# Energy Performance Certificate



**22a, Back Lane, WYMONDHAM, NR18 0LA**

| | | | |
|---|---|---|---|
| **Dwelling type:** | Detached house | **Reference number:** | 8965-7132-3450-7390-0996 |
| **Date of assessment:** | 10 February 2015 | **Type of assessment:** | SAP, new dwelling |
| **Date of certificate:** | 10 February 2015 | **Total floor area:** | 75 m² |

## Use this document to:

- Compare current ratings of properties to see which properties are more energy efficient
- Find out how you can save energy and money by installing improvement measures

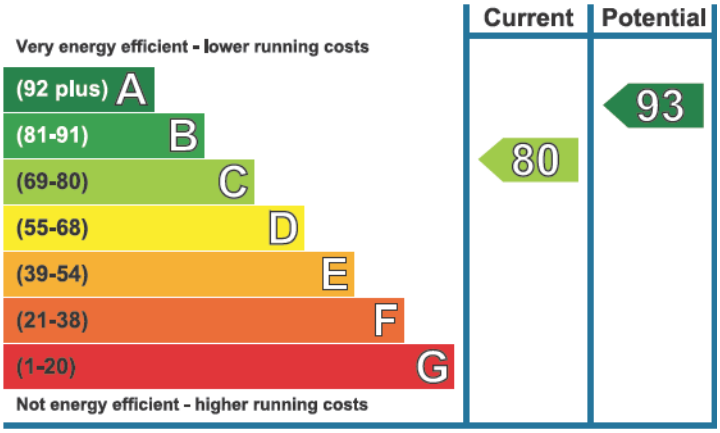
| | |
|---|---|
| **Estimated energy costs of dwelling for 3 years:** | **£ 1,326** |
| **Over 3 years you could save** | **£ 108** |

## Estimated energy costs of this home

| | Current costs | Potential costs | Potential future savings |
|---|---|---|---|
| **Lighting** | £ 144 over 3 years | £ 144 over 3 years | You could save £ 108 over 3 years |
| **Heating** | £ 882 over 3 years | £ 882 over 3 years | |
| **Hot Water** | £ 300 over 3 years | £ 192 over 3 years | |
| **Totals** | **£ 1,326** | **£ 1,218** | |

These figures show how much the average household would spend in this property for heating, lighting and hot water. This excludes energy use for running appliances like TVs, computers and cookers, and any electricity generated by microgeneration.

## Energy Efficiency Rating




The graph shows the current energy efficiency of your home.

The higher the rating the lower your fuel bills are likely to be.

The potential rating shows the effect of undertaking the recommendations on page 3.

The average energy efficiency rating for a dwelling in England and Wales is band D (rating 60).

## Actions you can take to save money and make your home more efficient

| Recommended measures | Indicative cost | Typical savings over 3 years |
|---|---|---|
| 1 Solar water heating | £4,000 - £6,000 | £ 108 |
| 2 Solar photovoltaic panels, 2.5 kWp | £5,000 - £8,000 | £ 807 |

## Summary of this home's energy performance related features

| Element | Description | Energy Efficiency |
|---|---|---|
| Walls | Average thermal transmittance 0.22 W/m²K | ★★★★★ |
| Roof | Average thermal transmittance 0.13 W/m²K | ★★★★★ |
| Floor | Average thermal transmittance 0.16 W/m²K | ★★★★★ |
| Windows | High performance glazing | ★★★★★ |
| Main heating | Boiler and radiators, mains gas | ★★★★☆ |
| Main heating controls | Time and temperature zone control | ★★★★★ |
| Secondary heating | Room heaters, wood logs | — |
| Hot water | From main system | ★★★★☆ |
| Lighting | Low energy lighting in all fixed outlets | ★★★★★ |
| Air tightness | Air permeability 2.1 m³/h.m² (as tested) | ★★★★★ |

Thermal transmittance is a measure of the rate of heat loss through a building element; the lower the value the better the energy performance.
Air permeability is a measure of the air tightness of a building; the lower the value the better the air tightness.

