

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Fri 21 Mar 2025 12:00:21

Project Information			
Assessed By	Connor Lewis	Building Type	Flat, End-terrace
OCDEA Registration	EES/032592	Assessment Date	2025-03-21

Dwelling Details			
Assessment Type	As designed	Total Floor Area	35 m ²
Site Reference	8606-2	Plot Reference	0001
Address	233 Flat 2 London Road, Reading, RG1 3NY		

Client Details	
Name	Client
Company	Company
Address	Address, Town, AA11 1AA

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

1a Target emission rate and dwelling emission rate			
Fuel for main heating system	Mains gas		
Target carbon dioxide emission rate	17.75 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	13.67 kgCO ₂ /m ²		OK
1b Target primary energy rate and dwelling primary energy			
Target primary energy	94.68 kWh _{PE} /m ²		
Dwelling primary energy	74.79 kWh _{PE} /m ²		OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	41.5 kWh/m ²		
Dwelling fabric energy efficiency	39.9 kWh/m ²		OK

2a Fabric U-values				
Element	Maximum permitted average U-Value [W/m ² K]	Dwelling average U-Value [W/m ² K]	Element with highest individual U-Value	
External walls	0.26	0.19	Walls (1) (0.19)	OK
Party walls	0.2	0	Party Wall (1) (0)	N/A
Curtain walls	1.6	0	N/A	N/A
Floors	0.18	N/A	N/A	N/A
Roofs	0.16	0.15	Roof (2) (0.16)	OK
Windows, doors, and roof windows	1.6	1.2	Opening (1.2)	OK
Rooflights	2.2	N/A	N/A	N/A

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))			
Name	Net area [m ²]	U-Value [W/m ² K]	
Exposed wall: Walls (1)	24.9015	0.19	
Party wall: Party Wall (1)	35.14	0 (!)	
Exposed roof: Roof (1)	21.27	0.14	
Exposed roof: Roof (2)	21.48	0.16	

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
Opening, Window	0.9595	South East	0.7	1.2
Opening, Window	0.9595	South East	0.7	1.2
Opening, Window	0.9595	South East	0.7	1.2
Opening, Window	0.9	North East	0.7	1.2
Opening, Window	0.9	North East	0.7	1.2
Opening, Window	0.9	North East	0.7	1.2

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))				
Building part 1: Thermal bridging calculated from linear thermal transmittances for each junction				
Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.033 (!)	

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E3: Sill	Calculated by person with suitable expertise	0.03 (!)	
External wall	E4: Jamb	Calculated by person with suitable expertise	0.024 (!)	
External wall	E7: Party floor between dwellings (in blocks of flats)	Calculated by person with suitable expertise	0.035 (!)	
External wall	E11: Eaves (insulation at rafter level)	Calculated by person with suitable expertise	0.021 (!)	
External wall	E13: Gable (insulation at rafter level)	Calculated by person with suitable expertise	0.038 (!)	
Party wall	P5: Roof (insulation at rafter level)	Calculated by person with suitable expertise	0.036 (!)	
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.033 (!)	
External wall	E18: Party wall between dwellings	Calculated by person with suitable expertise	0.039 (!)	
Roof	R4: Ridge (vaulted ceiling)	SAP table default	0.12	

3 Air permeability (better than typically expected values are flagged with a subsequent (!))

Maximum permitted air permeability at 50Pa	8 m ³ /hm ²	
Dwelling air permeability at 50Pa	3.5 m ³ /hm ² , Design value (!)	OK
Air permeability test certificate reference		

4 Space heating

Main heating system 1: Boiler with radiators or underfloor heating - Mains gas

Efficiency	89.0%
Emitter type	Radiators
Flow temperature	
System type	
Manufacturer	Boiler
Model	Boiler
Commissioning	

Secondary heating system: N/A

Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water

Cylinder/store - type: N/A

Capacity	N/A
Declared heat loss	N/A
Primary pipework insulated	N/A
Manufacturer	
Model	
Commissioning	

Waste water heat recovery system 1 - type: N/A

Efficiency	
Manufacturer	
Model	

6 Controls

Main heating 1 - type: Time and temperature zone control by arrangement of plumbing and electrical services

Function	
Ecodesign class	
Manufacturer	
Model	

Water heating - type: N/A

Manufacturer	
Model	

7 Lighting

Minimum permitted light source efficacy	75 lm/W	
Lowest light source efficacy	80 lm/W	OK
External lights control	N/A	

8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	1.5 W/(l/s)	
Specific fan power	0.57 W/(l/s)	OK
Minimum permitted heat recovery efficiency	73%	
Heat recovery efficiency	88%	OK
Manufacturer/Model	energiSava 260, Issue B	
Commissioning		
9 Local generation		
Technology type: Photovoltaic system (1)		
Peak power	2.15 kWp	
Orientation	South East	
Pitch	30°	
Overshading	None or very little	
Manufacturer		
MCS certificate		
10 Heat networks		
N/A		
11 Supporting documentary evidence		
N/A		
12 Declarations		
a. Assessor Declaration		
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.		
Signed:	Assessor ID:	
Name:	Date:	
b. Client Declaration		
N/A		

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Fri 21 Mar 2025 12:02:40

Project Information			
Assessed By	Connor Lewis	Building Type	Maisonette, Semi-detached
OCDEA Registration	EES/032592	Assessment Date	2025-03-21

Dwelling Details			
Assessment Type	As designed	Total Floor Area	61 m ²
Site Reference	8606-4	Plot Reference	0001
Address	233 Flat 4 London Road, Reading, RG1 3NY		

Client Details	
Name	Client
Company	Company
Address	Address, Town, AA11 1AA

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

1a Target emission rate and dwelling emission rate			
Fuel for main heating system	Mains gas		
Target carbon dioxide emission rate	14.72 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	10.97 kgCO ₂ /m ²		OK
1b Target primary energy rate and dwelling primary energy			
Target primary energy	77.82 kWh _{PE} /m ²		
Dwelling primary energy	59.0 kWh _{PE} /m ²		OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	42.3 kWh/m ²		
Dwelling fabric energy efficiency	32.1 kWh/m ²		OK

2a Fabric U-values				
Element	Maximum permitted average U-Value [W/m ² K]	Dwelling average U-Value [W/m ² K]	Element with highest individual U-Value	
External walls	0.26	0.15	Walls (1) (0.15)	OK
Party walls	0.2	0	Party Wall (1) (0)	N/A
Curtain walls	1.6	0	N/A	N/A
Floors	0.18	0.1	Ground floor (0.1)	OK
Roofs	0.16	N/A	N/A	N/A
Windows, doors, and roof windows	1.6	1.2	Opening (1.2)	OK
Rooflights	2.2	N/A	N/A	N/A

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	Net area [m ²]	U-Value [W/m ² K]
Exposed wall: Walls (1)	67.884	0.15
Party wall: Party Wall (1)	7.38	0 (!)
Ground floor: Ground floor, Ground floor	61.36	0.1 (!)

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
Opening, Door	1.911	North East	N/A	1.2
Window, Window	1.395	North East	0.7	1.2
Window, Window	1.395	North East	0.7	1.2
Window, Window	1.395	North East	0.7	1.2
Window, Window	1.395	North East	0.7	1.2
Window, Window	1.395	North East	0.7	1.2
Opening, Window	3.15	South East	0.7	1.2

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))				
Building part 1: Thermal bridging calculated from linear thermal transmittances for each junction				
Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E7: Party floor between dwellings (in blocks of flats)	Calculated by person with suitable expertise	0.035 (!)	

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.033 (!)	
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.065	
External wall	E18: Party wall between dwellings	Calculated by person with suitable expertise	0.039 (!)	
External wall	E25: Staggered party wall between dwellings	Calculated by person with suitable expertise	0.031 (!)	
Party wall	P1: Ground floor	Calculated by person with suitable expertise	0.037 (!)	
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.033 (!)	
External wall	E3: Sill	Calculated by person with suitable expertise	0.03 (!)	
External wall	E4: Jamb	Calculated by person with suitable expertise	0.024 (!)	
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.048	

3 Air permeability (better than typically expected values are flagged with a subsequent (!))

Maximum permitted air permeability at 50Pa	8 m ³ /hm ²	
Dwelling air permeability at 50Pa	3.5 m ³ /hm ² , Design value (!)	OK
Air permeability test certificate reference		

4 Space heating

Main heating system 1: Boiler with radiators or underfloor heating - Mains gas

Efficiency	89.0%
Emitter type	Radiators
Flow temperature	
System type	
Manufacturer	Boiler
Model	Boiler
Commissioning	

Secondary heating system: N/A

Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water

Cylinder/store - type: N/A

Capacity	N/A
Declared heat loss	N/A
Primary pipework insulated	N/A
Manufacturer	
Model	
Commissioning	

Waste water heat recovery system 1 - type: N/A

Efficiency	
Manufacturer	
Model	

6 Controls

Main heating 1 - type: Time and temperature zone control by arrangement of plumbing and electrical services

Function	
Ecodesign class	
Manufacturer	
Model	

Water heating - type: N/A

Manufacturer	
Model	

7 Lighting		
Minimum permitted light source efficacy	75 lm/W	
Lowest light source efficacy	80 lm/W	OK
External lights control	N/A	
8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	1.5 W/(l/s)	
Specific fan power	0.57 W/(l/s)	OK
Minimum permitted heat recovery efficiency	73%	
Heat recovery efficiency	88%	OK
Manufacturer/Model	energiSava 260, Issue B	
Commissioning		
9 Local generation		
Technology type: Photovoltaic system (1)		
Peak power	2.1 kWp	
Orientation	South West	
Pitch	30°	
Overshading	None or very little	
Manufacturer		
MCS certificate		
10 Heat networks		
N/A		
11 Supporting documentary evidence		
N/A		
12 Declarations		
a. Assessor Declaration		
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.		
Signed:	Assessor ID:	
Name:	Date:	
b. Client Declaration		
N/A		

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Fri 21 Mar 2025 12:03:56

Project Information			
Assessed By	Connor Lewis	Building Type	Flat, Semi-detached
OCDEA Registration	EES/032592	Assessment Date	2025-03-21

Dwelling Details			
Assessment Type	As designed	Total Floor Area	42 m ²
Site Reference	8606-6	Plot Reference	0001
Address	233 Flat 6 London Road, Reading, RG1 3NY		

Client Details	
Name	Client
Company	Company
Address	Address, Town, AA11 1AA

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

1a Target emission rate and dwelling emission rate			
Fuel for main heating system	Mains gas		
Target carbon dioxide emission rate	14.57 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	13.42 kgCO ₂ /m ²		OK
1b Target primary energy rate and dwelling primary energy			
Target primary energy	77.37 kWh _{PE} /m ²		
Dwelling primary energy	72.05 kWh _{PE} /m ²		OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	33.2 kWh/m ²		
Dwelling fabric energy efficiency	34.6 kWh/m ²		FAIL

2a Fabric U-values				
Element	Maximum permitted average U-Value [W/m ² K]	Dwelling average U-Value [W/m ² K]	Element with highest individual U-Value	
External walls	0.26	0.15	Walls (3) (0.3)	OK
Party walls	0.2	0	Party Wall (1) (0)	N/A
Curtain walls	1.6	0	N/A	N/A
Floors	0.18	N/A	N/A	N/A
Roofs	0.16	0.14	Roof (1) (0.14)	OK
Windows, doors, and roof windows	1.6	1.22	Opening (1.3)	OK
Rooflights	2.2	N/A	N/A	N/A

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	Net area [m ²]	U-Value [W/m ² K]
Exposed wall: Walls (1)	8.585	0.15
Exposed wall: Walls (2)	19.68	0.1 (!)
Exposed wall: Walls (3)	6.076	0.3
Party wall: Party Wall (1)	16.73	0 (!)
Exposed roof: Roof (1)	48.303	0.14
Exposed roof: Roof (2)	4.06	0.13

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
Opening, Window	1.395	North West	0.7	1.2
Opening, Window	1.062	North East	0.7	1.2
Opening, Window	1.062	North East	0.7	1.2
Opening, Window	1.89	South East	0.7	1.2
Opening, Roof window	0.399	South West	0.7	1.3
Opening, Roof window	0.399	South West	0.7	1.3
Opening, Roof window	0.399	South West	0.7	1.3

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))	
Building part 1: Thermal bridging calculated from linear thermal transmittances for each junction	

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E7: Party floor between dwellings (in blocks of flats)	Calculated by person with suitable expertise	0.035 (!)	
External wall	E11: Eaves (insulation at rafter level)	Calculated by person with suitable expertise	0.021 (!)	
External wall	E13: Gable (insulation at rafter level)	Calculated by person with suitable expertise	0.038 (!)	
Party wall	P5: Roof (insulation at rafter level)	Calculated by person with suitable expertise	0.036 (!)	
Roof	R4: Ridge (vaulted ceiling)	SAP table default	0.12	
External wall	E16: Corner (normal)	SAP table default	0.18	
Roof	R7: Flat ceiling (inverted)	SAP table default	0.12	
Roof	R9: Roof to wall (flat ceiling)	SAP table default	0.32	
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.033 (!)	
External wall	E3: Sill	Calculated by person with suitable expertise	0.03 (!)	
External wall	E4: Jamb	Calculated by person with suitable expertise	0.024 (!)	
Roof	R1: Head of roof window	Calculated by person with suitable expertise	0.061	
Roof	R2: Sill of roof window	Calculated by person with suitable expertise	0.06	
Roof	R3: Jamb of roof window	Calculated by person with suitable expertise	0.056	

3 Air permeability (better than typically expected values are flagged with a subsequent (!))

Maximum permitted air permeability at 50Pa	8 m ³ /hm ²	
Dwelling air permeability at 50Pa	3.5 m ³ /hm ² , Design value (!)	OK
Air permeability test certificate reference		

4 Space heating

Main heating system 1: Boiler with radiators or underfloor heating - Mains gas		
Efficiency	89.0%	
Emitter type	Radiators	
Flow temperature		
System type		
Manufacturer	Boiler	
Model	Boiler	
Commissioning		
Secondary heating system: N/A		
Fuel	N/A	
Efficiency	N/A	
Commissioning		

5 Hot water

Cylinder/store - type: N/A		
Capacity	N/A	
Declared heat loss	N/A	
Primary pipework insulated	N/A	
Manufacturer		
Model		
Commissioning		
Waste water heat recovery system 1 - type: N/A		
Efficiency		
Manufacturer		
Model		

6 Controls

Main heating 1 - type: Time and temperature zone control by arrangement of plumbing and electrical services		
Function		
Ecodesign class		
Manufacturer		
Model		

Water heating - type: N/A		
Manufacturer		
Model		
7 Lighting		
Minimum permitted light source efficacy	75 lm/W	
Lowest light source efficacy	80 lm/W	OK
External lights control	N/A	
8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	1.5 W/(l/s)	
Specific fan power	0.57 W/(l/s)	OK
Minimum permitted heat recovery efficiency	73%	
Heat recovery efficiency	88%	OK
Manufacturer/Model	energiSava 260, Issue B	
Commissioning		
9 Local generation		
Technology type: Photovoltaic system (1)		
Peak power	2.1 kWp	
Orientation	South West	
Pitch	45°	
Overshading	None or very little	
Manufacturer		
MCS certificate		
10 Heat networks		
N/A		
11 Supporting documentary evidence		
N/A		
12 Declarations		
a. Assessor Declaration		
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.		
Signed:	Assessor ID:	
Name:	Date:	
b. Client Declaration		
N/A		

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Fri 21 Mar 2025 12:03:19

Project Information			
Assessed By	Connor Lewis	Building Type	Flat, Semi-detached
OCDEA Registration	EES/032592	Assessment Date	2025-03-21

Dwelling Details			
Assessment Type	As designed	Total Floor Area	58 m ²
Site Reference	8606-5	Plot Reference	0001
Address	233 Flat 5 London Road, Reading, RG1 3NY		

Client Details	
Name	Client
Company	Company
Address	Address, Town, AA11 1AA

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

1a Target emission rate and dwelling emission rate			
Fuel for main heating system	Mains gas		
Target carbon dioxide emission rate	13.02 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	10.29 kgCO ₂ /m ²		OK
1b Target primary energy rate and dwelling primary energy			
Target primary energy	68.65 kWh _{PE} /m ²		
Dwelling primary energy	55.2 kWh _{PE} /m ²		OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	33.9 kWh/m ²		
Dwelling fabric energy efficiency	27.6 kWh/m ²		OK

2a Fabric U-values				
Element	Maximum permitted average U-Value [W/m ² K]	Dwelling average U-Value [W/m ² K]	Element with highest individual U-Value	
External walls	0.26	0.15	Walls (1) (0.15)	OK
Party walls	0.2	0	Party Wall (1) (0)	N/A
Curtain walls	1.6	0	N/A	N/A
Floors	0.18	N/A	N/A	N/A
Roofs	0.16	0.1	Roof (1) (0.1)	OK
Windows, doors, and roof windows	1.6	1.2	Opening (1.2)	OK
Rooflights	2.2	N/A	N/A	N/A

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))			
Name	Net area [m ²]	U-Value [W/m ² K]	
Exposed wall: Walls (1)	63.178	0.15	
Party wall: Party Wall (1)	7.37	0 (!)	
Exposed roof: Roof (1)	13.71	0.1 (!)	

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
Opening, Window	1.395	North East	0.7	1.2
Opening, Window	1.395	North East	0.7	1.2
Opening, Window	1.395	North East	0.7	1.2
Opening, Window	1.395	North East	0.7	1.2
Opening, Window	1.386	North West	0.7	1.2
Opening, Window	1.386	North West	0.7	1.2
Opening, Window	3.15	South East	0.7	1.2

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))				
Building part 1: Thermal bridging calculated from linear thermal transmittances for each junction				
Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.033 (!)	

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E3: Sill	Calculated by person with suitable expertise	0.03 (!)	
External wall	E4: Jamb	Calculated by person with suitable expertise	0.024 (!)	
External wall	E7: Party floor between dwellings (in blocks of flats)	Calculated by person with suitable expertise	0.035 (!)	
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.033 (!)	
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.065	
External wall	E18: Party wall between dwellings	Calculated by person with suitable expertise	0.039 (!)	

