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

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

Darren Evans

Property Reference	DE-21912-Plot 65	**Issued on Date**	25/01/2023
Assessment Reference	Plot 65	**Prop Type Ref**	TF- Flat
Property	Land at Tesco Extra Car Park, Plot 65, 1Bath, 2B3P, RG1		

SAP Rating	88 B	**DER**	17.89	**TER**	28.43
Environmental	90 B	**% DER<TER**	37.07		
CO_2 Emissions (t/year)	0.63	**DFEE**	48.15	**TFEE**	53.91
General Requirements Compliance	Pass	**% DFEE<TFEE**	10.69		

Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

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

Orientation	South
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	Flat, Mid-Terrace
2.0 Number of Storeys	1
3.0 Date Built	2023
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	18.69 m	65.09 m²	2.40 m

7.0 Living Area	24.70	m²
8.0 Thermal Mass Parameter	Simple calculation - Medium	
Thermal Mass	250.00	kJ/m²K

9.0 External Walls

Description	Type	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Wall 1	Cavity Wall	0.18	44.86	33.22

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall 1	Solid Wall		0.00	42.26

10.0 External Roofs

Description	Type	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Roof 1	External Flat Roof	0.13	65.09	65.09

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Windowss	Manufacturer	Window	Double glazed			0.63		0.70	1.20

13.0 Openings

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

Darren Evans

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
E Windows	Window	[1] External Wall 1	East	Dark-coloured curtain or roller blind	0.00					7.14	100
N Windows	Window	[1] External Wall 1	North	Dark-coloured curtain or roller blind	0.00					4.50	100

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	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	6.40	0.021	No	CBA-313
Independently assessed	E3 Sill	2.00	0.021	No	CBA-314
Independently assessed	E4 Jamb	17.40	0.017	No	CBA-315
Table K1 - Approved	E7 Party floor between dwellings (in blocks of flats)	15.41	0.070	No	
Table K1 - Default	E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.28	1.000	No	
Table K1 - Default	E15 Flat roof with parapet	18.69	0.560	No	
Independently assessed	E16 Corner (normal)	9.60	0.046	No	CBA-316
Independently assessed	E17 Corner (inverted – internal area greater than external area)	4.80	-0.040	No	
Table K1 - Approved	E18 Party wall between dwellings	2.40	0.060	No	
Table K1 - Default	E25 Staggered party wall between dwellings	2.40	0.120	No	
Table K1 - Default	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	17.61	0.000	No	
Table K1 - Default	P4 Party wall - Roof (insulation at ceiling level)	17.61	0.240	No	

Y-value	0.184	W/m²K

18.0 Pressure Testing	Yes	
Designed AP_{50}	4.00	m³/(h.m²) @ 50 Pa
Property Tested ?		
As Built AP_{50}		m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Windows half open
Cross ventilation possible	Yes
Night Ventilation	Yes
Air change rate	3.00

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - decentralised
MV Reference Number	500661
Duct Type	Flexible

19.1 Mechanical extract ventilation - Decentralised

SFP	Fan/Room Type	Count
0.12	Through Wall Fan Kitchen	1
0.16	In Room Fan Other Wet Room	1

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				0
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	10	
Total number of L.E.L. fittings	10	
Percentage of L.E.L. fittings	100.00	%
External		
External lights fitted	No	
23.0 Electricity Tariff	Standard	
24.0 Main Heating 1	SAP table	
Percentage of Heat	100	%
Main Heating	REA	
SAP Code	691	
Efficiency (SAP Table)	100.0	%
Controls	CRD Programmer and room thermostat	
Sap Code	2605	
25.0 Main Heating 2	Database	
Percentage of Heat	0	%
Database Ref. No.	190006	
Fuel Type	Electricity	
Main Heating	PEH	
SAP Code	524	
In Summer	367.8	
Controls	CWD Time and temperature zone control	
Sap Code	0	
Community Heating	None	
28.0 Water Heating	HWP From main heating 1	
Water Heating	Main Heating 2	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	

Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
SAP Code	914	
Immersion Only Heating Hot Water	Yes	
29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	201.00	L
Loss	1.610	kWh/day
32.0 Photovoltaic Unit	One Dwelling	

PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
1.64	Horizontal	Horizontal	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

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

Darren Evans

Property Reference	DE-21912-Plot 65	**Issued on Date**	25/01/2023
Assessment Reference	Plot 65	**Prop Type Ref**	TF- Flat
Property	Land at Tesco Extra Car Park, Plot 65, 1Bath, 2B3P, RG1		

SAP Rating	88 B	**DER**	17.89	**TER**	28.43
Environmental	90 B	**% DER<TER**	37.07		
CO_2 Emissions (t/year)	0.63	**DFEE**	48.15	**TFEE**	53.91
General Requirements Compliance	Pass	**% DFEE<TFEE**	10.69		

Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

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

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

DWELLING AS DESIGNED

Top-floor flat, total floor area 65 m²

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

1a TER and DER
Fuel for main heating:Electricity
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 28.43 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 17.89 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)53.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)48.1 kWh/m²/yrOK

---
2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	OK
Openings	1.20 (max. 2.00)	1.20 (max. 3.30)	OK

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

---
3 Air permeability
Air permeability at 50 pascals: 4.00 (design value)
Maximum 10.0 OK

---
4 Heating efficiency
Main heating system 1: Room heaters - Electric
Panel, convector or radiant heaters

Main heating system 2: Heat pump with warm air distribution - Electric
Dimplex EDL200UK-630

Secondary heating system: None

---
5 Cylinder insulation
Hot water storage No cylinder

---
6 Controls
Space heating controls 1: Programmer and room thermostat OK

Hot water controls: No cylinder

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

---
8 Mechanical ventilation
Continuous extract system (decentralised)
Specific fan power: 0.1200 0.1600
Maximum 0.7 OK

---
9 Summertime temperature
Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing North: 4.50 m², No overhang
Windows facing East: 7.14 m², No overhang
Air change rate: 3.00 ach
Blinds/curtains: Dark-coloured curtain or roller blind, closed 100% of daylight hours

---
10 Key features
Party wall U-value 0.00 W/m²K
Photovoltaic array 1.64 kW

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	65.0900 (1b)	x	2.4000 (2b)	=	156.2160	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.0900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	156.2160	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		4.0000	
Infiltration rate		0.2000	(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) =	0.1700	(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	0.2168	0.2125	0.2083	0.1870	0.1828	0.1615	0.1615	0.1573	0.1700	0.1828	0.1913	0.1998	(22b)

Mechanical extract ventilation - decentralised
If mechanical ventilation: 0.5000 (23a)

Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(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	
Windowss (Uw = 1.20)			11.6400	1.1450	13.3282			(27)
External Wall 1	44.8600	11.6400	33.2200	0.1800	5.9796			(29a)
External Roof 1	65.0900		65.0900	0.1300	8.4617			(30)
Total net area of external elements Aum(A, m2)			109.9500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.7695			(33)
Party Wall 1			42.2600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	20.2053	(36)
Total fabric heat loss (33) + (36) =	47.9748	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	25.7756	25.7756	25.7756	25.7756	25.7756	25.7756	25.7756	25.7756	25.7756	25.7756	25.7756	25.7756	(38)
Heat transfer coeff	73.7505	73.7505	73.7505	73.7505	73.7505	73.7505	73.7505	73.7505	73.7505	73.7505	73.7505	73.7505	(39)

Average = Sum(39)m / 12 = 73.7505 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1331	1.1331	1.1331	1.1331	1.1331	1.1331	1.1331	1.1331	1.1331	1.1331	1.1331	1.1331	(40)
HLP (average)												1.1331	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.1213 (42)
Average daily hot water use (litres/day)	84.5809 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	93.0390	89.6558	86.2726	82.8893	79.5061	76.1229	76.1229	79.5061	82.8893	86.2726	89.6558	93.0390	(44)
Energy conte	137.9742	120.6731	124.5239	108.5629	104.1687	89.8897	83.2960	95.5834	96.7249	112.7236	123.0466	133.6207	(45)
Energy content (annual)										Total = Sum(45)m =		1330.7876	(45)
Distribution loss (46)m = 0.15 x (45)m	20.6961	18.1010	18.6786	16.2844	15.6253	13.4835	12.4944	14.3375	14.5087	16.9085	18.4570	20.0431	(46)

Water storage loss:	
Store volume	201.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	1.6100 (48)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.8694	(55)
Total storage loss													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(56)
If cylinder contains dedicated solar storage													
	26.9514	24.3432	26.9514	26.0820	26.9514	26.0820	26.9514	26.9514	26.0820	26.9514	26.0820	26.9514	(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)
Total heat required for water heating calculated for each month													
	164.9256	145.0163	151.4753	134.6449	131.1201	115.9717	110.2474	122.5348	122.8069	139.6750	149.1286	160.5721	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)
Output from w/h													
	164.9256	145.0163	151.4753	134.6449	131.1201	115.9717	110.2474	122.5348	122.8069	139.6750	149.1286	160.5721	(64)
								Total per year (kWh/year) = Sum(64)m =				1648.1186	(64)
Heat gains from water heating, kWh/month													
	45.8764	40.1238	41.4042	36.0972	34.6361	29.8883	27.6959	31.7815	32.1610	37.4806	40.9130	44.4289	(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	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	16.9155	15.0242	12.2185	9.2502	6.9146	5.8376	6.3078	8.1991	11.0048	13.9731	16.3086	17.3856	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	185.5781	187.5038	182.6510	172.3201	159.2791	147.0225	138.8343	136.9086	141.7613	152.0923	165.1332	177.3899	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	(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)													
	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	(71)
Water heating gains (Table 5)													
	61.6619	59.7081	55.6508	50.1350	46.5539	41.5115	37.2257	42.7170	44.6681	50.3771	56.8236	59.7162	(72)
Total internal gains													
	318.9750	317.0556	305.3398	286.5248	267.5672	249.1912	237.1873	242.6442	252.2537	271.2620	293.0850	309.3113	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	4.5000	10.6334	0.6300	0.7000	0.7700	14.6237	(74)
East	7.1400	19.6403	0.6300	0.7000	0.7700	42.8566	(76)

Solar gains	57.4802	111.7831	185.5549	277.6402	349.5304	362.6207	343.2043	288.0690	217.6735	132.7458	71.4773	47.4342	(83)
Total gains	376.4552	428.8387	490.8947	564.1650	617.0976	611.8119	580.3916	530.7132	469.9272	404.0079	364.5623	356.7454	(84)

---

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.2896	61.2896	61.2896	61.2896	61.2896	61.2896	61.2896	61.2896	61.2896	61.2896	61.2896	61.2896	
alpha	5.0860	5.0860	5.0860	5.0860	5.0860	5.0860	5.0860	5.0860	5.0860	5.0860	5.0860	5.0860	
util living area													
	0.9983	0.9964	0.9896	0.9620	0.8765	0.7121	0.5459	0.6139	0.8671	0.9815	0.9966	0.9987	(86)
MIT	19.7614	19.8999	20.1553	20.4939	20.7901	20.9474	20.9889	20.9805	20.8532	20.4638	20.0422	19.7224	(87)
Th 2	19.9739	19.9739	19.9739	19.9739	19.9739	19.9739	19.9739	19.9739	19.9739	19.9739	19.9739	19.9739	(88)
util rest of house													
	0.9978	0.9952	0.9858	0.9473	0.8310	0.6208	0.4254	0.4894	0.7999	0.9719	0.9953	0.9983	(89)
MIT 2	18.3197	18.5220	18.8933	19.3756	19.7674	19.9389	19.9698	19.9658	19.8525	19.3408	18.7304	18.2628	(90)
Living area fraction									fLA = Living area / (4) =			0.3795	(91)
MIT	18.8668	19.0448	19.3722	19.8000	20.1555	20.3216	20.3566	20.3509	20.2322	19.7669	19.2282	18.8167	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8668	19.0448	19.3722	19.8000	20.1555	20.3216	20.3566	20.3509	20.2322	19.7669	19.2282	18.8167	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9969	0.9936	0.9828	0.9443	0.8400	0.6536	0.4715	0.5370	0.8193	0.9693	0.9938	0.9976	(94)
Useful gains	375.2725	426.0797	482.4615	532.7409	518.3834	399.8757	273.6426	284.9865	384.9938	391.6145	362.3039	355.8829	(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													
	1074.3077	1043.1894	949.3306	803.8782	623.5979	421.9727	277.0480	291.3787	452.2541	676.0653	894.4583	1077.9885	(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													
	520.0821	414.6978	347.3506	195.2189	78.2796	0.0000	0.0000	0.0000	0.0000	211.6314	383.1512	537.2466	(98)
Space heating												2687.6581	(98)
Space heating per m2											(98) / (4) =	41.2914	(99)

8c. Space cooling requirement

Not applicable

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	2687.6581	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	520.0821	414.6978	347.3506	195.2189	78.2796	0.0000	0.0000	0.0000	0.0000	211.6314	383.1512	537.2466	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	520.0821	414.6978	347.3506	195.2189	78.2796	0.0000	0.0000	0.0000	0.0000	211.6314	383.1512	537.2466	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
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)
Space heating fuel used, main system 2												0.0000	(213)

Water heating													
Water heating requirement													
	164.9256	145.0163	151.4753	134.6449	131.1201	115.9717	110.2474	122.5348	122.8069	139.6750	149.1286	160.5721	(64)
Efficiency of water heater												349.4100	(216)
(217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	(217)
Fuel for water heating, kWh/month													
	47.2012	41.5032	43.3517	38.5349	37.5261	33.1907	31.5524	35.0691	35.1469	39.9745	42.6801	45.9552	(219)
Water heating fuel used												471.6862	(219)
Annual totals kWh/year													
Space heating fuel - main system												2687.6581	(211)
Space heating fuel - secondary												0.0000	(215)

Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.6500, total flow = 21.0000, SFP = 0.1738)		
mechanical ventilation fans (SFP = 0.1738)	33.1252	(230a)
Total electricity for the above, kWh/year	33.1252	(231)
Electricity for lighting (calculated in Appendix L)	298.7330	(232)

Energy saving/generation technologies (Appendices M ,N and Q)			
PV Unit 0 (0.80 * 1.64 * 951 * 1.00) =	-1247.2082	-1247.2082	(233)
Total delivered energy for all uses		2243.9944	(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	2687.6581	0.5190	1394.8946	(261)
Space heating - main system 2	0.0000	0.5190	0.0000	(262)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	471.6862	0.5190	244.8051	(264)
Space and water heating			1639.6997	(265)
Pumps and fans	33.1252	0.5190	17.1920	(267)
Energy for lighting	298.7330	0.5190	155.0424	(268)
Energy saving/generation technologies				
PV Unit	-1247.2082	0.5190	-647.3011	(269)
Total CO2, kg/year			1164.6331	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			17.8900	(273)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES			
DER		17.8900	ZC1
Total Floor Area	TFA	65.0900	
Assumed number of occupants	N	2.1213	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.8950	ZC2
CO2 emissions from cooking, equation (L16)		2.6104	ZC3
Total CO2 emissions		37.3954	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		37.3954	ZC8

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	65.0900 (1b)	x	2.4000 (2b)	=	156.2160	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.0900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	156.2160	(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) =	0.1280	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3780	(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) =	0.3213	(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	0.4097	0.4017	0.3936	0.3535	0.3454	0.3053	0.3053	0.2972	0.3213	0.3454	0.3615	0.3776	(22b)
Effective ac	0.5839	0.5807	0.5775	0.5625	0.5597	0.5466	0.5466	0.5442	0.5516	0.5597	0.5653	0.5713	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opening Type (Uw = 1.40)			11.6400	1.3258	15.4318			(27)
External Wall 1	44.8600	11.6400	33.2200	0.1800	5.9796			(29a)
External Roof 1	65.0900		65.0900	0.1300	8.4617			(30)
Total net area of external elements Aum(A, m2)			109.9500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		29.8731			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.7339	(36)
Total fabric heat loss					(33) + (36) =		45.6070	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	30.1019	29.9339	29.7693	28.9958	28.8511	28.1775	28.1775	28.0527	28.4369	28.8511	29.1439	29.4499	(38)
Heat transfer coeff	75.7089	75.5409	75.3763	74.6028	74.4581	73.7845	73.7845	73.6597	74.0440	74.4581	74.7509	75.0569	(39)
Average = Sum(39)m / 12 =												74.6021	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1631	1.1606	1.1580	1.1461	1.1439	1.1336	1.1336	1.1317	1.1376	1.1439	1.1484	1.1531	(40)
HLP (average)												1.1461	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.1213	(42)
Average daily hot water use (litres/day)	84.5809	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	93.0390	89.6558	86.2726	82.8893	79.5061	76.1229	76.1229	79.5061	82.8893	86.2726	89.6558	93.0390	(44)
Energy conte	137.9742	120.6731	124.5239	108.5629	104.1687	89.8897	83.2960	95.5834	96.7249	112.7236	123.0466	133.6207	(45)
Energy content (annual)										Total = Sum(45)m =		1330.7876	(45)
Distribution loss (46)m = 0.15 x (45)m	20.6961	18.1010	18.6786	16.2844	15.6253	13.4835	12.4944	14.3375	14.5087	16.9085	18.4570	20.0431	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage

	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
	184.5691	162.7588	171.1188	153.6548	150.7636	134.9815	129.8909	142.1783	141.8168	159.3185	168.1385	180.2156 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
									Solar input (sum of months) = Sum(63)m =			0.0000 (63)
Output from w/h												
	184.5691	162.7588	171.1188	153.6548	150.7636	134.9815	129.8909	142.1783	141.8168	159.3185	168.1385	180.2156 (64)
									Total per year (kWh/year) = Sum(64)m =			1879.4050 (64)
Heat gains from water heating, kWh/month												
	83.1523	73.7924	78.6801	72.1706	71.9120	65.9618	64.9718	69.0574	68.2345	74.7565	76.9865	81.7048 (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	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	16.9155	15.0242	12.2185	9.2502	6.9146	5.8376	6.3078	8.1991	11.0048	13.9731	16.3086	17.3856	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	185.5781	187.5038	182.6510	172.3201	159.2791	147.0225	138.8343	136.9086	141.7613	152.0923	165.1332	177.3899	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	(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)													
	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	(71)
Water heating gains (Table 5)													
	111.7639	109.8101	105.7528	100.2370	96.6559	91.6136	87.3277	92.8191	94.7702	100.4792	106.9257	109.8183	(72)
Total internal gains													
	372.0770	370.1576	358.4419	339.6268	320.6692	302.2932	290.2893	295.7463	305.3558	324.3641	346.1870	362.4133	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	4.5000	10.6334	0.6300	0.7000	0.7700	14.6237	(74)
East	7.1400	19.6403	0.6300	0.7000	0.7700	42.8566	(76)

Solar gains	57.4802	111.7831	185.5549	277.6402	349.5304	362.6207	343.2043	288.0690	217.6735	132.7458	71.4773	47.4342	(83)
Total gains	429.5572	481.9407	543.9968	617.2670	670.1997	664.9140	633.4936	583.8153	523.0292	457.1099	417.6643	409.8475	(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	59.7042	59.8369	59.9677	60.5894	60.7071	61.2614	61.2614	61.3651	61.0467	60.7071	60.4694	60.2228	
alpha	4.9803	4.9891	4.9978	5.0393	5.0471	5.0841	5.0841	5.0910	5.0698	5.0471	5.0313	5.0149	
util living area	0.9969	0.9940	0.9844	0.9482	0.8480	0.6689	0.5040	0.5645	0.8253	0.9701	0.9939	0.9976	(86)
MIT	19.7965	19.9384	20.1969	20.5417	20.8207	20.9603	20.9922	20.9866	20.8854	20.5220	20.0995	19.7712	(87)
Th 2	19.9496	19.9517	19.9537	19.9633	19.9651	19.9735	19.9735	19.9751	19.9703	19.9651	19.9615	19.9577	(88)
util rest of house	0.9959	0.9920	0.9789	0.9295	0.7971	0.5781	0.3908	0.4467	0.7496	0.9557	0.9914	0.9968	(89)
MIT 2	18.3536	18.5618	18.9375	19.4312	19.7934	19.9479	19.9707	19.9697	19.8801	19.4141	18.8045	18.3225	(90)
Living area fraction										fLA = Living area / (4) =		0.3795	(91)
MIT	18.9012	19.0842	19.4154	19.8526	20.1832	20.3321	20.3584	20.3556	20.2616	19.8345	19.2959	18.8723	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.9012	19.0842	19.4154	19.8526	20.1832	20.3321	20.3584	20.3556	20.2616	19.8345	19.2959	18.8723	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9945	0.9897	0.9752	0.9271	0.8090	0.6113	0.4340	0.4917	0.7734	0.9534	0.9892	0.9956	(94)
Useful gains	427.1781	476.9752	530.4917	572.2590	542.1630	406.4597	274.9548	287.0633	404.5218	435.7863	413.1662	408.0324	(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	1105.4392	1071.4895	973.5133	817.0966	631.6433	422.9388	277.3081	291.3678	456.2272	687.5846	911.6551	1101.2555	(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	504.6263	399.5136	329.6081	176.2831	66.5733	0.0000	0.0000	0.0000	0.0000	187.3380	358.9120	515.7580	(98)
Space heating												2538.6124	(98)
Space heating per m2											(98) / (4) =	39.0016	(99)

8c. Space cooling requirement

Not applicable

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												93.5000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												2715.0935	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	504.6263	399.5136	329.6081	176.2831	66.5733	0.0000	0.0000	0.0000	0.0000	187.3380	358.9120	515.7580	(98)
Space heating efficiency (main heating system 1)													
	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)													
	539.7072	427.2873	352.5220	188.5381	71.2014	0.0000	0.0000	0.0000	0.0000	200.3615	383.8631	551.6129	(211)
Water heating requirement													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	184.5691	162.7588	171.1188	153.6548	150.7636	134.9815	129.8909	142.1783	141.8168	159.3185	168.1385	180.2156	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.3629	87.1187	86.5348	85.1809	82.7986	79.8000	79.8000	79.8000	79.8000	85.2468	86.7876	87.4633	(217)
Fuel for water heating, kWh/month													
	211.2671	186.8243	197.7457	180.3864	182.0846	169.1498	162.7705	178.1683	177.7153	186.8909	193.7355	206.0471	(219)
Water heating fuel used												2232.7855	(219)
Annual totals kWh/year													
Space heating fuel - main system												2715.0935	(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)												298.7330	(232)
Total delivered energy for all uses												5321.6121	(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	2715.0935	0.2160	586.4602	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2232.7855	0.2160	482.2817	(264)
Space and water heating			1068.7419	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	298.7330	0.5190	155.0424	(268)
Total CO2, kg/m2/year			1262.7093	(272)
Emissions per m2 for space and water heating			16.4194	(272a)
Fuel factor (electricity)			1.5500	
Emissions per m2 for lighting			2.3820	(272b)
Emissions per m2 for pumps and fans			0.5980	(272c)
Target Carbon Dioxide Emission Rate (TER) = (16.4194 * 1.55) + 2.3820 + 0.5980, rounded to 2 d.p.			28.4300	(273)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	65.0900 (1b)	x	2.4000 (2b)	=	156.2160	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.0900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	156.2160	(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) =	0.1280	(8)
Pressure test		Yes	
Measured/design AP50		4.0000	
Infiltration rate		0.3280	(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) =	0.2788	(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	0.3555	0.3485	0.3416	0.3067	0.2997	0.2649	0.2649	0.2579	0.2788	0.2997	0.3137	0.3276	(22b)
Effective ac	0.5632	0.5607	0.5583	0.5470	0.5449	0.5351	0.5351	0.5333	0.5389	0.5449	0.5492	0.5537	(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	
Windowss (Uw = 1.20)			11.6400	1.1450	13.3282			(27)
External Wall 1	44.8600	11.6400	33.2200	0.1800	5.9796			(29a)
External Roof 1	65.0900		65.0900	0.1300	8.4617			(30)
Total net area of external elements Aum(A, m2)			109.9500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		27.7695			(33)
Party Wall 1			42.2600	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	20.2053	(36)
Total fabric heat loss (33) + (36) =	47.9748	(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	29.0332	28.9067	28.7827	28.2003	28.0914	27.5841	27.5841	27.4902	27.7795	28.0914	28.3118	28.5422	(38)
Heat transfer coeff	77.0080	76.8815	76.7575	76.1752	76.0662	75.5590	75.5590	75.4650	75.7544	76.0662	76.2866	76.5171	(39)
Average = Sum(39)m / 12 =												76.1746	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1831	1.1812	1.1793	1.1703	1.1686	1.1608	1.1608	1.1594	1.1638	1.1686	1.1720	1.1756	(40)
HLP (average)												1.1703	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.1213 (42)
Average daily hot water use (litres/day)	84.5809 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	93.0390	89.6558	86.2726	82.8893	79.5061	76.1229	76.1229	79.5061	82.8893	86.2726	89.6558	93.0390	(44)
Energy conte	137.9742	120.6731	124.5239	108.5629	104.1687	89.8897	83.2960	95.5834	96.7249	112.7236	123.0466	133.6207	(45)
Energy content (annual)										Total = Sum(45)m =		1330.7876	(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)
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)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Heat gains from water heating, kWh/month