Current primary energy use per square metre of floor area: 121 kWh/m² per year

## Low and zero carbon energy sources

Low and zero carbon energy sources are sources of energy that release either very little or no carbon dioxide into the atmosphere when they are used. Installing these sources may help reduce energy bills as well as cutting carbon. The following low or zero carbon energy sources are provided for this home:

- Biomass secondary heating

## Recommendations

The measures below will improve the energy performance of your dwelling. The performance ratings after improvements listed below are cumulative; that is, they assume the improvements have been installed in the order that they appear in the table. Further information about the recommended measures and other simple actions you could take today to save money is available at **www.direct.gov.uk/savingenergy**. Before installing measures, you should make sure you have secured the appropriate permissions, where necessary. Such permissions might include permission from your landlord (if you are a tenant) or approval under Building Regulations for certain types of work.

| Recommended measures | Indicative cost | Typical savings per year | Rating after improvement |
|---|---|---|---|
| Solar water heating | £4,000 - £6,000 | £ 36 | B81 |
| Solar photovoltaic panels, 2.5 kWp | £5,000 - £8,000 | £ 269 | A93 |

## About this document

The Energy Performance Certificate for this dwelling was produced following an energy assessment undertaken by a qualified assessor, accredited by NES. You can get contact details of the accreditation scheme at www.nesltd.co.uk, together with details of their procedures for confirming authenticity of a certificate and for making a complaint. A copy of this EPC has been lodged on a national register. It will be publicly available and some of the underlying data may be shared with others for compliance and marketing of relevant energy efficiency information. The Government may use some of this data for research or statistical purposes. Green Deal financial details that are obtained by the Government for these purposes will not be disclosed to non-authorised recipients. The current property owner and/or tenant may opt out of having their information shared for marketing purposes.

| | |
|---|---|
| **Assessor's accreditation number:** | NHER003522 |
| **Assessor's name:** | Mr Michael Gilbert |
| **Phone number:** | 01493 377919 |
| **E-mail address:** | mikegilbertservices@me.com |
| **Related party disclosure:** | No related party |

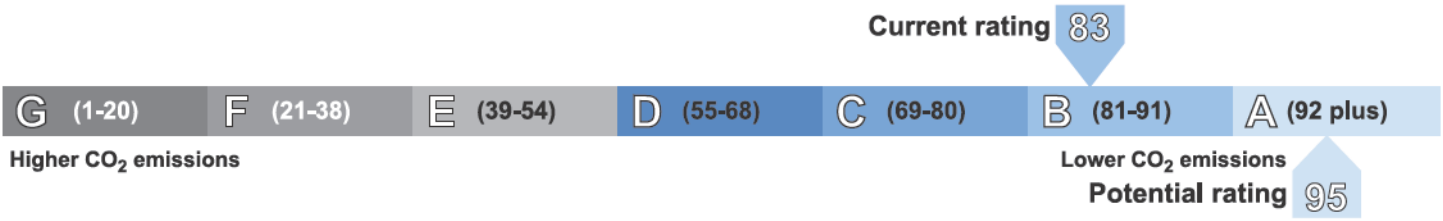
Further information about Energy Performance Certificates can be found under Frequently Asked Questions at **www.epcregister.com**.

## About the impact of buildings on the environment

One of the biggest contributors to global warming is carbon dioxide. The energy we use for heating, lighting and power in homes produces over a quarter of the UK's carbon dioxide emissions.

The average household causes about 6 tonnes of carbon dioxide every year. Based on this assessment, your home currently produces approximately 1.5 tonnes of carbon dioxide every year. Adopting the recommendations in this report can reduce emissions and protect the environment. If you were to install these recommendations you could reduce this amount by 1.1 tonnes per year. You could reduce emissions even more by switching to renewable energy sources.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide ($CO_2$) emissions. The higher the rating the less impact it has on the environment.




## Your home's heat demand

This table shows the energy used for space and water heating by an average household in this property.

**Heat demand**

| | |
|---|---|
| Space heating (kWh per year) | 3,545 |
| Water heating (kWh per year) | 2,017 |

# Authorised Submission for Building Regulations Compliance

This submission provides evidence of compliance with the Building Regulations. It has been carried out by an Authorised SAP Assessor and can be accepted for Building Control purposes without further checking.

## Assessment details

| | |
|---|---|
| Authorised SAP assessor | Mr Michael Gilbert |
| Assessor number | 3522 |
| Membership number | N/A |
| Company name | N/A |
| Date of issue | 10/02/2015 |

## As built submission for

| | |
|---|---|
| Address | 22A BACK LANE<br>WYMONDHAM<br>WYMONDHAM<br>NORFOLK<br>NR18 0LA |

# L1A 2010 - Regulations Compliance Report

## As Built - Final

This as built final submission provides evidence towards compliance with Part L of the Building Regulations, in accordance with Appendix A of AD L1A. It has been carried out by an On-Construction Domestic Energy Assessor and can be accepted for building control purposes without further checking. The assessor has confirmed any changes from the design submission with the builder.This report covers only items included within the SAP and is not a complete report of regulations compliance.