3 Air permeability (better than typically expected values are flagged with a subsequent (!))

Maximum permitted air permeability at 50Pa	8 m ³ /hm ²	
Dwelling air permeability at 50Pa	3.5 m ³ /hm ² , Design value (!)	OK
Air permeability test certificate reference		

4 Space heating

Main heating system 1: Boiler with radiators or underfloor heating - Mains gas

Efficiency	89.0%
Emitter type	Radiators
Flow temperature	
System type	
Manufacturer	Boiler
Model	Boiler
Commissioning	

Secondary heating system: N/A

Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water

Cylinder/store - type: N/A

Capacity	N/A
Declared heat loss	N/A
Primary pipework insulated	N/A
Manufacturer	
Model	
Commissioning	

Waste water heat recovery system 1 - type: N/A

Efficiency	
Manufacturer	
Model	

6 Controls

Main heating 1 - type: Time and temperature zone control by arrangement of plumbing and electrical services

Function	
Ecodesign class	
Manufacturer	
Model	

Water heating - type: N/A

Manufacturer	
Model	

7 Lighting

Minimum permitted light source efficacy	75 lm/W	
Lowest light source efficacy	80 lm/W	OK
External lights control	N/A	

8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	1.5 W/(l/s)	
Specific fan power	0.57 W/(l/s)	OK
Minimum permitted heat recovery efficiency	73%	
Heat recovery efficiency	88%	OK
Manufacturer/Model	energiSava 260, Issue B	
Commissioning		

9 Local generation	
Technology type: Photovoltaic system (1)	
Peak power	2.1 kWp
Orientation	South West
Pitch	45°
Overshading	None or very little
Manufacturer	
MCS certificate	

10 Heat networks	
N/A	

11 Supporting documentary evidence	
N/A	

12 Declarations		
a. Assessor Declaration		
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.		
Signed:	Assessor ID:	
Name:	Date:	
b. Client Declaration		
N/A		

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Fri 21 Mar 2025 12:02:10

Project Information			
Assessed By	Connor Lewis	Building Type	Maisonette, End-terrace
OCDEA Registration	EES/032592	Assessment Date	2025-03-21

Dwelling Details			
Assessment Type	As designed	Total Floor Area	59 m ²
Site Reference	8606-3	Plot Reference	0001
Address	233 Flat 3 London Road, Reading, RG1 3NY		

Client Details	
Name	Client
Company	Company
Address	Address, Town, AA11 1AA

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

1a Target emission rate and dwelling emission rate

Fuel for main heating system	Mains gas
Target carbon dioxide emission rate	16.07 kgCO ₂ /m ²
Dwelling carbon dioxide emission rate	13.38 kgCO ₂ /m ² OK

1b Target primary energy rate and dwelling primary energy

Target primary energy	85.04 kWh _{PE} /m ²
Dwelling primary energy	72.41 kWh _{PE} /m ² OK

1c Target fabric energy efficiency and dwelling fabric energy efficiency

Target fabric energy efficiency	47.8 kWh/m ²
Dwelling fabric energy efficiency	43.3 kWh/m ² OK

2a Fabric U-values

Element	Maximum permitted average U-Value [W/m ² K]	Dwelling average U-Value [W/m ² K]	Element with highest individual U-Value	
External walls	0.26	0.19	Walls (1) (0.19)	OK
Party walls	0.2	0	Party Wall (1) (0)	N/A
Curtain walls	1.6	0	N/A	N/A
Floors	0.18	0.1	Ground floor (0.1)	OK
Roofs	0.16	0.16	Roof (1) (0.16)	OK
Windows, doors, and roof windows	1.6	1.2	Opening (1.2)	OK
Rooflights	2.2	N/A	N/A	N/A

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))

Name	Net area [m ²]	U-Value [W/m ² K]
Exposed wall: Walls (1)	71.49	0.19
Party wall: Party Wall (1)	43.81	0 (!)
Ground floor: Ground floor, Ground floor	31.04	0.1 (!)
Exposed roof: Roof (1)	28.15	0.16

2c Openings (better than typically expected values are flagged with a subsequent (!))

Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
Opening, Door	1.89	North East	N/A	1.2
Opening, Window	1.305	North East	0.7	1.2
Opening, Window	1.305	North East	0.7	1.2
Opening, Window	1.305	North East	0.7	1.2
Opening, Window	0.9	North East	0.7	1.2
Opening, Window	1.305	North West	0.7	1.2
Opening, Window	1.305	North West	0.7	1.2
Opening, Window	1.305	North West	0.7	1.2
Opening, Window	1.305	North West	0.7	1.2
Opening, Window	1.305	North West	0.7	1.2

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))

Building part 1: Thermal bridging calculated from linear thermal transmittances for each junction

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.033 (!)	
External wall	E3: Sill	Calculated by person with suitable expertise	0.03 (!)	
External wall	E4: Jamb	Calculated by person with suitable expertise	0.024 (!)	
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.048	
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.001 (!)	
External wall	E7: Party floor between dwellings (in blocks of flats)	Calculated by person with suitable expertise	0.035 (!)	
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.033 (!)	
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.065	
External wall	E18: Party wall between dwellings	Calculated by person with suitable expertise	0.039 (!)	
External wall	E25: Staggered party wall between dwellings	Calculated by person with suitable expertise	0.031 (!)	
External wall	E14: Flat roof	SAP table default	0.16	
Party wall	P4: Roof (insulation at ceiling level)	Calculated by person with suitable expertise	0.033 (!)	

3 Air permeability (better than typically expected values are flagged with a subsequent (!))				
Maximum permitted air permeability at 50Pa		8 m ³ /hm ²		
Dwelling air permeability at 50Pa		3.5 m ³ /hm ² , Design value (!)		OK
Air permeability test certificate reference				

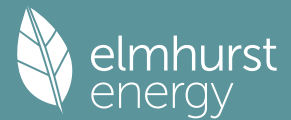
4 Space heating	
Main heating system 1: Boiler with radiators or underfloor heating - Mains gas	
Efficiency	89.0%
Emitter type	Radiators
Flow temperature	
System type	
Manufacturer	Boiler
Model	Boiler
Commissioning	
Secondary heating system: N/A	
Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water	
Cylinder/store - type: N/A	
Capacity	N/A
Declared heat loss	N/A
Primary pipework insulated	N/A
Manufacturer	
Model	
Commissioning	
Waste water heat recovery system 1 - type: N/A	
Efficiency	
Manufacturer	
Model	

6 Controls	
Main heating 1 - type: Time and temperature zone control by arrangement of plumbing and electrical services	
Function	
Ecodesign class	
Manufacturer	
Model	

Water heating - type: N/A		
Manufacturer		
Model		
7 Lighting		
Minimum permitted light source efficacy	75 lm/W	
Lowest light source efficacy	80 lm/W	OK
External lights control	N/A	
8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	1.5 W/(l/s)	
Specific fan power	0.68 W/(l/s)	OK
Minimum permitted heat recovery efficiency	73%	
Heat recovery efficiency	85%	OK
Manufacturer/Model	energiSava 260, Issue B	
Commissioning		
9 Local generation		
Technology type: Photovoltaic system (1)		
Peak power	2.15 kWp	
Orientation	South East	
Pitch	30°	
Overshading	None or very little	
Manufacturer		
MCS certificate		
10 Heat networks		
N/A		
11 Supporting documentary evidence		
N/A		
12 Declarations		
a. Assessor Declaration		
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.		
Signed:	Assessor ID:	
Name:		
	Date:	
b. Client Declaration		
N/A		

Block Compliance



Block Reference	8606 - extension	Issued on Date	21/03/2025
Block Name	233 London Road, Reading, RG1 3NY		
Calculation Type	New Build (As Designed)		

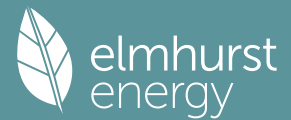
Assessor Details	Mr. Connor Lewis	Assessor ID	DQ56-0001
Client			

Block Compliance Report - DER				
Block Reference: 8606 - extension		Block Name: 233 London Road, Reading, RG1 3NY		
Property-Assessment Reference	Floor area (m ²)	DER (kgCO ₂ /m ²)	TER (kgCO ₂ /m ²)	% DER/TER
8606-2 - 0001	34.91	13.67	17.75	22.99 %
8606-3 - 0001	59.19	13.38	16.07	16.74 %
Totals:	94.10	27.05	33.82	
Average DER = 13.49 kgCO ₂ /m ²	% DER/TER	PASS		
Average TER = 16.69 kgCO ₂ /m ²	19.20 %			

Block Compliance Report - DFEE				
Block Reference: 8606 - extension		Block Name: 233 London Road, Reading, RG1 3NY		
Property-Assessment Reference	Floor area (m ²)	DFEE (kWh/m ² /yr)	TFEE (kWh/m ² /yr)	% DFEE/TFEE
8606-2 - 0001	34.91	39.90	41.54	3.95 %
8606-3 - 0001	59.19	43.27	47.84	9.55 %
Totals:	94.10	83.17	89.38	
Average DFEE = 42.02 kgCO ₂ /m ²	% DFEE/TFEE	PASS		
Average TFEE = 45.50 kgCO ₂ /m ²	7.66 %			

Block Compliance Report - DPER				
Block Reference: 8606 - extension		Block Name: 233 London Road, Reading, RG1 3NY		
Property-Assessment Reference	Floor area (m ²)	DPER (kWh/m ² /yr)	TPER (kWh/m ² /yr)	% DPER/TPER
8606-2 - 0001	34.91	74.79	94.68	21.01 %
8606-3 - 0001	59.19	72.41	85.04	14.85 %
Totals:	94.10	147.20	179.72	
Average DPER = 73.29 kgCO ₂ /m ²	% DPER/TPER	PASS		
Average TPER = 88.62 kgCO ₂ /m ²	17.29 %			

Block Compliance



Block Reference	8606 - new build	Issued on Date	21/03/2025
Block Name	233 London Road, Reading, RG1 3NY		
Calculation Type	New Build (As Designed)		

Assessor Details	Mr. Connor Lewis	Assessor ID	DQ56-0001
Client			

Block Compliance Report - DER				
Block Reference: 8606 - new build		Block Name: 233 London Road, Reading, RG1 3NY		
Property-Assessment Reference	Floor area (m ²)	DER (kgCO ₂ /m ²)	TER (kgCO ₂ /m ²)	% DER/TER
8606-4 - 0001	61.36	10.97	14.72	25.48 %
8606-5 - 0001	58.26	10.29	13.02	20.97 %
8606-6 - 0001	41.98	13.42	14.57	7.89 %
Totals:	161.60	34.68	42.31	
Average DER = 11.36 kgCO ₂ /m ²	% DER/TER	PASS		
Average TER = 14.07 kgCO ₂ /m ²	19.24 %			

Block Compliance Report - DFEE				
Block Reference: 8606 - new build	Block Name: 233 London Road, Reading, RG1 3NY			
Property-Assessment Reference	Floor area (m²)	DFEE (kWh/m²/yr)	TFEE (kWh/m²/yr)	% DFEE/TFEE
8606-4 - 0001	61.36	32.07	42.31	24.20 %
8606-5 - 0001	58.26	27.59	33.88	18.56 %
8606-6 - 0001	41.98	34.58	33.19	-4.18 %
Totals:	161.60	94.24	109.38	
Average DFEE = 31.11 kgCO₂/m²	% DFEE/TFEE	PASS		
Average TFEE = 36.90 kgCO₂/m²	15.70 %			

Block Compliance Report - DPER				
Block Reference: 8606 - new build		Block Name: 233 London Road, Reading, RG1 3NY		
Property-Assessment Reference	Floor area (m ²)	DPER (kWh/m ² /yr)	TPER (kWh/m ² /yr)	% DPER/TPER
8606-4 - 0001	61.36	59.00	77.82	24.18 %
8606-5 - 0001	58.26	55.20	68.65	19.59 %
8606-6 - 0001	41.98	72.05	77.37	6.88 %

Block Compliance



Totals:	161.60	186.25	223.84	
Average DPER = 61.02 kgCO ₂ /m ²	% DPER/TPER	PASS		
Average TPER = 74.40 kgCO ₂ /m ²	17.98 %			

Full SAP Calculation Printout



Property Reference	8606-1			Issued on Date	21/03/2025	
Assessment Reference	Notional		Prop Type Ref			
Property	Flat 1, 233, London Road, Reading, RG1 3NY					
SAP Rating	77 C	DER	29.06	TER	15.87	
Environmental	82 B	% DER < TER				-83.11
CO ₂ Emissions (t/year)	1.02	DFEE	70.81	TFEE	36.29	
Compliance Check	See BREL	% DFEE < TFEE				-95.09
% DPER < TPER	-91.92	DPER	162.08	TPER	84.45	
Assessor Details	Mr. Connor Lewis			Assessor ID	DQ56-0001	
Client						

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	38.1900 (1b)	2.6100 (2b)	99.6759 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	38.1900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	99.6759 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	No	
Pressure Test Method	Blower Door	
Measured/design AP50	15.0000	(17)
Infiltration rate	0.7500	(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) =	0.6375 (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	0.8128	0.7969	0.7809	0.7013	0.6853	0.6056	0.6056	0.5897	0.6375	0.6853	0.7172	0.7491 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												79.2000 (23c)
Effective ac	0.9168	0.9009	0.8849	0.8053	0.7893	0.7096	0.7096	0.6937	0.7415	0.7893	0.8212	0.8531 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			6.8500	1.3258	9.0814		(27)
HGD			1.7900	1.4000	2.5060		(26a)
Floor to commercial space			35.9300	0.2500	8.9825	20.0000	718.6000 (28b)
Upgraded wall	36.4400	8.6400	27.8000	0.3000	8.3400	9.0000	250.2000 (29a)
Total net area of external elements Aum(A, m ²)			72.3700				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	28.9099	(33)
Main dwelling							
Party Wall 1			36.4400	0.0000	0.0000	0.0000	0.0000 (32)
Party Floor 1			2.2700			30.0000	68.1000 (32d)
Party Ceiling 1			38.1900			30.0000	1145.7000 (32b)
Internal Wall 1			46.8200			9.0000	421.3800 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		2603.9800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							68.1849 (35)
Thermal bridges (Default value 0.200 * total exposed area)							14.4740 (36)

elmhurst
energy

$$\begin{aligned} (33) + (36) + (36a) &= 43.3839 \quad (37) \end{aligned}$$
[illegible]

4. Water heating energy requirements (kWh/year)

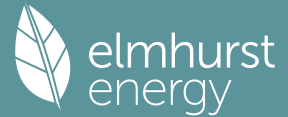
5. Internal gains (see Table 5 and 5a)

6. Solar gains

7. Mean internal temperature (heating season)

Page 2 of 14

Full SAP Calculation Printout



Th 2	19.3834	19.3927	19.4021	19.4494	19.4589	19.5072	19.5072	19.5169	19.4878	19.4589	19.4399	19.4209 (88)
util rest of house	0.8708	0.8486	0.8101	0.7408	0.6382	0.4909	0.3461	0.3806	0.5780	0.7509	0.8391	0.8766 (89)
MIT 2	14.8724	15.2894	16.0712	17.1860	18.1813	19.0033	19.3390	19.3082	18.7511	17.5213	16.0883	14.8731 (90)
Living area fraction									flA = Living area / (4) =			0.5609 (91)
MIT	15.9541	16.3307	17.0373	18.0449	18.9626	19.7337	20.0804	20.0377	19.4822	18.3387	17.0406	15.9498 (92)
Temperature adjustment												0.0000
adjusted MIT	15.9541	16.3307	17.0373	18.0449	18.9626	19.7337	20.0804	20.0377	19.4822	18.3387	17.0406	15.9498 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8227	0.7994	0.7620	0.7009	0.6174	0.5055	0.3978	0.4270	0.5776	0.7138	0.7923	0.8294	(94)
Useful gains	334.3618	353.1778	360.9147	352.4526	322.5704	256.4170	192.8890	195.2751	249.0355	289.0122	307.6630	324.1262	(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	857.0484	834.6263	763.8756	638.9641	503.6350	342.5464	232.2326	240.8196	364.7762	536.6535	699.7688	839.4497	(97)
Space heating kWh	388.8788	323.5334	299.8029	206.2883	134.7121	0.0000	0.0000	0.0000	0.0000	184.2451	282.3162	383.4007	(98a)
Space heating requirement - total per year (kWh/year)												2203.1775	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	388.8788	323.5334	299.8029	206.2883	134.7121	0.0000	0.0000	0.0000	0.0000	184.2451	282.3162	383.4007	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2203.1775	
Space heating per m2										(98c) / (4) =		57.6899	(99)

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 %)													89.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	388.8788	323.5334	299.8029	206.2883	134.7121	0.0000	0.0000	0.0000	0.0000	184.2451	282.3162	383.4007	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	436.9425	363.5207	336.8572	231.7846	151.3619	0.0000	0.0000	0.0000	0.0000	207.0170	317.2092	430.7872	(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)
Space heating fuel (secondary)	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	227.4797	201.4884	214.3677	188.6843	182.2482	162.4718	159.3234	166.9560	170.0994	190.2467	202.0856	224.9765	(64)
Efficiency of water heater	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	(216)
Fuel for water heating, kWh/month	255.5952	226.3914	240.8626	212.0048	204.7732	182.5526	179.0150	187.5910	191.1229	213.7603	227.0624	252.7825	(219)
Space cooling fuel requirement													
(221)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	(221)
Pumps and Fa	15.5459	14.0415	15.5459	15.0444	15.5459	15.0444	15.5459	15.5459	15.0444	15.5459	15.0444	15.5459	(231)
Lighting	12.7924	10.2626	9.2403	6.7698	5.2292	4.2723	4.7703	6.2006	8.0539	10.5672	11.9356	13.1480	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)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	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)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	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)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	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)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	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)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	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)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	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)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	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)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	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2475.4803	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												89.0000	
Water heating fuel used												2573.5140	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7980)													
mechanical ventilation fans (SFP = 0.7980)													97.0405 (230a)
central heating pump													41.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													183.0405 (231)
Electricity for lighting (calculated in Appendix L)													103.2423 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													0.0000 (233)
Wind generation													0.0000 (234)
Hydro-electric generation (Appendix N)													0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)													0.0000 (235)
Appendix Q - special features													
Energy saved or generated													-0.0000 (236)
Energy used													0.0000 (237)
Total delivered energy for all uses													5335.2771 (238)

Full SAP Calculation Printout



10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2475.4803	3.6400	90.1075 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2573.5140	3.6400	93.6759 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	183.0405	16.4900	30.1834 (249)
Energy for lighting	103.2423	16.4900	17.0247 (250)
Additional standing charges			92.0000 (251)
Total energy cost			322.9914 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.3977 (257)
SAP value		77.3428
SAP rating (Section 12)		77 (258)
SAP band		C

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	2475.4803	0.2100	519.8509 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2573.5140	0.2100	540.4379 (264)
Space and water heating			1060.2888 (265)
Pumps, fans and electric keep-hot	183.0405	0.1387	25.3900 (267)
Energy for lighting	103.2423	0.1443	14.9011 (268)
Total CO2, kg/year			1100.5798 (272)
CO2 emissions per m2			28.8200 (273)
EI value			82.2722
EI rating			82 (274)
EI band			B

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	38.1900	2.6100	99.6759
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	38.1900		99.6759
Dwelling volume			99.6759

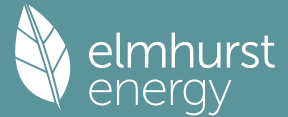
2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test			No
Pressure Test Method			Blower Door
Measured/design AP50			15.0000 (17)
Infiltration rate			0.7500 (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) =		0.6375 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000 (22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000 (22a)
Adj infilt rate	0.6853	0.6534	0.6534	0.6056	0.6216	0.5419	0.5419	0.5259	0.5419	0.6056	0.5897	0.6375 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												79.2000 (23c)
Effective ac	0.7893	0.7574	0.7574	0.7096	0.7256	0.6459	0.6459	0.6299	0.6459	0.7096	0.6937	0.7415 (25)