	29.3195	25.6430	26.4613	23.0696	22.1358	19.1016	17.7004	20.3115	20.5540	23.9538	26.1474	28.3944 (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	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	16.9155	15.0242	12.2185	9.2502	6.9146	5.8376	6.3078	8.1991	11.0048	13.9731	16.3086	17.3856	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	185.5781	187.5038	182.6510	172.3201	159.2791	147.0225	138.8343	136.9086	141.7613	152.0923	165.1332	177.3899	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	(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)													
	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	(71)
Water heating gains (Table 5)													
	39.4080	38.1593	35.5663	32.0411	29.7525	26.5299	23.7909	27.3004	28.5473	32.1959	36.3158	38.1645	(72)
Total internal gains													
	296.7211	295.5068	285.2554	268.4310	250.7658	234.2096	223.7525	227.2275	236.1329	253.0808	272.5772	287.7595	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	4.5000	10.6334	0.6300	0.7000	0.7700	14.6237	(74)
East	7.1400	19.6403	0.6300	0.7000	0.7700	42.8566	(76)

Solar gains	57.4802	111.7831	185.5549	277.6402	349.5304	362.6207	343.2043	288.0690	217.6735	132.7458	71.4773	47.4342	(83)
Total gains	354.2013	407.2899	470.8102	546.0712	600.2962	596.8303	566.9567	515.2965	453.8064	385.8266	344.0545	335.1937	(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	58.6970	58.7936	58.8885	59.3387	59.4237	59.8227	59.8227	59.8971	59.6684	59.4237	59.2520	59.0736	
alpha	4.9131	4.9196	4.9259	4.9559	4.9616	4.9882	4.9882	4.9931	4.9779	4.9616	4.9501	4.9382	
util living area	0.9987	0.9972	0.9916	0.9681	0.8926	0.7351	0.5687	0.6399	0.8857	0.9853	0.9974	0.9990	(86)
MIT	19.6629	19.8068	20.0727	20.4350	20.7533	20.9354	20.9856	20.9750	20.8262	20.4091	19.9693	19.6347	(87)
Th 2	19.9335	19.9351	19.9366	19.9438	19.9452	19.9515	19.9515	19.9526	19.9490	19.9452	19.9425	19.9396	(88)
util rest of house	0.9983	0.9962	0.9885	0.9554	0.8499	0.6428	0.4422	0.5105	0.8226	0.9774	0.9963	0.9987	(89)
MIT 2	18.7140	18.8588	19.1243	19.4845	19.7770	19.9216	19.9478	19.9454	19.8486	19.4652	19.0271	18.6907	(90)
Living area fraction									fLA = Living area / (4) =			0.3795	(91)
MIT	19.0741	19.2185	19.4842	19.8452	20.1475	20.3063	20.3416	20.3361	20.2196	19.8234	19.3847	19.0489	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0741	19.2185	19.4842	19.8452	20.1475	20.3063	20.3416	20.3361	20.2196	19.8234	19.3847	19.0489	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9978	0.9953	0.9867	0.9539	0.8593	0.6762	0.4908	0.5602	0.8415	0.9762	0.9956	0.9983	(94)
Useful gains	353.4110	405.3574	464.5590	520.9115	515.8070	403.5896	278.2377	288.6913	381.8621	376.6293	342.5240	334.6239	(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	1137.7228	1100.8308	996.6354	833.7490	642.5660	431.1653	282.7130	297.0363	463.5834	701.5885	937.1557	1136.1981	(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	583.5280	467.3581	395.8649	225.2429	94.3087	0.0000	0.0000	0.0000	0.0000	241.7697	428.1348	596.3712	(98)
Space heating												3032.5783	(98)
Space heating per m2											(98) / (4) =	46.5905	(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	710.2544	559.1364	573.5343	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8679	0.9258	0.8959	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	616.4439	517.6528	513.8315	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	776.6781	740.1987	681.1184	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	115.3687	165.5741	124.4614	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												405.4042	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling kWh

0.0000	0.0000	0.0000	0.0000	0.0000	28.8422	41.3935	31.1154	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling											101.3511	(107)
Space cooling per m2											1.5571	(108)
Energy for space heating											46.5905	(99)
Energy for space cooling											1.5571	(108)
Total											48.1476	(109)
Dwelling Fabric Energy Efficiency (DFEE)											48.1	(109)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	65.0900 (1b)	x	2.4000 (2b)	=	156.2160	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	65.0900					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	156.2160	(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) =	0.1280	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3780	(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) =	0.3213	(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	0.4097	0.4017	0.3936	0.3535	0.3454	0.3053	0.3053	0.2972	0.3213	0.3454	0.3615	0.3776	(22b)
Effective ac	0.5839	0.5807	0.5775	0.5625	0.5597	0.5466	0.5466	0.5442	0.5516	0.5597	0.5653	0.5713	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opening Type (Uw = 1.40)			11.6400	1.3258	15.4318			(27)
External Wall 1	44.8600	11.6400	33.2200	0.1800	5.9796			(29a)
External Roof 1	65.0900		65.0900	0.1300	8.4617			(30)
Total net area of external elements Aum(A, m2)			109.9500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.8731			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.7339	(36)
Total fabric heat loss					(33) + (36) =		45.6070	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	30.1019	29.9339	29.7693	28.9958	28.8511	28.1775	28.1775	28.0527	28.4369	28.8511	29.1439	29.4499	(38)
Heat transfer coeff	75.7089	75.5409	75.3763	74.6028	74.4581	73.7845	73.7845	73.6597	74.0440	74.4581	74.7509	75.0569	(39)
Average = Sum(39)m / 12 =												74.6021	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1631	1.1606	1.1580	1.1461	1.1439	1.1336	1.1336	1.1317	1.1376	1.1439	1.1484	1.1531	(40)
HLP (average)												1.1461	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.1213 (42)
Average daily hot water use (litres/day)		84.5809 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	93.0390	89.6558	86.2726	82.8893	79.5061	76.1229	76.1229	79.5061	82.8893	86.2726	89.6558	93.0390	(44)
Energy conte	137.9742	120.6731	124.5239	108.5629	104.1687	89.8897	83.2960	95.5834	96.7249	112.7236	123.0466	133.6207	(45)
Energy content (annual)										Total = Sum(45)m =		1330.7876	(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)
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													

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

	29.3195	25.6430	26.4613	23.0696	22.1358	19.1016	17.7004	20.3115	20.5540	23.9538	26.1474	28.3944	(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	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	106.0651	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	16.9155	15.0242	12.2185	9.2502	6.9146	5.8376	6.3078	8.1991	11.0048	13.9731	16.3086	17.3856	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	185.5781	187.5038	182.6510	172.3201	159.2791	147.0225	138.8343	136.9086	141.7613	152.0923	165.1332	177.3899	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	33.6065	(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)													
	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	-84.8521	(71)
Water heating gains (Table 5)													
	39.4080	38.1593	35.5663	32.0411	29.7525	26.5299	23.7909	27.3004	28.5473	32.1959	36.3158	38.1645	(72)
Total internal gains													
	296.7211	295.5068	285.2554	268.4310	250.7658	234.2096	223.7525	227.2275	236.1329	253.0808	272.5772	287.7595	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	4.5000	10.6334	0.6300	0.7000	0.7700	14.6237	(74)
East	7.1400	19.6403	0.6300	0.7000	0.7700	42.8566	(76)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	57.4802	111.7831	185.5549	277.6402	349.5304	362.6207	343.2043	288.0690	217.6735	132.7458	71.4773	47.4342	(83)
Total gains	354.2013	407.2899	470.8102	546.0712	600.2962	596.8303	566.9567	515.2965	453.8064	385.8266	344.0545	335.1937	(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	59.7042	59.8369	59.9677	60.5894	60.7071	61.2614	61.2614	61.3651	61.0467	60.7071	60.4694	60.2228	
alpha	4.9803	4.9891	4.9978	5.0393	5.0471	5.0841	5.0841	5.0910	5.0698	5.0471	5.0313	5.0149	
util living area													
	0.9987	0.9972	0.9915	0.9670	0.8881	0.7251	0.5577	0.6287	0.8805	0.9849	0.9974	0.9990	(86)
MIT	19.6893	19.8334	20.0979	20.4591	20.7698	20.9429	20.9878	20.9784	20.8390	20.4303	19.9957	19.6645	(87)
Th 2	19.9496	19.9517	19.9537	19.9633	19.9651	19.9735	19.9735	19.9751	19.9703	19.9651	19.9615	19.9577	(88)
util rest of house													
	0.9983	0.9962	0.9883	0.9540	0.8448	0.6339	0.4353	0.5027	0.8167	0.9768	0.9963	0.9987	(89)
MIT 2	18.7531	18.8986	19.1631	19.5238	19.8087	19.9472	19.9704	19.9688	19.8777	19.5023	19.0687	18.7349	(90)
Living area fraction										fLA = Living area / (4) =		0.3795	(91)
MIT	19.1084	19.2533	19.5178	19.8787	20.1735	20.3251	20.3565	20.3520	20.2425	19.8545	19.4204	19.0877	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1084	19.2533	19.5178	19.8787	20.1735	20.3251	20.3565	20.3520	20.2425	19.8545	19.4204	19.0877	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9978	0.9953	0.9866	0.9527	0.8547	0.6671	0.4822	0.5511	0.8362	0.9757	0.9956	0.9983	(94)
Useful gains	353.4203	405.3622	464.4948	520.2415	513.0601	398.1619	273.3966	283.9624	379.4614	376.4529	342.5298	334.6335	(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													
	1121.1262	1084.2626	981.2327	819.0435	630.9177	422.4210	277.1700	291.1006	454.8145	689.0694	920.9631	1117.4227	(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													
	571.1732	456.2211	384.4530	215.1375	87.6861	0.0000	0.0000	0.0000	0.0000	232.5867	416.4720	582.3952	(98)
Space heating												2946.1247	(98)
Space heating per m2											(98) / (4) =	45.2623	(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	693.5742	546.0052	559.8140	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8791	0.9337	0.9059	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	609.6964	509.8309	507.1271	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	776.6781	740.1987	681.1184	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	120.2269	171.3936	129.4495	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												421.0699	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling kWh													

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

	0.0000	0.0000	0.0000	0.0000	0.0000	30.0567	42.8484	32.3624	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												105.2675 (107)
Space cooling per m2												1.6173 (108)
Energy for space heating												45.2623 (99)
Energy for space cooling												1.6173 (108)
Total												46.8796 (109)
Target Fabric Energy Efficiency (TFEE)												53.9 (109)

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

Overheating Calculation Input Data

Dwelling type	MidTerrace Flat
Number of storeys	1
Cross ventilation possible	Yes
SAP Region	Thames Valley
Front of dwelling faces	South
Overshading	Average or unknown
Thermal mass parameter	250.0
Night ventilation	Yes
Ventilation rate during hot weather (ach)	3.00 (Windows half open)

Overheating Calculation

Summer ventilation heat loss coefficient	154.65 (P1)
Transmission heat loss coefficient	47.97 (37)
Summer heat loss coefficient	202.63 (P2)

Overhangs

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

Solar shading

Orientation	Z blinds	Solar access	Z overhangs	Z summer
North	0.850	0.90	1.000	0.765 (P8)
East	0.850	0.90	1.000	0.765 (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	4.5000	81.1852	0.6300	0.7000	0.7650	110.9256
East	7.1400	117.5071	0.6300	0.7000	0.7650	254.7445
total:						365.6701

	Jun	Jul	Aug	
Solar gains	390	366	314	(P3)
Internal gains	368	352	360	
Total summer gains	758	718	674	(P5)
Summer gain/loss ratio	3.74	3.54	3.33	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 250.0)	0.25	0.25	0.25	
Threshold temperature	19.99	21.69	21.38	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	

Assessment of likelihood of high internal temperature: Slight

BASIC COMPLIANCE REPORT
Calculation Type: New Build (As Designed)

Darren Evans

Property Reference	DE-21912-Plot 65	**Issued on Date**	25/01/2023
Assessment Reference	Plot 65	**Prop Type Ref**	TF- Flat
Property	Land at Tesco Extra Car Park, Plot 65, 1Bath, 2B3P, RG1		

SAP Rating	88 B	**DER**	17.89	**TER**	28.43
Environmental	90 B	**% DER<TER**	37.07		
CO_2 Emissions (t/year)	0.63	**DFEE**	48.15	**TFEE**	53.91
General Requirements Compliance	Pass	**% DFEE<TFEE**	10.69		

Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Electricity		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	28.43	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	17.89	$kgCO_2/m^2$	Pass
	-10.54 (-37.1%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	53.91	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	48.15	$kWh/m^2/yr$	
	-5.8 (-10.8%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	Pass
Openings	1.20 (max. 2.00)	1.20 (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	4.00 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system 1	Room heaters - Electric Panel, convector or radiant heaters	
Main heating system 2	Heat pump with warm air distribution - Electric Dimplex EDL200UK-630	

Secondary heating system	None		
5 Cylinder insulation			
Hot water storage	No cylinder		
6 Controls			
Space heating controls 1	Programmer and room thermostat		Pass
Hot water controls	No cylinder		
7 Low energy lights			
Percentage of fixed lights with low-energy fittings	100	%	
Minimum	75	%	Pass
8 Mechanical ventilation			
Continuous extract system (decentralised)			
Specific fan power	0.1200 0.1600		
Maximum	0.7		Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)	Slight	Pass

Based on:

Overshading	Average
Windows facing North	4.50 m², No overhang
Windows facing East	7.14 m², No overhang
Air change rate	3.00 ach
Blinds/curtains	Dark-coloured curtain or roller blind, closed 100% of daylight hours

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value		
Solid Wall	0.00	W/m²K	Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals	4.00 (design value)		
Maximum	10.0		Pass

10 Key features

Party wall U-value	0.00	W/m²K
Photovoltaic array	1.64	kW

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BLOCK COMPLIANCE
Calculation Type: New Build (As Designed)

Darren Evans

Block Reference	4 PV planel per falt	**Issued on Date**	25/01/2023
Block Name	335		
Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

Block Compliance Report - DER

Block Reference: 4 PV planel per falt		Block Name: 335			
Property-Assessment Reference	**Multiplier**	**Floor Area (m^2)**	**DER ($kgCO_2/m^2$)**	**TER ($kgCO_2/m^2$)**	**% DER/TER**
DE-21912-Plot 20-Plot 20	1	61.7	9.39	24.71	62.00 %
DE-21912-Plot 17-Plot 17	1	61.7	11.56	25.89	55.36 %
DE-21912- Plot 07-Plot 07	1	50.76	8.84	26.11	66.14 %
DE-21912 - Plot 05-Plot 05	1	65.09	12.75	26.21	51.36 %
DE-21912-Plot 40-Plot 40	1	61.7	6.66	21.38	68.85 %
DE-21912-Plot 27-Plot 27	1	62.48	6.76	20.78	67.47 %
DE-21912-Plot 25-Plot 25	1	65.09	9.65	22.66	57.41 %
DE-21912-Plot 67-Plot 67	1	62.48	13.70	25.47	46.21 %
DE-21912-Plot 80-Plot 80	1	61.7	15.75	27.54	42.81 %
DE-21912-Plot 65-Plot 65	1	65.09	17.89	28.43	37.07 %
DE-21912-Plot 77-Plot 77	1	61.7	20.17	30.69	34.27 %
DE-21912-Plot 37-Plot 37	1	61.7	11.61	24.84	53.25 %
Totals:	12	741.19	144.73	304.71	
Average DER = 12.12 $kgCO_2/m^2$		**% DER/TER**	PASS		
Average TER = 25.38 $kgCO_2/m^2$		52.25 %			

Block Compliance Report - DFEE

Block Reference: 4 PV planel per falt		Block Name: 335			
Property-Assessment Reference	**Multiplier**	**Floor Area (m^2)**	**DFEE ($kWh/m^2/yr$)**	**TFEE ($kWh/m^2/yr$)**	**% DFEE/TFEE**
DE-21912-Plot 20-Plot 20	1	61.7	32.22	39.28	17.99 %
DE-21912-Plot 17-Plot 17	1	61.7	36.71	43.81	16.22 %
DE-21912- Plot 07-Plot 07	1	50.76	34.10	38.48	11.38 %
DE-21912 - Plot 05-Plot 05	1	65.09	38.23	46.52	17.82 %
DE-21912-Plot 40-Plot 40	1	61.7	26.99	27.95	3.45 %
DE-21912-Plot 27-Plot 27	1	62.48	26.37	26.48	0.39 %
DE-21912-Plot 25-Plot 25	1	65.09	32.34	34.66	6.71 %
DE-21912-Plot 67-Plot 67	1	62.48	39.57	42.27	6.38 %
DE-21912-Plot 80-Plot 80	1	61.7	44.07	48.37	8.88 %
DE-21912-Plot 65-Plot 65	1	65.09	48.15	53.91	10.69 %
DE-21912-Plot 77-Plot 77	1	61.7	52.85	59.27	10.83 %
DE-21912-Plot 37-Plot 37	1	61.7	36.79	40.29	8.69 %
Totals:	12	741.19	448.37	501.28	
Average DFEE = 37.43 $kWh/m^2/yr$		**% DFEE/TFEE**	PASS		
Average TFEE = 41.85 $kWh/m^2/yr$		10.56 %			

PREDICTED ENERGY ASSESSMENT

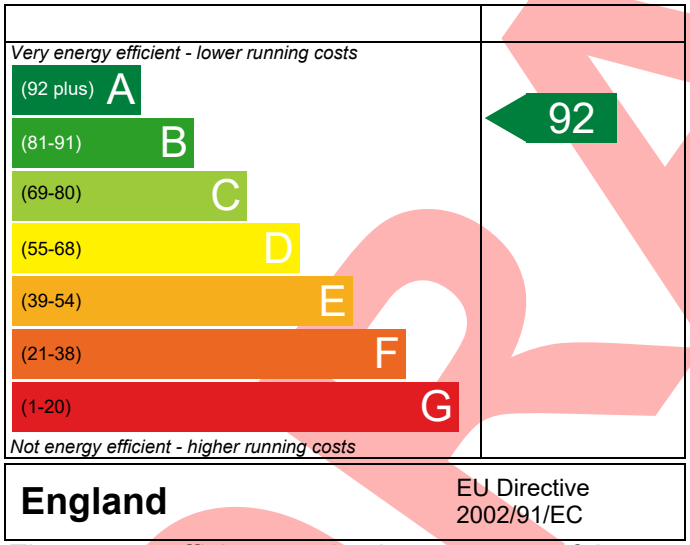
Land at Tesco Extra Car Park,
Plot 67,
1Bath,
1B2P,
RG1

Dwelling type:	Flat, Mid-Terrace
Date of assessment:	25/01/2023
Produced by:	Charles Sims
Total floor area:	62.48 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.

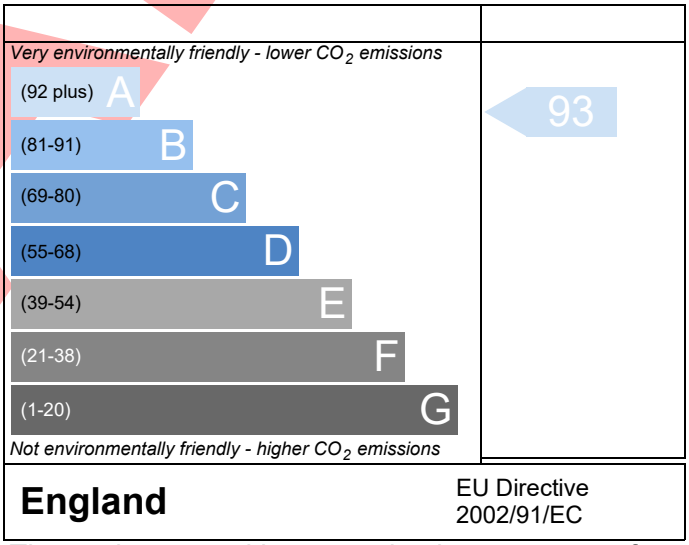
The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO_2) emissions.