| | | | |
|---|---|---|---|
| Assessor name | Mr Michael Gilbert | Assessor number | 3522 |
| Client | | Last modified | 10/02/2015 |
| Address | 22A BACK LANE, WYMONDHAM, WYMONDHAM, NORFOLK, NR18 0LA | | |

| Check | Evidence | Produced by | OK? |
|---|---|---|---|
| **Criterion 1: predicted carbon dioxide emission from proposed dwelling does not exceed the target** | | | |
| TER (kg $CO_2/m^2.a$) | Fuel = Mains gas<br>Fuel factor = 1.00<br>TER = 20.72 | Authorised SAP Assessor | |
| DER for dwelling as designed (kg $CO_2/m^2.a$) | DER = 20.59 | Authorised SAP Assessor | |
| Are emissions from dwelling as built less than or equal to the target? | DER 20.59 < TER 20.72 | Authorised SAP Assessor | Passed |
| **Criterion 2: the performance of the building fabric and the heating, hot water and fixed lighting systems should be no worse than the design limits** | | | |
| **Fabric U-values** | | | |
| Are all U-values better than the design limits in Table 2? | **Element** / **Weighted average** / **Highest**<br>Wall: 0.22 (max 0.30) / 0.25 (max 0.70)<br>Party wall: (no party wall)<br>Floor: 0.16 (max 0.25) / 0.17 (max 0.70)<br>Roof: 0.13 (max 0.20) / 0.16 (max 0.35)<br>Openings: 1.59 (max 2.00) / 1.60 (max 3.30) | Authorised SAP Assessor | Passed |
| **Thermal bridging** | | | |
| How has the loss from thermal bridges been calculated? | Thermal bridging calculated using user-specified y-value of 0.127, with reference: average calc | Authorised SAP Assessor | |
| **Heating and hot water systems** | | | |
| Does the efficiency of the heating systems meet the minimum value set out in the Domestic Heating Compliance Guide? | Main heating system:<br>Mains gas, Combi boiler from database<br>Viessmann Vitodens 100 W WB1B 26kW Combi Boiler<br>Efficiency = 89.00% - SEDBUK 2009<br>Minimum = 88.00%<br><br>Secondary heating system:<br>Room heaters - Wood logs<br>Closed room heater<br>Efficiency = 65.00%<br>Minimum = 65.00% | Authorised SAP Assessor | Passed |
| Does the insulation of the hot water cylinder meet the standards set out in the Domestic Heating Compliance Guide? | No hot water cylinder | Authorised SAP Assessor | |
| Do controls meet the minimum controls provision set out in the Domestic Heating Compliance Guide? | Space heating control:<br>Time and temperature zone control<br><br>Hot water control:<br>No hot water cylinder<br>Boiler interlock (main system 1)<br>Separate water control | Authorised SAP Assessor | Passed |

| Check | Evidence | Produced by | OK? |
|---|---|---|---|
| **Fixed internal lighting** | | | |
| Does fixed internal lighting comply with paragraphs 42 to 44? | Schedule of installed fixed internal lighting<br>Standard lights = 0<br>Low energy lights = 19<br><br>Percentage of low energy lights = 100 %<br>Minimum = 75 % | Authorised SAP Assessor | Passed |
| Criterion 3: the dwelling has appropriate passive control measures to limit solar gains | | | |
| Does the dwelling have a strong tendency to high summertime temperatures? | Overheating risk (June) = Not significant<br>Overheating risk (July) = Slight<br>Overheating risk (August) = Slight<br>Region = East Anglia<br>Thermal mass parameter = 250.00<br>Ventilation rate in hot weather = 4.00 ach<br>Blinds/curtains = None | Authorised SAP Assessor | Passed |
| Criterion 4: the performance of the dwelling, as built, is consistent with the DER | | | |
| Design air permeability ($m^3/(h.m^2)$ at 50Pa) | Design air permeability = 4.00<br>Max air permeability = 10.00<br>As built air permeability = 2.14 | Authorised SAP Assessor | Passed |
| Mechanical ventilation system Specific fan power (SFP) | Not applicable | Authorised SAP Assessor | |
| Have the key features of the design been included (or bettered) in practice? | The following walls/wall have a U-value less than 0.2W/$m^2$K:<br>• STUD (0.12)<br>The following floors/floor have a U-value less than 0.2W/$m^2$K:<br>• Floor 1 (0.17)<br>• Floor 2 (0.14)<br>The following roofs/roof have a U-value less than 0.13W/$m^2$K:<br>• FLAT (0.11)<br>• CIELING TO VOIDS (0.12)<br>The following openings have a U-value less than 1.5W/$m^2$K:<br>• Rooflight reference 1 (1.40)<br>As built air permeability of 2.14 $m^3/(h.m^2)$ is less than 5 $m^3/(h.m^2)$ at 50 Pa<br>Secondary heating system present - Wood logs<br>Use of the following low carbon or renewable technologies:<br>• Wood logs used for secondary heating | Authorised SAP Assessor | |