Full SAP Calculation Printout



3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K						
Main dwelling	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K						
Window			6.8500	1.3258	9.0814			(27)					
HGD			1.7900	1.4000	2.5060			(26a)					
Floor to commercial space			35.9300	0.2500	8.9825	20.0000	718.6000	(28b)					
Upgraded wall	36.4400	8.6400	27.8000	0.3000	8.3400	9.0000	250.2000	(29a)					
Total net area of external elements Aum(A, m2)			72.3700					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		28.9099			(33)					
Main dwelling													
Party Wall 1			36.4400	0.0000	0.0000	0.0000	0.0000	(32)					
Party Floor 1			2.2700			30.0000	68.1000	(32d)					
Party Ceiling 1			38.1900			30.0000	1145.7000	(32b)					
Internal Wall 1			46.8200			9.0000	421.3800	(32c)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =		2603.9800 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								68.1849 (35)					
Thermal bridges (Default value 0.200 * total exposed area)								14.4740 (36)					
Point Thermal bridges						(36a) =		0.0000					
Total fabric heat loss						(33) + (36) + (36a) =		43.3839 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	25.9629	24.9144	24.9144	23.3417	23.8660	21.2448	21.2448	20.7206	21.2448	23.3417	22.8175	24.3902	(38)
Heat transfer coeff	69.3468	68.2984	68.2984	66.7257	67.2499	64.6287	64.6287	64.1045	64.6287	66.7257	66.2014	67.7741	(39)
Average = Sum(39)m / 12 =												66.5509	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.8158	1.7884	1.7884	1.7472	1.7609	1.6923	1.6923	1.6786	1.6923	1.7472	1.7335	1.7747	(40)
HLP (average)												1.7426	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.3591 (42)
Hot water usage for mixer showers													
82.9085	81.6626	79.8470	76.3732	73.8096	70.9507	69.3257	71.1275	73.1027	76.1723	79.7207	82.5909	82.5909	(42a)
Hot water usage for baths													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses													
28.5486	27.5105	26.4723	25.4342	24.3961	23.3579	23.3579	24.3961	25.4342	26.4723	27.5105	28.5486	28.5486	(42c)
Average daily hot water use (litres/day)													102.3922 (43)
Daily hot water use	Jan 111.4571	Feb 109.1730	Mar 106.3193	Apr 101.8074	May 98.2056	Jun 94.3086	Jul 92.6836	Aug 95.5236	Sep 98.5369	Oct 102.6446	Nov 107.2312	Dec 111.1395	(44)
Energy conte	176.5208	155.4610	163.4088	139.3692	132.2037	115.9634	112.0928	118.2782	121.5059	139.2878	152.7705	174.0176	(45)
Energy content (annual)										Total = Sum(45)m =		1700.8796	
Distribution loss (46)m = 0.15 x (45)m	26.4781	23.3191	24.5113	20.9054	19.8305	17.3945	16.8139	17.7417	18.2259	20.8932	22.9156	26.1026	(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)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.0445	46.5084	47.2306	48.6778	48.5935	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	227.4797	201.4884	214.3677	188.6843	182.2482	162.4718	159.3234	166.9560	170.0994	190.2467	202.0856	224.9765	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
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	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	227.4797	201.4884	214.3677	188.6843	182.2482	162.4718	159.3234	166.9560	170.0994	190.2467	202.0856	224.9765	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	71.4329	63.1976	67.0732	58.6690	56.4688	50.1849	49.0785	51.4969	52.5491	59.0529	63.1250	70.6006	(65)

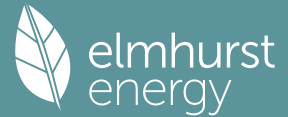
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan 81.5462	Feb 81.5462	Mar 81.5462	Apr 81.5462	May 81.5462	Jun 81.5462	Jul 81.5462	Aug 81.5462	Sep 81.5462	Oct 81.5462	Nov 81.5462	Dec 81.5462	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.6150	12.9809	10.5568	7.9922	5.9742	5.0437	5.4499	7.0840	9.5081	12.0728	14.0907	15.0212	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	174.6413	176.4536	171.8868	162.1647	149.8923	138.3580	130.6523	128.8401	133.4069	143.1290	155.4014	166.9357	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	44.5137	44.5137	44.5137	44.5137	44.5137	44.5137	44.5137	44.5137	44.5137	44.5137	44.5137	44.5137	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-54.3642	-54.3642	-54.3642	-54.3642	-54.3642	-54.3642	-54.3642	-54.3642	-54.3642	-54.3642	-54.3642	-54.3642	(71)
Water heating gains (Table 5)	96.0120	94.0441	90.1521	81.4848	75.8990	69.7013	65.9657	69.2163	72.9848	79.3722	87.6735	94.8932	(72)
Total internal gains	359.9641	358.1744	347.2915	326.3374	306.4613	284.7988	273.7638	276.8362	287.5956	309.2697	331.8614	351.5460	(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
-------	------------	--------------------------------	-----------------------------------	------------------------------------	------------------------------	------------

Full SAP Calculation Printout



Northeast	3.9200		13.7804		0.6300		0.7000		0.7700		16.5090 (75)	
Southeast	2.9300		43.0593		0.6300		0.7000		0.7700		38.5573 (77)	

Solar gains	55.0662	86.8979	131.0909	187.0683	223.6610	243.8529	229.0921	200.3834	159.1614	106.8840	65.9853	46.7314 (83)
Total gains	415.0304	445.0723	478.3824	513.4057	530.1223	528.6517	502.8559	477.2196	446.7571	416.1537	397.8467	398.2774 (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	10.4306	10.5907	10.5907	10.8403	10.7558	11.1920	11.1920	11.2836	11.1920	10.8403	10.9262	10.6726	
alpha	1.6954	1.7060	1.7060	1.7227	1.7171	1.7461	1.7461	1.7522	1.7461	1.7227	1.7284	1.7115	
util living area	0.8718	0.8514	0.8125	0.7415	0.6405	0.4882	0.3638	0.3856	0.5902	0.7561	0.8386	0.8770 (86)	
MIT	17.2646	17.6063	18.2476	19.1366	19.9435	20.5876	20.8395	20.8197	20.3437	19.3473	18.2576	17.2693 (87)	
Th 2	19.4589	19.4781	19.4781	19.5072	19.4975	19.5464	19.5464	19.5562	19.5464	19.5072	19.5169	19.4878 (88)	
util rest of house	0.8539	0.8308	0.7850	0.7006	0.5748	0.3861	0.2223	0.2437	0.4992	0.7087	0.8129	0.8599 (89)	
MIT 2	15.4543	15.8702	16.6399	17.6994	18.6096	19.2963	19.4968	19.4959	19.0808	17.9692	16.6796	15.4692 (90)	
Living area fraction	fLA = Living area / (4) =												0.5609 (91)
MIT	16.4696	16.8439	17.5416	18.5055	19.3578	20.0206	20.2499	20.2384	19.7891	18.7422	17.5647	16.4788 (92)	
Temperature adjustment													0.0000
adjusted MIT	16.4696	16.8439	17.5416	18.5055	19.3578	20.0206	20.2499	20.2384	19.7891	18.7422	17.5647	16.4788 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8060	0.7829	0.7400	0.6676	0.5678	0.4221	0.2948	0.3150	0.5162	0.6790	0.7683	0.8127 (94)
Useful gains	334.5306	348.4617	353.9895	342.7412	301.0097	223.1249	148.2297	150.3148	230.6281	282.5684	305.6787	323.6919 (95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000 (96)
Heat loss rate W												
Space heating	788.4484	761.1113	692.6566	574.2058	434.2830	272.7717	164.7987	169.1323	309.5162	483.2398	633.1950	771.1902 (97)
kWh	337.7149	277.3006	251.9683	166.6545	99.1554	0.0000	0.0000	0.0000	0.0000	149.2995	235.8118	332.9387 (98a)
Space heating requirement - total per year (kWh/year)												1850.8436
Solar heating												
kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating	337.7149	277.3006	251.9683	166.6545	99.1554	0.0000	0.0000	0.0000	0.0000	149.2995	235.8118	332.9387 (98c)
kWh												
Space heating requirement after solar contribution - total per year (kWh/year)												1850.8436
Space heating per m2												
										(98c) / (4) =		48.4641 (99)

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 %)												89.0000 (206)	
Efficiency of main space heating system 2 (in %)												0.0000 (207)	
Efficiency of secondary/supplementary heating system, %												0.0000 (208)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	337.7149	277.3006	251.9683	166.6545	99.1554	0.0000	0.0000	0.0000	0.0000	149.2995	235.8118	332.9387 (98)	
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000 (210)	
Space heating fuel (main heating system)	379.4549	311.5737	283.1105	187.2522	111.4106	0.0000	0.0000	0.0000	0.0000	167.7523	264.9571	374.0884 (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)	
Space heating fuel (secondary)	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	227.4797	201.4884	214.3677	188.6843	182.2482	162.4718	159.3234	166.9560	170.0994	190.2467	202.0856	224.9765 (64)	
Efficiency of water heater (217)m	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000 (216)	
Fuel for water heating, kWh/month	255.5952	226.3914	240.8626	212.0048	204.7732	182.5526	179.0150	187.5910	191.1229	213.7603	227.0624	252.7825 (219)	
Space cooling fuel requirement (221)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 (221)	
Pumps and Fa	15.5459	14.0415	15.5459	15.0444	15.5459	15.0444	15.5459	15.5459	15.0444	15.5459	15.0444	15.5459 (231)	
Lighting	12.7924	10.2626	9.2403	6.7698	5.2292	4.2723	4.7703	6.2006	8.0539	10.5672	11.9356	13.1480 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)	
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)	
Annual totals kWh/year													
Space heating fuel - main system 1													2079.5996 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													89.0000
Water heating fuel used													2573.5140 (219)
Space cooling fuel													0.0000 (221)

Full SAP Calculation Printout



Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7980)		
mechanical ventilation fans (SFP = 0.7980)	97.0405	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	183.0405	(231)
Electricity for lighting (calculated in Appendix L)	103.2423	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4939.3964	(238)

10a. Fuel costs - using BEDF prices (567)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2079.5996	5.6000	116.4576	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2573.5140	5.6000	144.1168	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	183.0405	26.0600	47.7003	(249)
Energy for lighting	103.2423	26.0600	26.9050	(250)
Additional standing charges			99.0000	(251)
Total energy cost			434.1797	(255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	2079.5996	0.2100	436.7159	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2573.5140	0.2100	540.4379	(264)
Space and water heating			977.1538	(265)
Pumps, fans and electric keep-hot	183.0405	0.1387	25.3900	(267)
Energy for lighting	103.2423	0.1443	14.9011	(268)
Total CO2, kg/year			1017.4449	(272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	2079.5996	1.1300	2349.9475	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2573.5140	1.1300	2908.0708	(278)
Space and water heating			5258.0183	(279)
Pumps, fans and electric keep-hot	183.0405	1.5128	276.9036	(281)
Energy for lighting	103.2423	1.5338	158.3566	(282)
Total Primary energy kWh/year			5693.2785	(286)

SAP 10 EPC IMPROVEMENTS

Notional

Current energy efficiency rating:	C 77
Current environmental impact rating:	B 82

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

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

Recommended measures	Typical annual savings		Energy efficiency	Environmental impact
(none)	Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating:	C 77
Potential environmental impact rating:	B 82

Fuel prices for cost data on this page from database revision number 567 TEST (07 Mar 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current	Potential	Saving
Electricity	£75	£75	£0
Mains gas	£360	£360	£0
Space heating	£263	£263	£0
Water heating	£144	£144	£0
Lighting	£27	£27	£0
Total cost of fuels	£435	£435	£0
Total cost of uses	£434	£434	£0
Delivered energy	129 kWh/m²	129 kWh/m²	0 kWh/m²

Full SAP Calculation Printout



Carbon dioxide emissions	1.0 tonnes	1.0 tonnes	0.0 tonnes
CO2 emissions per m ²	27 kg/m ²	27 kg/m ²	0 kg/m ²
Primary energy	149 kWh/m ²	149 kWh/m ²	0 kWh/m ²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	38.1900 (1b)	2.6100 (2b)	99.6759 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	38.1900		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	99.6759 (5)

2. Ventilation rate

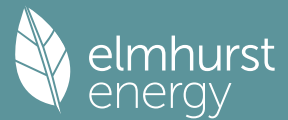
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	0.0000 / (5) = 0.0000 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.7500 (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) = 0.6375 (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	0.8128	0.7969	0.7809	0.7013	0.6853	0.6056	0.6056	0.5897	0.6375	0.6853	0.7172	0.7491 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												79.2000 (23c)
Effective ac	0.9168	0.9009	0.8849	0.8053	0.7893	0.7096	0.7096	0.6937	0.7415	0.7893	0.8212	0.8531 (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					
Main dwelling												
Window			6.8500	1.3258	9.0814		(27)					
HGD			1.7900	1.4000	2.5060		(26a)					
Floor to commercial space			35.9300	0.2500	8.9825	20.0000	718.6000 (28b)					
Upgraded wall	36.4400	8.6400	27.8000	0.3000	8.3400	9.0000	250.2000 (29a)					
Total net area of external elements Aum(A, m2)			72.3700				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.9099		(33)					
Main dwelling												
Party Wall 1			36.4400	0.0000	0.0000	0.0000	0.0000 (32)					
Party Floor 1			2.2700			30.0000	68.1000 (32d)					
Party Ceiling 1			38.1900			30.0000	1145.7000 (32b)					
Internal Wall 1			46.8200			9.0000	421.3800 (32c)					
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		2603.9800 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							68.1849 (35)					
Thermal bridges (Default value 0.200 * total exposed area)							14.4740 (36)					
Point Thermal bridges						(36a) =	0.0000					
Total fabric heat loss					(33) + (36) + (36a) =		43.3839 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	30.1568	29.6325	29.1083	26.4871	25.9629	23.3417	23.3417	22.8175	24.3902	25.9629	27.0114	28.0598 (38)
Average = Sum(39)m / 12 =	73.5407	73.0165	72.4922	69.8711	69.3468	66.7257	66.7257	66.2014	67.7741	69.3468	70.3953	71.4438 (39)
												69.7400
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.9257	1.9119	1.8982	1.8296	1.8158	1.7472	1.7472	1.7335	1.7747	1.8158	1.8433	1.8707 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

Full SAP Calculation Printout



4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.3591 (42)
Hot water usage for mixer showers												82.5909 (42a)
Hot water usage for baths												0.0000 (42b)
Hot water usage for other uses												28.5486 (42c)
Average daily hot water use (litres/day)												102.3922 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	111.4571	109.1730	106.3193	101.8074	98.2056	94.3086	92.6836	95.5236	98.5369	102.6446	107.2312	111.1395 (44)
Distribution loss (46)m = 0.15 x (45)m	176.5208	155.4610	163.4088	139.3692	132.2037	115.9634	112.0928	118.2782	121.5059	139.2878	152.7705	174.0176 (45)
Water storage loss:												Total = Sum(45)m = 1700.8796
Total storage loss	26.4781	23.3191	24.5113	20.9054	19.8305	17.3945	16.8139	17.7417	18.2259	20.8932	22.9156	26.1026 (46)
If cylinder contains dedicated solar storage												0.0000 (56)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Total heat required for water heating calculated for each month	50.9589	46.0274	50.9589	49.3151	50.0445	46.5084	47.2306	48.6778	48.5935	50.9589	49.3151	50.9589 (61)
WWHRS	227.4797	201.4884	214.3677	188.6843	182.2482	162.4718	159.3234	166.9560	170.0994	190.2467	202.0856	224.9765 (62)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
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 (63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
Output from w/h	227.4797	201.4884	214.3677	188.6843	182.2482	162.4718	159.3234	166.9560	170.0994	190.2467	202.0856	224.9765 (64)
Electric shower(s)												Total per year (kWh/year) = Sum(64a)m = 2290.4275 (64)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
	71.4329	63.1976	67.0732	58.6690	56.4688	50.1849	49.0785	51.4969	52.5491	59.0529	63.1250	70.6006 (65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)												

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	81.5462	81.5462	81.5462	81.5462	81.5462	81.5462	81.5462	81.5462	81.5462	81.5462	81.5462	81.5462 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.6150	12.9809	10.5568	7.9922	5.9742	5.0437	5.4499	7.0840	9.5081	12.0728	14.0907	15.0212 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	174.6413	176.4536	171.8868	162.1647	149.8923	138.3580	130.6523	128.8401	133.4069	143.1290	155.4014	166.9357 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	44.5137	44.5137	44.5137	44.5137	44.5137	44.5137	44.5137	44.5137	44.5137	44.5137	44.5137	44.5137 (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)	-54.3642	-54.3642	-54.3642	-54.3642	-54.3642	-54.3642	-54.3642	-54.3642	-54.3642	-54.3642	-54.3642	-54.3642 (71)
Water heating gains (Table 5)	96.0120	94.0441	90.1521	81.4848	75.8990	69.7013	65.9657	69.2163	72.9848	79.3722	87.6735	94.8932 (72)
Total internal gains	359.9641	358.1744	347.2915	326.3374	306.4613	284.7988	273.7638	276.8362	287.5956	309.2697	331.8614	351.5460 (73)

6. Solar gains

[Jan]																				
					Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d				Gains W					
Northeast					3.9200	11.2829		0.6300	0.7000		0.7700				13.5170 (75)					
Southeast					2.9300	36.7938		0.6300	0.7000		0.7700				32.9469 (77)					
Solar gains	46.4639	83.6350	126.3588	176.5539	216.0005	222.4640	211.1392	180.4833	143.5481	95.6500	56.4707	39.2343	(83)							
Total gains	406.4280	441.8094	473.6503	502.8914	522.4618	507.2628	484.9029	457.3196	431.1437	404.9197	388.3321	390.7803	(84)							

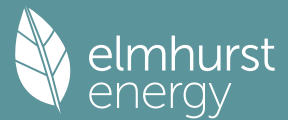
7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, n _l ,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	9.8357	9.9064	9.9780	10.3523	10.4306	10.8403	10.8403	10.9262	10.6726	10.4306	10.2752	10.1244
alpha	1.6557	1.6604	1.6652	1.6902	1.6954	1.7227	1.7227	1.7284	1.7115	1.6954	1.6850	1.6750
util living area	0.8868	0.8673	0.8346	0.7763	0.6932	0.5774	0.4704	0.5015	0.6566	0.7911	0.8613	0.8917 (86)
MIT	16.8009	17.1459	17.7937	18.7174	19.5742	20.3055	20.6609	20.6088	20.0546	18.9786	17.7861	16.7928 (87)
Th 2	19.3834	19.3927	19.4021	19.4494	19.4589	19.5072	19.5072	19.5169	19.4878	19.4589	19.4399	19.4209 (88)
util rest of house	0.8708	0.8486	0.8101	0.7408	0.6382	0.4909	0.3461	0.3806	0.5780	0.7509	0.8391	0.8766 (89)
MIT 2	14.8724	15.2894	16.0712	17.1860	18.1813	19.0033	19.3390	19.3082	18.7511	17.5213	16.0883	14.8731 (90)
Living area fraction	15.9541	16.3307	17.0373	18.0449	18.9626	19.7337	20.0804	20.0377	19.4822	18.3387	17.0406	15.9498 (91)
MIT	15.9541	16.3307	17.0373	18.0449	18.9626	19.7337	20.0804	20.0377	19.4822	18.3387	17.0406	15.9498 (92)
Temperature adjustment	15.9541	16.3307	17.0373	18.0449	18.9626	19.7337	20.0804	20.0377	19.4822	18.3387	17.0406	15.9498 (93)
adjusted MIT	15.9541	16.3307	17.0373	18.0449	18.9626	19.7337	20.0804	20.0377	19.4822	18.3387	17.0406	15.9498 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.8227	0.7994	0.7620	0.7009	0.6174	0.5055	0.3978	0.4270	0.5776	0.7138	0.7923	0.8294 (94)
Ext temp.	334.3618	353.1778	360.9147	352.4526	322.5704	256.4170	192.8890	195.2751	249.0355	289.0122	307.6630	324.1262 (95)
	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)

Full SAP Calculation Printout



Heat loss rate W	857.0484	834.6263	763.8756	638.9641	503.6350	342.5464	232.2326	240.8196	364.7762	536.6535	699.7688	839.4497 (97)
Space heating kWh	388.8788	323.5334	299.8029	206.2883	134.7121	0.0000	0.0000	0.0000	0.0000	184.2451	282.3162	383.4007 (98a)
Space heating requirement - total per year (kWh/year)												2203.1775
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	388.8788	323.5334	299.8029	206.2883	134.7121	0.0000	0.0000	0.0000	0.0000	184.2451	282.3162	383.4007 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2203.1775
Space heating per m2											(98c) / (4) =	57.6899 (99)