Energy Efficiency Rating



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 (CO_2) Rating



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

DRAFT

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BUILDING REGULATION COMPLIANCE
Calculation Type: New Build (As Designed)

Darren Evans

Property Reference	DE-21912-Plot 67	**Issued on Date**	25/01/2023
Assessment Reference	Plot 67	**Prop Type Ref**	TF -Flat
Property	Land at Tesco Extra Car Park, Plot 67, 1Bath, 1B2P, RG1		

SAP Rating	92 A	**DER**	13.70	**TER**	25.47
Environmental	93 A	**% DER<TER**	46.21		
CO_2 Emissions (t/year)	0.37	**DFEE**	39.57	**TFEE**	42.27
General Requirements Compliance	Pass	**% DFEE<TFEE**	6.38		

Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Electricity		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	25.47	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	13.70	$kgCO_2/m^2$	Pass
	-11.77 (-46.2%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	42.27	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	39.57	$kWh/m^2/yr$	
	-2.7 (-6.4%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	Pass
Openings	1.20 (max. 2.00)	1.20 (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	4.00 (design value)	$m^3/(h.m^2)$ @ 50 Pa	
Maximum	10.0	$m^3/(h.m^2)$ @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system 1	Room heaters - Electric Panel, convector or radiant heaters	

DRAFT

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

Main heating system 2	Heat pump with warm air distribution - Electric Dimplex EDL200UK-630		
Secondary heating system	None		
5 Cylinder insulation			
Hot water storage	No cylinder		
6 Controls			
Space heating controls 1	Programmer and room thermostat		Pass
Hot water controls	No cylinder		
7 Low energy lights			
Percentage of fixed lights with low-energy fittings	100	%	
Minimum	75	%	Pass
8 Mechanical ventilation			
Continuous extract system (decentralised)			
Specific fan power	0.1600 0.1600		
Maximum	0.7		Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)	Slight	Pass
Based on:		
Overshading	Average	
Windows facing East	8.44 m², No overhang	
Air change rate	3.00 ach	
Blinds/curtains	Dark-coloured curtain or roller blind, closed 100% of daylight hours	

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value		
Solid Wall	0.00	W/m²K	Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals	4.00 (design value)	m³/(h.m²) @ 50 Pa	
Maximum	10.0	m³/(h.m²) @ 50 Pa	Pass

10 Key features

Party wall U-value	0.00	W/m²K
Photovoltaic array	1.64	kW

DRAFT

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

	Typical cost	Typical savings per year	Energy efficiency	Environmental impact	Result
Low energy lights			0	0	Already installed
Solar water heating			0	0	Not applicable
Photovoltaic			0	0	Not applicable
Wind turbine			0	0	Not applicable
Totals	**£0**	**£0**	**A 92**	**A 93**	

DRAFT

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

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

Darren Evans

Property Reference	DE-21912-Plot 67	**Issued on Date**	25/01/2023
Assessment Reference	Plot 67	**Prop Type Ref**	TF -Flat
Property	Land at Tesco Extra Car Park, Plot 67, 1Bath, 1B2P, RG1		

SAP Rating	92 A	**DER**	13.70	**TER**	25.47
Environmental	93 A	**% DER<TER**	46.21		
CO_2 Emissions (t/year)	0.37	**DFEE**	39.57	**TFEE**	42.27
General Requirements Compliance	Pass	**% DFEE<TFEE**	6.38		

Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

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

Orientation	North
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	Flat, Mid-Terrace
2.0 Number of Storeys	1
3.0 Date Built	2023
4.0 Sheltered Sides	3
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	10.73 m	62.48 m²	2.40 m

7.0 Living Area	25.82	m²
8.0 Thermal Mass Parameter	Simple calculation - Medium	
Thermal Mass	250.00	kJ/m²K

9.0 External Walls

Description	Type	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Wall 1	Cavity Wall	0.18	25.75	17.31

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall 1	Solid Wall		0.00	50.57

10.0 External Roofs

Description	Type	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Roof 1	External Flat Roof	0.13	62.48	62.48

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Windows	Manufacturer	Window	Double glazed			0.63		0.70	1.20

13.0 Openings

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

Darren Evans

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
Opening 1	Window	[1] External Wall 1	East	Dark-coloured curtain or roller blind	0.00					8.44	100

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	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	4.40	0.021	No	CBA-313
Independently assessed	E3 Sill	1.00	0.021	No	CBA-314
Independently assessed	E4 Jamb	11.00	0.017	No	CBA-315
Table K1 - Approved	E7 Party floor between dwellings (in blocks of flats)	7.43	0.070	No	
Table K1 - Default	E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.30	1.000	No	
Table K1 - Default	E15 Flat roof with parapet	10.73	0.560	No	
Independently assessed	E16 Corner (normal)	2.40	0.046	No	CBA-316
Table K1 - Approved	E18 Party wall between dwellings	2.40	0.060	No	
Table K1 - Default	E25 Staggered party wall between dwellings	2.40	0.120	No	
Table K1 - Default	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	21.07	0.000	No	
Table K1 - Default	P4 Party wall - Roof (insulation at ceiling level)	21.07	0.240	No	

Y-value	0.178	W/m²K
18.0 Pressure Testing	Yes	
Designed AP_{50}	4.00	m³/(h.m²) @ 50 Pa
Property Tested ?		
As Built AP_{50}		m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Windows half open
Cross ventilation possible	Yes
Night Ventilation	Yes
Air change rate	3.00

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - decentralised
MV Reference Number	500661
Duct Type	Flexible

19.1 Mechanical extract ventilation - Decentralised

SFP	Fan/Room Type	Count
0.16	In Room Fan Kitchen	1

0.16	In Room Fan Other Wet Room	1

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				0
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	8	
Total number of L.E.L. fittings	8	
Percentage of L.E.L. fittings	100.00	%
External		
External lights fitted	No	
23.0 Electricity Tariff	Standard	
24.0 Main Heating 1	SAP table	
Percentage of Heat	100	%
Main Heating	REA	
SAP Code	691	
Efficiency (SAP Table)	100.0	%
Controls	CRD Programmer and room thermostat	
Sap Code	2605	
25.0 Main Heating 2	Database	
Percentage of Heat	0	%
Database Ref. No.	190006	
Fuel Type	Electricity	
Main Heating	PEH	
SAP Code	524	
In Summer	367.8	
Controls	CWD Time and temperature zone control	
Sap Code	0	
Community Heating	None	
28.0 Water Heating	HWP From main heating 1	
Water Heating	Main Heating 2	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	

Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
SAP Code	914	
Immersion Only Heating Hot Water	Yes	
29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	201.00	L
Loss	1.610	kWh/day
32.0 Photovoltaic Unit	One Dwelling	

PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
1.64	Horizontal	Horizontal	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

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

Property Reference	DE-21912-Plot 67	**Issued on Date**	25/01/2023
Assessment Reference	Plot 67	**Prop Type Ref**	TF -Flat
Property	Land at Tesco Extra Car Park, Plot 67, 1Bath, 1B2P, RG1		

SAP Rating	92 A	**DER**	13.70	**TER**	25.47
Environmental	93 A	**% DER<TER**	46.21		
CO_2 Emissions (t/year)	0.37	**DFEE**	39.57	**TFEE**	42.27
General Requirements Compliance	Pass	**% DFEE<TFEE**	6.38		

Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

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

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

DWELLING AS DESIGNED

Top-floor flat, total floor area 62 m²

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

1a TER and DER
Fuel for main heating:Electricity
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 25.47 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.70 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)42.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)39.6 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	OK
Openings	1.20 (max. 2.00)	1.20 (max. 3.30)	OK

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

3 Air permeability
Air permeability at 50 pascals: 4.00 (design value)
Maximum 10.0 OK

4 Heating efficiency
Main heating system 1: Room heaters - Electric
Panel, convector or radiant heaters

Main heating system 2: Heat pump with warm air distribution - Electric
Dimplex EDL200UK-630

Secondary heating system: None

5 Cylinder insulation
Hot water storage No cylinder

6 Controls
Space heating controls 1: Programmer and room thermostat OK

Hot water controls: No cylinder

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

8 Mechanical ventilation
Continuous extract system (decentralised)
Specific fan power: 0.1600 0.1600
Maximum 0.7 OK

9 Summertime temperature
Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing East: 8.44 m², No overhang
Air change rate: 3.00 ach
Blinds/curtains: Dark-coloured curtain or roller blind, closed 100% of daylight hours

10 Key features
Party wall U-value 0.00 W/m²K
Photovoltaic array 1.64 kW

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	62.4800 (1b)	x	2.4000 (2b)	=	149.9520	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.4800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	149.9520	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		4.0000	
Infiltration rate		0.2000	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1550	(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	0.1976	0.1938	0.1899	0.1705	0.1666	0.1473	0.1473	0.1434	0.1550	0.1666	0.1744	0.1821	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation:												0.5000	(23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(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	
Windows (Uw = 1.20)			8.4400	1.1450	9.6641			(27)
External Wall 1	25.7500	8.4400	17.3100	0.1800	3.1158			(29a)
External Roof 1	62.4800		62.4800	0.1300	8.1224			(30)
Total net area of external elements Aum(A, m2)			88.2300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.9023			(33)
Party Wall 1			50.5700	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.7285	(36)
Total fabric heat loss					(33) + (36) =		36.6308	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	24.7421	24.7421	24.7421	24.7421	24.7421	24.7421	24.7421	24.7421	24.7421	24.7421	24.7421	24.7421	(38)
Heat transfer coeff	61.3729	61.3729	61.3729	61.3729	61.3729	61.3729	61.3729	61.3729	61.3729	61.3729	61.3729	61.3729	(39)
Average = Sum(39)m / 12 =												61.3729	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9823	0.9823	0.9823	0.9823	0.9823	0.9823	0.9823	0.9823	0.9823	0.9823	0.9823	0.9823	(40)
HLP (average)												0.9823	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.0508	(42)
Average daily hot water use (litres/day)	82.9069	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	91.1975	87.8813	84.5650	81.2487	77.9324	74.6162	74.6162	77.9324	81.2487	84.5650	87.8813	91.1975	(44)
Energy conte	135.2433	118.2847	122.0592	106.4142	102.1069	88.1105	81.6473	93.6915	94.8105	110.4925	120.6112	130.9759	(45)
Energy content (annual)										Total = Sum(45)m =		1304.4477	(45)
Distribution loss (46)m = 0.15 x (45)m	20.2865	17.7427	18.3089	15.9621	15.3160	13.2166	12.2471	14.0537	14.2216	16.5739	18.0917	19.6464	(46)
Water storage loss:													
Store volume												201.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

```
  Temperature factor from Table 2b                                                                                0.5400 (49)
Enter (49) or (54) in (55)                                                                                        0.8694 (55)
Total storage loss
              26.9514    24.3432    26.9514    26.0820    26.9514    26.0820    26.9514    26.9514    26.0820    26.9514    26.0820    26.9514 (56)
If cylinder contains dedicated solar storage
              26.9514    24.3432    26.9514    26.0820    26.9514    26.0820    26.9514    26.9514    26.0820    26.9514    26.0820    26.9514 (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)
Total heat required for water heating calculated for each month
             162.1947   142.6279   149.0106   132.4962   129.0583   114.1925   108.5987   120.6429   120.8925   137.4439   146.6932   157.9273 (62)
Solar input      0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000     0.0000 (63)
                                                                                  Solar input (sum of months) = Sum(63)m =      0.0000 (63)
Output from w/h
             162.1947   142.6279   149.0106   132.4962   129.0583   114.1925   108.5987   120.6429   120.8925   137.4439   146.6932   157.9273 (64)
                                                                                  Total per year (kWh/year) = Sum(64)m =   1621.7787 (64)
Heat gains from water heating, kWh/month
              44.9684    39.3297    40.5847    35.3827    33.9506    29.2967    27.1477    31.1524    31.5245    36.7388    40.1032    43.5495 (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       102.5408   102.5408   102.5408   102.5408   102.5408   102.5408   102.5408   102.5408   102.5408   102.5408   102.5408   102.5408 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
              17.2694    15.3386    12.4742     9.4437     7.0593     5.9598     6.4397     8.3706    11.2350    14.2654    16.6499    17.7494 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
             179.1554   181.0145   176.3297   166.3563   153.7667   141.9342   134.0294   132.1703   136.8551   146.8285   159.4181   171.2506 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
              33.2541    33.2541    33.2541    33.2541    33.2541    33.2541    33.2541    33.2541    33.2541    33.2541    33.2541    33.2541 (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)
             -82.0326   -82.0326   -82.0326   -82.0326   -82.0326   -82.0326   -82.0326   -82.0326   -82.0326   -82.0326   -82.0326   -82.0326 (71)
Water heating gains (Table 5)
              60.4414    58.5263    54.5493    49.1427    45.6325    40.6899    36.4889    41.8715    43.7840    49.3800    55.6989    58.5343 (72)
Total internal gains
             310.6285   308.6415   297.1154   278.7049   260.2207   242.3461   230.7203   236.1747   245.6364   264.2362   285.5291   301.2965 (73)
```

---

6. Solar gains

```
[Jan]                                  Area          Solar flux              g              FF            Access              Gains
                                       m2            Table 6a      Specific data  Specific data          factor                  W
                                                        W/m2        or Table 6b    or Table 6c        Table 6d
-------------------------------------------------------------------------------------------------------------------------------
East                                 8.4400            19.6403            0.6300          0.7000          0.7700           50.6596 (76)
-------------------------------------------------------------------------------------------------------------------------------

Solar gains     50.6596    99.1009   163.2050   238.0248   291.7084   298.6154   284.2940   244.2044   189.8142   117.5916    63.1665    41.6600 (83)
Total gains    361.2881   407.7424   460.3204   516.7297   551.9290   540.9615   515.0143   480.3791   435.4506   381.8278   348.6957   342.9565 (84)
```

---

7. Mean internal temperature (heating season)

```
Temperature during heating periods in the living area from Table 9, Th1 (C)                                      21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)
                Jan        Feb        Mar        Apr        May        Jun        Jul        Aug        Sep        Oct        Nov        Dec
tau          70.6971    70.6971    70.6971    70.6971    70.6971    70.6971    70.6971    70.6971    70.6971    70.6971    70.6971    70.6971
alpha         5.7131     5.7131     5.7131     5.7131     5.7131     5.7131     5.7131     5.7131     5.7131     5.7131     5.7131     5.7131
util living area
              0.9983     0.9963     0.9887     0.9580     0.8649     0.6899     0.5180     0.5757     0.8389     0.9780     0.9964     0.9988 (86)

MIT          19.9701    20.0978    20.3259    20.6161    20.8552    20.9697    20.9950    20.9911    20.9098    20.5893    20.2160    19.9324 (87)
Th 2         20.0981    20.0981    20.0981    20.0981    20.0981    20.0981    20.0981    20.0981    20.0981    20.0981    20.0981    20.0981 (88)
util rest of house
              0.9978     0.9950     0.9847     0.9429     0.8204     0.6072     0.4152     0.4690     0.7713     0.9673     0.9950     0.9983 (89)
MIT 2        18.7149    18.9012    19.2323    19.6439    19.9560    20.0778    20.0962    20.0944    20.0249    19.6131    19.0744    18.6599 (90)
Living area fraction                                                                                fLA = Living area / (4) =      0.4133 (91)
MIT          19.2336    19.3957    19.6842    20.0457    20.3276    20.4464    20.4676    20.4649    20.3906    20.0165    19.5462    19.1858 (92)
Temperature adjustment                                                                                           0.0000
adjusted MIT 19.2336    19.3957    19.6842    20.0457    20.3276    20.4464    20.4676    20.4649    20.3906    20.0165    19.5462    19.1858 (93)
```

---

8. Space heating requirement

```
                Jan        Feb        Mar        Apr        May        Jun        Jul        Aug        Sep        Oct        Nov        Dec
Utilisation      0.9970     0.9937     0.9824     0.9419     0.8328     0.6404     0.4579     0.5133     0.7954     0.9661     0.9938     0.9978 (94)
Useful gains   360.2134   405.1681   452.2285   486.7101   459.6602   346.4507   235.8264   246.6021   346.3583   368.8906   346.5370   342.1881 (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
             916.5192   889.6436   809.1538   684.0425   529.4993   358.8094   237.3666   249.4765   386.0720   577.9200   763.8590   919.7199 (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
             413.8915   325.5675   265.5524   142.0794    51.9603     0.0000     0.0000     0.0000     0.0000   155.5179   300.4719   429.6837 (98)
Space heating                                                                                                   2084.7245 (98)
Space heating per m2                                                                                  (98) / (4) =     33.3663 (99)
```

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	2084.7245	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	413.8915	325.5675	265.5524	142.0794	51.9603	0.0000	0.0000	0.0000	0.0000	155.5179	300.4719	429.6837	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	413.8915	325.5675	265.5524	142.0794	51.9603	0.0000	0.0000	0.0000	0.0000	155.5179	300.4719	429.6837	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
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)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	162.1947	142.6279	149.0106	132.4962	129.0583	114.1925	108.5987	120.6429	120.8925	137.4439	146.6932	157.9273	(64)
Efficiency of water heater												349.4100	(216)
(217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	(217)
Fuel for water heating, kWh/month	46.4196	40.8196	42.6463	37.9200	36.9361	32.6815	31.0806	34.5276	34.5990	39.3360	41.9831	45.1983	(219)
Water heating fuel used												464.1478	(219)
Annual totals kWh/year													
Space heating fuel - main system												2084.7245	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 4.8720, total flow = 21.0000, SFP = 0.2320)													
mechanical ventilation fans (SFP = 0.2320)												42.4424	(230a)
Total electricity for the above, kWh/year												42.4424	(231)
Electricity for lighting (calculated in Appendix L)												304.9836	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.64 * 951 * 1.00) =												-1247.2082	(233)
Total delivered energy for all uses												1649.0901	(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	2084.7245	0.5190	1081.9720	(261)
Space heating - main system 2	0.0000	0.5190	0.0000	(262)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	464.1478	0.5190	240.8927	(264)
Space and water heating			1322.8647	(265)
Pumps and fans	42.4424	0.5190	22.0276	(267)
Energy for lighting	304.9836	0.5190	158.2865	(268)
Energy saving/generation technologies				
PV Unit	-1247.2082	0.5190	-647.3011	(269)
Total CO2, kg/year			855.8778	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			13.7000	(273)

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

DER		13.7000	ZC1
Total Floor Area	TFA	62.4800	
Assumed number of occupants	N	2.0508	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.9916	ZC2
CO2 emissions from cooking, equation (L16)		2.6924	ZC3
Total CO2 emissions		33.3840	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		33.3840	ZC8

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	62.4800 (1b)	x	2.4000 (2b)	=	149.9520	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.4800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	149.9520	(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) =	0.1334	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3834	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2971	(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	0.3788	0.3714	0.3640	0.3268	0.3194	0.2823	0.2823	0.2748	0.2971	0.3194	0.3343	0.3491	(22b)
Effective ac	0.5718	0.5690	0.5662	0.5534	0.5510	0.5398	0.5398	0.5378	0.5441	0.5510	0.5559	0.5609	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opening Type (Uw = 1.40)			8.4400	1.3258	11.1894			(27)
External Wall 1	25.7500	8.4400	17.3100	0.1800	3.1158			(29a)
External Roof 1	62.4800		62.4800	0.1300	8.1224			(30)
Total net area of external elements Aum(A, m2)			88.2300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		22.4276			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.4473	(36)
Total fabric heat loss						(33) + (36) =	32.8749	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.2927	28.1549	28.0197	27.3849	27.2662	26.7133	26.7133	26.6109	26.9263	27.2662	27.5064	27.7576	(38)
Heat transfer coeff	61.1676	61.0298	60.8946	60.2598	60.1411	59.5882	59.5882	59.4858	59.8012	60.1411	60.3813	60.6325	(39)
Average = Sum(39)m / 12 =												60.2593	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9790	0.9768	0.9746	0.9645	0.9626	0.9537	0.9537	0.9521	0.9571	0.9626	0.9664	0.9704	(40)
HLP (average)												0.9645	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.0508	(42)
Average daily hot water use (litres/day)	82.9069	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	91.1975	87.8813	84.5650	81.2487	77.9324	74.6162	74.6162	77.9324	81.2487	84.5650	87.8813	91.1975	(44)
Energy conte	135.2433	118.2847	122.0592	106.4142	102.1069	88.1105	81.6473	93.6915	94.8105	110.4925	120.6112	130.9759	(45)
Energy content (annual)										Total = Sum(45)m =		1304.4477	(45)
Distribution loss (46)m = 0.15 x (45)m	20.2865	17.7427	18.3089	15.9621	15.3160	13.2166	12.2471	14.0537	14.2216	16.5739	18.0917	19.6464	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage

	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	181.8382	160.3704	168.6541	151.5060	148.7018	133.2024	128.2422	140.2864	139.9023	157.0874	165.7030	177.5708	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
									Solar input (sum of months) = Sum(63)m =			0.0000	(63)
Output from w/h													
	181.8382	160.3704	168.6541	151.5060	148.7018	133.2024	128.2422	140.2864	139.9023	157.0874	165.7030	177.5708	(64)
									Total per year (kWh/year) = Sum(64)m =			1853.0651	(64)
Heat gains from water heating, kWh/month													
	82.2443	72.9982	77.8606	71.4562	71.2265	65.3702	64.4237	68.4284	67.5980	74.0147	76.1767	80.8254	(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	102.5408	102.5408	102.5408	102.5408	102.5408	102.5408	102.5408	102.5408	102.5408	102.5408	102.5408	102.5408	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.2694	15.3386	12.4742	9.4437	7.0593	5.9598	6.4397	8.3706	11.2350	14.2654	16.6499	17.7494	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	179.1554	181.0145	176.3297	166.3563	153.7667	141.9342	134.0294	132.1703	136.8551	146.8285	159.4181	171.2506	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.2541	33.2541	33.2541	33.2541	33.2541	33.2541	33.2541	33.2541	33.2541	33.2541	33.2541	33.2541	(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)													
	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	(71)
Water heating gains (Table 5)													
	110.5435	108.6283	104.6513	99.2447	95.7345	90.7920	86.5909	91.9736	93.8861	99.4821	105.8010	108.6363	(72)
Total internal gains													
	363.7305	361.7436	350.2174	331.8070	313.3227	295.4482	283.8223	289.2768	298.7384	317.3383	338.6312	354.3986	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	8.4400	19.6403	0.6300	0.7000	0.7700	50.6596	(76)

Solar gains	50.6596	99.1009	163.2050	238.0248	291.7084	298.6154	284.2940	244.2044	189.8142	117.5916	63.1665	41.6600	(83)
Total gains	414.3901	460.8445	513.4225	569.8318	605.0311	594.0636	568.1164	533.4811	488.5527	434.9298	401.7977	396.0585	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.9344	71.0946	71.2524	72.0030	72.1452	72.8146	72.8146	72.9399	72.5553	72.1452	71.8581	71.5604	
alpha	5.7290	5.7396	5.7502	5.8002	5.8097	5.8543	5.8543	5.8627	5.8370	5.8097	5.7905	5.7707	
util living area													
	0.9966	0.9931	0.9810	0.9357	0.8176	0.6239	0.4588	0.5079	0.7731	0.9597	0.9926	0.9974	(86)
MIT	20.0559	20.1853	20.4110	20.6951	20.8994	20.9833	20.9976	20.9958	20.9456	20.6762	20.3150	20.0309	(87)
Th 2	20.1009	20.1027	20.1045	20.1131	20.1146	20.1221	20.1221	20.1235	20.1192	20.1146	20.1114	20.1080	(88)
util rest of house													
	0.9955	0.9909	0.9747	0.9150	0.7675	0.5460	0.3687	0.4138	0.6996	0.9424	0.9898	0.9965	(89)
MIT 2	18.8421	19.0316	19.3586	19.7615	20.0197	20.1113	20.1212	20.1217	20.0777	19.7446	19.2278	18.8110	(90)
Living area fraction										fLA = Living area / (4) =		0.4133	(91)
MIT	19.3437	19.5083	19.7935	20.1473	20.3832	20.4717	20.4834	20.4830	20.4364	20.1296	19.6771	19.3152	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3437	19.5083	19.7935	20.1473	20.3832	20.4717	20.4834	20.4830	20.4364	20.1296	19.6771	19.3152	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9943	0.9889	0.9720	0.9159	0.7838	0.5778	0.4061	0.4528	0.7277	0.9427	0.9880	0.9955	(94)
Useful gains	412.0207	455.7419	499.0617	521.9232	474.2016	343.2224	230.6878	241.5594	355.5096	410.0126	396.9915	394.2767	(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													
	920.1872	891.5433	809.5034	677.7615	522.2185	349.8832	231.4032	242.8779	378.9222	573.1181	759.4221	916.4704	(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													
	378.0759	292.8585	230.9686	112.2036	35.7246	0.0000	0.0000	0.0000	0.0000	121.3505	260.9500	388.5121	(98)
Space heating												1820.6438	(98)
Space heating per m2											(98) / (4) =	29.1396	(99)