# Data Input Report
## As Built - Final

This as built submission has been carried out by an On-Construction Domestic Energy Assessor. The assessor has confirmed any changes from the design submission with the builder.

| | | | |
|---|---|---|---|
| Assessor name | Mr Michael Gilbert | Assessor number | 3522 |
| Client | | Last modified | 10/02/2015 |
| Address | 22A BACK LANE, WYMONDHAM, WYMONDHAM, NORFOLK, NR18 0LA | | |

### Dwelling

| | | | |
|---|---|---|---|
| Development: | | House type: | |
| Property type: | House | | |
| Built form: | Detached | Year built: | 2013 |
| Tariff: | Standard | Assess summer overheating: | Yes |
| Thermal mass: | Medium | Thermal mass parameter: | 250.00 |
| Separated heated conservatory: | No | Degree day region: | East Anglia |
| Sheltered sides: | 4 | Terrain: | Low Rise U/S |

**Storeys:**

| Name | Area (m²) | Height (m) |
|---|---|---|
| Lowest occupied | 34.18 | 2.40 |
| +1 | 40.43 | 2.40 |

### Floors

| Ref - Name | Type | Construction | Storey Location | Living Area (m²) | Area (m²) | U-value (W/m²K) |
|---|---|---|---|---|---|---|
| Floor 1 - Floor 1 | Ground | Solid | Lowest occupied | 25.60 | 34.18 | 0.17 |
| Floor 2 - Floor 2 | Upper | Suspended timber sealed | +1 | 0.00 | 10.92 | 0.14 |

Living area that has no heat loss: 0.00

### Walls

| Ref - Name | Type | Construction | Gross Area (m²) | U-value (W/m²K) |
|---|---|---|---|---|
| Wall 1 - EXTERNAL BRICK | External | Cavity | 70.59 | 0.25 |
| Wall 2 - GARAGE WALL | Sheltered | Cavity | 13.44 | 0.20 |
| Wall 3 - DORMER | External | Timber | 5.48 | 0.20 |
| Wall 4 - STUD | Sheltered | Timber | 13.91 | 0.12 |

### Roofs

| Ref - Name | Construction | Gross Area (m²) | U-value (W/m²K) |
|---|---|---|---|
| Roof 1 - FLAT | Pitched (joists) | 25.74 | 0.11 |
| Roof 2 - SLOPING | Pitched (rafters) | 19.16 | 0.16 |
| Roof 3 - CIELING TO VOIDS | Pitched (joists) | 7.08 | 0.12 |

### Openings

**Opening Ref: 1 Rooflight, Double glazed (low-E), ' VELUX', master: No, linked to: 0**

| | | | | | |
|---|---|---|---|---|---|
| Location: | Roof 2 | Source: | From Manufacturer | Orientation: | East |
| Overshading: | None / Very little | Width (m): | 0.60 | Height (m): | 1.20 |
| Frame: | Wood | Transmittance factor: | 0.63 | U-value (W/m²K): | 1.40 |

**Opening Ref: 2 Window, Double glazed (low-E), ' window', master: Yes, linked to: 0**

| | | | | | |
|---|---|---|---|---|---|
| Location: | Wall 1 | Source: | From Manufacturer | Orientation: | West |
| Overshading: | Average / Unknown | Width (m): | 1.80 | Height (m): | 2.10 |
| Frame: | u-PVC | Transmittance factor: | 0.63 | U-value (W/m²K): | 1.60 |

**Opening Ref: 3 Window, Double glazed (low-E), ' window', master: No, linked to: 2**

| | | | | | |
|---|---|---|---|---|---|
| Location: | Wall 1 | Source: | From Manufacturer | Orientation: | West |
| Overshading: | Average / Unknown | Width (m): | 1.80 | Height (m): | 1.35 |
| Frame: | u-PVC | Transmittance factor: | 0.63 | U-value (W/m²K): | 1.60 |