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

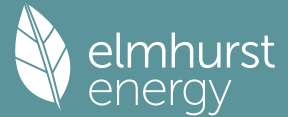
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												89.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
388.8788	323.5334	299.8029	206.2883	134.7121	0.0000	0.0000	0.0000	0.0000	0.0000	184.2451	282.3162	383.4007 (98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000 (210)
Space heating fuel (main heating system)	436.9425	363.5207	336.8572	231.7846	151.3619	0.0000	0.0000	0.0000	0.0000	207.0170	317.2092	430.7872 (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)
Space heating fuel (secondary)	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	227.4797	201.4884	214.3677	188.6843	182.2482	162.4718	159.3234	166.9560	170.0994	190.2467	202.0856	224.9765 (64)
Efficiency of water heater	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000 (216)
Fuel for water heating, kWh/month	255.5952	226.3914	240.8626	212.0048	204.7732	182.5526	179.0150	187.5910	191.1229	213.7603	227.0624	252.7825 (219)
Space cooling fuel requirement												
(221)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 (221)
Pumps and Fa	15.5459	14.0415	15.5459	15.0444	15.5459	15.0444	15.5459	15.5459	15.0444	15.5459	15.0444	15.5459 (231)
Lighting	12.7924	10.2626	9.2403	6.7698	5.2292	4.2723	4.7703	6.2006	8.0539	10.5672	11.9356	13.1480 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)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 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)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 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)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 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)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 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)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 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)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 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)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 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)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 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												2475.4803 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												89.0000
Water heating fuel used												2573.5140 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7980)												
mechanical ventilation fans (SFP = 0.7980)												97.0405 (230a)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												183.0405 (231)
Electricity for lighting (calculated in Appendix L)												103.2423 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												
Energy saved or generated												-0.0000 (236)
Energy used												0.0000 (237)
Total delivered energy for all uses												5335.2771 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2475.4803	3.6400	90.1075 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2573.5140	3.6400	93.6759 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	183.0405	16.4900	30.1834 (249)
Energy for lighting	103.2423	16.4900	17.0247 (250)
Additional standing charges			92.0000 (251)
Total energy cost			322.9914 (255)

11a. SAP rating - Individual heating systems

Full SAP Calculation Printout



Energy cost deflator (Table 12): 0.3600 (256)
Energy cost factor (ECF) 1.3977 (257)
SAP value 77.3428
SAP rating (Section 12) 77 (258)
SAP band C

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

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Space heating - main system 1	2475.4803	0.2100	519.8509 (261)
Total CO ₂ associated with community systems			0.0000 (373)
Water heating (other fuel)	2573.5140	0.2100	540.4379 (264)
Space and water heating			1060.2888 (265)
Pumps, fans and electric keep-hot	183.0405	0.1387	25.3900 (267)
Energy for lighting	103.2423	0.1443	14.9011 (268)
Total CO ₂ , kg/year			1100.5798 (272)
CO ₂ emissions per m ²			28.8200 (273)
EI value			82.2722
EI rating			82 (274)
EI band			B

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	38.1900	2.6100	99.6759
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	38.1900		99.6759 (1b) - (3b)
Dwelling volume			99.6759 (5)

2. Ventilation rate

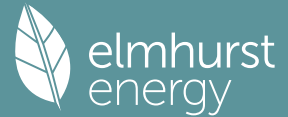
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	0.0000 / (5) = 0.0000 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.7500 (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) = 0.6375 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000 (22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000 (22a)
Adj infilt rate	0.6853	0.6534	0.6534	0.6056	0.6216	0.5419	0.5419	0.5259	0.5419	0.6056	0.5897	0.6375 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												79.2000 (23c)
Effective ac	0.7893	0.7574	0.7574	0.7096	0.7256	0.6459	0.6459	0.6299	0.6459	0.7096	0.6937	0.7415 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			6.8500	1.3258	9.0814		(27)
HGD			1.7900	1.4000	2.5060		(26a)
Floor to commercial space			35.9300	0.2500	8.9825	20.0000	718.6000 (28b)
Upgraded wall	36.4400	8.6400	27.8000	0.3000	8.3400	9.0000	250.2000 (29a)
Total net area of external elements Aum(A, m ²)			72.3700				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 28.9099		(33)
Main dwelling							
Party Wall 1			36.4400	0.0000	0.0000	0.0000	0.0000 (32)
Party Floor 1			2.2700			30.0000	68.1000 (32d)
Party Ceiling 1			38.1900			30.0000	1145.7000 (32b)
Internal Wall 1			46.8200			9.0000	421.3800 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	2603.9800 (34)

Full SAP Calculation Printout



Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 68.1849 (35)
Thermal bridges (Default value 0.200 * total exposed area) 14.4740 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 43.3839 (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	25.9629	24.9144	24.9144	23.3417	23.8660	21.2448	21.2448	20.7206	21.2448	23.3417	22.8175	24.3902
Heat transfer coeff	69.3468	68.2984	68.2984	66.7257	67.2499	64.6287	64.6287	64.1045	64.6287	66.7257	66.2014	67.7741
Average = Sum(39)m / 12 =												66.5509
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.8158	1.7884	1.7884	1.7472	1.7609	1.6923	1.6923	1.6786	1.6923	1.7472	1.7335	1.7747
HLP (average)												1.7426
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.3591
Hot water usage for mixer showers												(42)
82.9085	81.6626	79.8470	76.3732	73.8096	70.9507	69.3257	71.1275	73.1027	76.1723	79.7207	82.5909	(42a)
Hot water usage for baths												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses												
28.5486	27.5105	26.4723	25.4342	24.3961	23.3579	23.3579	24.3961	25.4342	26.4723	27.5105	28.5486	(42c)
Average daily hot water use (litres/day)												102.3922
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	111.4571	109.1730	106.3193	101.8074	98.2056	94.3086	92.6836	95.5236	98.5369	102.6446	107.2312	111.1395
Energy conte	176.5208	155.4610	163.4088	139.3692	132.2037	115.9634	112.0928	118.2782	121.5059	139.2878	152.7705	174.0176
Energy content (annual)												1700.8796
Distribution loss (46)m = 0.15 x (45)m												
26.4781	23.3191	24.5113	20.9054	19.8305	17.3945	16.8139	17.7417	18.2259	20.8932	22.9156	26.1026	(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
If cylinder contains dedicated solar storage												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
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
Combi loss	50.9589	46.0274	50.9589	49.3151	50.0445	46.5084	47.2306	48.6778	48.5935	50.9589	49.3151	50.9589
Total heat required for water heating calculated for each month	227.4797	201.4884	214.3677	188.6843	182.2482	162.4718	159.3234	166.9560	170.0994	190.2467	202.0856	224.9765
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
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
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Output from w/h	227.4797	201.4884	214.3677	188.6843	182.2482	162.4718	159.3234	166.9560	170.0994	190.2467	202.0856	224.9765
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000
Heat gains from water heating, kWh/month	71.4329	63.1976	67.0732	58.6690	56.4688	50.1849	49.0785	51.4969	52.5491	59.0529	63.1250	70.6006

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

Metabolic gains (Table 5), Watts												
(66)m	81.5462	81.5462	81.5462	81.5462	81.5462	81.5462	81.5462	81.5462	81.5462	81.5462	81.5462	81.5462
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.6150	12.9809	10.5568	7.9922	5.9742	5.0437	5.4499	7.0840	9.5081	12.0728	14.0907	15.0212
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	174.6413	176.4536	171.8868	162.1647	149.8923	138.3580	130.6523	128.8401	133.4069	143.1290	155.4014	166.9357
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	44.5137	44.5137	44.5137	44.5137	44.5137	44.5137	44.5137	44.5137	44.5137	44.5137	44.5137	44.5137
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000
Losses e.g. evaporation (negative values) (Table 5)	-54.3642	-54.3642	-54.3642	-54.3642	-54.3642	-54.3642	-54.3642	-54.3642	-54.3642	-54.3642	-54.3642	-54.3642
Water heating gains (Table 5)	96.0120	94.0441	90.1521	81.4848	75.8990	69.7013	65.9657	69.2163	72.9848	79.3722	87.6735	94.8932
Total internal gains	359.9641	358.1744	347.2915	326.3374	306.4613	284.7988	273.7638	276.8362	287.5956	309.2697	331.8614	351.5460

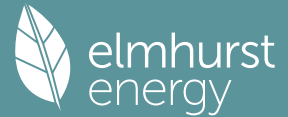
6. Solar gains

[Jan]		Area	Solar flux	g	FF	Access	Gains
		m2	Table 6a	Specific data	Specific data	factor	W
			W/m2	or Table 6b	or Table 6c	Table 6d	
Northeast		3.9200	13.7804	0.6300	0.7000	0.7700	16.5090
Southeast		2.9300	43.0593	0.6300	0.7000	0.7700	38.5573
Solar gains	55.0662	86.8979	131.0909	187.0683	223.6610	243.8529	229.0921
Total gains	415.0304	445.0723	478.3824	513.4057	530.1223	528.6517	502.8559

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000
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	10.4306	10.5907	10.5907	10.8403	10.7558	11.1920	11.1920	11.2836	11.1920	10.8403	10.9262	10.6726
alpha	1.6954	1.7060	1.7060	1.7227	1.7171	1.7461	1.7461	1.7522	1.7461	1.7227	1.7284	1.7115
util living area	0.8718	0.8514	0.8125	0.7415	0.6405	0.4882	0.3638	0.3856	0.5902	0.7561	0.8386	0.8770

Full SAP Calculation Printout



MIT	17.2646	17.6063	18.2476	19.1366	19.9435	20.5876	20.8395	20.8197	20.3437	19.3473	18.2576	17.2693 (87)
Th 2	19.4589	19.4781	19.4781	19.5072	19.4975	19.5464	19.5464	19.5562	19.5464	19.5072	19.5169	19.4878 (88)
util rest of house	0.8539	0.8308	0.7850	0.7006	0.5748	0.3861	0.2223	0.2437	0.4992	0.7087	0.8129	0.8599 (89)
MIT 2	15.4543	15.8702	16.6399	17.6994	18.6096	19.2963	19.4968	19.4959	19.0808	17.9692	16.6796	15.4692 (90)
Living area fraction									FLA = Living area / (4) =			0.5609 (91)
MIT	16.4696	16.8439	17.5416	18.5055	19.3578	20.0206	20.2499	20.2384	19.7891	18.7422	17.5647	16.4788 (92)
Temperature adjustment												0.0000
adjusted MIT	16.4696	16.8439	17.5416	18.5055	19.3578	20.0206	20.2499	20.2384	19.7891	18.7422	17.5647	16.4788 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8060	0.7829	0.7400	0.6676	0.5678	0.4221	0.2948	0.3150	0.5162	0.6790	0.7683	0.8127 (94)
Useful gains	334.5306	348.4617	353.9895	342.7412	301.0097	223.1249	148.2297	150.3148	230.6281	282.5684	305.6787	323.6919 (95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000 (96)
Heat loss rate W	788.4484	761.1113	692.6566	574.2058	434.2830	272.7717	164.7987	169.1323	309.5162	483.2398	633.1950	771.1902 (97)
Space heating kWh	337.7149	277.3006	251.9683	166.6545	99.1554	0.0000	0.0000	0.0000	0.0000	149.2995	235.8118	332.9387 (98a)
Space heating requirement - total per year (kWh/year)												1850.8436
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	337.7149	277.3006	251.9683	166.6545	99.1554	0.0000	0.0000	0.0000	0.0000	149.2995	235.8118	332.9387 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1850.8436
Space heating per m2										(98c) / (4) =		48.4641 (99)

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 %)												89.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	337.7149	277.3006	251.9683	166.6545	99.1554	0.0000	0.0000	0.0000	0.0000	149.2995	235.8118	332.9387 (98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000 (210)
Space heating fuel (main heating system)	379.4549	311.5737	283.1105	187.2522	111.4106	0.0000	0.0000	0.0000	0.0000	167.7523	264.9571	374.0884 (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)
Space heating fuel (secondary)	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	227.4797	201.4884	214.3677	188.6843	182.2482	162.4718	159.3234	166.9560	170.0994	190.2467	202.0856	224.9765 (64)
Efficiency of water heater (217)m	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000 (216)
Fuel for water heating, kWh/month	255.5952	226.3914	240.8626	212.0048	204.7732	182.5526	179.0150	187.5910	191.1229	213.7603	227.0624	252.7825 (219)
Space cooling fuel requirement (221)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 (221)
Pumps and Fa	15.5459	14.0415	15.5459	15.0444	15.5459	15.0444	15.5459	15.0444	15.0444	15.5459	15.0444	15.5459 (231)
Lighting	12.7924	10.2626	9.2403	6.7698	5.2292	4.2723	4.7703	6.2006	8.0539	10.5672	11.9356	13.1480 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)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 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)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 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)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 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)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 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)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 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)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 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)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 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)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 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												2079.5996 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												89.0000
Water heating fuel used												2573.5140 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7980)												
mechanical ventilation fans (SFP = 0.7980)												97.0405 (230a)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												183.0405 (231)
Electricity for lighting (calculated in Appendix L)												103.2423 (232)

Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												
Energy saved or generated												-0.0000 (236)
Energy used												0.0000 (237)
Total delivered energy for all uses												4939.3964 (238)

Full SAP Calculation Printout



10a. Fuel costs - using BEDF prices (567)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2079.5996	5.6000	116.4576 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2573.5140	5.6000	144.1168 (247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (247a)
Pumps, fans and electric keep-hot	183.0405	26.0600	47.7003 (249)
Energy for lighting	103.2423	26.0600	26.9050 (250)
Additional standing charges			99.0000 (251)
Total energy cost			434.1797 (255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2079.5996	0.2100	436.7159 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2573.5140	0.2100	540.4379 (264)
Space and water heating			977.1538 (265)
Pumps, fans and electric keep-hot	183.0405	0.1387	25.3900 (267)
Energy for lighting	103.2423	0.1443	14.9011 (268)
Total CO2, kg/year			1017.4449 (272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2079.5996	1.1300	2349.9475 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2573.5140	1.1300	2908.0708 (278)
Space and water heating			5258.0183 (279)
Pumps, fans and electric keep-hot	183.0405	1.5128	276.9036 (281)
Energy for lighting	103.2423	1.5338	158.3566 (282)
Total Primary energy kWh/year			5693.2785 (286)

Full SAP Calculation Printout



Property Reference	8606-1			Issued on Date	21/03/2025	
Assessment Reference	Proposed		Prop Type Ref			
Property	Flat 1, 233, London Road, Reading, RG1 3NY					
SAP Rating	78 C	DER	28.45	TER	15.87	
Environmental	83 B	% DER < TER				-79.27
CO ₂ Emissions (t/year)	1	DFEE	68.30	TFEE	36.29	
Compliance Check	See BREL	% DFEE < TFEE				-88.18
% DPER < TPER	-87.83	DPER	158.62	TPER	84.45	
Assessor Details	Mr. Connor Lewis			Assessor ID	DQ56-0001	
Client						

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	38.1900 (1b)	2.6100 (2b)	99.6759 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	38.1900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	99.6759 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

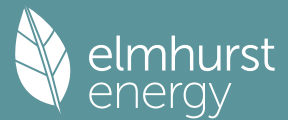
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	No	
Pressure Test Method	Blower Door	
Measured/design AP50	15.0000	(17)
Infiltration rate	0.7500	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.6375 (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	0.8128	0.7969	0.7809	0.7013	0.6853	0.6056	0.6056	0.5897	0.6375	0.6853	0.7172	0.7491 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												79.2000 (23c)
Effective ac	0.9168	0.9009	0.8849	0.8053	0.7893	0.7096	0.7096	0.6937	0.7415	0.7893	0.8212	0.8531 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			6.8500	1.3258	9.0814		(27)
HGD			1.7900	1.4000	2.5060		(26a)
Floor to commercial space			35.9300	0.2600	9.3418	20.0000	718.6000 (28b)
Upgraded wall	36.4400	8.6400	27.8000	0.2000	5.5600	9.0000	250.2000 (29a)
Total net area of external elements Aum(A, m ²)			72.3700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.4892		(33)
Main dwelling							
Party Wall 1			36.4400	0.0000	0.0000	0.0000	0.0000 (32)
Party Floor 1			2.2700			30.0000	68.1000 (32d)
Party Ceiling 1			38.1900			30.0000	1145.7000 (32b)
Internal Wall 1			46.8200			9.0000	421.3800 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		2603.9800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							68.1849 (35)
Thermal bridges (Default value 0.200 * total exposed area)							14.4740 (36)

Full SAP Calculation Printout



Point Thermal bridges
Total fabric heat loss

(33) + (36) + (36a) = 0.0000
40.9632 (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	30.1568	29.6325	29.1083	26.4871	25.9629	23.3417	23.3417	22.8175	24.3902	25.9629	27.0114	28.0598	(38)
Heat transfer coeff	71.1200	70.5958	70.0715	67.4504	66.9261	64.3050	64.3050	63.7807	65.3534	66.9261	67.9746	69.0231	(39)
Average = Sum(39)m / 12 =												67.3193	(39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.8623	1.8485	1.8348	1.7662	1.7525	1.6838	1.6838	1.6701	1.7113	1.7525	1.7799	1.8074	(40)
HLP (average)												1.7627	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.3591 (42)
Hot water usage for mixer showers	82.9085	81.6626	79.8470	76.3732	73.8096	70.9507	69.3257	71.1275	73.1027	76.1723	79.7207	82.5909	(42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses	28.5486	27.5105	26.4723	25.4342	24.3961	23.3579	23.3579	24.3961	25.4342	26.4723	27.5105	28.5486	(42c)
Average daily hot water use (litres/day)												102.3922	(43)
Daily hot water use	111.4571	109.1730	106.3193	101.8074	98.2056	94.3086	92.6836	95.5236	98.5369	102.6446	107.2312	111.1395	(44)
Energy conte	176.5208	155.4610	163.4088	139.3692	132.2037	115.9634	112.0928	118.2782	121.5059	139.2878	152.7705	174.0176	(45)
Energy content (annual)										Total = Sum(45)m =		1700.8796	(45)
Distribution loss (46)m = 0.15 x (45)m	26.4781	23.3191	24.5113	20.9054	19.8305	17.3945	16.8139	17.7417	18.2259	20.8932	22.9156	26.1026	(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)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.0445	46.5084	47.2306	48.6778	48.5935	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	227.4797	201.4884	214.3677	188.6843	182.2482	162.4718	159.3234	166.9560	170.0994	190.2467	202.0856	224.9765	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
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	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	227.4797	201.4884	214.3677	188.6843	182.2482	162.4718	159.3234	166.9560	170.0994	190.2467	202.0856	224.9765	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	71.4329	63.1976	67.0732	58.6690	56.4688	50.1849	49.0785	51.4969	52.5491	59.0529	63.1250	70.6006	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	81.5462	81.5462	81.5462	81.5462	81.5462	81.5462	81.5462	81.5462	81.5462	81.5462	81.5462	81.5462	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.6150	12.9809	10.5568	7.9922	5.9742	5.0437	5.4499	7.0840	9.5081	12.0728	14.0907	15.0212	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	174.6413	176.4536	171.8868	162.1647	149.8923	138.3580	130.6523	128.8401	133.4069	143.1290	155.4014	166.9357	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	44.5137	44.5137	44.5137	44.5137	44.5137	44.5137	44.5137	44.5137	44.5137	44.5137	44.5137	44.5137	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-54.3642	-54.3642	-54.3642	-54.3642	-54.3642	-54.3642	-54.3642	-54.3642	-54.3642	-54.3642	-54.3642	-54.3642	(71)
Water heating gains (Table 5)	96.0120	94.0441	90.1521	81.4848	75.8990	69.7013	65.9657	69.2163	72.9848	79.3722	87.6735	94.8932	(72)
Total internal gains	359.9641	358.1744	347.2915	326.3374	306.4613	284.7988	273.7638	276.8362	287.5956	309.2697	331.8614	351.5460	(73)