8c. Space cooling requirement

Not applicable

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

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												93.5000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												1947.2127	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	378.0759	292.8585	230.9686	112.2036	35.7246	0.0000	0.0000	0.0000	0.0000	121.3505	260.9500	388.5121	(98)
Space heating efficiency (main heating system 1)													
	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)													
	404.3593	313.2176	247.0253	120.0039	38.2081	0.0000	0.0000	0.0000	0.0000	129.7866	279.0909	415.5210	(211)
Water heating requirement													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	181.8382	160.3704	168.6541	151.5060	148.7018	133.2024	128.2422	140.2864	139.9023	157.0874	165.7030	177.5708	(64)
Efficiency of water heater												79.8000	(216)
(217)m	86.7236	86.4007	85.6530	84.0270	81.6704	79.8000	79.8000	79.8000	79.8000	84.1354	86.0204	86.8472	(217)
Fuel for water heating, kWh/month													
	209.6757	185.6123	196.9038	180.3063	182.0755	166.9202	160.7046	175.7975	175.3162	186.7079	192.6322	204.4636	(219)
Water heating fuel used												2217.1157	(219)
Annual totals kWh/year													
Space heating fuel - main system												1947.2127	(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)												304.9836	(232)
Total delivered energy for all uses												4544.3119	(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	1947.2127	0.2160	420.5979	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2217.1157	0.2160	478.8970	(264)
Space and water heating			899.4949	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	304.9836	0.5190	158.2865	(268)
Total CO2, kg/m2/year			1096.7064	(272)
Emissions per m2 for space and water heating			14.3965	(272a)
Fuel factor (electricity)			1.5500	
Emissions per m2 for lighting			2.5334	(272b)
Emissions per m2 for pumps and fans			0.6230	(272c)
Target Carbon Dioxide Emission Rate (TER) = (14.3965 * 1.55) + 2.5334 + 0.6230, rounded to 2 d.p.			25.4700	(273)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	62.4800 (1b)	x	2.4000 (2b)	=	149.9520	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.4800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	149.9520	(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) =	0.1334	(8)
Pressure test		Yes	
Measured/design AP50		4.0000	
Infiltration rate		0.3334	(18)
Number of sides sheltered		3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2584	(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	0.3294	0.3230	0.3165	0.2842	0.2777	0.2454	0.2454	0.2390	0.2584	0.2777	0.2907	0.3036	(22b)
Effective ac	0.5543	0.5522	0.5501	0.5404	0.5386	0.5301	0.5301	0.5286	0.5334	0.5386	0.5422	0.5461	(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	
Windows (Uw = 1.20)			8.4400	1.1450	9.6641			(27)
External Wall 1	25.7500	8.4400	17.3100	0.1800	3.1158			(29a)
External Roof 1	62.4800		62.4800	0.1300	8.1224			(30)
Total net area of external elements Aum(A, m2)			88.2300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		20.9023			(33)
Party Wall 1			50.5700	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.7285	(36)
Total fabric heat loss					(33) + (36) =		36.6308	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	27.4270	27.3227	27.2205	26.7405	26.6507	26.2327	26.2327	26.1552	26.3937	26.6507	26.8324	27.0223	(38)
Heat transfer coeff	64.0578	63.9535	63.8514	63.3714	63.2815	62.8635	62.8635	62.7861	63.0245	63.2815	63.4632	63.6532	(39)
Average = Sum(39)m / 12 =												63.3709	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0253	1.0236	1.0219	1.0143	1.0128	1.0061	1.0061	1.0049	1.0087	1.0128	1.0157	1.0188	(40)
HLP (average)												1.0143	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.0508	(42)
Average daily hot water use (litres/day)	82.9069	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	91.1975	87.8813	84.5650	81.2487	77.9324	74.6162	74.6162	77.9324	81.2487	84.5650	87.8813	91.1975	(44)
Energy conte	135.2433	118.2847	122.0592	106.4142	102.1069	88.1105	81.6473	93.6915	94.8105	110.4925	120.6112	130.9759	(45)
Energy content (annual)										Total = Sum(45)m =		1304.4477	(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)
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)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Heat gains from water heating, kWh/month

	28.7392	25.1355	25.9376	22.6130	21.6977	18.7235	17.3501	19.9094	20.1472	23.4797	25.6299	27.8324 (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	102.5408	102.5408	102.5408	102.5408	102.5408	102.5408	102.5408	102.5408	102.5408	102.5408	102.5408	102.5408	(66)

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

	17.2694	15.3386	12.4742	9.4437	7.0593	5.9598	6.4397	8.3706	11.2350	14.2654	16.6499	17.7494	(67)

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

	179.1554	181.0145	176.3297	166.3563	153.7667	141.9342	134.0294	132.1703	136.8551	146.8285	159.4181	171.2506	(68)

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

	33.2541	33.2541	33.2541	33.2541	33.2541	33.2541	33.2541	33.2541	33.2541	33.2541	33.2541	33.2541	(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)

	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	(71)

Water heating gains (Table 5)

	38.6280	37.4040	34.8623	31.4070	29.1636	26.0048	23.3200	26.7600	27.9823	31.5587	35.5971	37.4091	(72)

Total internal gains

	288.8150	287.5193	277.4284	260.9692	243.7518	227.6610	217.5513	221.0632	229.8346	246.4149	265.4273	280.1714	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	8.4400	19.6403	0.6300	0.7000	0.7700	50.6596	(76)

Solar gains	50.6596	99.1009	163.2050	238.0248	291.7084	298.6154	284.2940	244.2044	189.8142	117.5916	63.1665	41.6600	(83)
Total gains	339.4746	386.6202	440.6334	498.9940	535.4602	526.2765	501.8454	465.2676	419.6489	364.0064	328.5938	321.8313	(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	67.7340	67.8444	67.9530	68.4677	68.5648	69.0208	69.0208	69.1059	68.8445	68.5648	68.3686	68.1645	
alpha	5.5156	5.5230	5.5302	5.5645	5.5710	5.6014	5.6014	5.6071	5.5896	5.5710	5.5579	5.5443	
util living area	0.9988	0.9972	0.9913	0.9660	0.8848	0.7163	0.5422	0.6038	0.8629	0.9832	0.9974	0.9991	(86)
MIT	19.8761	20.0090	20.2473	20.5611	20.8231	20.9609	20.9931	20.9878	20.8878	20.5371	20.1458	19.8484	(87)
Th 2	20.0623	20.0637	20.0651	20.0715	20.0727	20.0782	20.0782	20.0793	20.0761	20.0727	20.0702	20.0677	(88)
util rest of house	0.9984	0.9962	0.9882	0.9531	0.8433	0.6320	0.4333	0.4915	0.7989	0.9747	0.9963	0.9988	(89)
MIT 2	19.0306	19.1643	19.4022	19.7134	19.9520	20.0600	20.0764	20.0757	20.0122	19.6955	19.3064	19.0073	(90)
Living area fraction									fLA = Living area / (4) =			0.4133	(91)
MIT	19.3800	19.5134	19.7514	20.0637	20.3120	20.4323	20.4552	20.4526	20.3740	20.0433	19.6533	19.3549	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3800	19.5134	19.7514	20.0637	20.3120	20.4323	20.4552	20.4526	20.3740	20.0433	19.6533	19.3549	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9980	0.9955	0.9868	0.9530	0.8552	0.6659	0.4787	0.5383	0.8219	0.9743	0.9957	0.9985	(94)
Useful gains	338.7856	384.8837	434.8287	475.5460	457.9174	350.4658	240.2097	250.4640	344.9180	354.6566	327.1835	321.3433	(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	965.9935	934.5759	846.1224	707.4586	544.9799	366.6387	242.3518	254.4479	395.4187	597.5855	796.6709	964.6572	(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	466.6427	369.3932	306.0025	166.9771	64.7745	0.0000	0.0000	0.0000	0.0000	180.7391	338.0310	478.6255	(98)
Space heating												2371.1855	(98)
Space heating per m2											(98) / (4) =	37.9511	(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	590.9167	465.1898	477.1741	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9069	0.9544	0.9358	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	535.9034	443.9720	446.5354	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	692.1494	662.1269	620.7614	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	112.4971	162.3073	129.6242	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												404.4285	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)

Space cooling kWh

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

	0.0000	0.0000	0.0000	0.0000	0.0000	28.1243	40.5768	32.4060	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												101.1071 (107)
Space cooling per m2												1.6182 (108)
Energy for space heating												37.9511 (99)
Energy for space cooling												1.6182 (108)
Total												39.5693 (109)
Dwelling Fabric Energy Efficiency (DFEE)												39.6 (109)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	62.4800 (1b)	x	2.4000 (2b)	=	149.9520	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	62.4800					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	149.9520	(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) =	0.1334	(8)
Pressure test			Yes	
Measured/design AP50			5.0000	
Infiltration rate			0.3834	(18)
Number of sides sheltered			3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.2971	(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	0.3788	0.3714	0.3640	0.3268	0.3194	0.2823	0.2823	0.2748	0.2971	0.3194	0.3343	0.3491	(22b)
Effective ac	0.5718	0.5690	0.5662	0.5534	0.5510	0.5398	0.5398	0.5378	0.5441	0.5510	0.5559	0.5609	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opening Type (Uw = 1.40)			8.4400	1.3258	11.1894			(27)
External Wall 1	25.7500	8.4400	17.3100	0.1800	3.1158			(29a)
External Roof 1	62.4800		62.4800	0.1300	8.1224			(30)
Total net area of external elements Aum(A, m2)			88.2300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		22.4276			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.4473	(36)
Total fabric heat loss						(33) + (36) =	32.8749	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.2927	28.1549	28.0197	27.3849	27.2662	26.7133	26.7133	26.6109	26.9263	27.2662	27.5064	27.7576	(38)
Heat transfer coeff	61.1676	61.0298	60.8946	60.2598	60.1411	59.5882	59.5882	59.4858	59.8012	60.1411	60.3813	60.6325	(39)
Average = Sum(39)m / 12 =												60.2593	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9790	0.9768	0.9746	0.9645	0.9626	0.9537	0.9537	0.9521	0.9571	0.9626	0.9664	0.9704	(40)
HLP (average)												0.9645	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0508	(42)
Average daily hot water use (litres/day)												82.9069	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	91.1975	87.8813	84.5650	81.2487	77.9324	74.6162	74.6162	77.9324	81.2487	84.5650	87.8813	91.1975	(44)
Energy conte	135.2433	118.2847	122.0592	106.4142	102.1069	88.1105	81.6473	93.6915	94.8105	110.4925	120.6112	130.9759	(45)
Energy content (annual)										Total = Sum(45)m =		1304.4477	(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)
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													

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

	28.7392	25.1355	25.9376	22.6130	21.6977	18.7235	17.3501	19.9094	20.1472	23.4797	25.6299	27.8324	(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	102.5408	102.5408	102.5408	102.5408	102.5408	102.5408	102.5408	102.5408	102.5408	102.5408	102.5408	102.5408	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.2694	15.3386	12.4742	9.4437	7.0593	5.9598	6.4397	8.3706	11.2350	14.2654	16.6499	17.7494	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	179.1554	181.0145	176.3297	166.3563	153.7667	141.9342	134.0294	132.1703	136.8551	146.8285	159.4181	171.2506	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.2541	33.2541	33.2541	33.2541	33.2541	33.2541	33.2541	33.2541	33.2541	33.2541	33.2541	33.2541	(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)													
	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	-82.0326	(71)
Water heating gains (Table 5)													
	38.6280	37.4040	34.8623	31.4070	29.1636	26.0048	23.3200	26.7600	27.9823	31.5587	35.5971	37.4091	(72)
Total internal gains													
	288.8150	287.5193	277.4284	260.9692	243.7518	227.6610	217.5513	221.0632	229.8346	246.4149	265.4273	280.1714	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	8.4400	19.6403	0.6300	0.7000	0.7700	50.6596	(76)

Solar gains	50.6596	99.1009	163.2050	238.0248	291.7084	298.6154	284.2940	244.2044	189.8142	117.5916	63.1665	41.6600	(83)
Total gains	339.4746	386.6202	440.6334	498.9940	535.4602	526.2765	501.8454	465.2676	419.6489	364.0064	328.5938	321.8313	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	70.9344	71.0946	71.2524	72.0030	72.1452	72.8146	72.8146	72.9399	72.5553	72.1452	71.8581	71.5604	
alpha	5.7290	5.7396	5.7502	5.8002	5.8097	5.8543	5.8543	5.8627	5.8370	5.8097	5.7905	5.7707	
util living area	0.9988	0.9971	0.9907	0.9622	0.8711	0.6906	0.5168	0.5771	0.8464	0.9815	0.9973	0.9991	(86)
MIT	19.9412	20.0733	20.3068	20.6126	20.8554	20.9721	20.9956	20.9920	20.9105	20.5826	20.2044	19.9168	(87)
Th 2	20.1009	20.1027	20.1045	20.1131	20.1146	20.1221	20.1221	20.1235	20.1192	20.1146	20.1114	20.1080	(88)
util rest of house	0.9984	0.9962	0.9874	0.9484	0.8280	0.6096	0.4167	0.4728	0.7811	0.9725	0.9963	0.9988	(89)
MIT 2	19.1272	19.2604	19.4938	19.7981	20.0171	20.1093	20.1209	20.1211	20.0691	19.7750	19.3987	19.1087	(90)
Living area fraction										fLA = Living area / (4) =		0.4133	(91)
MIT	19.4636	19.5963	19.8298	20.1347	20.3635	20.4658	20.4824	20.4810	20.4168	20.1088	19.7317	19.4426	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.4636	19.5963	19.8298	20.1347	20.3635	20.4658	20.4824	20.4810	20.4168	20.1088	19.7317	19.4426	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9980	0.9954	0.9861	0.9488	0.8412	0.6425	0.4583	0.5162	0.8053	0.9724	0.9956	0.9985	(94)
Useful gains	338.7945	384.8574	434.5300	473.4229	450.4555	338.1510	229.9977	240.1701	337.9504	353.9528	327.1626	321.3546	(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	927.5220	896.9139	811.7101	676.9989	521.0342	349.5344	231.3440	242.7614	377.7531	571.8670	762.7175	924.1993	(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	438.0133	344.1020	280.6220	146.5747	52.5105	0.0000	0.0000	0.0000	0.0000	162.1282	313.5995	448.5165	(98)
Space heating												2186.0667	(98)
Space heating per m2											(98) / (4) =	34.9883	(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	560.1291	440.9527	452.0922	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9278	0.9671	0.9522	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	519.7028	426.4234	430.4954	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	692.1494	662.1269	620.7614	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	124.1615	175.3634	141.5579	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												441.0828	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	31.0404	43.8409	35.3895	0.0000	0.0000	0.0000	0.0000	(107)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling	110.2707 (107)
Space cooling per m2	1.7649 (108)
Energy for space heating	34.9883 (99)
Energy for space cooling	1.7649 (108)
Total	36.7532 (109)
Target Fabric Energy Efficiency (TFEE)	42.3 (109)

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

Overheating Calculation Input Data

Dwelling type	MidTerrace Flat
Number of storeys	1
Cross ventilation possible	Yes
SAP Region	Thames Valley
Front of dwelling faces	North
Overshading	Average or unknown
Thermal mass parameter	250.0
Night ventilation	Yes
Ventilation rate during hot weather (ach)	3.00 (Windows half open)

Overheating Calculation

Summer ventilation heat loss coefficient	148.45 (P1)
Transmission heat loss coefficient	36.63 (37)
Summer heat loss coefficient	185.08 (P2)

Overhangs

Orientation	Ratio	Z_overhangs	Overhang type
East	0.000	1.000	None

Solar shading

Orientation	Z blinds	Solar access	Z overhangs	Z summer
East	0.850	0.90	1.000	0.765 (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
East	8.4400	117.5071	0.6300	0.7000	0.7650	301.1265
total:						301.1265

	Jun	Jul	Aug	
Solar gains	320	301	265	(P3)
Internal gains	358	343	350	
Total summer gains	677	644	615	(P5)
Summer gain/loss ratio	3.66	3.48	3.32	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 250.0)	0.25	0.25	0.25	
Threshold temperature	19.91	21.63	21.37	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	

Assessment of likelihood of high internal temperature: Slight

BASIC COMPLIANCE REPORT
Calculation Type: New Build (As Designed)

Darren Evans

Property Reference	DE-21912-Plot 67	**Issued on Date**	25/01/2023
Assessment Reference	Plot 67	**Prop Type Ref**	TF -Flat
Property	Land at Tesco Extra Car Park, Plot 67, 1Bath, 1B2P, RG1		

SAP Rating	92 A	**DER**	13.70	**TER**	25.47
Environmental	93 A	**% DER<TER**	46.21		
CO_2 Emissions (t/year)	0.37	**DFEE**	39.57	**TFEE**	42.27
General Requirements Compliance	Pass	**% DFEE<TFEE**	6.38		

Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Electricity		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	25.47	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	13.70	$kgCO_2/m^2$	Pass
	-11.77 (-46.2%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	42.27	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	39.57	$kWh/m^2/yr$	
	-2.7 (-6.4%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	Pass
Openings	1.20 (max. 2.00)	1.20 (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	4.00 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system 1	Room heaters - Electric Panel, convector or radiant heaters	
Main heating system 2	Heat pump with warm air distribution - Electric Dimplex EDL200UK-630	

Secondary heating system	None		
5 Cylinder insulation			
Hot water storage	No cylinder		
6 Controls			
Space heating controls 1	Programmer and room thermostat		Pass
Hot water controls	No cylinder		
7 Low energy lights			
Percentage of fixed lights with low-energy fittings	100	%	
Minimum	75	%	Pass
8 Mechanical ventilation			
Continuous extract system (decentralised)			
Specific fan power	0.1600 0.1600		
Maximum	0.7		Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)	Slight	Pass

Based on:

Overshading	Average
Windows facing East	8.44 m², No overhang
Air change rate	3.00 ach
Blinds/curtains	Dark-coloured curtain or roller blind, closed 100% of daylight hours

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value		
Solid Wall	0.00	W/m²K	Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals	4.00 (design value)		
Maximum	10.0		Pass

10 Key features

Party wall U-value	0.00	W/m²K
Photovoltaic array	1.64	kW

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BLOCK COMPLIANCE
Calculation Type: New Build (As Designed)

Darren Evans

Block Reference	4 PV planel per falt	**Issued on Date**	25/01/2023
Block Name	335		
Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

Block Compliance Report - DER

Block Reference: 4 PV planel per falt		Block Name: 335			
Property-Assessment Reference	**Multiplier**	**Floor Area (m^2)**	**DER ($kgCO_2/m^2$)**	**TER ($kgCO_2/m^2$)**	**% DER/TER**
DE-21912-Plot 20-Plot 20	1	61.7	9.39	24.71	62.00 %
DE-21912-Plot 17-Plot 17	1	61.7	11.56	25.89	55.36 %
DE-21912- Plot 07-Plot 07	1	50.76	8.84	26.11	66.14 %
DE-21912 - Plot 05-Plot 05	1	65.09	12.75	26.21	51.36 %
DE-21912-Plot 40-Plot 40	1	61.7	6.66	21.38	68.85 %
DE-21912-Plot 27-Plot 27	1	62.48	6.76	20.78	67.47 %
DE-21912-Plot 25-Plot 25	1	65.09	9.65	22.66	57.41 %
DE-21912-Plot 67-Plot 67	1	62.48	13.70	25.47	46.21 %
DE-21912-Plot 80-Plot 80	1	61.7	15.75	27.54	42.81 %
DE-21912-Plot 65-Plot 65	1	65.09	17.89	28.43	37.07 %
DE-21912-Plot 77-Plot 77	1	61.7	20.17	30.69	34.27 %
DE-21912-Plot 37-Plot 37	1	61.7	11.61	24.84	53.25 %
Totals:	12	741.19	144.73	304.71	
Average DER = 12.12 $kgCO_2/m^2$		**% DER/TER**	PASS		
Average TER = 25.38 $kgCO_2/m^2$		52.25 %			

Block Compliance Report - DFEE

Block Reference: 4 PV planel per falt		Block Name: 335			
Property-Assessment Reference	**Multiplier**	**Floor Area (m^2)**	**DFEE ($kWh/m^2/yr$)**	**TFEE ($kWh/m^2/yr$)**	**% DFEE/TFEE**
DE-21912-Plot 20-Plot 20	1	61.7	32.22	39.28	17.99 %
DE-21912-Plot 17-Plot 17	1	61.7	36.71	43.81	16.22 %
DE-21912- Plot 07-Plot 07	1	50.76	34.10	38.48	11.38 %
DE-21912 - Plot 05-Plot 05	1	65.09	38.23	46.52	17.82 %
DE-21912-Plot 40-Plot 40	1	61.7	26.99	27.95	3.45 %
DE-21912-Plot 27-Plot 27	1	62.48	26.37	26.48	0.39 %
DE-21912-Plot 25-Plot 25	1	65.09	32.34	34.66	6.71 %
DE-21912-Plot 67-Plot 67	1	62.48	39.57	42.27	6.38 %
DE-21912-Plot 80-Plot 80	1	61.7	44.07	48.37	8.88 %
DE-21912-Plot 65-Plot 65	1	65.09	48.15	53.91	10.69 %
DE-21912-Plot 77-Plot 77	1	61.7	52.85	59.27	10.83 %
DE-21912-Plot 37-Plot 37	1	61.7	36.79	40.29	8.69 %
Totals:	12	741.19	448.37	501.28	
Average DFEE = 37.43 $kWh/m^2/yr$		**% DFEE/TFEE**	PASS		
Average TFEE = 41.85 $kWh/m^2/yr$		10.56 %			

PREDICTED ENERGY ASSESSMENT

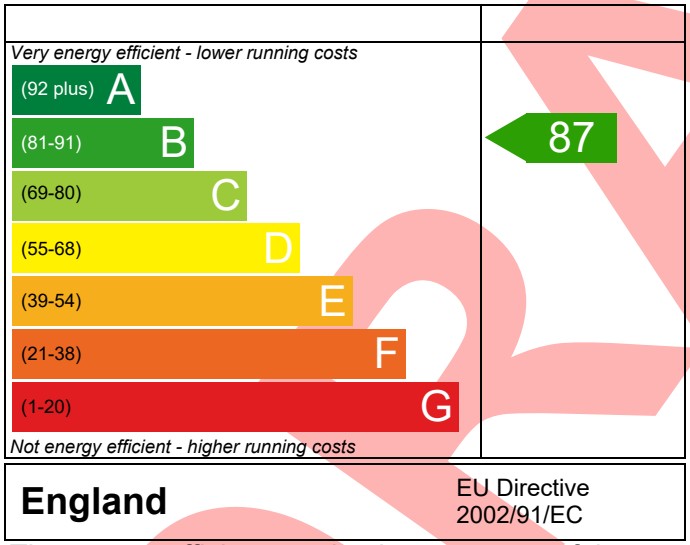
Land at Tesco Extra Car Park,
Plot 77,
1Bath,
2B3P,
RG1

Dwelling type:	Flat, Mid-Terrace
Date of assessment:	25/01/2023
Produced by:	Charles Sims
Total floor area:	61.7 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 (CO_2) emissions.

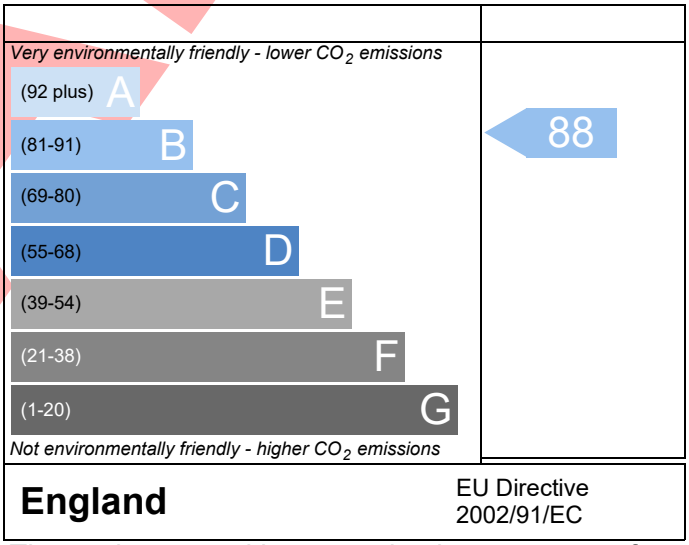
Energy Efficiency Rating



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 (CO_2) 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 (CO_2) emissions. The higher the rating the less impact it has on the environment.