**Opening Ref: 4 Window, Double glazed (low-E), ' window', master: No, linked to: 2**

| | | | | | |
|---|---|---|---|---|---|
| Location: | Wall 1 | Source: | From Manufacturer | Orientation: | West |
| Overshading: | Average / Unknown | Width (m): | 1.00 | Height (m): | 1.70 |
| Frame: | u-PVC | Transmittance factor: | 0.63 | U-value (W/m²K): | 1.60 |

**Opening Ref: 5 Window, Double glazed (low-E), ' window', master: No, linked to: 2**

| | | | | | |
|---|---|---|---|---|---|
| Location: | Wall 3 | Source: | From Manufacturer | Orientation: | West |
| Overshading: | Average / Unknown | Width (m): | 1.20 | Height (m): | 1.05 |
| Frame: | u-PVC | Transmittance factor: | 0.63 | U-value (W/m²K): | 1.60 |

**Opening Ref: 6 Window, Double glazed (low-E), ' window', master: No, linked to: 2**

| | | | | | |
|---|---|---|---|---|---|
| Location: | Wall 3 | Source: | From Manufacturer | Orientation: | West |
| Overshading: | Average / Unknown | Width (m): | 1.20 | Height (m): | 1.05 |
| Frame: | u-PVC | Transmittance factor: | 0.63 | U-value (W/m²K): | 1.60 |

**Opening Ref: 7 Window, Double glazed (low-E), ' window', master: No, linked to: 2**

| | | | | | |
|---|---|---|---|---|---|
| Location: | Wall 1 | Source: | From Manufacturer | Orientation: | South |
| Overshading: | Average / Unknown | Width (m): | 1.20 | Height (m): | 1.35 |
| Frame: | u-PVC | Transmittance factor: | 0.63 | U-value (W/m²K): | 1.60 |

**Opening Ref: 8 Window, Double glazed (low-E), ' window', master: No, linked to: 2**

| | | | | | |
|---|---|---|---|---|---|
| Location: | Wall 1 | Source: | From Manufacturer | Orientation: | East |
| Overshading: | Average / Unknown | Width (m): | 1.40 | Height (m): | 2.10 |
| Frame: | u-PVC | Transmittance factor: | 0.63 | U-value (W/m²K): | 1.60 |

**Opening Ref: 9 Window, Double glazed (low-E), ' window', master: No, linked to: 2**

| | | | | | |
|---|---|---|---|---|---|
| Location: | Wall 1 | Source: | From Manufacturer | Orientation: | East |
| Overshading: | Average / Unknown | Width (m): | 1.20 | Height (m): | 1.05 |
| Frame: | u-PVC | Transmittance factor: | 0.63 | U-value (W/m²K): | 1.60 |

**Opening Ref: 10 Window, Double glazed (low-E), ' window', master: No, linked to: 2**

| | | | | | |
|---|---|---|---|---|---|
| Location: | Wall 1 | Source: | From Manufacturer | Orientation: | East |
| Overshading: | Average / Unknown | Width (m): | 1.20 | Height (m): | 1.05 |
| Frame: | u-PVC | Transmittance factor: | 0.63 | U-value (W/m²K): | 1.60 |

**Opening Ref: 11 Window, Double glazed (low-E), ' window', master: No, linked to: 2**

| | | | | | |
|---|---|---|---|---|---|
| Location: | Wall 1 | Source: | From Manufacturer | Orientation: | East |
| Overshading: | Average / Unknown | Width (m): | 0.90 | Height (m): | 2.10 |
| Frame: | u-PVC | Transmittance factor: | 0.63 | U-value (W/m²K): | 1.60 |

## Ventilation

| | | | |
|---|---|---|---|
| Air permeability entered: | Yes | Seek exemption (<3 dwellings): | No |
| Design air permeability rate: | 4.00 | | |
| Measured air permeability rate: | 2.14 | Measured in this dwelling: | Yes |
| As-built air permeability rate: | 2.14 | As-built air permeability reference: | 2012022739 |

| Number of... | Open fireplaces | Open flues | Flueless gas fires | Extract fans | Passive vents |
|---|---|---|---|---|---|
| | 0 | 1 | 0 | 3 | 0 |

Mechanical ventilation: Not present (natural)