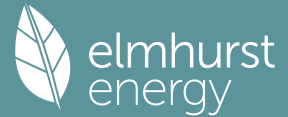
6. Solar gains

[Jan]																				
					Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d				Gains W					
Northeast					3.9200	11.2829		0.6300	0.7000		0.7700				13.5170 (75)					
Southeast					2.9300	36.7938		0.6300	0.7000		0.7700				32.9469 (77)					
Solar gains	46.4639	83.6350	126.3588	176.5539	216.0005	222.4640	211.1392	180.4833	143.5481	95.6500	56.4707	39.2343	(83)							
Total gains	406.4280	441.8094	473.6503	502.8914	522.4618	507.2628	484.9029	457.3196	431.1437	404.9197	388.3321	390.7803	(84)							

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	10.1705	10.2461	10.3227	10.7239	10.8079	11.2484	11.2484	11.3409	11.0679	10.8079	10.6411	10.4795	
alpha	1.6780	1.6831	1.6882	1.7149	1.7205	1.7499	1.7499	1.7561	1.7379	1.7205	1.7094	1.6986	
util living area	0.8847	0.8647	0.8311	0.7713	0.6864	0.5685	0.4610	0.4921	0.6489	0.7864	0.8584	0.8896	(86)
MIT	16.8967	17.2418	17.8841	18.7991	19.6371	20.3466	20.6848	20.6355	20.1016	19.0492	17.8741	16.8926	(87)

Full SAP Calculation Printout



Th 2	19.4267	19.4362	19.4457	19.4938	19.5035	19.5525	19.5525	19.5623	19.5328	19.5035	19.4841	19.4649 (88)
util rest of house	0.8688	0.8461	0.8068	0.7362	0.6323	0.4845	0.3416	0.3756	0.5720	0.7465	0.8363	0.8747 (89)
MIT 2	14.9991	15.4169	16.1930	17.2988	18.2731	19.0726	19.3925	19.3637	18.8253	17.6212	16.2072	15.0045 (90)
Living area fraction									fLA = Living area / (4) =			0.5609 (91)
MIT	16.0634	16.4405	17.1415	18.1403	19.0382	19.7871	20.1173	20.0770	19.5411	18.4221	17.1421	16.0635 (92)
Temperature adjustment												0.0000
adjusted MIT	16.0634	16.4405	17.1415	18.1403	19.0382	19.7871	20.1173	20.0770	19.5411	18.4221	17.1421	16.0635 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8210	0.7974	0.7594	0.6973	0.6127	0.4995	0.3917	0.4209	0.5725	0.7104	0.7901	0.8278	(94)
Useful gains	333.6769	352.2782	359.6894	350.6564	320.1249	253.3994	189.9582	192.4869	246.8298	287.6611	306.8197	323.4953	(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	836.6120	814.7075	745.6681	623.2588	491.1150	333.5580	226.1807	234.5226	355.5967	523.5057	682.6092	818.8566	(97)
Space heating kWh	374.1837	310.7525	287.1682	196.2737	127.2166	0.0000	0.0000	0.0000	0.0000	175.4684	270.5684	368.5487	(98a)
Space heating requirement - total per year (kWh/year)												2110.1804	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	374.1837	310.7525	287.1682	196.2737	127.2166	0.0000	0.0000	0.0000	0.0000	175.4684	270.5684	368.5487	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2110.1804	
Space heating per m2										(98c) / (4) =		55.2548	(99)

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 %)													89.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	374.1837	310.7525	287.1682	196.2737	127.2166	0.0000	0.0000	0.0000	0.0000	175.4684	270.5684	368.5487	(98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)
Space heating fuel (main heating system)	420.4312	349.1601	322.6609	220.5323	142.9401	0.0000	0.0000	0.0000	0.0000	197.1555	304.0095	414.0997	(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)
Space heating fuel (secondary)	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	227.4797	201.4884	214.3677	188.6843	182.2482	162.4718	159.3234	166.9560	170.0994	190.2467	202.0856	224.9765	(64)
Efficiency of water heater	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	(216)
Fuel for water heating, kWh/month	255.5952	226.3914	240.8626	212.0048	204.7732	182.5526	179.0150	187.5910	191.1229	213.7603	227.0624	252.7825	(219)
Space cooling fuel requirement													
(221)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	(221)
Pumps and Fa	14.6629	13.2439	14.6629	14.1899	14.6629	14.1899	14.6629	14.6629	14.1899	14.6629	14.1899	14.6629	(231)
Lighting	12.7924	10.2626	9.2403	6.7698	5.2292	4.2723	4.7703	6.2006	8.0539	10.5672	11.9356	13.1480	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)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	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)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	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)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	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)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	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)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	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)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	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)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	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)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	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												2370.9892	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												89.0000	
Water heating fuel used												2573.5140	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7125)													
mechanical ventilation fans (SFP = 0.7125)												86.6433	(230a)
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												172.6433	(231)
Electricity for lighting (calculated in Appendix L)												103.2423	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												5220.3888	(238)

Full SAP Calculation Printout



10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2370.9892	3.6400	86.3040 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2573.5140	3.6400	93.6759 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	172.6433	16.4900	28.4689 (249)
Energy for lighting	103.2423	16.4900	17.0247 (250)
Additional standing charges			92.0000 (251)
Total energy cost			317.4735 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.3738 (257)
SAP value		77.7299
SAP rating (Section 12)		78 (258)
SAP band		C

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	2370.9892	0.2100	497.9077 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2573.5140	0.2100	540.4379 (264)
Space and water heating			1038.3457 (265)
Pumps, fans and electric keep-hot	172.6433	0.1387	23.9478 (267)
Energy for lighting	103.2423	0.1443	14.9011 (268)
Total CO2, kg/year			1077.1945 (272)
CO2 emissions per m2			28.2100 (273)
EI value			82.6489
EI rating			83 (274)
EI band			B

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling	38.1900	2.6100	99.6759
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	38.1900		99.6759
Dwelling volume			

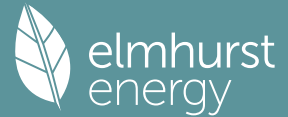
2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test			No
Pressure Test Method			Blower Door
Measured/design AP50			15.0000 (17)
Infiltration rate			0.7500 (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) =		0.6375 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000 (22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000 (22a)
Adj infilt rate	0.6853	0.6534	0.6534	0.6056	0.6216	0.5419	0.5419	0.5259	0.5419	0.6056	0.5897	0.6375 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												79.2000 (23c)
Effective ac	0.7893	0.7574	0.7574	0.7096	0.7256	0.6459	0.6459	0.6299	0.6459	0.7096	0.6937	0.7415 (25)

Full SAP Calculation Printout



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						
Main dwelling													
Window			6.8500	1.3258	9.0814		(27)						
HGD			1.7900	1.4000	2.5060		(26a)						
Floor to commercial space			35.9300	0.2600	9.3418	20.0000	718.6000 (28b)						
Upgraded wall	36.4400	8.6400	27.8000	0.2000	5.5600	9.0000	250.2000 (29a)						
Total net area of external elements Aum(A, m2)			72.3700				(31)						
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.4892		(33)						
Main dwelling													
Party Wall 1			36.4400	0.0000	0.0000	0.0000	0.0000 (32)						
Party Floor 1			2.2700			30.0000	68.1000 (32d)						
Party Ceiling 1			38.1900			30.0000	1145.7000 (32b)						
Internal Wall 1			46.8200			9.0000	421.3800 (32c)						
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	2603.9800 (34)						
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							68.1849 (35)						
Thermal bridges (Default value 0.200 * total exposed area)							14.4740 (36)						
Point Thermal bridges						(36a) =	0.0000						
Total fabric heat loss						(33) + (36) + (36a) =	40.9632 (37)						
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 25.9629	Feb 24.9144	Mar 24.9144	Apr 23.3417	May 23.8660	Jun 21.2448	Jul 21.2448	Aug 20.7206	Sep 21.2448	Oct 23.3417	Nov 22.8175	Dec 24.3902	(38)
Heat transfer coeff	66.9261	65.8777	65.8777	64.3050	64.8292	62.2080	62.2080	61.6838	62.2080	64.3050	63.7807	65.3534	(39)
Average = Sum(39)m / 12 =												64.1302	
HLP	Jan 1.7525	Feb 1.7250	Mar 1.7250	Apr 1.6838	May 1.6975	Jun 1.6289	Jul 1.6289	Aug 1.6152	Sep 1.6289	Oct 1.6838	Nov 1.6701	Dec 1.7113	(40)
HLP (average)												1.6792	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.3591 (42)
Hot water usage for mixer showers													
82.9085	81.6626	79.8470	76.3732	73.8096	70.9507	69.3257	71.1275	73.1027	76.1723	79.7207	82.5909	82.5909	(42a)
Hot water usage for baths													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42b)
Hot water usage for other uses													
28.5486	27.5105	26.4723	25.4342	24.3961	23.3579	23.3579	24.3961	25.4342	26.4723	27.5105	28.5486	28.5486	(42c)
Average daily hot water use (litres/day)													102.3922 (43)
Daily hot water use	Jan 111.4571	Feb 109.1730	Mar 106.3193	Apr 101.8074	May 98.2056	Jun 94.3086	Jul 92.6836	Aug 95.5236	Sep 98.5369	Oct 102.6446	Nov 107.2312	Dec 111.1395	(44)
Energy conte	176.5208	155.4610	163.4088	139.3692	132.2037	115.9634	112.0928	118.2782	121.5059	139.2878	152.7705	174.0176	(45)
Energy content (annual)										Total = Sum(45)m =		1700.8796	
Distribution loss (46)m = 0.15 x (45)m													
26.4781	23.3191	24.5113	20.9054	19.8305	17.3945	16.8139	17.7417	18.2259	20.8932	22.9156	26.1026	26.1026	(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	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	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)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.0445	46.5084	47.2306	48.6778	48.5935	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
227.4797	201.4884	214.3677	188.6843	182.2482	162.4718	159.3234	166.9560	170.0994	190.2467	202.0856	224.9765	224.9765	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
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	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	227.4797	201.4884	214.3677	188.6843	182.2482	162.4718	159.3234	166.9560	170.0994	190.2467	202.0856	224.9765	(64)
Electric shower(s)													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Heat gains from water heating, kWh/month													
71.4329	63.1976	67.0732	58.6690	56.4688	50.1849	49.0785	51.4969	52.5491	59.0529	63.1250	70.6006	70.6006	(65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)

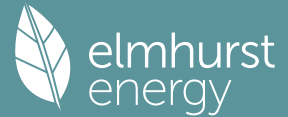
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	Jan 81.5462	Feb 81.5462	Mar 81.5462	Apr 81.5462	May 81.5462	Jun 81.5462	Jul 81.5462	Aug 81.5462	Sep 81.5462	Oct 81.5462	Nov 81.5462	Dec 81.5462	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
14.6150	12.9809	10.5568	7.9922	5.9742	5.0437	5.4499	7.0840	9.5081	12.0728	14.0907	15.0212	15.0212	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
174.6413	176.4536	171.8868	162.1647	149.8923	138.3580	130.6523	128.8401	133.4069	143.1290	155.4014	166.9357	166.9357	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
44.5137	44.5137	44.5137	44.5137	44.5137	44.5137	44.5137	44.5137	44.5137	44.5137	44.5137	44.5137	44.5137	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)													
-54.3642	-54.3642	-54.3642	-54.3642	-54.3642	-54.3642	-54.3642	-54.3642	-54.3642	-54.3642	-54.3642	-54.3642	-54.3642	(71)
Water heating gains (Table 5)													
96.0120	94.0441	90.1521	81.4848	75.8990	69.7013	65.9657	69.2163	72.9848	79.3722	87.6735	94.8932	94.8932	(72)
Total internal gains	359.9641	358.1744	347.2915	326.3374	306.4613	284.7988	273.7638	276.8362	287.5956	309.2697	331.8614	351.5460	(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
-------	------------	--------------------------------	-----------------------------------	------------------------------------	------------------------------	------------

Full SAP Calculation Printout



Northeast					3.9200	13.7804	0.6300	0.7000	0.7700	16.5090	(75)
Southeast					2.9300	43.0593	0.6300	0.7000	0.7700	38.5573	(77)

Solar gains	55.0662	86.8979	131.0909	187.0683	223.6610	243.8529	229.0921	200.3834	159.1614	106.8840	65.9853	46.7314	(83)
Total gains	415.0304	445.0723	478.3824	513.4057	530.1223	528.6517	502.8559	477.2196	446.7571	416.1537	397.8467	398.2774	(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	10.8079	10.9799	10.9799	11.2484	11.1574	11.6276	11.6276	11.7264	11.6276	11.2484	11.3409	11.0679	
alpha	1.7205	1.7320	1.7320	1.7499	1.7438	1.7752	1.7752	1.7818	1.7752	1.7499	1.7561	1.7379	
util living area	0.8692	0.8482	0.8083	0.7353	0.6325	0.4785	0.3545	0.3761	0.5811	0.7503	0.8349	0.8744	(86)
MIT	17.3662	17.7084	18.3410	19.2160	19.9984	20.6176	20.8536	20.8352	20.3840	19.4154	18.3492	17.3737	(87)
Th 2	19.5035	19.5230	19.5230	19.5525	19.5426	19.5922	19.5922	19.6022	19.5922	19.5525	19.5623	19.5328	(88)
util rest of house	0.8514	0.8277	0.7809	0.6950	0.5682	0.3802	0.2202	0.2411	0.4928	0.7035	0.8094	0.8574	(89)
MIT 2	15.5886	16.0058	16.7660	17.8105	18.6934	19.3562	19.5451	19.5449	19.1493	18.0669	16.8037	15.6069	(90)
Living area fraction									fLA = Living area / (4) =			0.5609	(91)
MIT	16.5856	16.9608	17.6494	18.5988	19.4253	20.0637	20.2790	20.2686	19.8419	18.8233	17.6705	16.5978	(92)
Temperature adjustment												0.0000	
adjusted MIT	16.5856	16.9608	17.6494	18.5988	19.4253	20.0637	20.2790	20.2686	19.8419	18.8233	17.6705	16.5978	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8040	0.7805	0.7369	0.6633	0.5624	0.4155	0.2892	0.3092	0.5102	0.6750	0.7656	0.8108	(94)
Useful gains	333.6952	347.3881	352.5142	340.5495	298.1294	219.6673	145.4267	147.5411	227.9261	280.9015	304.6088	322.9195	(95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000	(96)
Heat loss rate W	768.6888	741.8330	675.2042	559.3778	423.0322	265.2367	160.4337	164.6090	301.2023	470.9219	616.7928	751.4232	(97)
Space heating kWh	323.6353	265.0670	240.0813	157.5564	92.9277	0.0000	0.0000	0.0000	0.0000	141.3752	224.7725	318.8068	(98a)
Space heating requirement - total per year (kWh/year)												1764.2221	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	323.6353	265.0670	240.0813	157.5564	92.9277	0.0000	0.0000	0.0000	0.0000	141.3752	224.7725	318.8068	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1764.2221	
Space heating per m2										(98c) / (4) =		46.1959	(99)

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 %)													89.0000	(206)
Efficiency of main space heating system 2 (in %)													0.0000	(207)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	323.6353	265.0670	240.0813	157.5564	92.9277	0.0000	0.0000	0.0000	0.0000	141.3752	224.7725	318.8068	(98)	
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000	(210)	
Space heating fuel (main heating system)	363.6351	297.8281	269.7543	177.0296	104.4131	0.0000	0.0000	0.0000	0.0000	158.8485	252.5534	358.2099	(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)	
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Water heating requirement	227.4797	201.4884	214.3677	188.6843	182.2482	162.4718	159.3234	166.9560	170.0994	190.2467	202.0856	224.9765	(64)	
Efficiency of water heater (217)m	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	(216)	
Fuel for water heating, kWh/month	255.5952	226.3914	240.8626	212.0048	204.7732	182.5526	179.0150	187.5910	191.1229	213.7603	227.0624	252.7825	(219)	
Space cooling fuel requirement (221)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	(221)	
Pumps and Fa	14.6629	13.2439	14.6629	14.1899	14.6629	14.1899	14.6629	14.6629	14.1899	14.6629	14.1899	14.6629	(231)	
Lighting	12.7924	10.2626	9.2403	6.7698	5.2292	4.2723	4.7703	6.2006	8.0539	10.5672	11.9356	13.1480	(232)	
Electricity generated by PVs (Appendix M) (negative quantity)														
(233a)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	(233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)														
(234a)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	(234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)														
(235a)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	(235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)														
(235c)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	(235c)	
Electricity generated by PVs (Appendix M) (negative quantity)														
(233b)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	(233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)														
(234b)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	(234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)														
(235b)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	(235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)														
(235d)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	(235d)	
Annual totals kWh/year														
Space heating fuel - main system 1												1982.2720	(211)	
Space heating fuel - main system 2												0.0000	(213)	
Space heating fuel - secondary												0.0000	(215)	
Efficiency of water heater												89.0000		
Water heating fuel used												2573.5140	(219)	
Space cooling fuel												0.0000	(221)	

Full SAP Calculation Printout



Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7125)		
mechanical ventilation fans (SFP = 0.7125)	86.6433	(230a)
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	172.6433	(231)
Electricity for lighting (calculated in Appendix L)	103.2423	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	4831.6716	(238)

10a. Fuel costs - using BEDF prices (567)			

	Fuel	Fuel price	Fuel cost
	kWh/year	p/kWh	£/year
Space heating - main system 1	1982.2720	5.6000	111.0072 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2573.5140	5.6000	144.1168 (247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (247a)
Pumps, fans and electric keep-hot	172.6433	26.0600	44.9908 (249)
Energy for lighting	103.2423	26.0600	26.9050 (250)
Additional standing charges			99.0000 (251)
Total energy cost			426.0198 (255)

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

	Energy	Emission factor	Emissions
	kWh/year	kg CO2/kWh	kg CO2/year
Space heating - main system 1	1982.2720	0.2100	416.2771 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2573.5140	0.2100	540.4379 (264)
Space and water heating			956.7151 (265)
Pumps, fans and electric keep-hot	172.6433	0.1387	23.9478 (267)
Energy for lighting	103.2423	0.1443	14.9011 (268)
Total CO2, kg/year			995.5639 (272)

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

	Energy	Primary energy factor	Primary energy
	kWh/year	kg CO2/kWh	kWh/year
Space heating - main system 1	1982.2720	1.1300	2239.9673 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2573.5140	1.1300	2908.0708 (278)
Space and water heating			5148.0381 (279)
Pumps, fans and electric keep-hot	172.6433	1.5128	261.1747 (281)
Energy for lighting	103.2423	1.5338	158.3566 (282)
Total Primary energy kWh/year			5567.5695 (286)

SAP 10 EPC IMPROVEMENTS

Proposed

Current energy efficiency rating:	C 78
Current environmental impact rating:	B 83

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

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

Recommended measures (none)	Typical annual savings		Energy efficiency	Environmental impact
	Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating:	C 78
Potential environmental impact rating:	B 83

Fuel prices for cost data on this page from database revision number 567 TEST (07 Mar 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current	Potential	Saving
Electricity	£72	£72	£0
Mains gas	£354	£354	£0
Space heating	£255	£255	£0
Water heating	£144	£144	£0
Lighting	£27	£27	£0
Total cost of fuels	£426	£426	£0
Total cost of uses	£426	£426	£0
Delivered energy	127 kWh/m²	127 kWh/m²	0 kWh/m²