DRAFT

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BUILDING REGULATION COMPLIANCE
Calculation Type: New Build (As Designed)

Darren Evans

Property Reference	DE-21912-Plot 77	**Issued on Date**	25/01/2023
Assessment Reference	Plot 77	**Prop Type Ref**	TF - Flat
Property	Land at Tesco Extra Car Park, Plot 77, 1Bath, 2B3P, RG1		

SAP Rating	87 B	**DER**	20.17	**TER**	30.69
Environmental	88 B	**% DER<TER**	34.27		
CO_2 Emissions (t/year)	0.71	**DFEE**	52.85	**TFEE**	59.27
General Requirements Compliance	Pass	**% DFEE<TFEE**	10.83		

Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Electricity		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	30.69	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	20.17	$kgCO_2/m^2$	Pass
	-10.52 (-34.3%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	59.27	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	52.85	$kWh/m^2/yr$	
	-6.5 (-11.0%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	Pass
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	Pass
Openings	1.20 (max. 2.00)	1.20 (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	4.00 (design value)	$m^3/(h.m^2)$ @ 50 Pa	
Maximum	10.0	$m^3/(h.m^2)$ @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system 1	Room heaters - Electric Panel, convector or radiant heaters	

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

DRAFT

Main heating system 2	Heat pump with warm air distribution - Electric Dimplex EDL200UK-630		
Secondary heating system	None		
5 Cylinder insulation			
Hot water storage	No cylinder		
6 Controls			
Space heating controls 1	Programmer and room thermostat		Pass
Hot water controls	No cylinder		
7 Low energy lights			
Percentage of fixed lights with low-energy fittings	100	%	
Minimum	75	%	Pass
8 Mechanical ventilation			
Continuous extract system (decentralised)			
Specific fan power	0.1600 0.1200		
Maximum	0.7		Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)	Slight		Pass
Based on:			
Overshading	Average		
Windows facing West	8.11 m², No overhang		
Air change rate	3.00 ach		
Blinds/curtains	Dark-coloured curtain or roller blind, closed 100% of daylight hours		

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value		
Solid Wall	0.00	W/m²K	Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals	4.00 (design value)	m³/(h.m²) @ 50 Pa	
Maximum	10.0	m³/(h.m²) @ 50 Pa	Pass

10 Key features

Party wall U-value	0.00	W/m²K
Floor U-value	0.11	W/m²K
Photovoltaic array	1.64	kW

DRAFT

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

	Typical cost	Typical savings per year	Energy efficiency	Environmental impact	Result
Low energy lights			0	0	Already installed
Solar water heating			0	0	Not applicable
Photovoltaic			0	0	Not applicable
Wind turbine			0	0	Not applicable
Totals	**£0**	**£0**	**B 87**	**B 88**	

DRAFT

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

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

Darren Evans

Property Reference	DE-21912-Plot 77	**Issued on Date**	25/01/2023
Assessment Reference	Plot 77	**Prop Type Ref**	TF - Flat
Property	Land at Tesco Extra Car Park, Plot 77, 1Bath, 2B3P, RG1		

SAP Rating	87 B	**DER**	20.17	**TER**	30.69
Environmental	88 B	**% DER<TER**	34.27		
CO_2 Emissions (t/year)	0.71	**DFEE**	52.85	**TFEE**	59.27
General Requirements Compliance	Pass	**% DFEE<TFEE**	10.83		

Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

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

Orientation	East
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	Flat, Mid-Terrace
2.0 Number of Storeys	1
3.0 Date Built	2023
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	17.02 m	61.70 m²	2.40 m

7.0 Living Area	27.08	m²
8.0 Thermal Mass Parameter	Simple calculation - Medium	
Thermal Mass	250.00	kJ/m²K

9.0 External Walls

Description	Type	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Wall 1	Cavity Wall	0.18	40.85	32.74

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall 1	Solid Wall		0.00	47.21

10.0 External Roofs

Description	Type	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Roof 1	External Flat Roof	0.13	61.70	61.70

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Heat Loss Floor 1	Ground Floor - Solid		0.11	61.70

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Windows	Manufacturer	Window	Double glazed			0.63		0.70	1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
Windows	Window	[1] External Wall 1	West	Dark-coloured curtain or roller blind	0.00					8.11	100

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	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	5.00	0.021	No	CBA-313
Independently assessed	E3 Sill	3.00	0.021	No	CBA-314
Independently assessed	E4 Jamb	12.01	0.017	No	CBA-315
Table K1 - Approved	E7 Party floor between dwellings (in blocks of flats)	13.77	0.070	No	
Table K1 - Default	E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.25	1.000	No	
Table K1 - Default	E15 Flat roof with parapet	17.02	0.560	No	
Independently assessed	E16 Corner (normal)	7.20	0.046	No	CBA-316
Independently assessed	E17 Corner (inverted – internal area greater than external area)	4.80	-0.040	No	
Table K1 - Approved	E18 Party wall between dwellings	2.40	0.060	No	
Table K1 - Default	E25 Staggered party wall between dwellings	2.40	0.120	No	
Table K1 - Default	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	19.67	0.000	No	
Table K1 - Default	P4 Party wall - Roof (insulation at ceiling level)	19.67	0.240	No	

Y-value	0.118	W/m²K
18.0 Pressure Testing	Yes	
Designed AP_{50}	4.00	m³/(h.m²) @ 50 Pa
Property Tested ?		
As Built AP_{50}		m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Windows half open
Cross ventilation possible	Yes
Night Ventilation	Yes
Air change rate	3.00

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - decentralised
MV Reference Number	500661
Duct Type	Flexible

19.1 Mechanical extract ventilation - Decentralised

SFP	Fan/Room Type	Count
0.16	In Room Fan Other Wet Room	1
0.12	Through Wall Fan Kitchen	1

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				0
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	10	
Total number of L.E.L. fittings	10	
Percentage of L.E.L. fittings	100.00	%
External		
External lights fitted	No	
23.0 Electricity Tariff	Standard	
24.0 Main Heating 1	SAP table	
Percentage of Heat	100	%
Main Heating	REA	
SAP Code	691	
Efficiency (SAP Table)	100.0	%
Controls	CRD Programmer and room thermostat	
Sap Code	2605	
25.0 Main Heating 2	Database	
Percentage of Heat	0	%
Database Ref. No.	190006	
Fuel Type	Electricity	
Main Heating	PEH	
SAP Code	524	
In Summer	367.8	
Controls	CWD Time and temperature zone control	
Sap Code	0	
Community Heating	None	
28.0 Water Heating	HWP From main heating 1	
Water Heating	Main Heating 2	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery	No	

Instantaneous System 2		
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
SAP Code	914	
Immersion Only Heating Hot Water	No	

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	201.00	L
Loss	1.610	kWh/day

32.0 Photovoltaic Unit One Dwelling

PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
1.64	Horizontal	Horizontal	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

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

Darren Evans

Property Reference	DE-21912-Plot 77	**Issued on Date**	25/01/2023
Assessment Reference	Plot 77	**Prop Type Ref**	TF - Flat
Property	Land at Tesco Extra Car Park, Plot 77, 1Bath, 2B3P, RG1		

SAP Rating	87 B	**DER**	20.17	**TER**	30.69
Environmental	88 B	**% DER<TER**	34.27		
CO_2 Emissions (t/year)	0.71	**DFEE**	52.85	**TFEE**	59.27
General Requirements Compliance	Pass	**% DFEE<TFEE**	10.83		

Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

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

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

DWELLING AS DESIGNED

Top-floor flat, total floor area 62 m²

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

1a TER and DER
Fuel for main heating:Electricity
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 30.69 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 20.17 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)59.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)52.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	OK
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	OK
Openings	1.20 (max. 2.00)	1.20 (max. 3.30)	OK

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

3 Air permeability
Air permeability at 50 pascals: 4.00 (design value)
Maximum 10.0 OK

4 Heating efficiency
Main heating system 1: Room heaters - Electric
Panel, convector or radiant heaters

Main heating system 2: Heat pump with warm air distribution - Electric
Dimplex EDL200UK-630

Secondary heating system: None

5 Cylinder insulation
Hot water storage No cylinder

6 Controls
Space heating controls 1: Programmer and room thermostat OK

Hot water controls: No cylinder

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

8 Mechanical ventilation
Continuous extract system (decentralised)
Specific fan power: 0.1600 0.1200
Maximum 0.7 OK

9 Summertime temperature
Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing West: 8.11 m², No overhang
Air change rate: 3.00 ach
Blinds/curtains: Dark-coloured curtain or roller blind, closed 100% of daylight hours

10 Key features
Party wall U-value 0.00 W/m²K
Floor U-value 0.11 W/m²K
Photovoltaic array 1.64 kW

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	61.7000 (1b)	x	2.4000 (2b)	=	148.0800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	148.0800	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		4.0000	
Infiltration rate		0.2000	(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) =	0.1700	(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	0.2168	0.2125	0.2083	0.1870	0.1828	0.1615	0.1615	0.1573	0.1700	0.1828	0.1913	0.1998	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation:												0.5000	(23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(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	
Windows (Uw = 1.20)			8.1100	1.1450	9.2863			(27)
Heat Loss Floor 1			61.7000	0.1100	6.7870			(28a)
External Wall 1	40.8500	8.1100	32.7400	0.1800	5.8932			(29a)
External Roof 1	61.7000		61.7000	0.1300	8.0210			(30)
Total net area of external elements Aum(A, m2)			164.2500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.9875			(33)
Party Wall 1			47.2100	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							19.4093	(36)
Total fabric heat loss					(33) + (36) =		49.3967	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	24.4332	24.4332	24.4332	24.4332	24.4332	24.4332	24.4332	24.4332	24.4332	24.4332	24.4332	24.4332	(38)
Heat transfer coeff	73.8299	73.8299	73.8299	73.8299	73.8299	73.8299	73.8299	73.8299	73.8299	73.8299	73.8299	73.8299	(39)
Average = Sum(39)m / 12 =												73.8299	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1966	1.1966	1.1966	1.1966	1.1966	1.1966	1.1966	1.1966	1.1966	1.1966	1.1966	1.1966	(40)
HLP (average)												1.1966	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0293	(42)
Average daily hot water use (litres/day)												82.3952	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	90.6347	87.3389	84.0431	80.7472	77.4514	74.1556	74.1556	77.4514	80.7472	84.0431	87.3389	90.6347	(44)
Energy conte	134.4086	117.5546	121.3058	105.7574	101.4767	87.5667	81.1434	93.1132	94.2253	109.8105	119.8668	130.1675	(45)
Energy content (annual)										Total = Sum(45)m =		1296.3965	(45)
Distribution loss (46)m = 0.15 x (45)m	20.1613	17.6332	18.1959	15.8636	15.2215	13.1350	12.1715	13.9670	14.1338	16.4716	17.9800	19.5251	(46)
Water storage loss:													
Store volume												201.0000	(47)

a) If manufacturer declared loss factor is known (kWh/day): 1.6100 (48)
Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)
Total storage loss
26.9514 24.3432 26.9514 26.0820 26.9514 26.0820 26.9514 26.9514 26.0820 26.9514 26.0820 26.9514 (56)
If cylinder contains dedicated solar storage
26.9514 24.3432 26.9514 26.0820 26.9514 26.0820 26.9514 26.9514 26.0820 26.9514 26.0820 26.9514 (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)
Total heat required for water heating calculated for each month
161.3600 141.8978 148.2572 131.8394 128.4281 113.6487 108.0948 120.0646 120.3073 136.7619 145.9488 157.1189 (62)
Solar input 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)
Output from w/h
161.3600 141.8978 148.2572 131.8394 128.4281 113.6487 108.0948 120.0646 120.3073 136.7619 145.9488 157.1189 (64)
Total per year (kWh/year) = Sum(64)m = 1613.7275 (64)
Heat gains from water heating, kWh/month
44.6909 39.0869 40.3342 35.1643 33.7410 29.1159 26.9802 30.9602 31.3299 36.5120 39.8557 43.2807 (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	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.1855	15.2640	12.4135	9.3978	7.0250	5.9308	6.4084	8.3299	11.1804	14.1961	16.5689	17.6631	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	177.2131	179.0520	174.4180	164.5527	152.0996	140.3954	132.5763	130.7374	135.3714	145.2367	157.6898	169.3940	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	(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)													
	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	(71)
Water heating gains (Table 5)													
	60.0684	58.1650	54.2126	48.8393	45.3508	40.4388	36.2637	41.6131	43.5138	49.0753	55.3551	58.1730	(72)
Total internal gains													
	307.9060	305.9201	294.4832	276.2289	257.9145	240.2041	228.6875	234.1195	243.5046	261.9471	283.0529	298.6691	(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	
West	8.1100	19.6403	0.6300	0.7000	0.7700	48.6788	(80)
Solar gains	48.6788	95.2261	156.8238	228.7182	280.3027	286.9397	273.1783	234.6561	182.3926	112.9938	60.6968	40.0311	(83)
Total gains	356.5848	401.1462	451.3070	504.9471	538.2172	527.1437	501.8658	468.7756	425.8972	374.9408	343.7497	338.7002	(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	58.0350	58.0350	58.0350	58.0350	58.0350	58.0350	58.0350	58.0350	58.0350	58.0350	58.0350	58.0350	
alpha	4.8690	4.8690	4.8690	4.8690	4.8690	4.8690	4.8690	4.8690	4.8690	4.8690	4.8690	4.8690	
util living area													
	0.9983	0.9967	0.9913	0.9720	0.9132	0.7813	0.6175	0.6755	0.8946	0.9842	0.9968	0.9987	(86)
MIT	19.6763	19.8094	20.0595	20.3924	20.7055	20.9084	20.9774	20.9654	20.8062	20.3980	19.9682	19.6385	(87)
Th 2	19.9227	19.9227	19.9227	19.9227	19.9227	19.9227	19.9227	19.9227	19.9227	19.9227	19.9227	19.9227	(88)
util rest of house													
	0.9977	0.9955	0.9881	0.9604	0.8754	0.6902	0.4810	0.5403	0.8335	0.9757	0.9954	0.9982	(89)
MIT 2	18.1594	18.3536	18.7177	19.1958	19.6223	19.8583	19.9141	19.9077	19.7571	19.2098	18.5863	18.1040	(90)
Living area fraction										fLA = Living area / (4) =		0.4389	(91)
MIT	18.8252	18.9925	19.3066	19.7210	20.0977	20.3192	20.3808	20.3719	20.2175	19.7313	19.1928	18.7775	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8252	18.9925	19.3066	19.7210	20.0977	20.3192	20.3808	20.3719	20.2175	19.7313	19.1928	18.7775	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9969	0.9940	0.9855	0.9577	0.8826	0.7267	0.5415	0.6001	0.8530	0.9737	0.9941	0.9975	(94)
Useful gains	355.4654	398.7582	444.7831	483.6009	475.0065	383.0714	271.7801	281.3001	363.2984	365.0631	341.7153	337.8657	(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													
	1072.3938	1040.4513	945.5123	798.9133	620.0009	422.2497	279.1360	293.2466	451.6571	674.1659	892.8131	1076.2546	(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													
	533.3947	431.2178	372.5426	227.0249	107.8759	0.0000	0.0000	0.0000	0.0000	229.9725	396.7904	549.3614	(98)
Space heating												2848.1800	(98)
Space heating per m2											(98) / (4) =	46.1618	(99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	2848.1800	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	533.3947	431.2178	372.5426	227.0249	107.8759	0.0000	0.0000	0.0000	0.0000	229.9725	396.7904	549.3614	(98)
Space heating efficiency (main heating system 1)													
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)													
	533.3947	431.2178	372.5426	227.0249	107.8759	0.0000	0.0000	0.0000	0.0000	229.9725	396.7904	549.3614	(211)
Space heating efficiency (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
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)
Space heating fuel used, main system 2												0.0000	(213)

Water heating													
Water heating requirement													
	161.3600	141.8978	148.2572	131.8394	128.4281	113.6487	108.0948	120.0646	120.3073	136.7619	145.9488	157.1189	(64)
Efficiency of water heater												349.4100	(216)
(217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	(217)
Fuel for water heating, kWh/month													
	46.1807	40.6107	42.4307	37.7320	36.7557	32.5259	30.9364	34.3621	34.4316	39.1408	41.7701	44.9669	(219)
Water heating fuel used												461.8436	(219)
Annual totals kWh/year													
Space heating fuel - main system												2848.1800	(211)
Space heating fuel - secondary												0.0000	(215)

Electricity for pumps and fans:		
(MEVDecentralised, Database: total watage = 3.6500, total flow = 21.0000, SFP = 0.1738)		
mechanical ventilation fans (SFP = 0.1738)	31.4000	(230a)
Total electricity for the above, kWh/year	31.4000	(231)
Electricity for lighting (calculated in Appendix L)	303.5008	(232)

Energy saving/generation technologies (Appendices M ,N and Q)			
PV Unit 0 (0.80 * 1.64 * 951 * 1.00) =	-1247.2082	-1247.2082	(233)
Total delivered energy for all uses		2397.7162	(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	2848.1800	0.5190	1478.2054	(261)
Space heating - main system 2	0.0000	0.5190	0.0000	(262)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	461.8436	0.5190	239.6968	(264)
Space and water heating			1717.9022	(265)
Pumps and fans	31.4000	0.5190	16.2966	(267)
Energy for lighting	303.5008	0.5190	157.5169	(268)
Energy saving/generation technologies				
PV Unit	-1247.2082	0.5190	-647.3011	(269)
Total CO2, kg/year			1244.4147	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			20.1700	(273)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES			
DER		20.1700	ZC1
Total Floor Area	TFA	61.7000	
Assumed number of occupants	N	2.0293	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.0199	ZC2
CO2 emissions from cooking, equation (L16)		2.7180	ZC3
Total CO2 emissions		39.9079	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		39.9079	ZC8

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	61.7000 (1b)	x	2.4000 (2b)	=	148.0800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	148.0800	(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) =	0.1351	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3851	(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) =	0.3273	(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	0.4173	0.4091	0.4009	0.3600	0.3519	0.3109	0.3109	0.3028	0.3273	0.3519	0.3682	0.3846	(22b)
Effective ac	0.5871	0.5837	0.5804	0.5648	0.5619	0.5483	0.5483	0.5458	0.5536	0.5619	0.5678	0.5740	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opening Type (Uw = 1.40)			8.1100	1.3258	10.7519			(27)
Heat Loss Floor 1			61.7000	0.1300	8.0210			(28a)
External Wall 1	40.8500	8.1100	32.7400	0.1800	5.8932			(29a)
External Roof 1	61.7000		61.7000	0.1300	8.0210			(30)
Total net area of external elements Aum(A, m2)			164.2500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.6871			(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)		14.4250 (36)
Total fabric heat loss	(33) + (36) =	47.1121 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.6882	28.5230	28.3610	27.6003	27.4580	26.7955	26.7955	26.6728	27.0507	27.4580	27.7459	28.0469	(38)
Heat transfer coeff	75.8003	75.6351	75.4731	74.7124	74.5701	73.9076	73.9076	73.7849	74.1628	74.5701	74.8580	75.1590	(39)
Average = Sum(39)m / 12 =												74.7117	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2285	1.2259	1.2232	1.2109	1.2086	1.1979	1.1979	1.1959	1.2020	1.2086	1.2133	1.2181	(40)
HLP (average)												1.2109	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.0293 (42)
Average daily hot water use (litres/day)		82.3952 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	90.6347	87.3389	84.0431	80.7472	77.4514	74.1556	74.1556	77.4514	80.7472	84.0431	87.3389	90.6347	(44)
Energy conte	134.4086	117.5546	121.3058	105.7574	101.4767	87.5667	81.1434	93.1132	94.2253	109.8105	119.8668	130.1675	(45)
Energy content (annual)										Total = Sum(45)m =		1296.3965	(45)
Distribution loss (46)m = 0.15 x (45)m	20.1613	17.6332	18.1959	15.8636	15.2215	13.1350	12.1715	13.9670	14.1338	16.4716	17.9800	19.5251	(46)

Water storage loss:		
Store volume		150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):		1.3938 (48)
Temperature factor from Table 2b		0.5400 (49)
Enter (49) or (54) in (55)		0.7527 (55)
Total storage loss		

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage													
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	181.0035	159.6403	167.9007	150.8492	148.0716	132.6585	127.7383	139.7081	139.3171	156.4054	164.9586	176.7624	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)
Output from w/h													
	181.0035	159.6403	167.9007	150.8492	148.0716	132.6585	127.7383	139.7081	139.3171	156.4054	164.9586	176.7624	(64)
								Total per year (kWh/year) = Sum(64)m =				1845.0139	(64)
Heat gains from water heating, kWh/month													
	81.9668	72.7555	77.6101	71.2378	71.0169	65.1894	64.2561	68.2361	67.4034	73.7879	75.9292	80.5566	(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	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.1855	15.2640	12.4135	9.3978	7.0250	5.9308	6.4084	8.3299	11.1804	14.1961	16.5689	17.6631	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	177.2131	179.0520	174.4180	164.5527	152.0996	140.3954	132.5763	130.7374	135.3714	145.2367	157.6898	169.3940	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	(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)													
	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	(71)
Water heating gains (Table 5)													
	110.1704	108.2671	104.3147	98.9414	95.4529	90.5408	86.3657	91.7152	93.6158	99.1773	105.4572	108.2750	(72)
Total internal gains													
	361.0080	359.0221	347.5852	329.3310	311.0165	293.3061	281.7895	287.2215	296.6067	315.0491	336.1550	351.7712	(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	
West	8.1100	19.6403	0.6300	0.7000	0.7700	48.6788	(80)

Solar gains	48.6788	95.2261	156.8238	228.7182	280.3027	286.9397	273.1783	234.6561	182.3926	112.9938	60.6968	40.0311	(83)
Total gains	409.6868	454.2482	504.4090	558.0492	591.3192	580.2458	554.9678	521.8776	478.9992	428.0429	396.8517	391.8023	(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	56.5265	56.6499	56.7715	57.3495	57.4590	57.9741	57.9741	58.0705	57.7746	57.4590	57.2380	57.0088	
alpha	4.7684	4.7767	4.7848	4.8233	4.8306	4.8649	4.8649	4.8714	4.8516	4.8306	4.8159	4.8006	
util living area	0.9969	0.9943	0.9866	0.9602	0.8873	0.7354	0.5671	0.6200	0.8553	0.9738	0.9940	0.9975	(86)
MIT	19.7132	19.8499	20.1037	20.4458	20.7457	20.9301	20.9842	20.9761	20.8461	20.4598	20.0278	19.6892	(87)
Th 2	19.8972	19.8994	19.9015	19.9113	19.9131	19.9217	19.9217	19.9233	19.9184	19.9131	19.9094	19.9055	(88)
util rest of house	0.9958	0.9924	0.9817	0.9448	0.8427	0.6412	0.4377	0.4896	0.7831	0.9606	0.9916	0.9966	(89)
MIT 2	18.1954	18.3959	18.7657	19.2598	19.6613	19.8747	19.9159	19.9135	19.7939	19.2882	18.6633	18.1660	(90)
Living area fraction										fLA = Living area / (4) =		0.4389	(91)
MIT	18.8616	19.0341	19.3529	19.7803	20.1373	20.3379	20.3848	20.3798	20.2557	19.8024	19.2622	18.8346	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.8616	19.0341	19.3529	19.7803	20.1373	20.3379	20.3848	20.3798	20.2557	19.8024	19.2622	18.8346	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9944	0.9903	0.9785	0.9425	0.8531	0.6800	0.4950	0.5472	0.8086	0.9589	0.9896	0.9955	(94)
Useful gains	407.3962	449.8360	493.5670	525.9502	504.4765	394.5502	274.6846	285.5760	387.3145	410.4471	392.7139	390.0206	(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	1103.7700	1069.0306	970.0491	812.8959	629.1682	424.0739	279.7263	293.6516	456.5248	686.2248	910.4378	1099.9186	(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	518.1021	416.0988	354.5027	206.6009	92.7706	0.0000	0.0000	0.0000	0.0000	205.1786	372.7612	528.1641	(98)
Space heating												2694.1789	(98)
Space heating per m2											(98) / (4) =	43.6658	(99)