## Space heating

| | | | |
|---|---|---|---|
| Main heating category: | Individual system/s | Number of systems: | 1 |
| Secondary heating: | Yes | Smoke control area: | No |
| Type: | Boiler | Efficiency source: | Product database |
| Product index: | 015977 | | |
| Product details: | Viessmann Vitodens 100 W WB1B 26kW Combi Boiler | | |
| Boiler type: | Combi | Fuel: | Mains gas |
| Condensing: | Yes | Flue type: | Balanced |

| | | | |
|---|---|---|---|
| Fan assisted flue: | Yes | | |
| Combi type: | Keep hot | Uses electricity: | No |
| Keep hot power rating: | N/A | | |
| System: | Condensing combi with automatic ignition (1998 or later) | | |
| Controls: | Time and temperature zone control | | |
| Interlock: | Yes | Delayed start thermostat: | Yes |
| Compensation: | Weather compensator | Burner control: | N/A |
| Emitter: | Radiators | Pump in heated space: | Yes |
| FGHRS: | No | | |

**Secondary heating:**

| | | | |
|---|---|---|---|
| Efficiency source: | SAP table | Fuel: | Wood logs |
| System: | Closed room heater | | |
| Flue type: | Open | | |
| HETAS approved: | Yes | Efficiency: | 65.00 |

## Water heating

| | | | |
|---|---|---|---|
| Type: | From main | Fuel: | Mains gas |
| Water separately timed: | Yes | Water use ≤125 litres/person/day: | Yes |
| Heat pump uses immersion: | N/A | Summer immersion: | N/A |
| Thermal store type: | N/A | | |

**Store details:**

| | | | |
|---|---|---|---|
| Cylinder volume (litres): | N/A | | |
| Thermostat: | N/A | In heated space: | N/A |
| Primary pipework insulated: | N/A | | |

**WWHRS:**

| | |
|---|---|
| WWHRS: | N/A |

## Renewables

No renewables present

## Other

**Thermal Bridging**

| | | | |
|---|---|---|---|
| Thermal bridge specification: | Enter y value | y-value: | 0.13 |
| y-value description: | average calc | | |

**Internal lighting**

| | | | | | |
|---|---|---|---|---|---|
| Standard fittings: | 0 | Low energy fittings: | 19 | Total fittings: | 19 |

**Summer overheating**

| | | | |
|---|---|---|---|
| Thermal mass parameter (TMP): | 250.00 | | |
| User defined air change rate: | No | Air change rate (ach): | N/A |
| Cross ventilation on most floors: | Yes | Window ventilation: | Fully open half the time |
| Source of user defined values: | N/A | | |
| Curtains closed in daylight hours: | No | Fraction curtains closed: | N/A |
| Blind/curtain type: | N/A | | |

**Special features (Appendix Q)**

No Appendix Q special features present

**Cooling details**

No space cooling present

# SAP 2009 Worksheet

## As Built - Final

This as built submission has been carried out by an On-Construction Domestic Energy Assessor. The assessor has confirmed any changes from the design submission with the builder.

| | | | |
|---|---|---|---|
| Assessor name | Mr Michael Gilbert | Assessor number | 3522 |
| Client | | Last modified | 10/02/2015 |
| Address | 22A BACK LANE, WYMONDHAM, WYMONDHAM, NORFOLK, NR18 0LA | | |

### 1. Overall dwelling dimensions

| | | Area (m²) | | Average storey height (m) | | Volume (m³) | |
|---|---|---|---|---|---|---|---|
| Lowest occupied | | 34.18 | (1a) x | 2.40 | (2a) = | 82.03 | (3a) |
| +1 | | 40.43 | (1b) x | 2.40 | (2b) = | 97.03 | (3b) |
| Total floor area | (1a) + (1b) + (1c) + (1d)...(1n) = | 74.61 | (4) | | | | |
| Dwelling volume | | | | | (3a) + (3b) + (3c) + (3d)...(3n) = | 179.06 | (5) |

### 2. Ventilation rate

| | | | | m³ per hour | |
|---|---|---|---|---|---|
| Number of chimneys | | 0 | x 40 = | 0 | (6a) |
| Number of open flues | | 1 | x 20 = | 20 | (6b) |
| Number of intermittent fans | | 3 | x 10 = | 30 | (7a) |
| Number of passive vents | | 0 | x 10 = | 0 | (7b) |
| Number of flueless gas fires | | 0 | x 40 = | 0 | (7c) |
| | | | | Air changes per hour | |
| Infiltration due to chimneys, flues, fans, PSVs | (6a) + (6b) + (7a) + (7b) + (7c) = | 50 | ÷ (5) = | 0.28 | (8) |

*If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)*

| | | |
|---|---|---|
| Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area | 2.14 | (17) |
| If based on air permeability value, then (18) = [(17) ÷ 20] + (8), otherwise (18) = (16) | 0.39 | (18) |