Full SAP Calculation Printout



Carbon dioxide emissions	1.0 tonnes	1.0 tonnes	0.0 tonnes
CO2 emissions per m ²	26 kg/m ²	26 kg/m ²	0 kg/m ²
Primary energy	146 kWh/m ²	146 kWh/m ²	0 kWh/m ²

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	38.1900 (1b)	2.6100 (2b)	99.6759 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	38.1900		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	99.6759 (5)

2. Ventilation rate

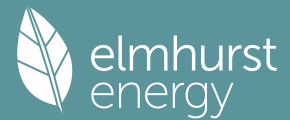
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	0.0000 / (5) = 0.0000 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.7500 (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) = 0.6375 (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	0.8128	0.7969	0.7809	0.7013	0.6853	0.6056	0.6056	0.5897	0.6375	0.6853	0.7172	0.7491 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												79.2000 (23c)
Effective ac	0.9168	0.9009	0.8849	0.8053	0.7893	0.7096	0.7096	0.6937	0.7415	0.7893	0.8212	0.8531 (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					
Main dwelling												
Window			6.8500	1.3258	9.0814		(27)					
HGD			1.7900	1.4000	2.5060		(26a)					
Floor to commercial space			35.9300	0.2600	9.3418	20.0000	718.6000 (28b)					
Upgraded wall	36.4400	8.6400	27.8000	0.2000	5.5600	9.0000	250.2000 (29a)					
Total net area of external elements Aum(A, m2)			72.3700				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	26.4892		(33)					
Main dwelling												
Party Wall 1			36.4400	0.0000	0.0000	0.0000	0.0000 (32)					
Party Floor 1			2.2700			30.0000	68.1000 (32d)					
Party Ceiling 1			38.1900			30.0000	1145.7000 (32b)					
Internal Wall 1			46.8200			9.0000	421.3800 (32c)					
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	2603.9800 (34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							68.1849 (35)					
Thermal bridges (Default value 0.200 * total exposed area)							14.4740 (36)					
Point Thermal bridges						(36a) =	0.0000					
Total fabric heat loss						(33) + (36) + (36a) =	40.9632 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	30.1568	29.6325	29.1083	26.4871	25.9629	23.3417	23.3417	22.8175	24.3902	25.9629	27.0114	28.0598 (38)
Average = Sum(39)m / 12 =	71.1200	70.5958	70.0715	67.4504	66.9261	64.3050	64.3050	63.7807	65.3534	66.9261	67.9746	69.0231 (39)
												67.3193
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.8623	1.8485	1.8348	1.7662	1.7525	1.6838	1.6838	1.6701	1.7113	1.7525	1.7799	1.8074 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

Full SAP Calculation Printout



4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.3591 (42)
Hot water usage for mixer showers												82.5909 (42a)
Hot water usage for baths												0.0000 (42b)
Hot water usage for other uses												28.5486 (42c)
Average daily hot water use (litres/day)												102.3922 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	111.4571	109.1730	106.3193	101.8074	98.2056	94.3086	92.6836	95.5236	98.5369	102.6446	107.2312	111.1395 (44)
Distribution loss (46)m = 0.15 x (45)m	176.5208	155.4610	163.4088	139.3692	132.2037	115.9634	112.0928	118.2782	121.5059	139.2878	152.7705	174.0176 (45)
Water storage loss:												Total = Sum(45)m = 1700.8796
Total storage loss	26.4781	23.3191	24.5113	20.9054	19.8305	17.3945	16.8139	17.7417	18.2259	20.8932	22.9156	26.1026 (46)
If cylinder contains dedicated solar storage												0.0000 (56)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Total heat required for water heating calculated for each month	50.9589	46.0274	50.9589	49.3151	50.0445	46.5084	47.2306	48.6778	48.5935	50.9589	49.3151	50.9589 (61)
WWHRS	227.4797	201.4884	214.3677	188.6843	182.2482	162.4718	159.3234	166.9560	170.0994	190.2467	202.0856	224.9765 (62)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
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 (63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	227.4797	201.4884	214.3677	188.6843	182.2482	162.4718	159.3234	166.9560	170.0994	190.2467	202.0856	224.9765 (64)
Electric shower(s)												Total per year (kWh/year) = Sum(64)m = 2290.4275 (64)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
	71.4329	63.1976	67.0732	58.6690	56.4688	50.1849	49.0785	51.4969	52.5491	59.0529	63.1250	70.6006 (65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)												

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	81.5462	81.5462	81.5462	81.5462	81.5462	81.5462	81.5462	81.5462	81.5462	81.5462	81.5462	81.5462 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	14.6150	12.9809	10.5568	7.9922	5.9742	5.0437	5.4499	7.0840	9.5081	12.0728	14.0907	15.0212 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	174.6413	176.4536	171.8868	162.1647	149.8923	138.3580	130.6523	128.8401	133.4069	143.1290	155.4014	166.9357 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	44.5137	44.5137	44.5137	44.5137	44.5137	44.5137	44.5137	44.5137	44.5137	44.5137	44.5137	44.5137 (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)	-54.3642	-54.3642	-54.3642	-54.3642	-54.3642	-54.3642	-54.3642	-54.3642	-54.3642	-54.3642	-54.3642	-54.3642 (71)
Water heating gains (Table 5)	96.0120	94.0441	90.1521	81.4848	75.8990	69.7013	65.9657	69.2163	72.9848	79.3722	87.6735	94.8932 (72)
Total internal gains	359.9641	358.1744	347.2915	326.3374	306.4613	284.7988	273.7638	276.8362	287.5956	309.2697	331.8614	351.5460 (73)

6. Solar gains

[Jan]																				
					Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d				Gains W					
Northeast					3.9200	11.2829		0.6300	0.7000		0.7700				13.5170 (75)					
Southeast					2.9300	36.7938		0.6300	0.7000		0.7700				32.9469 (77)					
Solar gains	46.4639	83.6350	126.3588	176.5539	216.0005	222.4640	211.1392	180.4833	143.5481	95.6500	56.4707	39.2343	(83)							
Total gains	406.4280	441.8094	473.6503	502.8914	522.4618	507.2628	484.9029	457.3196	431.1437	404.9197	388.3321	390.7803	(84)							

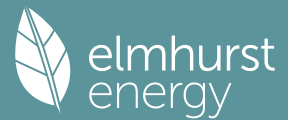
7. Mean internal temperature (heating season)

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	10.1705	10.2461	10.3227	10.7239	10.8079	11.2484	11.2484	11.3409	11.0679	10.8079	10.6411	10.4795
alpha	1.6780	1.6831	1.6882	1.7149	1.7205	1.7499	1.7499	1.7561	1.7379	1.7205	1.7094	1.6986
util living area	0.8847	0.8647	0.8311	0.7713	0.6864	0.5685	0.4610	0.4921	0.6489	0.7864	0.8584	0.8896 (86)
MIT	16.8967	17.2418	17.8841	18.7991	19.6371	20.3466	20.6848	20.6355	20.1016	19.0492	17.8741	16.8926 (87)
Th 2	19.4267	19.4362	19.4457	19.4938	19.5035	19.5525	19.5525	19.5623	19.5328	19.5035	19.4841	19.4649 (88)
util rest of house	0.8688	0.8461	0.8068	0.7362	0.6323	0.4845	0.3416	0.3756	0.5720	0.7465	0.8363	0.8747 (89)
MIT 2	14.9991	15.4169	16.1930	17.2988	18.2731	19.0726	19.3925	19.3637	18.8253	17.6212	16.2072	15.0045 (90)
Living area fraction	16.0634	16.4405	17.1415	18.1403	19.0382	19.7871	20.1173	20.0770	19.5411	18.4221	17.1421	16.0635 (92)
MIT	16.0634	16.4405	17.1415	18.1403	19.0382	19.7871	20.1173	20.0770	19.5411	18.4221	17.1421	16.0635 (93)
Temperature adjustment	16.0634	16.4405	17.1415	18.1403	19.0382	19.7871	20.1173	20.0770	19.5411	18.4221	17.1421	16.0635 (93)
adjusted MIT	16.0634	16.4405	17.1415	18.1403	19.0382	19.7871	20.1173	20.0770	19.5411	18.4221	17.1421	16.0635 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.8210	0.7974	0.7594	0.6973	0.6127	0.4995	0.3917	0.4209	0.5725	0.7104	0.7901	0.8278 (94)
Ext temp.	333.6769	352.2782	359.6894	350.6564	320.1249	253.3994	189.9582	192.4869	246.8298	287.6611	306.8197	323.4953 (95)
	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)

Full SAP Calculation Printout



Heat loss rate W	836.6120	814.7075	745.6681	623.2588	491.1150	333.5580	226.1807	234.5226	355.5967	523.5057	682.6092	818.8566 (97)
Space heating kWh	374.1837	310.7525	287.1682	196.2737	127.2166	0.0000	0.0000	0.0000	0.0000	175.4684	270.5684	368.5487 (98a)
Space heating requirement - total per year (kWh/year)												2110.1804
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	374.1837	310.7525	287.1682	196.2737	127.2166	0.0000	0.0000	0.0000	0.0000	175.4684	270.5684	368.5487 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2110.1804
Space heating per m2										(98c) / (4) =		55.2548 (99)

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

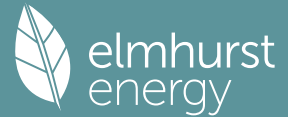
Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												89.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
374.1837	310.7525	287.1682	196.2737	127.2166	0.0000	0.0000	0.0000	0.0000	0.0000	175.4684	270.5684	368.5487 (98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000 (210)
Space heating fuel (main heating system)	420.4312	349.1601	322.6609	220.5323	142.9401	0.0000	0.0000	0.0000	0.0000	197.1555	304.0095	414.0997 (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)
Space heating fuel (secondary)	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	227.4797	201.4884	214.3677	188.6843	182.2482	162.4718	159.3234	166.9560	170.0994	190.2467	202.0856	224.9765 (64)
Efficiency of water heater	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000 (216)
(217)m	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000 (217)
Fuel for water heating, kWh/month	255.5952	226.3914	240.8626	212.0048	204.7732	182.5526	179.0150	187.5910	191.1229	213.7603	227.0624	252.7825 (219)
Space cooling fuel requirement												
(221)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 (221)
Pumps and Fa	14.6629	13.2439	14.6629	14.1899	14.6629	14.1899	14.6629	14.6629	14.1899	14.6629	14.1899	14.6629 (231)
Lighting	12.7924	10.2626	9.2403	6.7698	5.2292	4.2723	4.7703	6.2006	8.0539	10.5672	11.9356	13.1480 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)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 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)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 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)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 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)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 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)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 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)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 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)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 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)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 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												2370.9892 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												89.0000
Water heating fuel used												2573.5140 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7125)												
mechanical ventilation fans (SFP = 0.7125)												86.6433 (230a)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												172.6433 (231)
Electricity for lighting (calculated in Appendix L)												103.2423 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												
Energy saved or generated												-0.0000 (236)
Energy used												0.0000 (237)
Total delivered energy for all uses												5220.3888 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2370.9892	3.6400	86.3040 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2573.5140	3.6400	93.6759 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	172.6433	16.4900	28.4689 (249)
Energy for lighting	103.2423	16.4900	17.0247 (250)
Additional standing charges			92.0000 (251)
Total energy cost			317.4735 (255)

11a. SAP rating - Individual heating systems

Full SAP Calculation Printout



Energy cost deflator (Table 12): 0.3600 (256)
Energy cost factor (ECF) [(255) x (256)] / [(4) + 45.0] = 1.3738 (257)
SAP value 77.7299
SAP rating (Section 12) 78 (258)
SAP band C

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

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Space heating - main system 1	2370.9892	0.2100	497.9077 (261)
Total CO ₂ associated with community systems			0.0000 (373)
Water heating (other fuel)	2573.5140	0.2100	540.4379 (264)
Space and water heating			1038.3457 (265)
Pumps, fans and electric keep-hot	172.6433	0.1387	23.9478 (267)
Energy for lighting	103.2423	0.1443	14.9011 (268)
Total CO ₂ , kg/year			1077.1945 (272)
CO ₂ emissions per m ²			28.2100 (273)
EI value			82.6489
EI rating			83 (274)
EI band			B

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling	38.1900 (1b)	2.6100 (2b)	99.6759 (1b) - (3b)
Ground floor			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	38.1900		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 99.6759 (5)

2. Ventilation rate

m³ per hour

Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract 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)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 0.0000 / (5) = 0.0000 (8)
Pressure test No
Pressure Test Method Blower Door
Measured/design AP50 15.0000 (17)
Infiltration rate 0.7500 (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) = 0.6375 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.3000	4.1000	4.1000	3.8000	3.9000	3.4000	3.4000	3.3000	3.4000	3.8000	3.7000	4.0000 (22)
Wind factor	1.0750	1.0250	1.0250	0.9500	0.9750	0.8500	0.8500	0.8250	0.8500	0.9500	0.9250	1.0000 (22a)
Adj infilt rate	0.6853	0.6534	0.6534	0.6056	0.6216	0.5419	0.5419	0.5259	0.5419	0.6056	0.5897	0.6375 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												79.2000 (23c)
Effective ac	0.7893	0.7574	0.7574	0.7096	0.7256	0.6459	0.6459	0.6299	0.6459	0.7096	0.6937	0.7415 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Window			6.8500	1.3258	9.0814		(27)
HGD			1.7900	1.4000	2.5060		(26a)
Floor to commercial space			35.9300	0.2600	9.3418	20.0000	718.6000 (28b)
Upgraded wall	36.4400	8.6400	27.8000	0.2000	5.5600	9.0000	250.2000 (29a)
Total net area of external elements Aum(A, m ²)			72.3700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		26.4892		(33)
Main dwelling							
Party Wall 1			36.4400	0.0000	0.0000	0.0000	0.0000 (32)
Party Floor 1			2.2700			30.0000	68.1000 (32d)
Party Ceiling 1			38.1900			30.0000	1145.7000 (32b)
Internal Wall 1			46.8200			9.0000	421.3800 (32c)
Heat capacity Cm = Sum(A x k)					(28)...(30) + (32) + (32a)...(32e) =		2603.9800 (34)

Full SAP Calculation Printout



Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 68.1849 (35)
Thermal bridges (Default value 0.200 * total exposed area) 14.4740 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 40.9632 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
(38)m Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Heat transfer coeff 25.9629 24.9144 24.9144 23.3417 23.8660 21.2448 21.2448 20.7206 21.2448 23.3417 22.8175 24.3902 (38)
Average = Sum(39)m / 12 = 66.9261 65.8777 65.8777 64.3050 64.8292 62.2080 62.2080 61.6838 62.2080 64.3050 63.7807 65.3534 (39)
64.1302

HLP Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
HLP (average) 1.7525 1.7250 1.7250 1.6838 1.6975 1.6289 1.6289 1.6152 1.6289 1.6838 1.6701 1.7113 (40)
Days in mont 31 28 31 30 31 30 31 31 30 31 30 31
1.6792
31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.3591 (42)
Hot water usage for mixer showers 82.9085 81.6626 79.8470 76.3732 73.8096 70.9507 69.3257 71.1275 73.1027 76.1723 79.7207 82.5909 (42a)
Hot water usage for baths 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (42b)
Hot water usage for other uses 28.5486 27.5105 26.4723 25.4342 24.3961 23.3579 23.3579 24.3961 25.4342 26.4723 27.5105 28.5486 (42c)
Average daily hot water use (litres/day) 102.3922 (43)
Daily hot water use Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Energy conte 111.4571 109.1730 106.3193 101.8074 98.2056 94.3086 92.6836 95.5236 98.5369 102.6446 107.2312 111.1395 (44)
Energy content (annual) 176.5208 155.4610 163.4088 139.3692 132.2037 115.9634 112.0928 118.2782 121.5059 139.2878 152.7705 174.0176 (45)
Distribution loss (46)m = 0.15 x (45)m Total = Sum(45)m = 1700.8796
26.4781 23.3191 24.5113 20.9054 19.8305 17.3945 16.8139 17.7417 18.2259 20.8932 22.9156 26.1026 (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)
Combi loss 50.9589 46.0274 50.9589 49.3151 50.0445 46.5084 47.2306 48.6778 48.5935 50.9589 49.3151 50.9589 (61)
Total heat required for water heating calculated for each month
WWHRS 227.4797 201.4884 214.3677 188.6843 182.2482 162.4718 159.3234 166.9560 170.0994 190.2467 202.0856 224.9765 (62)
PV diverter 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63a)
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 (63b)
FGHRS 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63c)
Output from w/h 227.4797 201.4884 214.3677 188.6843 182.2482 162.4718 159.3234 166.9560 170.0994 190.2467 202.0856 224.9765 (64)
Total per year (kWh/year) = Sum(64)m = 2290.4275 (64)
Electric shower(s) 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)
Heat gains from water heating, kWh/month 71.4329 63.1976 67.0732 58.6690 56.4688 50.1849 49.0785 51.4969 52.5491 59.0529 63.1250 70.6006 (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 81.5462 81.5462 81.5462 81.5462 81.5462 81.5462 81.5462 81.5462 81.5462 81.5462 81.5462 81.5462 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 14.6150 12.9809 10.5568 7.9922 5.9742 5.0437 5.4499 7.0840 9.5081 12.0728 14.0907 15.0212 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 174.6413 176.4536 171.8868 162.1647 149.8923 138.3580 130.6523 128.8401 133.4069 143.1290 155.4014 166.9357 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 44.5137 44.5137 44.5137 44.5137 44.5137 44.5137 44.5137 44.5137 44.5137 44.5137 44.5137 44.5137 (69)
Pumps, fans 3.0000 3.0000 3.0000 3.0000 3.0000 0.0000 0.0000 0.0000 0.0000 3.0000 3.0000 3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5) -54.3642 -54.3642 -54.3642 -54.3642 -54.3642 -54.3642 -54.3642 -54.3642 -54.3642 -54.3642 -54.3642 -54.3642 (71)
Water heating gains (Table 5) 96.0120 94.0441 90.1521 81.4848 75.8990 69.7013 65.9657 69.2163 72.9848 79.3722 87.6735 94.8932 (72)
Total internal gains 359.9641 358.1744 347.2915 326.3374 306.4613 284.7988 273.7638 276.8362 287.5956 309.2697 331.8614 351.5460 (73)

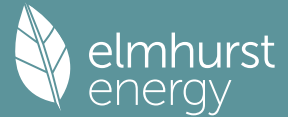
6. Solar gains

[Jan] Area Solar flux g FF Access Gains
m2 Table 6a Specific data factor Table 6d W
W/m2 or Table 6b or Table 6c
Northeast 3.9200 13.7804 0.6300 0.7000 0.7700 16.5090 (75)
Southeast 2.9300 43.0593 0.6300 0.7000 0.7700 38.5573 (77)
Solar gains 55.0662 86.8979 131.0909 187.0683 223.6610 243.8529 229.0921 200.3834 159.1614 106.8840 65.9853 46.7314 (83)
Total gains 415.0304 445.0723 478.3824 513.4057 530.1223 528.6517 502.8559 477.2196 446.7571 416.1537 397.8467 398.2774 (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 10.8079 10.9799 10.9799 11.2484 11.1574 11.6276 11.6276 11.7264 11.6276 11.2484 11.3409 11.0679
alpha 1.7205 1.7320 1.7320 1.7499 1.7438 1.7752 1.7752 1.7818 1.7752 1.7499 1.7561 1.7379
util living area 0.8692 0.8482 0.8083 0.7353 0.6325 0.4785 0.3545 0.3761 0.5811 0.7503 0.8349 0.8744 (86)