8c. Space cooling requirement

Not applicable

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												93.5000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												2881.4748	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	518.1021	416.0988	354.5027	206.6009	92.7706	0.0000	0.0000	0.0000	0.0000	205.1786	372.7612	528.1641	(98)
Space heating efficiency (main heating system 1)													
	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)													
	554.1199	445.0254	379.1472	220.9635	99.2199	0.0000	0.0000	0.0000	0.0000	219.4423	398.6751	564.8814	(211)
Water heating requirement													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	181.0035	159.6403	167.9007	150.8492	148.0716	132.6585	127.7383	139.7081	139.3171	156.4054	164.9586	176.7624	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.4636	87.2559	86.7610	85.6532	83.6077	79.8000	79.8000	79.8000	79.8000	85.5388	86.9245	87.5562	(217)
Fuel for water heating, kWh/month													
	206.9471	182.9565	193.5209	176.1162	177.1029	166.2388	160.0731	175.0729	174.5829	182.8473	189.7724	201.8846	(219)
Water heating fuel used												2187.1155	(219)
Annual totals kWh/year													
Space heating fuel - main system												2881.4748	(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)												303.5008	(232)
Total delivered energy for all uses												5447.0910	(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	2881.4748	0.2160	622.3985	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2187.1155	0.2160	472.4169	(264)
Space and water heating			1094.8155	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	303.5008	0.5190	157.5169	(268)
Total CO2, kg/m2/year			1291.2574	(272)
Emissions per m2 for space and water heating			17.7442	(272a)
Fuel factor (electricity)			1.5500	
Emissions per m2 for lighting			2.5529	(272b)
Emissions per m2 for pumps and fans			0.6309	(272c)
Target Carbon Dioxide Emission Rate (TER) = (17.7442 * 1.55) + 2.5529 + 0.6309, rounded to 2 d.p.			30.6900	(273)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	61.7000 (1b)	x	2.4000 (2b)	=	148.0800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	148.0800	(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) =	0.1351	(8)
Pressure test		Yes	
Measured/design AP50		4.0000	
Infiltration rate		0.3351	(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) =	0.2848	(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	0.3631	0.3560	0.3489	0.3133	0.3062	0.2706	0.2706	0.2634	0.2848	0.3062	0.3204	0.3346	(22b)
Effective ac	0.5659	0.5634	0.5609	0.5491	0.5469	0.5366	0.5366	0.5347	0.5406	0.5469	0.5513	0.5560	(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	
Windows (Uw = 1.20)			8.1100	1.1450	9.2863			(27)
Heat Loss Floor 1			61.7000	0.1100	6.7870			(28a)
External Wall 1	40.8500	8.1100	32.7400	0.1800	5.8932			(29a)
External Roof 1	61.7000		61.7000	0.1300	8.0210			(30)
Total net area of external elements Aum(A, m2)			164.2500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.9875			(33)
Party Wall 1			47.2100	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	19.4093	(36)
Total fabric heat loss (33) + (36) =	49.3967	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	27.6549	27.5298	27.4072	26.8312	26.7235	26.2218	26.2218	26.1289	26.4150	26.7235	26.9415	27.1694	(38)
Heat transfer coeff	77.0517	76.9266	76.8039	76.2280	76.1202	75.6185	75.6185	75.5256	75.8118	76.1202	76.3382	76.5661	(39)
Average = Sum(39)m / 12 =												76.2274	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2488	1.2468	1.2448	1.2355	1.2337	1.2256	1.2256	1.2241	1.2287	1.2337	1.2372	1.2409	(40)
HLP (average)												1.2355	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.0293 (42)
Average daily hot water use (litres/day)	82.3952 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	90.6347	87.3389	84.0431	80.7472	77.4514	74.1556	74.1556	77.4514	80.7472	84.0431	87.3389	90.6347	(44)
Energy conte	134.4086	117.5546	121.3058	105.7574	101.4767	87.5667	81.1434	93.1132	94.2253	109.8105	119.8668	130.1675	(45)
Energy content (annual)										Total = Sum(45)m =		1296.3965	(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)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Heat gains from water heating, kWh/month													
	28.5618	24.9804	25.7775	22.4734	21.5638	18.6079	17.2430	19.7866	20.0229	23.3347	25.4717	27.6606	(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	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.1855	15.2640	12.4135	9.3978	7.0250	5.9308	6.4084	8.3299	11.1804	14.1961	16.5689	17.6631	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	177.2131	179.0520	174.4180	164.5527	152.0996	140.3954	132.5763	130.7374	135.3714	145.2367	157.6898	169.3940	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	(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)													
	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	(71)
Water heating gains (Table 5)													
	38.3896	37.1731	34.6472	31.2131	28.9836	25.8443	23.1760	26.5948	27.8096	31.3639	35.3773	37.1782	(72)
Total internal gains													
	286.2272	284.9282	274.9177	258.6027	241.5472	225.6096	215.5998	219.1012	227.8004	244.2357	263.0751	277.6744	(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	
West	8.1100	19.6403	0.6300	0.7000	0.7700	48.6788	(80)

Solar gains	48.6788	95.2261	156.8238	228.7182	280.3027	286.9397	273.1783	234.6561	182.3926	112.9938	60.6968	40.0311	(83)
Total gains	334.9060	380.1543	431.7415	487.3209	521.8499	512.5493	488.7781	453.7573	410.1930	357.2295	323.7719	317.7055	(84)

---

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	55.6084	55.6989	55.7878	56.2093	56.2889	56.6623	56.6623	56.7320	56.5179	56.2889	56.1282	55.9611	
alpha	4.7072	4.7133	4.7192	4.7473	4.7526	4.7775	4.7775	4.7821	4.7679	4.7526	4.7419	4.7307	
util living area													
	0.9987	0.9973	0.9930	0.9766	0.9254	0.8024	0.6419	0.7020	0.9102	0.9874	0.9975	0.9990	(86)
MIT	19.5761	19.7146	19.9751	20.3309	20.6627	20.8908	20.9715	20.9566	20.7753	20.3419	19.8940	19.5492	(87)
Th 2	19.8811	19.8828	19.8843	19.8917	19.8931	19.8996	19.8996	19.9008	19.8971	19.8931	19.8903	19.8874	(88)
util rest of house													
	0.9982	0.9964	0.9903	0.9666	0.8909	0.7125	0.5002	0.5635	0.8539	0.9804	0.9964	0.9986	(89)
MIT 2	18.5859	18.7253	18.9859	19.3419	19.6551	19.8462	19.8920	19.8877	19.7632	19.3576	18.9107	18.5640	(90)
Living area fraction										fLA = Living area / (4) =		0.4389	(91)
MIT	19.0205	19.1595	19.4201	19.7760	20.0973	20.3047	20.3658	20.3568	20.2074	19.7896	19.3423	18.9964	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0205	19.1595	19.4201	19.7760	20.0973	20.3047	20.3658	20.3568	20.2074	19.7896	19.3423	18.9964	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9977	0.9956	0.9888	0.9653	0.8983	0.7489	0.5634	0.6251	0.8726	0.9795	0.9957	0.9982	(94)
Useful gains	334.1482	378.4676	426.8963	470.4014	468.7956	383.8472	275.3536	283.6384	357.9488	349.9065	322.3803	317.1467	(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													
	1134.2396	1096.9356	992.3115	829.0522	639.2053	431.3797	284.7662	298.8436	463.0120	699.5158	934.5557	1132.9011	(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													
	595.2680	482.8105	420.6689	258.2286	126.7848	0.0000	0.0000	0.0000	0.0000	260.1093	440.7663	606.9213	(98)
Space heating												3191.5577	(98)
Space heating per m2											(98) / (4) =	51.7270	(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	710.8143	559.5772	573.9949	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8051	0.8806	0.8491	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	572.2921	492.7716	487.3720	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	675.3911	646.1618	606.6137	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	74.2312	114.1223	88.7159	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												277.0694	(104)
Cooled fraction										fC = cooled area / (4) =		1.0000	(105)
Intermittency factor (Table 10b)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

```
Space cooling kWh
                0.0000     0.0000     0.0000     0.0000     0.0000    18.5578    28.5306    22.1790     0.0000     0.0000     0.0000     0.0000 (107)
Space cooling                                                                                                                              69.2673 (107)
Space cooling per m2                                                                                                                        1.1226 (108)
Energy for space heating                                                                                                                   51.7270 (99)
Energy for space cooling                                                                                                                    1.1226 (108)
Total                                                                                                                                      52.8497 (109)
Dwelling Fabric Energy Efficiency (DFEE)                                                                                                      52.8 (109)


------------------------------------------------------------------------------------------------------------
```

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	61.7000 (1b)	x	2.4000 (2b)	=	148.0800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	148.0800	(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) =	0.1351	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3851	(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) =	0.3273	(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	0.4173	0.4091	0.4009	0.3600	0.3519	0.3109	0.3109	0.3028	0.3273	0.3519	0.3682	0.3846	(22b)
Effective ac	0.5871	0.5837	0.5804	0.5648	0.5619	0.5483	0.5483	0.5458	0.5536	0.5619	0.5678	0.5740	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opening Type (Uw = 1.40)			8.1100	1.3258	10.7519			(27)
Heat Loss Floor 1			61.7000	0.1300	8.0210			(28a)
External Wall 1	40.8500	8.1100	32.7400	0.1800	5.8932			(29a)
External Roof 1	61.7000		61.7000	0.1300	8.0210			(30)
Total net area of external elements Aum(A, m2)			164.2500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		32.6871			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.4250	(36)
Total fabric heat loss					(33) + (36) =		47.1121	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.6882	28.5230	28.3610	27.6003	27.4580	26.7955	26.7955	26.6728	27.0507	27.4580	27.7459	28.0469	(38)
Heat transfer coeff	75.8003	75.6351	75.4731	74.7124	74.5701	73.9076	73.9076	73.7849	74.1628	74.5701	74.8580	75.1590	(39)
Average = Sum(39)m / 12 =												74.7117	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2285	1.2259	1.2232	1.2109	1.2086	1.1979	1.1979	1.1959	1.2020	1.2086	1.2133	1.2181	(40)
HLP (average)												1.2109	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.0293 (42)
Average daily hot water use (litres/day)		82.3952 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	90.6347	87.3389	84.0431	80.7472	77.4514	74.1556	74.1556	77.4514	80.7472	84.0431	87.3389	90.6347	(44)
Energy conte	134.4086	117.5546	121.3058	105.7574	101.4767	87.5667	81.1434	93.1132	94.2253	109.8105	119.8668	130.1675	(45)
Energy content (annual)										Total = Sum(45)m =		1296.3965	(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)
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)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Heat gains from water heating, kWh/month

	28.5618	24.9804	25.7775	22.4734	21.5638	18.6079	17.2430	19.7866	20.0229	23.3347	25.4717	27.6606 (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	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.1855	15.2640	12.4135	9.3978	7.0250	5.9308	6.4084	8.3299	11.1804	14.1961	16.5689	17.6631	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	177.2131	179.0520	174.4180	164.5527	152.0996	140.3954	132.5763	130.7374	135.3714	145.2367	157.6898	169.3940	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	(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)													
	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	(71)
Water heating gains (Table 5)													
	38.3896	37.1731	34.6472	31.2131	28.9836	25.8443	23.1760	26.5948	27.8096	31.3639	35.3773	37.1782	(72)
Total internal gains													
	286.2272	284.9282	274.9177	258.6027	241.5472	225.6096	215.5998	219.1012	227.8004	244.2357	263.0751	277.6744	(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	
West	8.1100	19.6403	0.6300	0.7000	0.7700	48.6788	(80)

Solar gains	48.6788	95.2261	156.8238	228.7182	280.3027	286.9397	273.1783	234.6561	182.3926	112.9938	60.6968	40.0311	(83)
Total gains	334.9060	380.1543	431.7415	487.3209	521.8499	512.5493	488.7781	453.7573	410.1930	357.2295	323.7719	317.7055	(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	56.5265	56.6499	56.7715	57.3495	57.4590	57.9741	57.9741	58.0705	57.7746	57.4590	57.2380	57.0088	
alpha	4.7684	4.7767	4.7848	4.8233	4.8306	4.8649	4.8649	4.8714	4.8516	4.8306	4.8159	4.8006	
util living area													
	0.9987	0.9974	0.9929	0.9759	0.9226	0.7946	0.6316	0.6920	0.9065	0.9871	0.9975	0.9990	(86)
MIT	19.6023	19.7410	20.0001	20.3550	20.6806	20.9008	20.9751	20.9616	20.7891	20.3631	19.9202	19.5788	(87)
Th 2	19.8972	19.8994	19.9015	19.9113	19.9131	19.9217	19.9217	19.9233	19.9184	19.9131	19.9094	19.9055	(88)
util rest of house													
	0.9982	0.9964	0.9902	0.9658	0.8875	0.7049	0.4933	0.5561	0.8494	0.9800	0.9964	0.9987	(89)
MIT 2	18.6247	18.7648	19.0243	19.3813	19.6883	19.8734	19.9151	19.9118	19.7931	19.3945	18.9520	18.6078	(90)
Living area fraction									fLA = Living area / (4) =			0.4389	(91)
MIT	19.0538	19.1932	19.4526	19.8087	20.1238	20.3243	20.3803	20.3725	20.2302	19.8196	19.3769	19.0340	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0538	19.1932	19.4526	19.8087	20.1238	20.3243	20.3803	20.3725	20.2302	19.8196	19.3769	19.0340	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9978	0.9956	0.9887	0.9646	0.8954	0.7415	0.5549	0.6165	0.8688	0.9792	0.9957	0.9983	(94)
Useful gains	334.1582	378.4766	426.8689	470.0573	467.2732	380.0717	271.2107	279.7393	356.3673	349.8040	322.3896	317.1568	(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													
	1118.3409	1081.0692	977.5707	815.0135	628.1644	423.0710	279.3963	293.1140	454.6362	687.5050	919.0258	1114.9069	(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													
	583.4319	472.1423	409.7221	248.3685	119.7031	0.0000	0.0000	0.0000	0.0000	251.2496	429.5781	593.5261	(98)
Space heating												3107.7216	(98)
Space heating per m2										(98) / (4) =		50.3683	(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	694.7310	546.9159	560.7649	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8176	0.8906	0.8606	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	567.9959	487.0986	482.5708	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	675.3911	646.1618	606.6137	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	77.3245	118.3430	92.2879	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												287.9555	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling kWh													

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

	0.0000	0.0000	0.0000	0.0000	0.0000	19.3311	29.5857	23.0720	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												71.9889 (107)
Space cooling per m2												1.1668 (108)
Energy for space heating												50.3683 (99)
Energy for space cooling												1.1668 (108)
Total												51.5350 (109)
Target Fabric Energy Efficiency (TFEE)												59.3 (109)

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

Overheating Calculation Input Data

Dwelling type	MidTerrace Flat
Number of storeys	1
Cross ventilation possible	Yes
SAP Region	Thames Valley
Front of dwelling faces	East
Overshading	Average or unknown
Thermal mass parameter	250.0
Night ventilation	Yes
Ventilation rate during hot weather (ach)	3.00 (Windows half open)

Overheating Calculation

Summer ventilation heat loss coefficient	146.60 (P1)
Transmission heat loss coefficient	49.40 (37)
Summer heat loss coefficient	196.00 (P2)

Overhangs

Orientation	Ratio	Z_overhangs	Overhang type
West	0.000	1.000	None

Solar shading

Orientation	Z blinds	Solar access	Z overhangs	Z summer
West	0.850	0.90	1.000	0.765 (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
West	8.1100	117.5071	0.6300	0.7000	0.7650	289.3526
total:						289.3526

	Jun	Jul	Aug	
Solar gains	307	289	255	(P3)
Internal gains	355	340	347	
Total summer gains	662	629	602	(P5)
Summer gain/loss ratio	3.38	3.21	3.07	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 250.0)	0.25	0.25	0.25	
Threshold temperature	19.63	21.36	21.12	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	

Assessment of likelihood of high internal temperature: Slight

BASIC COMPLIANCE REPORT
Calculation Type: New Build (As Designed)

Darren Evans

Property Reference	DE-21912-Plot 77	**Issued on Date**	25/01/2023
Assessment Reference	Plot 77	**Prop Type Ref**	TF - Flat
Property	Land at Tesco Extra Car Park, Plot 77, 1Bath, 2B3P, RG1		

SAP Rating	87 B	**DER**	20.17	**TER**	30.69
Environmental	88 B	**% DER<TER**	34.27		
CO_2 Emissions (t/year)	0.71	**DFEE**	52.85	**TFEE**	59.27
General Requirements Compliance	Pass	**% DFEE<TFEE**	10.83		

Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Electricity		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	30.69	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	20.17	$kgCO_2/m^2$	Pass
	-10.52 (-34.3%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	59.27	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	52.85	$kWh/m^2/yr$	
	-6.5 (-11.0%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	Pass
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	Pass
Openings	1.20 (max. 2.00)	1.20 (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	4.00 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system 1	Room heaters - Electric Panel, convector or radiant heaters	

Main heating system 2	Heat pump with warm air distribution - Electric Dimplex EDL200UK-630		
Secondary heating system	None		
5 Cylinder insulation			
Hot water storage	No cylinder		
6 Controls			
Space heating controls 1	Programmer and room thermostat		Pass
Hot water controls	No cylinder		
7 Low energy lights			
Percentage of fixed lights with low-energy fittings	100	%	
Minimum	75	%	Pass
8 Mechanical ventilation			
Continuous extract system (decentralised)			
Specific fan power	0.1600 0.1200		
Maximum	0.7		Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature			
Overheating risk (Thames Valley)	Slight		Pass
Based on:			
Overshading	Average		
Windows facing West	8.11 m², No overhang		
Air change rate	3.00 ach		
Blinds/curtains	Dark-coloured curtain or roller blind, closed 100% of daylight hours		

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value		
Solid Wall	0.00	W/m²K	Pass

Air permeability and pressure testing

3 Air permeability			
Air permeability at 50 pascals	4.00 (design value)		
Maximum	10.0		Pass
10 Key features			
Party wall U-value	0.00	W/m²K	
Floor U-value	0.11	W/m²K	
Photovoltaic array	1.64	kW	

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BLOCK COMPLIANCE
Calculation Type: New Build (As Designed)

Darren Evans

Block Reference	4 PV planel per falt	**Issued on Date**	25/01/2023
Block Name	335		
Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

Block Compliance Report - DER

Block Reference: 4 PV planel per falt		Block Name: 335			
Property-Assessment Reference	**Multiplier**	**Floor Area (m^2)**	**DER ($kgCO_2/m^2$)**	**TER ($kgCO_2/m^2$)**	**% DER/TER**
DE-21912-Plot 20-Plot 20	1	61.7	9.39	24.71	62.00 %
DE-21912-Plot 17-Plot 17	1	61.7	11.56	25.89	55.36 %
DE-21912- Plot 07-Plot 07	1	50.76	8.84	26.11	66.14 %
DE-21912 - Plot 05-Plot 05	1	65.09	12.75	26.21	51.36 %
DE-21912-Plot 40-Plot 40	1	61.7	6.66	21.38	68.85 %
DE-21912-Plot 27-Plot 27	1	62.48	6.76	20.78	67.47 %
DE-21912-Plot 25-Plot 25	1	65.09	9.65	22.66	57.41 %
DE-21912-Plot 67-Plot 67	1	62.48	13.70	25.47	46.21 %
DE-21912-Plot 80-Plot 80	1	61.7	15.75	27.54	42.81 %
DE-21912-Plot 65-Plot 65	1	65.09	17.89	28.43	37.07 %
DE-21912-Plot 77-Plot 77	1	61.7	20.17	30.69	34.27 %
DE-21912-Plot 37-Plot 37	1	61.7	11.61	24.84	53.25 %
Totals:	12	741.19	144.73	304.71	
Average DER = 12.12 $kgCO_2/m^2$		**% DER/TER**	PASS		
Average TER = 25.38 $kgCO_2/m^2$		52.25 %			

Block Compliance Report - DFEE

Block Reference: 4 PV planel per falt		Block Name: 335			
Property-Assessment Reference	**Multiplier**	**Floor Area (m^2)**	**DFEE ($kWh/m^2/yr$)**	**TFEE ($kWh/m^2/yr$)**	**% DFEE/TFEE**
DE-21912-Plot 20-Plot 20	1	61.7	32.22	39.28	17.99 %
DE-21912-Plot 17-Plot 17	1	61.7	36.71	43.81	16.22 %
DE-21912- Plot 07-Plot 07	1	50.76	34.10	38.48	11.38 %
DE-21912 - Plot 05-Plot 05	1	65.09	38.23	46.52	17.82 %
DE-21912-Plot 40-Plot 40	1	61.7	26.99	27.95	3.45 %
DE-21912-Plot 27-Plot 27	1	62.48	26.37	26.48	0.39 %
DE-21912-Plot 25-Plot 25	1	65.09	32.34	34.66	6.71 %
DE-21912-Plot 67-Plot 67	1	62.48	39.57	42.27	6.38 %
DE-21912-Plot 80-Plot 80	1	61.7	44.07	48.37	8.88 %
DE-21912-Plot 65-Plot 65	1	65.09	48.15	53.91	10.69 %
DE-21912-Plot 77-Plot 77	1	61.7	52.85	59.27	10.83 %
DE-21912-Plot 37-Plot 37	1	61.7	36.79	40.29	8.69 %
Totals:	12	741.19	448.37	501.28	
Average DFEE = 37.43 $kWh/m^2/yr$		**% DFEE/TFEE**	PASS		
Average TFEE = 41.85 $kWh/m^2/yr$		10.56 %			

PREDICTED ENERGY ASSESSMENT

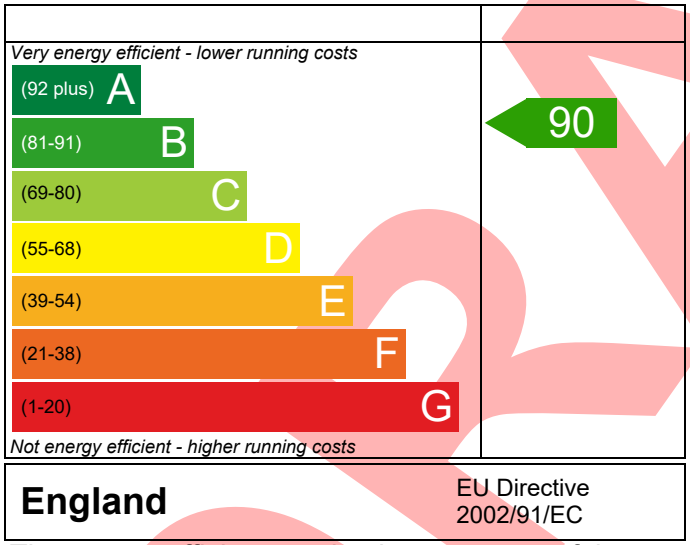
Land at Tesco Extra Car Park,
Plot 80,
1Bath,
2B3P,
RG1

Dwelling type:	Flat, Mid-Terrace
Date of assessment:	25/01/2023
Produced by:	Charles Sims
Total floor area:	61.7 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.

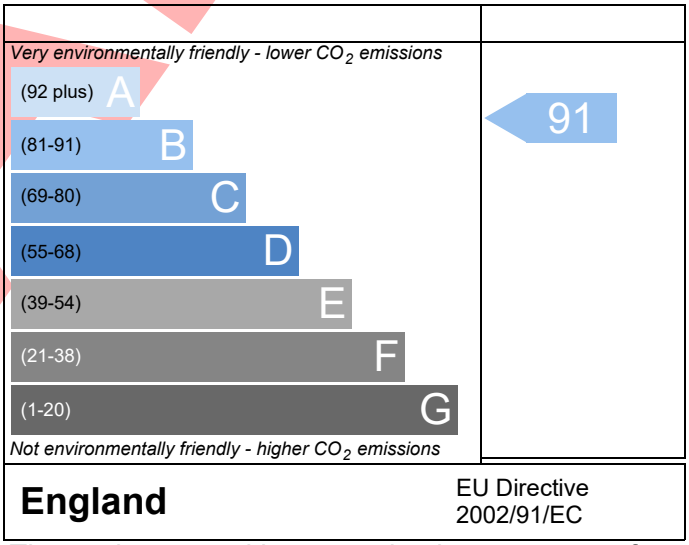
The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO_2) emissions.