*Air permeability value applies if a pressurisation test has been done, or a design or specified air permeability is being used*

| | | | |
|---|---|---|---|
| Number of sides on which dwelling is sheltered | | 4 | (19) |
| Shelter factor | 1 - [0.075 x (19)] = | 0.70 | (20) |
| Adjusted infiltration rate | (18) x (20) = | 0.27 | (21) |

Infiltration rate modified for monthly wind speed:

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Monthly average wind speed from Table 7 | | | | | | | | | | | | | |
| (22)m | 5.40 | 5.10 | 5.10 | 4.50 | 4.10 | 3.90 | 3.70 | 3.70 | 4.20 | 4.50 | 4.80 | 5.10 | |
| | | | | | | | | | | ∑(22)1...12 = | | 54.10 | (22) |
| Wind Factor (22a)m = (22)m ÷ 4 | | | | | | | | | | | | | |
| (22a)m | 1.35 | 1.27 | 1.27 | 1.12 | 1.02 | 0.98 | 0.92 | 0.92 | 1.05 | 1.12 | 1.20 | 1.27 | |
| | | | | | | | | | | ∑(22a)1...12 = | | 13.52 | (22a) |
| Adjusted infiltration rate (allowing for shelter and wind speed) = (21) × (22a)m | | | | | | | | | | | | | |
| (22b)m | 0.36 | 0.34 | 0.34 | 0.30 | 0.28 | 0.26 | 0.25 | 0.25 | 0.28 | 0.30 | 0.32 | 0.34 | |
| | | | | | | | | | | ∑(22b)1...12 = | | 3.66 | (22b) |

Calculate effective air change rate for the applicable case:

| | | |
|---|---|---|
| If mechanical ventilation: air change rate through system | N/A | (23a) |

If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a) | N/A | (23b)

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = | N/A | (23c)

d) If natural ventilation or whole house positive input ventilation from loft

if (22b)m ≥ 1, then (24d)m = (22b)m; otherwise (24d)m = 0.5 + [(22b)m2 x 0.5]

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (24d)m | 0.57 | 0.56 | 0.56 | 0.55 | 0.54 | 0.53 | 0.53 | 0.53 | 0.54 | 0.55 | 0.55 | 0.56 | (24d) |

Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (25)m | 0.57 | 0.56 | 0.56 | 0.55 | 0.54 | 0.53 | 0.53 | 0.53 | 0.54 | 0.55 | 0.55 | 0.56 | (25) |

## 3. Heat losses and heat loss parameter

*The κ-value is the heat capacity per unit area, see Table 1e.*

| Element | Gross Area, m² | Openings, m² | Net area A, m² | | U-value, W/m²K | | A x U, W/K | κ-value, kJ/m².K | A x κ, kJ/K | |
|---|---|---|---|---|---|---|---|---|---|---|
| Roof window* | | | 0.72 | x | 1.33 | = | 0.95 | N/A | N/A | (27a) |
| Window* | | | 19.40 | x | 1.50 | = | 29.17 | N/A | N/A | (27) |
| Ground floor | | | 34.18 | x | 0.17 | = | 5.81 | N/A | N/A | (28a) |
| Exposed floor | | | 10.92 | x | 0.14 | = | 1.53 | N/A | N/A | (28b) |
| External wall | | | 53.71 | x | 0.25 | = | 13.43 | N/A | N/A | (29a) |
| External wall | | | 16.40 | x | 0.20 | = | 3.28 | N/A | N/A | (29a) |
| External wall | | | 13.91 | x | 0.12 | = | 1.67 | N/A | N/A | (29a) |
| Roof | | | 25.74 | x | 0.11 | = | 2.83 | N/A | N/A | (30) |
| Roof | | | 18.44 | x | 0.16 | = | 2.95 | N/A | N/A | (30) |
| Roof | | | 7.08 | x | 0.12 | = | 0.85 | N/A | N/A | (30) |
| Total area of external elements ∑A, m² | | | 200.50 | (31) | | | | | | |

** for windows and roof windows, effective window U-value is calculated using formula 1/[(1/UValue)+0.04] paragraph 3.2*

Fabric heat loss, W/K = ∑(A × U) | (26)...(30) + (32) = | 62.47 | (33)

Heat capacity Cm = ∑(A x κ) | (28)...(30) + (32) + (32a)...(32e) = | N/A | (34)

Thermal mass parameter (TMP) in kJ/m²K | Calculated separately = | 250.00 | (35)

Thermal bridges: ∑(L x Ψ) calculated using Appendix K | 25.46 | (36)

*if details of thermal bridging are not known then (36) = 0.15 x (31)*

Total fabric heat loss | (33) + (36) = | 87.94 | (37)