Full SAP Calculation Printout



MIT	17.3662	17.7084	18.3410	19.2160	19.9984	20.6176	20.8536	20.8352	20.3840	19.4154	18.3492	17.3737 (87)
Th 2	19.5035	19.5230	19.5230	19.5525	19.5426	19.5922	19.5922	19.6022	19.5922	19.5525	19.5623	19.5328 (88)
util rest of house	0.8514	0.8277	0.7809	0.6950	0.5682	0.3802	0.2202	0.2411	0.4928	0.7035	0.8094	0.8574 (89)
MIT 2	15.5886	16.0058	16.7660	17.8105	18.6934	19.3562	19.5451	19.5449	19.1493	18.0669	16.8037	15.6069 (90)
Living area fraction									fLA = Living area / (4) =			0.5609 (91)
MIT	16.5856	16.9608	17.6494	18.5988	19.4253	20.0637	20.2790	20.2686	19.8419	18.8233	17.6705	16.5978 (92)
Temperature adjustment												0.0000
adjusted MIT	16.5856	16.9608	17.6494	18.5988	19.4253	20.0637	20.2790	20.2686	19.8419	18.8233	17.6705	16.5978 (93)

8. Space heating requirement

Utilisation	Jan 0.8040	Feb 0.7805	Mar 0.7369	Apr 0.6633	May 0.5624	Jun 0.4155	Jul 0.2892	Aug 0.3092	Sep 0.5102	Oct 0.6750	Nov 0.7656	Dec 0.8108 (94)
Useful gains	333.6952	347.3881	352.5142	340.5495	298.1294	219.6673	145.4267	147.5411	227.9261	280.9015	304.6088	322.9195 (95)
Ext temp.	5.1000	5.7000	7.4000	9.9000	12.9000	15.8000	17.7000	17.6000	15.0000	11.5000	8.0000	5.1000 (96)
Heat loss rate W	768.6888	741.8330	675.2042	559.3778	423.0322	265.2367	160.4337	164.6090	301.2023	470.9219	616.7928	751.4232 (97)
Space heating kWh	323.6353	265.0670	240.0813	157.5564	92.9277	0.0000	0.0000	0.0000	0.0000	141.3752	224.7725	318.8068 (98a)
Space heating requirement - total per year (kWh/year)												1764.2221
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	323.6353	265.0670	240.0813	157.5564	92.9277	0.0000	0.0000	0.0000	0.0000	141.3752	224.7725	318.8068 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1764.2221
Space heating per m2										(98c) / (4) =		46.1959 (99)

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 %)												89.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	Jan 323.6353	Feb 265.0670	Mar 240.0813	Apr 157.5564	May 92.9277	Jun 0.0000	Jul 0.0000	Aug 0.0000	Sep 0.0000	Oct 141.3752	Nov 224.7725	Dec 318.8068 (98)
Space heating efficiency (main heating system 1)	89.0000	89.0000	89.0000	89.0000	89.0000	0.0000	0.0000	0.0000	0.0000	89.0000	89.0000	89.0000 (210)
Space heating fuel (main heating system)	363.6351	297.8281	269.7543	177.0296	104.4131	0.0000	0.0000	0.0000	0.0000	158.8485	252.5534	358.2099 (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)
Space heating fuel (secondary)	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	227.4797	201.4884	214.3677	188.6843	182.2482	162.4718	159.3234	166.9560	170.0994	190.2467	202.0856	224.9765 (64)
Efficiency of water heater (217)m	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000	89.0000 (216)
Fuel for water heating, kWh/month	255.5952	226.3914	240.8626	212.0048	204.7732	182.5526	179.0150	187.5910	191.1229	213.7603	227.0624	252.7825 (219)
Space cooling fuel requirement (221)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 (221)
Pumps and Fa	14.6629	13.2439	14.6629	14.1899	14.6629	14.1899	14.6629	14.6629	14.1899	14.6629	14.1899	14.6629 (231)
Lighting	12.7924	10.2626	9.2403	6.7698	5.2292	4.2723	4.7703	6.2006	8.0539	10.5672	11.9356	13.1480 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)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 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)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 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)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 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)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 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)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 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)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 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)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 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)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 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1982.2720 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												89.0000
Water heating fuel used												2573.5140 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7125)												
mechanical ventilation fans (SFP = 0.7125)												86.6433 (230a)
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												172.6433 (231)
Electricity for lighting (calculated in Appendix L)												103.2423 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												
Energy saved or generated												-0.0000 (236)
Energy used												0.0000 (237)
Total delivered energy for all uses												4831.6716 (238)

Full SAP Calculation Printout



10a. Fuel costs - using BEDF prices (567)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1982.2720	5.6000	111.0072 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2573.5140	5.6000	144.1168 (247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000 (247a)
Pumps, fans and electric keep-hot	172.6433	26.0600	44.9908 (249)
Energy for lighting	103.2423	26.0600	26.9050 (250)
Additional standing charges			99.0000 (251)
Total energy cost			426.0198 (255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1982.2720	0.2100	416.2771 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2573.5140	0.2100	540.4379 (264)
Space and water heating			956.7151 (265)
Pumps, fans and electric keep-hot	172.6433	0.1387	23.9478 (267)
Energy for lighting	103.2423	0.1443	14.9011 (268)
Total CO2, kg/year			995.5639 (272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1982.2720	1.1300	2239.9673 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2573.5140	1.1300	2908.0708 (278)
Space and water heating			5148.0381 (279)
Pumps, fans and electric keep-hot	172.6433	1.5128	261.1747 (281)
Energy for lighting	103.2423	1.5338	158.3566 (282)
Total Primary energy kWh/year			5567.5695 (286)

Approved Document L1 2021

Design-stage SAP calculation (BREL report)

Please find attached a copy of the design-stage SAP compliance report and a summary of the design specification upon which the SAP calculation is based.

Please review the summary of the design specification and inform us immediately of any changes required. To ensure compliance is achieved at the post-construction stage, it is vitally important that any future variation from this specification is verified within the SAP calculation before being applied on-site.

For new dwellings, a signed copy of the Building Regulations England Part L compliance report (BREL report) and photographic evidence of the build quality should be provided to the homeowner as part of the sign-off procedure. **The insulation junction details shown in the photographs must be consistent with the thermal bridging details that form part of the design specification. Please ensure the required photographs are captured before construction works become too far advanced to do so.** Additionally, there is now a requirement to consider airtightness throughout the build. Please familiarise yourself with the guidance from Approved Document L1 2021, as detailed below.

Appendix B: Reporting evidence of compliance

Photographic evidence

B6 Photographs should be taken for each dwelling on a development as a record during the construction of a property. The photographs should be made available to the energy assessor and the building control body. Anyone may take the photographs.

B7 Photographs should be taken of typical details as listed below and should be unique to each property. One photograph per detail should be recorded. Additional images, such as a close-up detail, should be provided only when necessary (see below). Photographs should be taken at appropriate construction stages for each detail when completed, but prior to closing-up works.

1. Foundations/substructure and ground floor, to show thermal continuity and quality of insulation in the following places.
 - a. At ground floor perimeter edge insulation.
 - b. At external door threshold.
 - c. Below damp-proof course on external walls.
2. External walls: for each main wall type, to show thermal continuity and quality of insulation for the following.

- a. Ground floor to wall junction.
 - b. Structural penetrating elements.
3. Roof: for each main roof type, to show thermal continuity and quality of insulation at the following.
 - a. Joist/rafter level.
 - b. Eaves and gable edges.
4. Openings: for each opening type (one image per wall or roof type is sufficient), to show thermal continuity and quality of insulation with photographs of the following.
 - a. Window positioning in relation to cavity closer or insulation line.
 - b. External doorset positioning in relation to cavity closer or insulation line.
5. Airtightness: additional photographs for all details 1–4 to show airtightness details (only if not included or visible in continuity of insulation image).
6. Building services: for all plant associated with space heating, hot water, ventilation and low or zero carbon technology equipment within or on the building, show the following.
 - a. Plant/equipment identification label(s), including make/model and serial number.
 - b. Primary pipework continuity of insulation.
 - c. Mechanical ventilation ductwork continuity of insulation (for duct sections outside the thermal envelope).

B8 Photographs should be digital and of sufficient quality and high enough resolution to allow a qualitative audit of the subject detail. Close-up photographs may be needed where a long shot image provides insufficient detail. More than one image of each detail may be needed. Geo- location should be enabled to confirm the location, date and time of each image. Each image file name should include a plot number and detail reference according to the numbers used in paragraph B7. For example, Plot 1 eaves detail would be P1/3b.

Airtightness in new dwellings

4.21 To ensure airtightness in new dwellings, all of the following apply.

- a. **Drawings:** all relevant drawings should be provided to clearly identify the position, continuity and extent of the air barrier. Drawings should be reviewed by the designer and installer and should include specifications for key materials.
- b. **Incoming services:** ducts, and cables wherever possible, should be grouped to minimise how often the air barrier is penetrated, while ensuring sufficient space to allow adequate screed

flow between ducts. (Use temporary supports for services during floor works.) Grommets or flexible collars should be used around incoming services and sealed to the air barrier with air-sealing tape or sealant.

- c. **Internal building services:** where services penetrate the air barrier, holes should be as small as possible and should be core drilled to limit damage. The penetrating services should be sealed to the air barrier using proprietary grommets or collars with air-sealing tape or sealant. Where membranes are penetrated, careful detailing should be used to achieve a robust and durable seal at these penetrations.
- d. **Structural penetrations** need to be effectively sealed for airtightness. Timber joist hangers should be considered as an alternative to penetrating through the inner leaf.
- e. **Cavity walls:** the inner block leaf mortar joint should be fully filled and pointed within the cavity. Where dense aggregate blocks have been used, plaster, parge coat or liquid membranes should be applied internally to reduce air permeability. Internal plasterboard linings are not appropriate for use as an air barrier solution.
- f. **Timber frame:** the vapour control layer should overlap at seams and junctions and be taped where it forms the airtightness barrier. Any damage, such as tears, should be repaired before boarding. Where sheathing board forms the air barrier, air-sealing tape should be applied at junctions and edges.
- g. **Fixings:** care should be taken to ensure that fixings do not damage the airtightness barrier.
- h. **Windows and doors:** to ensure continuity of the air barrier, window and door units should connect to the primary air barrier and window and door frames should be taped to surrounding structural openings, using air sealing tape. Compressible seals or gun sealant may be used to supplement taping.
- i. **Loft hatches:** where the roof is insulated at ceiling level, hatches should be suitably designed and installed to ensure optimum airtightness.

4.22 To avoid air movement within thermal elements, either of the following measures should be implemented.

- a. The insulation layer should abut the air barrier at all points in the building envelope.
- b. The space between the air barrier and the insulation layer should be filled with solid material.

Approved Document F1 2021

Natural ventilation with background ventilators and intermittent extract fans is now only permitted in dwellings that are classified as “less airtight dwellings”.

A less airtight dwelling is a dwelling that has a design air permeability rate higher than 5 m³/h.m² and an as-built air permeability rate higher than 3 m³/h.m².

4 St John's Road
Tunbridge Wells
Kent TN4 9NP

Tel: 01892 315 466
sales@achievegreen.co.uk
www.achievegreen.co.uk



For dwellings that have a design air permeability rate below $5 \text{ m}^3/\text{h.m}^2$ or an as-built air permeability rate below $3 \text{ m}^3/\text{h.m}^2$ a continuous mechanical extract ventilation system or mechanical ventilation with heat recovery should be specified. For retrospective installations, Approved Document F1 2021 states that intermittent extract fans may be replaced with a decentralised continuous mechanical extract ventilation system fan.

Approved Document O 2021

Approved Document O sets limits on the maximum area of glazing (to limit solar gains) and a minimum free area (for natural ventilation). There are two allowable methods to demonstrate compliance:

- Simplified method; or
- Dynamic Thermal Modelling (CIBSE TM59).

It is important to ensure the design achieves compliance using one of these methods prior to work commencing on site, as solutions to achieve compliance may require a change to the design.

Let Achieve Green guide you

As experts in providing professional advice on the design and construction of low energy and sustainable buildings, we can offer an analytical view on the proposed solutions and practical guidance on how best to achieve compliance.

We have a team of professionally trained consultants that offer nationwide coverage, and that can guide you smoothly through the processes, from concept to completion. Talk to us today to find out how we can help.



ACHIEVE GREEN CAN BE YOUR SINGLE-SOURCE PROVIDER FOR BUILDING REGULATIONS TESTING AND ASSESSMENT SERVICES.

New dwelling compliance pack

- ☒ Part L: SAP calculations and Energy Performance Certificates.
- ☒ Part L: air leakage testing.
- ☒ Part E: sound insulation testing.
- ☒ Part F: extractor fan flow-rate testing.
- ☒ Part G: water calculations.
- ☒ Part O: dynamic thermal modelling.

4 St John's Road
Tunbridge Wells
Kent TN4 9NP

Tel: 01892 315 466
sales@achievegreen.co.uk
www.achievegreen.co.uk



Mr Yashani Gohil
233 London Road
Reading
RG1 3NY

21st March 2025

Dear Mr Gohil,

SUMMARY OF COMPLIANCE CRITERIA FOR BUILDING REGULATIONS PART L1 2021

Re: SAP calculation for a change of use of a building that will result in a new dwelling being created at 233 London Road, Reading, RG1 3NY.

Based on the information you have provided to us, one of our SAP assessors has calculated the dwelling carbon emission rate (DER), the dwelling primary energy rate (DPER) and the dwelling fabric energy efficiency rate (DFEE) for the proposed dwelling, and for a corresponding notional dwelling.

I am pleased to say the proposed dwelling has **passed** the SAP assessment. The result of this calculation is contingent upon the following key design features:

- Thermal elements within the proposed dwelling to achieve the following U-values:

Floor to commercial space	0.26
Upgraded wall	0.20
Window	1.40
Doors	1.40

Criterion One

The carbon emission rate and primary energy rate for the proposed dwelling must not exceed the respective targets. The following results have been calculated:

Proposed Dwelling CO ₂ Emission Rate (DER)	=	28.45 kg CO ₂ /m ² /yr
Notional Dwelling CO ₂ Emission Rate (DER)	=	29.06 kg CO ₂ /m ² /yr
Proposed Dwelling Primary Energy Rate (DPER)	=	158.62 kWh _{PE} /m ² /yr
Notional Dwelling Primary Energy Rate (DPER)	=	162.08 kWh _{PE} /m ² /yr

Result: Pass

In defining the notional dwelling our SAP assessor has adhered to the guidelines outlined in Approved Document L1 as follows:

- The notional dwelling is of the same size and shape as the actual dwelling and has the same exposed facades;
- The area of openings in the notional dwelling is not more than 25% of the total floor area.
- The notional dwelling has the following elemental U-values:

	New or replaced elements	Retained elements that are upgraded
Floor	0.18	0.25
Walls, cavity insulation	0.18	0.55
Walls, other	0.18	0.30
Roof	0.15	0.16
Door	1.40	1.40
Windows	1.40	1.40

- Any new or replacement fixed building services within the notional building have an efficiency:
 - I. equal to that recommended in the Approved Document L1; and
 - II. not less than that of the controlled service being replaced.

Criterion Two

The U-values of any individual element within the proposed dwelling must not exceed the following threshold limits as prescribed in Approved Document L1:

	Highest U-value ¹
Wall	0.70
Floor	0.70
Roof	0.35
Openings	3.30

Result: Pass

For the specification of thermal elements please consult with the Building Regulation drawings.

As the dwelling primary energy rate and the dwelling carbon emission rate for the proposed dwelling do not exceed those for the notional dwelling, the proposed dwelling satisfies the compliance criteria of Approved Document L1 2021 of the Building Regulations.

¹ Limit for sub-elements of stated type.

4 St John's Road
Tunbridge Wells
Kent TN4 9NP

Tel: 01892 315 466
sales@achievegreen.co.uk
www.achievegreen.co.uk



Please find attached for your reference a copy of the SAP calculation worksheets. If you have any questions regarding the SAP calculations, then please do not hesitate to contact me.

Yours sincerely,

A handwritten signature in blue ink, appearing to read "JS", with a horizontal line extending to the right.

Jonathan Southworth

Predicted Energy Assessment



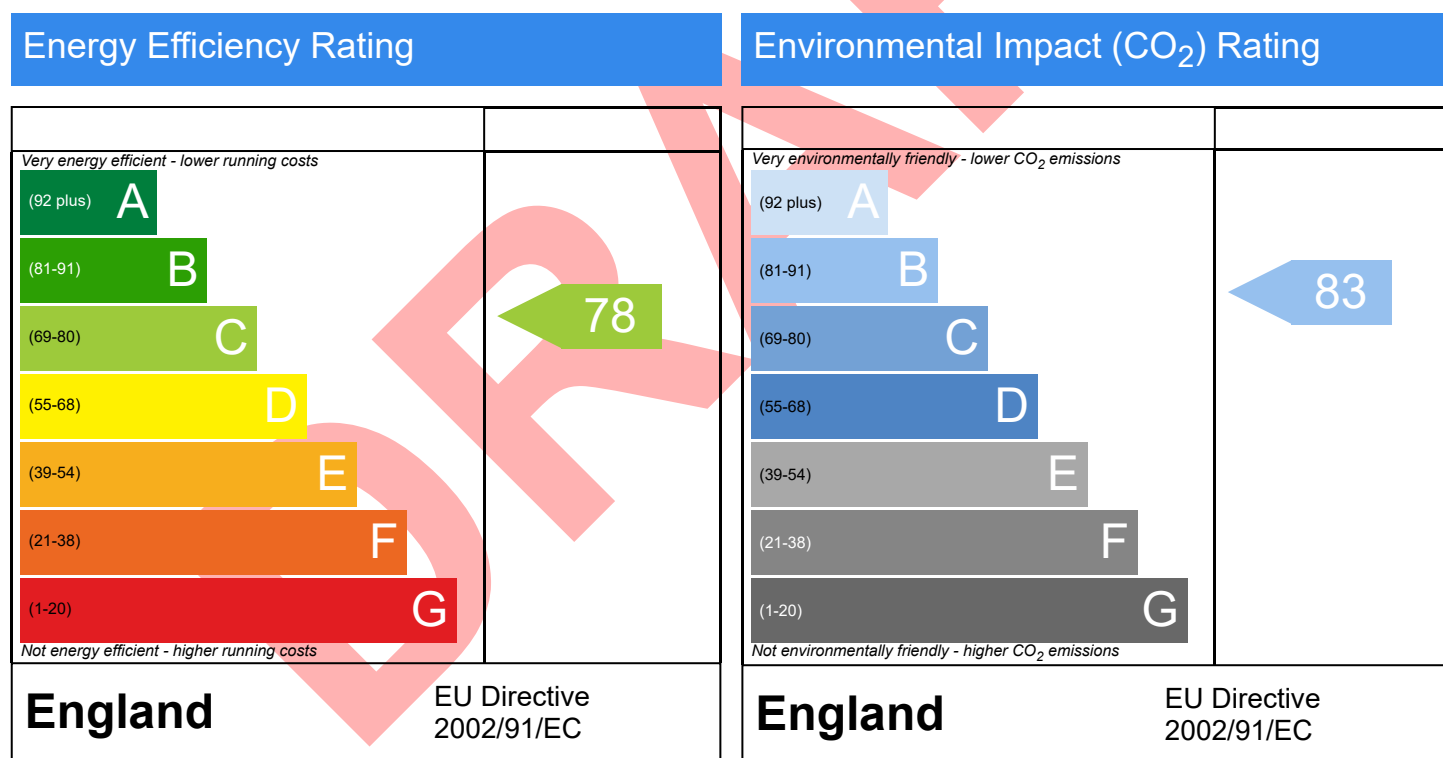
Flat 1, 233, London Road, Reading, RG1 3NY

Dwelling type:
Date of assessment:
Produced by:
Total floor area:
DRRN:

Flat, End-Terrace
21/03/2025
Connor Lewis
38.19 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 SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.