Energy Efficiency Rating



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 (CO_2) Rating



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO_2) emissions. The higher the rating the less impact it has on the environment.

DRAFT

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BUILDING REGULATION COMPLIANCE
Calculation Type: New Build (As Designed)

Darren Evans

Property Reference	DE-21912-Plot 80	Issued on Date	25/01/2023
Assessment Reference	Plot 80	Prop Type Ref	TF-Flat
Property	Land at Tesco Extra Car Park, Plot 80, 1Bath, 2B3P, RG1		

SAP Rating	90 B	DER	15.75	TER	27.54
Environmental	91 B	% DER<TER	42.81		
CO_2 Emissions (t/year)	0.47	DFEE	44.07	TFEE	48.37
General Requirements Compliance	Pass	% DFEE<TFEE	8.88		

Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	Assessor ID	P081-0001
Client			

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Electricity		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	27.54	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	15.75	$kgCO_2/m^2$	Pass
	-11.79 (-42.8%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	48.37	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	44.07	$kWh/m^2/yr$	
	-4.3 (-8.9%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	Pass
Openings	1.20 (max. 2.00)	1.20 (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	4.00 (design value)	$m^3/(h.m^2)$ @ 50 Pa	
Maximum	10.0	$m^3/(h.m^2)$ @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system 1	Room heaters - Electric Panel, convector or radiant heaters	

DRAFT

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

Main heating system 2	Heat pump with warm air distribution - Electric Dimplex EDL200UK-630		
Secondary heating system	None		
5 Cylinder insulation			
Hot water storage	No cylinder		
6 Controls			
Space heating controls 1	Programmer and room thermostat		Pass
Hot water controls	No cylinder		
7 Low energy lights			
Percentage of fixed lights with low-energy fittings	100	%	
Minimum	75	%	Pass
8 Mechanical ventilation			
Continuous extract system (decentralised)			
Specific fan power	0.1600 0.1200		
Maximum	0.7		Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)	Slight		Pass
Based on:			
Overshading	Average		
Windows facing South	8.10 m², No overhang		
Air change rate	3.00 ach		
Blinds/curtains	Dark-coloured curtain or roller blind, closed 100% of daylight hours		

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value		
Filled Cavity with Edge Sealing	0.00	W/m²K	Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals	4.00 (design value)	m³/(h.m²) @ 50 Pa	
Maximum	10.0	m³/(h.m²) @ 50 Pa	Pass

10 Key features

Party wall U-value	0.00	W/m²K
Photovoltaic array	1.64	kW

DRAFT

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

	Typical cost	Typical savings per year	Energy efficiency	Environmental impact	Result
Low energy lights			0	0	Already installed
Solar water heating			0	0	Not applicable
Photovoltaic			0	0	Not applicable
Wind turbine			0	0	Not applicable
Totals	**£0**	**£0**	**B 90**	**B 91**	

DRAFT

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

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

Darren Evans

Property Reference	DE-21912-Plot 80	**Issued on Date**	25/01/2023
Assessment Reference	Plot 80	**Prop Type Ref**	TF-Flat
Property	Land at Tesco Extra Car Park, Plot 80, 1Bath, 2B3P, RG1		

SAP Rating	90 B	**DER**	15.75	**TER**	27.54
Environmental	91 B	**% DER<TER**	42.81		
CO_2 Emissions (t/year)	0.47	**DFEE**	44.07	**TFEE**	48.37
General Requirements Compliance	Pass	**% DFEE<TFEE**	8.88		

Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

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

Orientation	North
Property Tenure	Unknown
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	Flat, Mid-Terrace
2.0 Number of Storeys	1
3.0 Date Built	2023
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	20.33 m	61.70 m²	2.40 m

7.0 Living Area	27.08	m²
8.0 Thermal Mass Parameter	Simple calculation - Medium	
Thermal Mass	250.00	kJ/m²K

9.0 External Walls

Description	Type	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Wall 1	Cavity Wall	0.18	48.80	40.70

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Area (m²)
Party Wall 1	Filled Cavity with Edge Sealing		0.00	39.25

10.0 External Roofs

Description	Type	U-Value (W/m²K)	Gross Area (m²)	Nett Area (m²)
External Roof 1	External Flat Roof	0.13	61.70	61.70

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Windows	Manufacturer	Window	Double glazed			0.63		0.70	1.20

13.0 Openings

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

Darren Evans

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
S Windows	Window	[1] External Wall 1	South	Dark-coloured curtain or roller blind	0.00					8.10	100

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	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	5.00	0.021	No	CBA-313
Independently assessed	E3 Sill	3.00	0.021	No	CBA-314
Independently assessed	E4 Jamb	12.00	0.017	No	CBA-315
Table K1 - Approved	E7 Party floor between dwellings (in blocks of flats)	17.09	0.070	No	
Table K1 - Default	E23 Balcony within or between dwellings, balcony support penetrates wall insulation	3.25	1.000	No	
Table K1 - Default	E15 Flat roof with parapet	20.33	0.560	No	
Independently assessed	E16 Corner (normal)	9.60	0.046	No	CBA-316
Independently assessed	E17 Corner (inverted – internal area greater than external area)	4.80	-0.040	No	
Table K1 - Approved	E18 Party wall between dwellings	2.40	0.060	No	
Table K1 - Default	E25 Staggered party wall between dwellings	2.40	0.120	No	
Table K1 - Default	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	16.36	0.000	No	
Table K1 - Default	P4 Party wall - Roof (insulation at ceiling level)	16.36	0.240	No	

Y-value	0.188	W/m²K
18.0 Pressure Testing	Yes	
Designed AP_{50}	4.00	m³/(h.m²) @ 50 Pa
Property Tested ?		
As Built AP_{50}		m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Windows half open
Cross ventilation possible	Yes
Night Ventilation	No
Air change rate	3.00

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	Yes
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - decentralised
MV Reference Number	500661
Duct Type	Flexible

19.1 Mechanical extract ventilation - Decentralised

SFP	Fan/Room Type	Count
0.16	In Room Fan Other Wet Room	1
0.12	Through Wall Fan Kitchen	1

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				0
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	10	
Total number of L.E.L. fittings	10	
Percentage of L.E.L. fittings	100.00	%
External		
External lights fitted	No	
23.0 Electricity Tariff	Standard	
24.0 Main Heating 1	SAP table	
Percentage of Heat	100	%
Main Heating	REA	
SAP Code	691	
Efficiency (SAP Table)	100.0	%
Controls	CRD Programmer and room thermostat	
Sap Code	2605	
25.0 Main Heating 2	Database	
Percentage of Heat	0	%
Database Ref. No.	190006	
Fuel Type	Electricity	
Main Heating	PEH	
SAP Code	524	
In Summer	367.8	
Controls	CWD Time and temperature zone control	
Sap Code	0	
Community Heating	None	
28.0 Water Heating	HWP From main heating 1	
Water Heating	Main Heating 2	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery	No	

Instantaneous System 2		
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
SAP Code	914	
Immersion Only Heating Hot Water	Yes	

29.0 Hot Water Cylinder	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	201.00	L
Loss	1.610	kWh/day

32.0 Photovoltaic Unit One Dwelling

PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
1.64	Horizontal	Horizontal	None Or Little	Yes

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

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

Property Reference	DE-21912-Plot 80	**Issued on Date**	25/01/2023
Assessment Reference	Plot 80	**Prop Type Ref**	TF-Flat
Property	Land at Tesco Extra Car Park, Plot 80, 1Bath, 2B3P, RG1		

SAP Rating	90 B	**DER**	15.75	**TER**	27.54
Environmental	91 B	**% DER<TER**	42.81		
CO_2 Emissions (t/year)	0.47	**DFEE**	44.07	**TFEE**	48.37
General Requirements Compliance	Pass	**% DFEE<TFEE**	8.88		

Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

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

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

DWELLING AS DESIGNED

Top-floor flat, total floor area 62 m²

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

1a TER and DER
Fuel for main heating:Electricity
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 27.54 kgCO□/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.75 kgCO□/m²OK

1b TFEE and DFEE
Target Fabric Energy Efficiency (TFEE)48.4 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)44.1 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	OK
Openings	1.20 (max. 2.00)	1.20 (max. 3.30)	OK

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

3 Air permeability
Air permeability at 50 pascals: 4.00 (design value)
Maximum 10.0 OK

4 Heating efficiency
Main heating system 1: Room heaters - Electric
Panel, convector or radiant heaters

Main heating system 2: Heat pump with warm air distribution - Electric
Dimplex EDL200UK-630

Secondary heating system: None

5 Cylinder insulation
Hot water storage No cylinder

6 Controls
Space heating controls 1: Programmer and room thermostat OK

Hot water controls: No cylinder

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

8 Mechanical ventilation
Continuous extract system (decentralised)
Specific fan power: 0.1600 0.1200
Maximum 0.7 OK

9 Summertime temperature
Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing South: 8.10 m², No overhang
Air change rate: 3.00 ach
Blinds/curtains: Dark-coloured curtain or roller blind, closed 100% of daylight hours

10 Key features
Party wall U-value 0.00 W/m²K
Photovoltaic array 1.64 kW

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	61.7000 (1b)	x	2.4000 (2b)	=	148.0800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	148.0800	(5)

2. Ventilation rate

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

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Pressure test		Yes	
Measured/design AP50		4.0000	
Infiltration rate		0.2000	(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) =	0.1700	(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	0.2168	0.2125	0.2083	0.1870	0.1828	0.1615	0.1615	0.1573	0.1700	0.1828	0.1913	0.1998	(22b)
Mechanical extract ventilation - decentralised													
If mechanical ventilation:												0.5000	(23a)
Effective ac	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(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	
Windows (Uw = 1.20)			8.1000	1.1450	9.2748			(27)
External Wall 1	48.8000	8.1000	40.7000	0.1800	7.3260			(29a)
External Roof 1	61.7000		61.7000	0.1300	8.0210			(30)
Total net area of external elements Aum(A, m2)			110.5000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.6218			(33)
Party Wall 1			39.2500	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							20.8111	(36)
Total fabric heat loss					(33) + (36) =		45.4329	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	24.4332	24.4332	24.4332	24.4332	24.4332	24.4332	24.4332	24.4332	24.4332	24.4332	24.4332	24.4332	(38)
Heat transfer coeff	69.8661	69.8661	69.8661	69.8661	69.8661	69.8661	69.8661	69.8661	69.8661	69.8661	69.8661	69.8661	(39)
Average = Sum(39)m / 12 =												69.8661	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1324	1.1324	1.1324	1.1324	1.1324	1.1324	1.1324	1.1324	1.1324	1.1324	1.1324	1.1324	(40)
HLP (average)												1.1324	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.0293	(42)
Average daily hot water use (litres/day)												82.3952	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	90.6347	87.3389	84.0431	80.7472	77.4514	74.1556	74.1556	77.4514	80.7472	84.0431	87.3389	90.6347	(44)
Energy conte	134.4086	117.5546	121.3058	105.7574	101.4767	87.5667	81.1434	93.1132	94.2253	109.8105	119.8668	130.1675	(45)
Energy content (annual)										Total = Sum(45)m =		1296.3965	(45)
Distribution loss (46)m = 0.15 x (45)m	20.1613	17.6332	18.1959	15.8636	15.2215	13.1350	12.1715	13.9670	14.1338	16.4716	17.9800	19.5251	(46)
Water storage loss:													
Store volume												201.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.6100	(48)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Temperature factor from Table 2b 0.5400 (49)
Enter (49) or (54) in (55) 0.8694 (55)
Total storage loss
26.9514 24.3432 26.9514 26.0820 26.9514 26.0820 26.9514 26.9514 26.0820 26.9514 26.0820 26.9514 (56)
If cylinder contains dedicated solar storage
26.9514 24.3432 26.9514 26.0820 26.9514 26.0820 26.9514 26.9514 26.0820 26.9514 26.0820 26.9514 (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)
Total heat required for water heating calculated for each month
161.3600 141.8978 148.2572 131.8394 128.4281 113.6487 108.0948 120.0646 120.3073 136.7619 145.9488 157.1189 (62)
Solar input 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)
Output from w/h
161.3600 141.8978 148.2572 131.8394 128.4281 113.6487 108.0948 120.0646 120.3073 136.7619 145.9488 157.1189 (64)
Total per year (kWh/year) = Sum(64)m = 1613.7275 (64)
Heat gains from water heating, kWh/month
44.6909 39.0869 40.3342 35.1643 33.7410 29.1159 26.9802 30.9602 31.3299 36.5120 39.8557 43.2807 (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	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	(66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
17.1902 15.2681 12.4169 9.4004 7.0269 5.9324 6.4102 8.3322 11.1834 14.1999 16.5734 17.6679 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
177.2131 179.0520 174.4180 164.5527 152.0996 140.3954 132.5763 130.7374 135.3714 145.2367 157.6898 169.3940 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
33.1463 33.1463 33.1463 33.1463 33.1463 33.1463 33.1463 33.1463 33.1463 33.1463 33.1463 33.1463 (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)
-81.1708 -81.1708 -81.1708 -81.1708 -81.1708 -81.1708 -81.1708 -81.1708 -81.1708 -81.1708 -81.1708 -81.1708 (71)
Water heating gains (Table 5)
60.0684 58.1650 54.2126 48.8393 45.3508 40.4388 36.2637 41.6131 43.5138 49.0753 55.3551 58.1730 (72)
Total internal gains
307.9107 305.9243 294.4866 276.2315 257.9164 240.2057 228.6892 234.1217 243.5077 261.9509 283.0574 298.6740 (73)

---
6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	8.1000	46.7521	0.6300	0.7000	0.7700	115.7331	(78)

Solar gains	115.7331	189.5410	241.4416	272.8815	284.3594	273.6572	267.3797	259.6628	252.2143	204.4378	137.1832	100.0041	(83)
Total gains	423.6438	495.4653	535.9282	549.1130	542.2757	513.8629	496.0690	493.7845	495.7220	466.3887	420.2406	398.6780	(84)

---
7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.3276	61.3276	61.3276	61.3276	61.3276	61.3276	61.3276	61.3276	61.3276	61.3276	61.3276	61.3276	
alpha	5.0885	5.0885	5.0885	5.0885	5.0885	5.0885	5.0885	5.0885	5.0885	5.0885	5.0885	5.0885	
util living area	0.9963	0.9913	0.9812	0.9580	0.9012	0.7727	0.5979	0.6233	0.8239	0.9598	0.9920	0.9973	(86)
MIT	19.8628	20.0323	20.2560	20.5123	20.7541	20.9235	20.9835	20.9792	20.8875	20.5740	20.1536	19.8148	(87)
Th 2	19.9745	19.9745	19.9745	19.9745	19.9745	19.9745	19.9745	19.9745	19.9745	19.9745	19.9745	19.9745	(88)
util rest of house	0.9951	0.9885	0.9747	0.9421	0.8613	0.6839	0.4695	0.4978	0.7482	0.9414	0.9888	0.9964	(89)
MIT 2	18.4681	18.7143	19.0373	19.4010	19.7261	19.9207	19.9681	19.9658	19.8861	19.4917	18.8921	18.3980	(90)
Living area fraction									fLA = Living area / (4) =			0.4389	(91)
MIT	19.0802	19.2928	19.5722	19.8888	20.1773	20.3608	20.4138	20.4106	20.3256	19.9667	19.4458	19.0198	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0802	19.2928	19.5722	19.8888	20.1773	20.3608	20.4138	20.4106	20.3256	19.9667	19.4458	19.0198	(93)

---
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9936	0.9860	0.9715	0.9405	0.8703	0.7200	0.5264	0.5533	0.7767	0.9413	0.9866	0.9952	(94)
Useful gains	420.9485	488.5160	520.6353	516.4573	471.9378	369.9736	261.1128	273.1974	385.0299	438.9960	414.6191	396.7653	(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	1032.6365	1005.5680	913.3004	767.7436	592.2758	402.4874	266.4532	280.2024	434.9579	654.4141	862.5503	1035.4031	(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	455.0959	347.4589	292.1428	180.9261	89.5315	0.0000	0.0000	0.0000	0.0000	160.2711	322.5104	475.1465	(98)
Space heating												2323.0832	(98)
Space heating per m2											(98) / (4) =	37.6513	(99)

8c. Space cooling requirement

Not applicable

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(201)
Fraction of space heat from main system(s)	1.0000	(202)
Fraction of main heating from main system 2	0.0000	(203)
Fraction of total heating from main system 1	1.0000	(204)
Fraction of total heating from main system 2	0.0000	(205)
Efficiency of main space heating system 1 (in %)	100.0000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)
Space heating requirement	2323.0832	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	455.0959	347.4589	292.1428	180.9261	89.5315	0.0000	0.0000	0.0000	0.0000	160.2711	322.5104	475.1465	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	455.0959	347.4589	292.1428	180.9261	89.5315	0.0000	0.0000	0.0000	0.0000	160.2711	322.5104	475.1465	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
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)
Space heating fuel used, main system 2												0.0000	(213)
Water heating													
Water heating requirement	161.3600	141.8978	148.2572	131.8394	128.4281	113.6487	108.0948	120.0646	120.3073	136.7619	145.9488	157.1189	(64)
Efficiency of water heater												349.4100	(216)
(217)m	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	349.4100	(217)
Fuel for water heating, kWh/month	46.1807	40.6107	42.4307	37.7320	36.7557	32.5259	30.9364	34.3621	34.4316	39.1408	41.7701	44.9669	(219)
Water heating fuel used												461.8436	(219)
Annual totals kWh/year													
Space heating fuel - main system												2323.0832	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEVDecentralised, Database: total watage = 3.6500, total flow = 21.0000, SFP = 0.1738)													
mechanical ventilation fans (SFP = 0.1738)												31.4000	(230a)
Total electricity for the above, kWh/year												31.4000	(231)
Electricity for lighting (calculated in Appendix L)												303.5836	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.64 * 951 * 1.00) =												-1247.2082	(233)
Total delivered energy for all uses												1872.7022	(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	2323.0832	0.5190		1205.6802	(261)
Space heating - main system 2	0.0000	0.5190		0.0000	(262)
Space heating - secondary	0.0000	0.0000		0.0000	(263)
Water heating (other fuel)	461.8436	0.5190		239.6968	(264)
Space and water heating				1445.3770	(265)
Pumps and fans	31.4000	0.5190		16.2966	(267)
Energy for lighting	303.5836	0.5190		157.5599	(268)
Energy saving/generation technologies					
PV Unit	-1247.2082	0.5190		-647.3011	(269)
Total CO2, kg/year				971.9325	(272)
Dwelling Carbon Dioxide Emission Rate (DER)				15.7500	(273)

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

DER		15.7500	ZC1
Total Floor Area	TFA	61.7000	
Assumed number of occupants	N	2.0293	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.0199	ZC2
CO2 emissions from cooking, equation (L16)		2.7180	ZC3
Total CO2 emissions		35.4879	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		35.4879	ZC8

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	61.7000 (1b)	x	2.4000 (2b)	=	148.0800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	148.0800	(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) =	0.1351	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3851	(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) =	0.3273	(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	0.4173	0.4091	0.4009	0.3600	0.3519	0.3109	0.3109	0.3028	0.3273	0.3519	0.3682	0.3846	(22b)
Effective ac	0.5871	0.5837	0.5804	0.5648	0.5619	0.5483	0.5483	0.5458	0.5536	0.5619	0.5678	0.5740	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opening Type (Uw = 1.40)			8.1000	1.3258	10.7386			(27)
External Wall 1	48.8000	8.1000	40.7000	0.1800	7.3260			(29a)
External Roof 1	61.7000		61.7000	0.1300	8.0210			(30)
Total net area of external elements Aum(A, m2)			110.5000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.0856			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							16.3293	(36)
Total fabric heat loss					(33) + (36) =		42.4149	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.6882	28.5230	28.3610	27.6003	27.4580	26.7955	26.7955	26.6728	27.0507	27.4580	27.7459	28.0469	(38)
Heat transfer coeff	71.1031	70.9379	70.7760	70.0153	69.8729	69.2104	69.2104	69.0877	69.4656	69.8729	70.1609	70.4619	(39)
Average = Sum(39)m / 12 =												70.0146	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1524	1.1497	1.1471	1.1348	1.1325	1.1217	1.1217	1.1197	1.1259	1.1325	1.1371	1.1420	(40)
HLP (average)												1.1348	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.0293	(42)
Average daily hot water use (litres/day)	82.3952	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	90.6347	87.3389	84.0431	80.7472	77.4514	74.1556	74.1556	77.4514	80.7472	84.0431	87.3389	90.6347	(44)
Energy conte	134.4086	117.5546	121.3058	105.7574	101.4767	87.5667	81.1434	93.1132	94.2253	109.8105	119.8668	130.1675	(45)
Energy content (annual)										Total = Sum(45)m =		1296.3965	(45)
Distribution loss (46)m = 0.15 x (45)m	20.1613	17.6332	18.1959	15.8636	15.2215	13.1350	12.1715	13.9670	14.1338	16.4716	17.9800	19.5251	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage

	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	181.0035	159.6403	167.9007	150.8492	148.0716	132.6585	127.7383	139.7081	139.3171	156.4054	164.9586	176.7624	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
								Solar input (sum of months) = Sum(63)m =				0.0000	(63)
Output from w/h													
	181.0035	159.6403	167.9007	150.8492	148.0716	132.6585	127.7383	139.7081	139.3171	156.4054	164.9586	176.7624	(64)
								Total per year (kWh/year) = Sum(64)m =				1845.0139	(64)
Heat gains from water heating, kWh/month													
	81.9668	72.7555	77.6101	71.2378	71.0169	65.1894	64.2561	68.2361	67.4034	73.7879	75.9292	80.5566	(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	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.1902	15.2681	12.4169	9.4004	7.0269	5.9324	6.4102	8.3322	11.1834	14.1999	16.5734	17.6679	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	177.2131	179.0520	174.4180	164.5527	152.0996	140.3954	132.5763	130.7374	135.3714	145.2367	157.6898	169.3940	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	(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)													
	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	(71)
Water heating gains (Table 5)													
	110.1704	108.2671	104.3147	98.9414	95.4529	90.5408	86.3657	91.7152	93.6158	99.1773	105.4572	108.2750	(72)
Total internal gains													
	361.0127	359.0263	347.5886	329.3336	311.0184	293.3077	281.7913	287.2238	296.6097	315.0530	336.1595	351.7760	(73)

---

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	8.1000	46.7521	0.6300	0.7000	0.7700	115.7331	(78)