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.

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

Predicted Energy Assessment



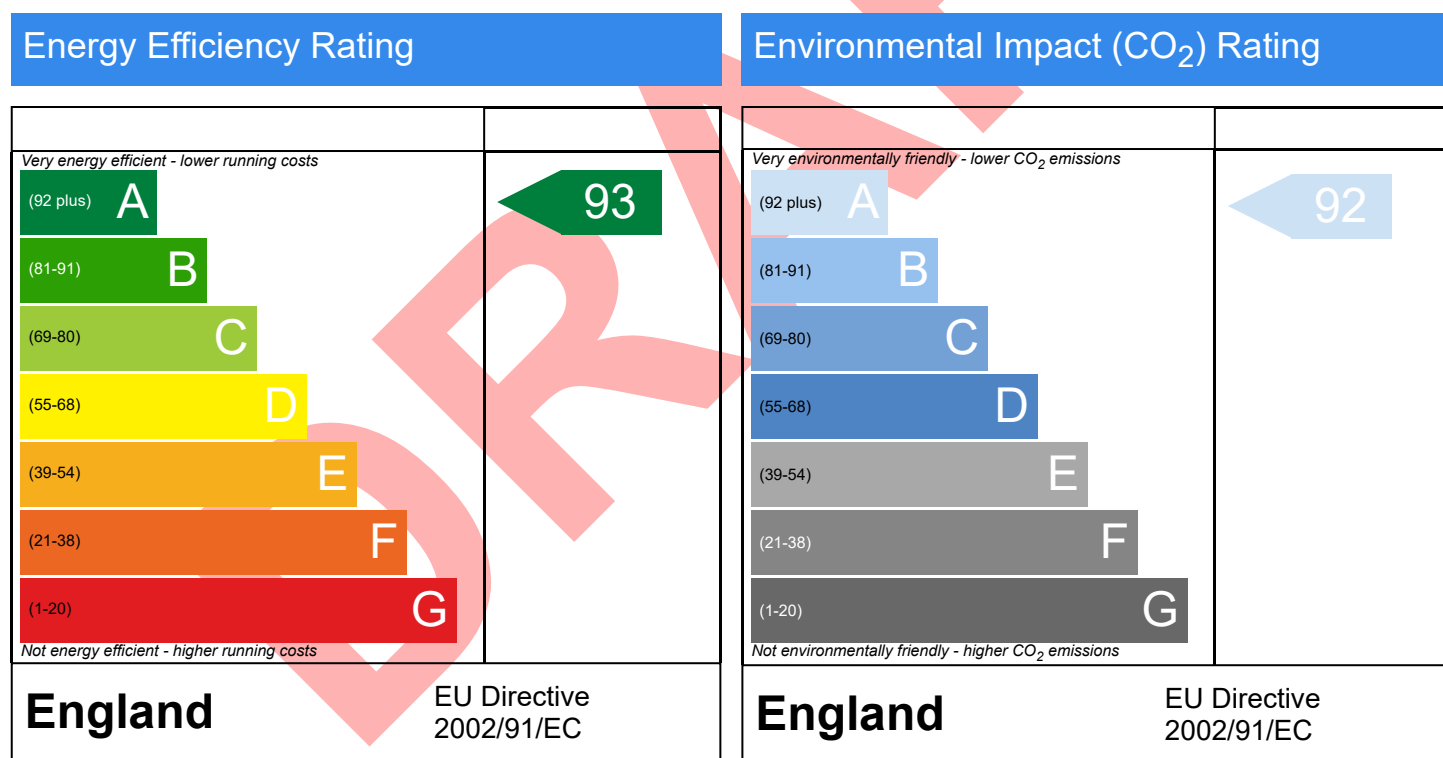
Flat 2, 233, London Road, Reading, RG1 3NY

Dwelling type:
Date of assessment:
Produced by:
Total floor area:
DRRN:

Flat, End-Terrace
21/03/2025
Connor Lewis
34.91 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 SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.



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.

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

Predicted Energy Assessment



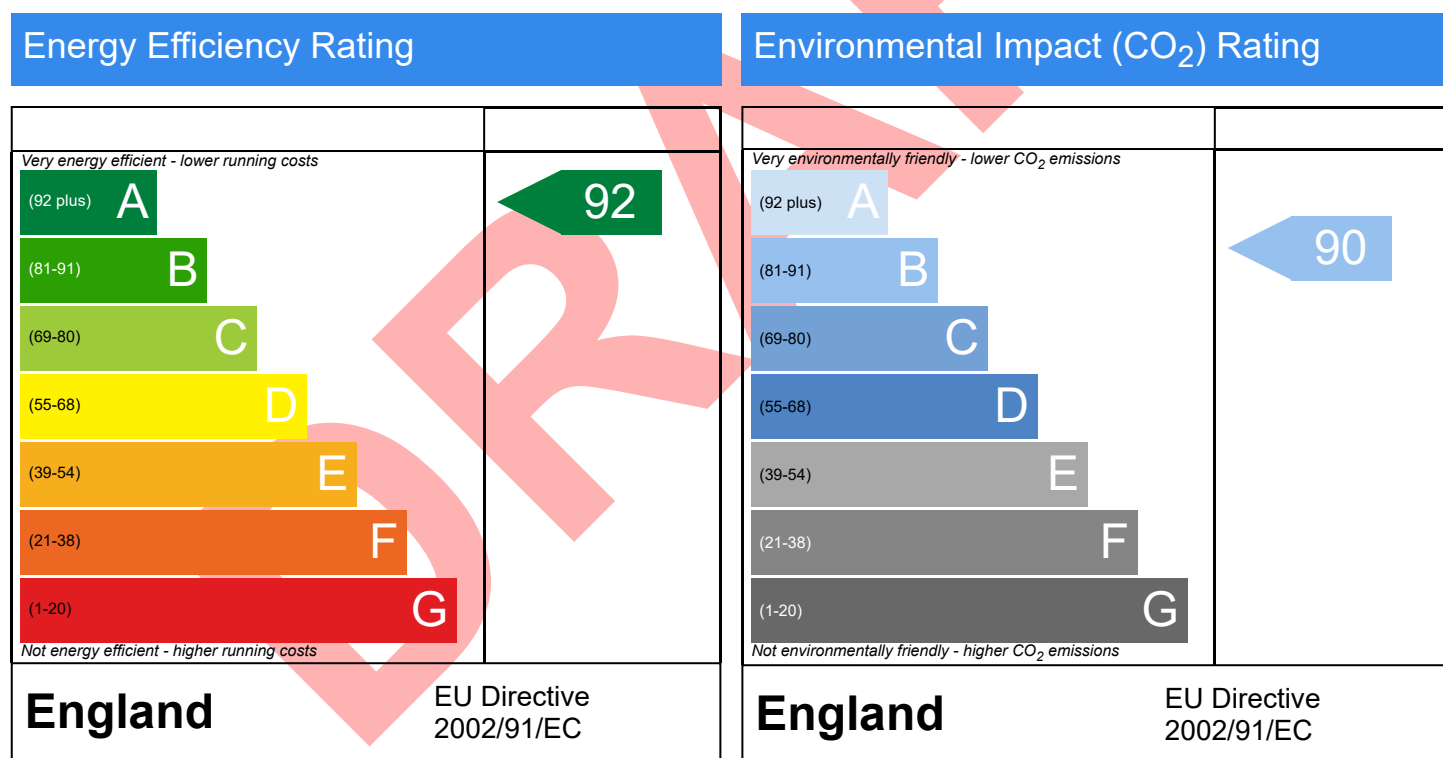
Flat 3, 233, London Road, Reading, RG1 3NY

Dwelling type:
Date of assessment:
Produced by:
Total floor area:
DRRN:

Maisonette, End-Terrace
21/03/2025
Connor Lewis
59.19 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 SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.



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.

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

Predicted Energy Assessment



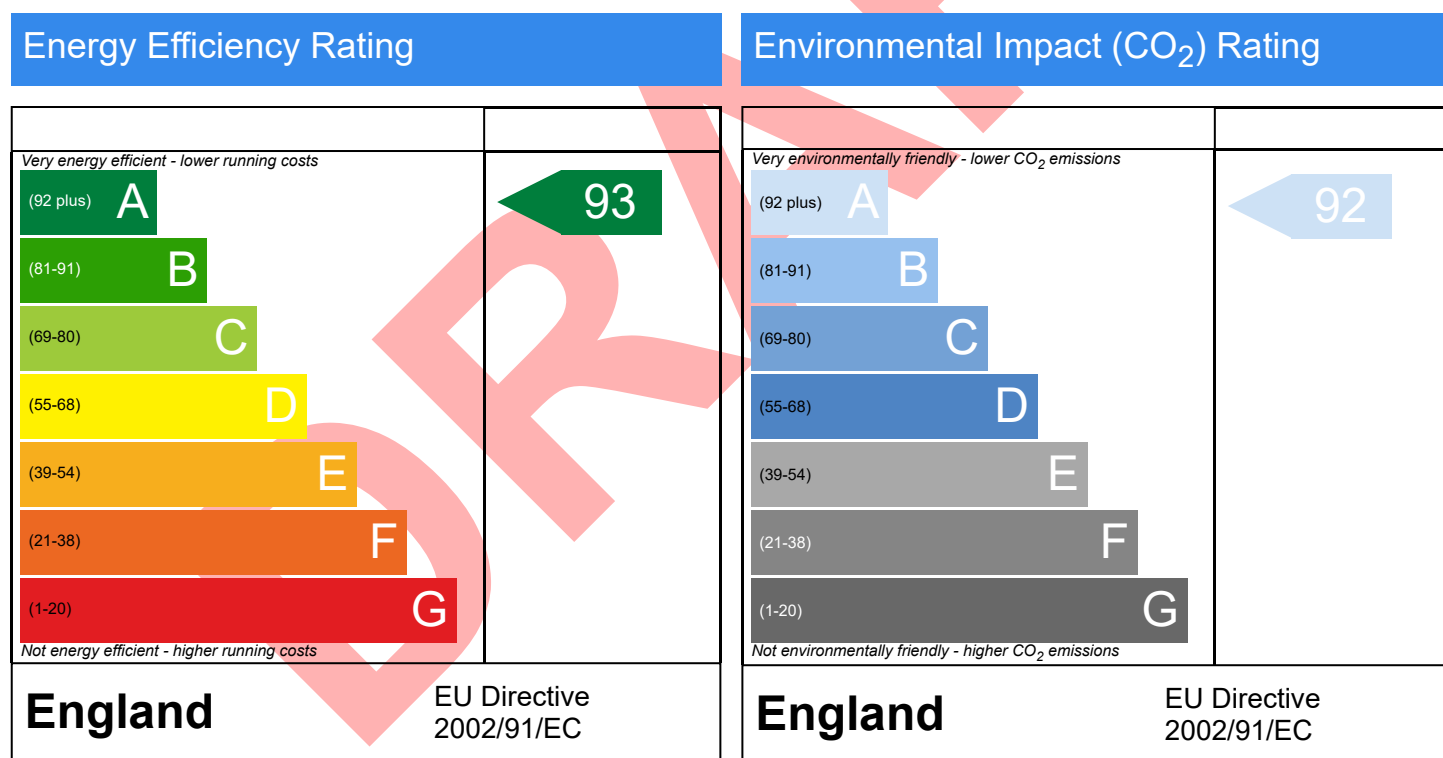
Flat 4, 233, London Road, Reading, RG1 3NY

Dwelling type:
Date of assessment:
Produced by:
Total floor area:
DRRN:

Maisonette, Semi-Detached
21/03/2025
Connor Lewis
61.36 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 SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.



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.

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

Predicted Energy Assessment



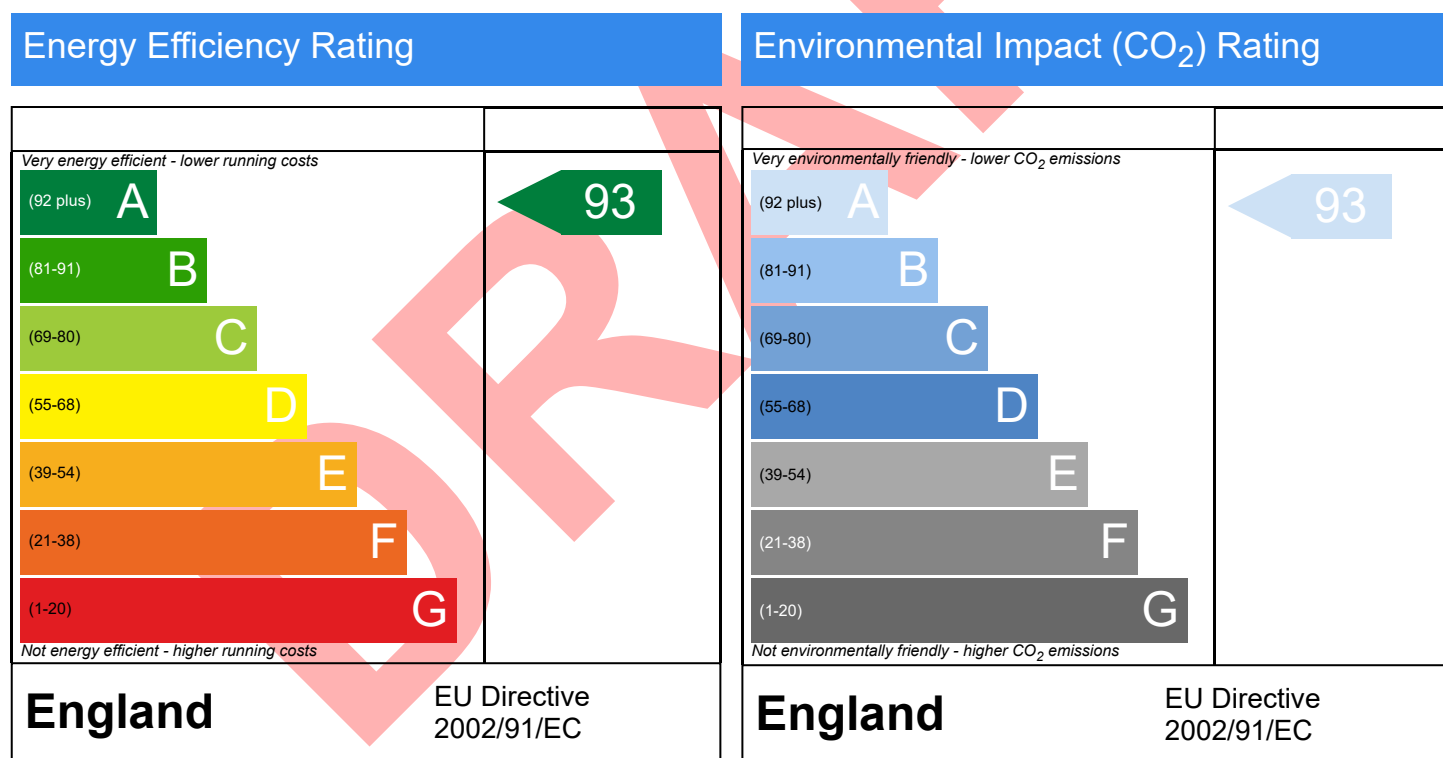
Flat 5, 233, London Road, Reading, RG1 3NY

Dwelling type:
Date of assessment:
Produced by:
Total floor area:
DRRN:

Flat, Semi-Detached
21/03/2025
Connor Lewis
58.26 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 SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.



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.

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

Predicted Energy Assessment



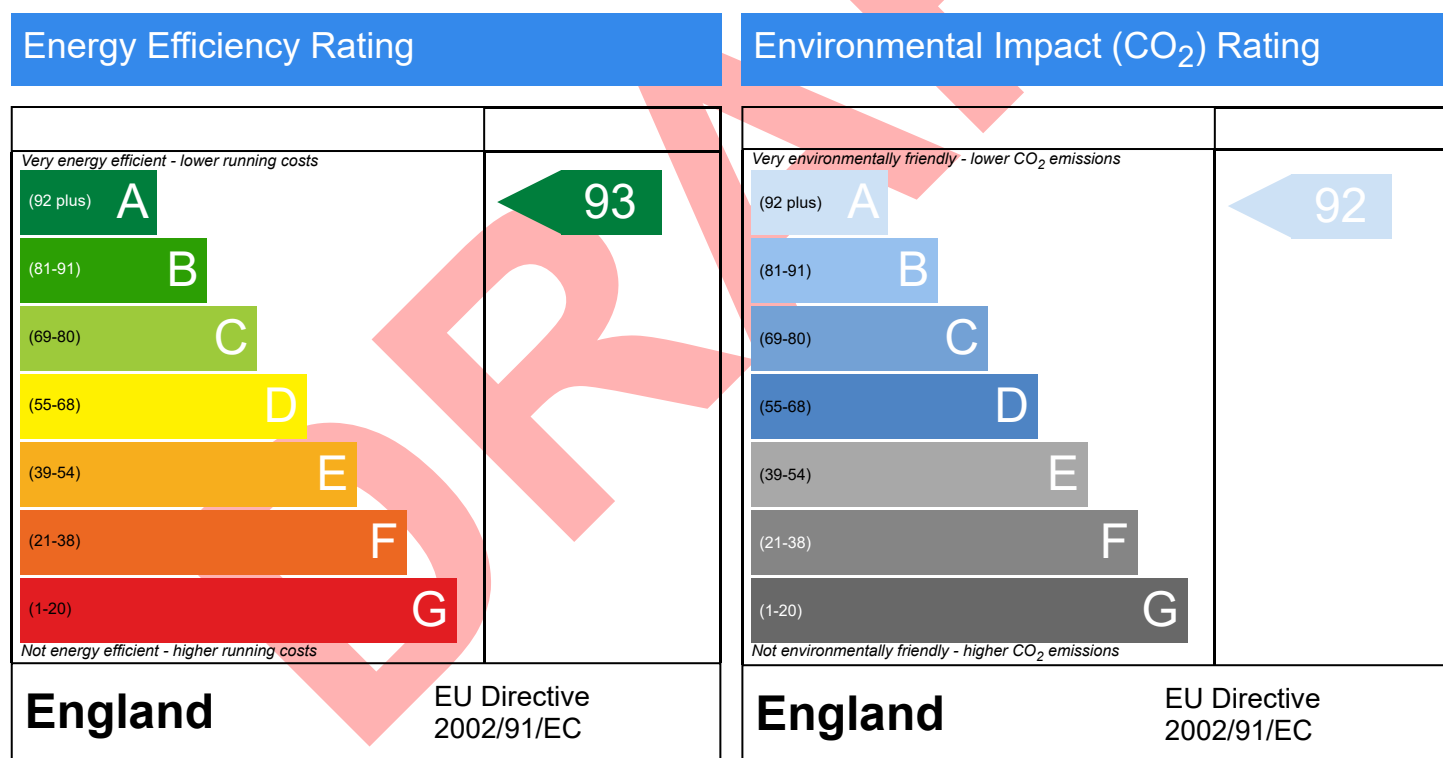
Flat 6, 233, London Road, Reading, RG1 3NY

Dwelling type:
Date of assessment:
Produced by:
Total floor area:
DRRN:

Flat, Semi-Detached
21/03/2025
Connor Lewis
41.98 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 SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.



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.

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