Solar gains	115.7331	189.5410	241.4416	272.8815	284.3594	273.6572	267.3797	259.6628	252.2143	204.4378	137.1832	100.0041	(83)
Total gains	476.7458	548.5673	589.0302	602.2150	595.3778	566.9649	549.1710	546.8866	548.8240	519.4908	473.3427	451.7801	(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	60.2607	60.4010	60.5392	61.1970	61.3216	61.9087	61.9087	62.0186	61.6812	61.3216	61.0700	60.8091	
alpha	5.0174	5.0267	5.0359	5.0798	5.0881	5.1272	5.1272	5.1346	5.1121	5.0881	5.0713	5.0539	
util living area													
	0.9938	0.9868	0.9730	0.9416	0.8700	0.7194	0.5422	0.5656	0.7750	0.9406	0.9867	0.9952	(86)
MIT	19.9142	20.0855	20.3100	20.5724	20.7987	20.9464	20.9896	20.9870	20.9175	20.6365	20.2246	19.8809	(87)
Th 2	19.9583	19.9604	19.9626	19.9725	19.9744	19.9831	19.9831	19.9847	19.9798	19.9744	19.9706	19.9667	(88)
util rest of house													
	0.9918	0.9826	0.9642	0.9211	0.8232	0.6288	0.4233	0.4486	0.6939	0.9159	0.9817	0.9937	(89)
MIT 2	18.5310	18.7803	19.1040	19.4796	19.7776	19.9471	19.9793	19.9795	19.9179	19.5736	18.9911	18.4886	(90)
Living area fraction									fLA = Living area / (4) =			0.4389	(91)
MIT	19.1381	19.3532	19.6333	19.9592	20.2257	20.3857	20.4227	20.4217	20.3566	20.0401	19.5325	19.0997	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.1381	19.3532	19.6333	19.9592	20.2257	20.3857	20.4227	20.4217	20.3566	20.0401	19.5325	19.0997	(93)

---

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9897	0.9795	0.9607	0.9208	0.8360	0.6667	0.4758	0.5002	0.7261	0.9178	0.9789	0.9919	(94)
Useful gains	471.8488	537.3093	565.8649	554.5424	497.7263	377.9909	261.2928	273.5578	398.5027	476.7644	463.3462	448.1290	(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													
	1055.0347	1025.2770	929.5206	774.3128	595.7180	400.4302	264.5728	277.8490	434.6215	659.6069	872.2728	1049.8602	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	433.8903	327.9143	270.5599	158.2347	72.9058	0.0000	0.0000	0.0000	0.0000	136.0348	294.4272	447.6880	(98)
Space heating												2141.6549	(98)
Space heating per m2											(98) / (4) =	34.7108	(99)

8c. Space cooling requirement

Not applicable

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

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000	(201)
Fraction of space heat from main system(s)												1.0000	(202)
Efficiency of main space heating system 1 (in %)												93.5000	(206)
Efficiency of secondary/supplementary heating system, %												0.0000	(208)
Space heating requirement												2290.5400	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	433.8903	327.9143	270.5599	158.2347	72.9058	0.0000	0.0000	0.0000	0.0000	136.0348	294.4272	447.6880	(98)
Space heating efficiency (main heating system 1)													
	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)													
	464.0538	350.7104	289.3688	169.2350	77.9741	0.0000	0.0000	0.0000	0.0000	145.4917	314.8954	478.8107	(211)
Water heating requirement													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement													
	181.0035	159.6403	167.9007	150.8492	148.0716	132.6585	127.7383	139.7081	139.3171	156.4054	164.9586	176.7624	(64)
Efficiency of water heater												79.8000	(216)
(217)m	87.0636	86.6938	86.0802	84.9414	83.0392	79.8000	79.8000	79.8000	79.8000	84.4443	86.3428	87.1906	(217)
Fuel for water heating, kWh/month													
	207.8980	184.1427	195.0516	177.5921	178.3154	166.2388	160.0731	175.0729	174.5829	185.2173	191.0509	202.7310	(219)
Water heating fuel used												2197.9665	(219)
Annual totals kWh/year													
Space heating fuel - main system												2290.5400	(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)												303.5836	(232)
Total delivered energy for all uses												4867.0901	(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	2290.5400	0.2160	494.7566	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2197.9665	0.2160	474.7608	(264)
Space and water heating			969.5174	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	303.5836	0.5190	157.5599	(268)
Total CO2, kg/m2/year			1166.0023	(272)
Emissions per m2 for space and water heating			15.7134	(272a)
Fuel factor (electricity)			1.5500	
Emissions per m2 for lighting			2.5536	(272b)
Emissions per m2 for pumps and fans			0.6309	(272c)
Target Carbon Dioxide Emission Rate (TER) = (15.7134 * 1.55) + 2.5536 + 0.6309, rounded to 2 d.p.			27.5400	(273)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	61.7000 (1b)	x	2.4000 (2b)	=	148.0800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	148.0800	(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) =	0.1351	(8)
Pressure test		Yes	
Measured/design AP50		4.0000	
Infiltration rate		0.3351	(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) =	0.2848	(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	0.3631	0.3560	0.3489	0.3133	0.3062	0.2706	0.2706	0.2634	0.2848	0.3062	0.3204	0.3346	(22b)
Effective ac	0.5659	0.5634	0.5609	0.5491	0.5469	0.5366	0.5366	0.5347	0.5406	0.5469	0.5513	0.5560	(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	
Windows (Uw = 1.20)			8.1000	1.1450	9.2748			(27)
External Wall 1	48.8000	8.1000	40.7000	0.1800	7.3260			(29a)
External Roof 1	61.7000		61.7000	0.1300	8.0210			(30)
Total net area of external elements Aum(A, m2)			110.5000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.6218			(33)
Party Wall 1			39.2500	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							20.8111	(36)
Total fabric heat loss					(33) + (36) =		45.4329	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	27.6549	27.5298	27.4072	26.8312	26.7235	26.2218	26.2218	26.1289	26.4150	26.7235	26.9415	27.1694	(38)
Heat transfer coeff	73.0878	72.9627	72.8401	72.2641	72.1564	71.6547	71.6547	71.5618	71.8480	72.1564	72.3744	72.6023	(39)
Average = Sum(39)m / 12 =												72.2636	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1846	1.1825	1.1806	1.1712	1.1695	1.1613	1.1613	1.1598	1.1645	1.1695	1.1730	1.1767	(40)
HLP (average)												1.1712	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.0293 (42)
Average daily hot water use (litres/day)		82.3952 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	90.6347	87.3389	84.0431	80.7472	77.4514	74.1556	74.1556	77.4514	80.7472	84.0431	87.3389	90.6347	(44)
Energy conte	134.4086	117.5546	121.3058	105.7574	101.4767	87.5667	81.1434	93.1132	94.2253	109.8105	119.8668	130.1675	(45)
Energy content (annual)										Total = Sum(45)m =		1296.3965	(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)
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)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Heat gains from water heating, kWh/month

	28.5618	24.9804	25.7775	22.4734	21.5638	18.6079	17.2430	19.7866	20.0229	23.3347	25.4717	27.6606 (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	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.1902	15.2681	12.4169	9.4004	7.0269	5.9324	6.4102	8.3322	11.1834	14.1999	16.5734	17.6679	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	177.2131	179.0520	174.4180	164.5527	152.0996	140.3954	132.5763	130.7374	135.3714	145.2367	157.6898	169.3940	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	(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)													
	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	(71)
Water heating gains (Table 5)													
	38.3896	37.1731	34.6472	31.2131	28.9836	25.8443	23.1760	26.5948	27.8096	31.3639	35.3773	37.1782	(72)
Total internal gains													
	286.2319	284.9324	274.9211	258.6053	241.5492	225.6112	215.6016	219.1035	227.8035	244.2396	263.0796	277.6792	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	8.1000	46.7521	0.6300	0.7000	0.7700	115.7331	(78)

Solar gains	115.7331	189.5410	241.4416	272.8815	284.3594	273.6572	267.3797	259.6628	252.2143	204.4378	137.1832	100.0041	(83)
Total gains	401.9650	474.4734	516.3627	531.4867	525.9085	499.2684	482.9813	478.7662	480.0178	448.6773	400.2628	377.6833	(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	58.6243	58.7248	58.8237	59.2925	59.3811	59.7968	59.7968	59.8744	59.6360	59.3811	59.2022	59.0164	
alpha	4.9083	4.9150	4.9216	4.9528	4.9587	4.9865	4.9865	4.9916	4.9757	4.9587	4.9468	4.9344	
util living area													
	0.9971	0.9930	0.9847	0.9649	0.9157	0.7957	0.6235	0.6505	0.8458	0.9671	0.9937	0.9979	(86)
MIT	19.7600	19.9354	20.1709	20.4517	20.7126	20.9068	20.9785	20.9731	20.8637	20.5199	20.0780	19.7233	(87)
Th 2	19.9324	19.9340	19.9356	19.9431	19.9445	19.9511	19.9511	19.9523	19.9485	19.9445	19.9417	19.9387	(88)
util rest of house													
	0.9961	0.9907	0.9792	0.9510	0.8790	0.7078	0.4894	0.5202	0.7728	0.9513	0.9911	0.9972	(89)
MIT 2	18.8098	18.9855	19.2196	19.4995	19.7434	19.9054	19.9453	19.9444	19.8738	19.5692	19.1342	18.7783	(90)
Living area fraction									fLA = Living area / (4) =			0.4389	(91)
MIT	19.2269	19.4024	19.6371	19.9174	20.1688	20.3449	20.3988	20.3959	20.3083	19.9865	19.5484	19.1930	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2269	19.4024	19.6371	19.9174	20.1688	20.3449	20.3988	20.3959	20.3083	19.9865	19.5484	19.1930	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9953	0.9892	0.9773	0.9506	0.8880	0.7438	0.5490	0.5780	0.8007	0.9521	0.9899	0.9965	(94)
Useful gains	400.0707	469.3496	504.6432	505.2454	467.0012	371.3612	265.1672	276.7414	384.3464	427.1759	396.2107	376.3514	(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													
	1090.9721	1058.1349	956.9083	796.1655	611.0747	411.6524	272.2015	285.9522	446.0520	677.2936	900.9469	1088.5295	(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													
	514.0306	395.6637	336.4852	209.4625	107.1907	0.0000	0.0000	0.0000	0.0000	186.0875	363.4101	529.8605	(98)
Space heating												2642.1908	(98)
Space heating per m2										(98) / (4) =		42.8232	(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	673.5544	530.2449	543.8698	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8243	0.9004	0.8909	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	555.2059	477.4267	484.5385	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	659.8701	639.3886	635.8480	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh													
	0.0000	0.0000	0.0000	0.0000	0.0000	75.3582	120.4997	112.5743	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												308.4322	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling kWh													

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

	0.0000	0.0000	0.0000	0.0000	0.0000	18.8396	30.1249	28.1436	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												77.1081 (107)
Space cooling per m2												1.2497 (108)
Energy for space heating												42.8232 (99)
Energy for space cooling												1.2497 (108)
Total												44.0729 (109)
Dwelling Fabric Energy Efficiency (DFEE)												44.1 (109)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)		Storey height (m)		Volume (m3)	
Ground floor	61.7000 (1b)	x	2.4000 (2b)	=	148.0800	(1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.7000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	148.0800	(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) =	0.1351	(8)
Pressure test		Yes	
Measured/design AP50		5.0000	
Infiltration rate		0.3851	(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) =	0.3273	(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	0.4173	0.4091	0.4009	0.3600	0.3519	0.3109	0.3109	0.3028	0.3273	0.3519	0.3682	0.3846	(22b)
Effective ac	0.5871	0.5837	0.5804	0.5648	0.5619	0.5483	0.5483	0.5458	0.5536	0.5619	0.5678	0.5740	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opening Type (Uw = 1.40)			8.1000	1.3258	10.7386			(27)
External Wall 1	48.8000	8.1000	40.7000	0.1800	7.3260			(29a)
External Roof 1	61.7000		61.7000	0.1300	8.0210			(30)
Total net area of external elements Aum(A, m2)			110.5000					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.0856			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							16.3293	(36)
Total fabric heat loss					(33) + (36) =		42.4149	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	28.6882	28.5230	28.3610	27.6003	27.4580	26.7955	26.7955	26.6728	27.0507	27.4580	27.7459	28.0469	(38)
Heat transfer coeff	71.1031	70.9379	70.7760	70.0153	69.8729	69.2104	69.2104	69.0877	69.4656	69.8729	70.1609	70.4619	(39)
Average = Sum(39)m / 12 =												70.0146	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1524	1.1497	1.1471	1.1348	1.1325	1.1217	1.1217	1.1197	1.1259	1.1325	1.1371	1.1420	(40)
HLP (average)												1.1348	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.0293	(42)
Average daily hot water use (litres/day)	82.3952	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	90.6347	87.3389	84.0431	80.7472	77.4514	74.1556	74.1556	77.4514	80.7472	84.0431	87.3389	90.6347	(44)
Energy conte	134.4086	117.5546	121.3058	105.7574	101.4767	87.5667	81.1434	93.1132	94.2253	109.8105	119.8668	130.1675	(45)
Energy content (annual)										Total = Sum(45)m =		1296.3965	(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)
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													

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

	28.5618	24.9804	25.7775	22.4734	21.5638	18.6079	17.2430	19.7866	20.0229	23.3347	25.4717	27.6606	(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	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	101.4635	(66)

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

	17.1902	15.2681	12.4169	9.4004	7.0269	5.9324	6.4102	8.3322	11.1834	14.1999	16.5734	17.6679	(67)

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

	177.2131	179.0520	174.4180	164.5527	152.0996	140.3954	132.5763	130.7374	135.3714	145.2367	157.6898	169.3940	(68)

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

	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	33.1463	(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)

	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	-81.1708	(71)

Water heating gains (Table 5)

	38.3896	37.1731	34.6472	31.2131	28.9836	25.8443	23.1760	26.5948	27.8096	31.3639	35.3773	37.1782	(72)

Total internal gains

	286.2319	284.9324	274.9211	258.6053	241.5492	225.6112	215.6016	219.1035	227.8035	244.2396	263.0796	277.6792	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South	8.1000	46.7521	0.6300	0.7000	0.7700	115.7331	(78)

Solar gains	115.7331	189.5410	241.4416	272.8815	284.3594	273.6572	267.3797	259.6628	252.2143	204.4378	137.1832	100.0041	(83)
Total gains	401.9650	474.4734	516.3627	531.4867	525.9085	499.2684	482.9813	478.7662	480.0178	448.6773	400.2628	377.6833	(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	60.2607	60.4010	60.5392	61.1970	61.3216	61.9087	61.9087	62.0186	61.6812	61.3216	61.0700	60.8091	
alpha	5.0174	5.0267	5.0359	5.0798	5.0881	5.1272	5.1272	5.1346	5.1121	5.0881	5.0713	5.0539	
util living area	0.9971	0.9929	0.9841	0.9629	0.9103	0.7829	0.6072	0.6342	0.8358	0.9653	0.9935	0.9979	(86)
MIT	19.8032	19.9786	20.2110	20.4881	20.7387	20.9204	20.9828	20.9783	20.8806	20.5517	20.1188	19.7700	(87)
Th 2	19.9583	19.9604	19.9626	19.9725	19.9744	19.9831	19.9831	19.9847	19.9798	19.9744	19.9706	19.9667	(88)
util rest of house	0.9961	0.9905	0.9785	0.9486	0.8726	0.6956	0.4786	0.5087	0.7623	0.9490	0.9909	0.9972	(89)
MIT 2	18.8736	19.0496	19.2810	19.5588	19.7923	19.9444	19.9786	19.9784	19.9147	19.6244	19.1980	18.8473	(90)
Living area fraction									fLA = Living area / (4) =			0.4389	(91)
MIT	19.2816	19.4573	19.6891	19.9666	20.2077	20.3728	20.4193	20.4173	20.3386	20.0314	19.6022	19.2523	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2816	19.4573	19.6891	19.9666	20.2077	20.3728	20.4193	20.4173	20.3386	20.0314	19.6022	19.2523	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9953	0.9891	0.9767	0.9485	0.8824	0.7318	0.5357	0.5643	0.7909	0.9501	0.9897	0.9965	(94)
Useful gains	400.0769	469.2820	504.3269	504.1252	464.0636	365.3491	258.7556	270.1879	379.6261	426.2670	396.1567	376.3636	(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	1065.2362	1032.6661	933.4741	774.8337	594.4587	399.5361	264.3370	277.5441	433.3708	658.9964	877.1623	1060.6114	(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	494.8785	378.5941	319.2856	194.9102	97.0139	0.0000	0.0000	0.0000	0.0000	173.1507	346.3241	509.0803	(98)
Space heating												2513.2374	(98)
Space heating per m2										(98) / (4) =		40.7332	(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	650.5777	512.1569	525.0665	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8427	0.9142	0.9056	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	548.2223	468.1979	475.5243	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	659.8701	639.3886	635.8480	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	80.3865	127.3659	119.2808	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling												327.0332	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	20.0966	31.8415	29.8202	0.0000	0.0000	0.0000	0.0000	(107)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling	81.7583 (107)
Space cooling per m2	1.3251 (108)
Energy for space heating	40.7332 (99)
Energy for space cooling	1.3251 (108)
Total	42.0583 (109)
Target Fabric Energy Efficiency (TFEE)	48.4 (109)

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

Overheating Calculation Input Data

Dwelling type	MidTerrace Flat
Number of storeys	1
Cross ventilation possible	Yes
SAP Region	Thames Valley
Front of dwelling faces	North
Overshading	Average or unknown
Thermal mass parameter	250.0
Night ventilation	No
Ventilation rate during hot weather (ach)	3.00 (Windows half open)

Overheating Calculation

Summer ventilation heat loss coefficient	146.60 (P1)
Transmission heat loss coefficient	45.43 (37)
Summer heat loss coefficient	192.03 (P2)

Overhangs

Orientation	Ratio	Z_overhangs	Overhang type
South	0.000	1.000	None

Solar shading

Orientation	Z blinds	Solar access	Z overhangs	Z summer
South	0.850	0.90	1.000	0.765 (P8)

[Jul]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Shading	Gains W
South	8.1000	112.2060	0.6300	0.7000	0.7650	275.9584
total:						275.9584

	Jun	Jul	Aug	
Solar gains	286	276	272	(P3)
Internal gains	355	340	347	
Total summer gains	641	616	620	(P5)
Summer gain/loss ratio	3.34	3.21	3.23	(P6)
Summer external temperature	16.00	17.90	17.80	
Thermal mass temperature increment (TMP = 250.0)	0.25	0.25	0.25	
Threshold temperature	19.59	21.36	21.28	(P7)
Likelihood of high internal temperature	Not significant	Slight	Slight	

Assessment of likelihood of high internal temperature: Slight

BASIC COMPLIANCE REPORT
Calculation Type: New Build (As Designed)

Darren Evans

Property Reference	DE-21912-Plot 80	**Issued on Date**	25/01/2023
Assessment Reference	Plot 80	**Prop Type Ref**	TF-Flat
Property	Land at Tesco Extra Car Park, Plot 80, 1Bath, 2B3P, RG1		

SAP Rating	90 B	**DER**	15.75	**TER**	27.54
Environmental	91 B	**% DER<TER**	42.81		
CO_2 Emissions (t/year)	0.47	**DFEE**	44.07	**TFEE**	48.37
General Requirements Compliance	Pass	**% DFEE<TFEE**	8.88		

Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Electricity		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	27.54	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	15.75	$kgCO_2/m^2$	Pass
	-11.79 (-42.8%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	48.37	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	44.07	$kWh/m^2/yr$	
	-4.3 (-8.9%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Roof	0.13 (max. 0.20)	0.13 (max. 0.35)	Pass
Openings	1.20 (max. 2.00)	1.20 (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	4.00 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system 1	Room heaters - Electric Panel, convector or radiant heaters	
Main heating system 2	Heat pump with warm air distribution - Electric Dimplex EDL200UK-630	

Secondary heating system	None		
5 Cylinder insulation			
Hot water storage	No cylinder		
6 Controls			
Space heating controls 1	Programmer and room thermostat		Pass
Hot water controls	No cylinder		
7 Low energy lights			
Percentage of fixed lights with low-energy fittings	100	%	
Minimum	75	%	Pass
8 Mechanical ventilation			
Continuous extract system (decentralised)			
Specific fan power	0.1600 0.1200		
Maximum	0.7		Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Thames Valley)	Slight	Pass

Based on:

Overshading	Average
Windows facing South	8.10 m², No overhang
Air change rate	3.00 ach
Blinds/curtains	Dark-coloured curtain or roller blind, closed 100% of daylight hours

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value		
Filled Cavity with Edge Sealing	0.00	W/m²K	Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals	4.00 (design value)		
Maximum	10.0		Pass

10 Key features

Party wall U-value	0.00	W/m²K
Photovoltaic array	1.64	kW

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BLOCK COMPLIANCE
Calculation Type: New Build (As Designed)

Darren Evans

Block Reference	4 PV planel per falt	**Issued on Date**	25/01/2023
Block Name	335		
Assessor Details	Mr. Charles Sims, Charles Sims, Tel: , charles@darren-evans.co.uk	**Assessor ID**	P081-0001
Client			

Block Compliance Report - DER

Block Reference: 4 PV planel per falt		Block Name: 335			
Property-Assessment Reference	**Multiplier**	**Floor Area (m^2)**	**DER ($kgCO_2/m^2$)**	**TER ($kgCO_2/m^2$)**	**% DER/TER**
DE-21912-Plot 20-Plot 20	1	61.7	9.39	24.71	62.00 %
DE-21912-Plot 17-Plot 17	1	61.7	11.56	25.89	55.36 %
DE-21912- Plot 07-Plot 07	1	50.76	8.84	26.11	66.14 %
DE-21912 - Plot 05-Plot 05	1	65.09	12.75	26.21	51.36 %
DE-21912-Plot 40-Plot 40	1	61.7	6.66	21.38	68.85 %
DE-21912-Plot 27-Plot 27	1	62.48	6.76	20.78	67.47 %
DE-21912-Plot 25-Plot 25	1	65.09	9.65	22.66	57.41 %
DE-21912-Plot 67-Plot 67	1	62.48	13.70	25.47	46.21 %
DE-21912-Plot 80-Plot 80	1	61.7	15.75	27.54	42.81 %
DE-21912-Plot 65-Plot 65	1	65.09	17.89	28.43	37.07 %
DE-21912-Plot 77-Plot 77	1	61.7	20.17	30.69	34.27 %
DE-21912-Plot 37-Plot 37	1	61.7	11.61	24.84	53.25 %
Totals:	12	741.19	144.73	304.71	
Average DER = 12.12 $kgCO_2/m^2$		**% DER/TER**	PASS		
Average TER = 25.38 $kgCO_2/m^2$		52.25 %			

Block Compliance Report - DFEE

Block Reference: 4 PV planel per falt		Block Name: 335			
Property-Assessment Reference	**Multiplier**	**Floor Area (m^2)**	**DFEE ($kWh/m^2/yr$)**	**TFEE ($kWh/m^2/yr$)**	**% DFEE/TFEE**
DE-21912-Plot 20-Plot 20	1	61.7	32.22	39.28	17.99 %
DE-21912-Plot 17-Plot 17	1	61.7	36.71	43.81	16.22 %
DE-21912- Plot 07-Plot 07	1	50.76	34.10	38.48	11.38 %
DE-21912 - Plot 05-Plot 05	1	65.09	38.23	46.52	17.82 %
DE-21912-Plot 40-Plot 40	1	61.7	26.99	27.95	3.45 %
DE-21912-Plot 27-Plot 27	1	62.48	26.37	26.48	0.39 %
DE-21912-Plot 25-Plot 25	1	65.09	32.34	34.66	6.71 %
DE-21912-Plot 67-Plot 67	1	62.48	39.57	42.27	6.38 %
DE-21912-Plot 80-Plot 80	1	61.7	44.07	48.37	8.88 %
DE-21912-Plot 65-Plot 65	1	65.09	48.15	53.91	10.69 %
DE-21912-Plot 77-Plot 77	1	61.7	52.85	59.27	10.83 %
DE-21912-Plot 37-Plot 37	1	61.7	36.79	40.29	8.69 %
Totals:	12	741.19	448.37	501.28	
Average DFEE = 37.43 $kWh/m^2/yr$		**% DFEE/TFEE**	PASS		
Average TFEE = 41.85 $kWh/m^2/yr$		10.56 %			