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

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (38)m | 33.48 | 33.06 | 33.06 | 32.28 | 31.81 | 31.60 | 31.39 | 31.39 | 31.93 | 32.28 | 32.66 | 33.06 | (38) |

Heat transfer coefficient, W/K (37)m + (38)m

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (39)m | 121.42 | 120.99 | 120.99 | 120.22 | 119.75 | 119.54 | 119.33 | 119.33 | 119.87 | 120.22 | 120.59 | 120.99 | |

Average = ∑(39)1...12/12 = | 120.27 | (39)

Heat loss parameter (HLP), W/m²K (39)m ÷ (4)

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (40)m | 1.63 | 1.62 | 1.62 | 1.61 | 1.61 | 1.60 | 1.60 | 1.60 | 1.61 | 1.61 | 1.62 | 1.62 | |

Average = ∑(40)1...12/12 = | 1.61 | (40)

## 4. Water heating energy requirement

**kWh/year**

Assumed occupancy, N | 2.35 | (42)

If TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)²)] + 0.0013 x (TFA - 13.9)

If TFA ≤ 13.9, N = 1

Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 | 90.08 | (43)

*Annual average hot water usage has been reduced by 5% if the dwelling is designed to achieve a water use target of not more than 125 litres per person per day (all water use, hot and cold)*

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43) | | | | | | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (44)m | 99.08 | 95.48 | 91.88 | 88.27 | 84.67 | 81.07 | 81.07 | 84.67 | 88.27 | 91.88 | 95.48 | 99.08 |

∑(44)1...12 = 1080.91 (44)

Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x Tm/3600 kWh/month (see Tables 1b, 1c 1d)

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (45)m | 147.29 | 128.82 | 132.93 | 115.89 | 111.20 | 95.96 | 88.92 | 102.04 | 103.25 | 120.33 | 131.35 | 142.64 |

∑(45)1...12 = 1420.63 (45)

*If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)*

*For community heating include distribution loss whether or not hot water tank is present*

Distribution loss 0.15 x (45)m

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (46)m | 22.09 | 19.32 | 19.94 | 17.38 | 16.68 | 14.39 | 13.34 | 15.31 | 15.49 | 18.05 | 19.70 | 21.40 |

Water storage loss:

Cylinder volume (litres) including any solar storage within same cylinder 0 (50)

Energy lost from water storage, kWh/day (50) x (51) x (52) x (53) 0.00 (54)

Enter (49) or (54) in (55) 0.00 (55)

Water storage loss calculated for each month = (55) x (41)m

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (56)m | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

If cylinder contains dedicated solar storage, = (56)m x [(50) - (H11)] ÷ (50), else = (56)m where (H11) is from Appendix H

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (57)m | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Primary circuit loss (annual) from Table 3 0.00 (58)

Primary circuit loss for each month (58) ÷ 365 × (41)m

(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (59)m | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Combi loss for each month from Table 3a, 3b or 3c (enter '0' if not a combi boiler)

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (61)m | 50.96 | 46.03 | 50.96 | 49.32 | 50.96 | 49.32 | 50.96 | 50.96 | 49.32 | 50.96 | 49.32 | 50.96 |

Total heat required for water heating calculated for each month 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (62)m | 198.25 | 174.85 | 183.89 | 165.21 | 162.16 | 145.27 | 139.88 | 153.00 | 152.57 | 171.29 | 180.67 | 193.60 |

Solar DHW input calculated using Appendix H (negative quantity) ('0' entered if no solar contribution to water heating)

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (63)m | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

∑(63)1...12 = 0.00 (63)

Output from water heater for each month, kWh/month (62)m + (63)m

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (64)m | 198.25 | 174.85 | 183.89 | 165.21 | 162.16 | 145.27 | 139.88 | 153.00 | 152.57 | 171.29 | 180.67 | 193.60 |

∑(64)1...12 = 2020.63 (64)

*if (64)m < 0 then set to 0*

Heat gains from water heating, kWh/month 0.25 × [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m]

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (65)m | 61.71 | 54.34 | 56.94 | 50.86 | 49.71 | 44.23 | 42.31 | 46.67 | 46.66 | 52.75 | 56.00 | 60.17 |

*include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating*

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

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Metabolic gains (Table 5), Watts | | | | | | | | | | | | |
| (66)m | 141.16 | 141.16 | 141.16 | 141.16 | 141.16 | 141.16 | 141.16 | 141.16 | 141.16 | 141.16 | 141.16 | 141.16 |
| Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 | | | | | | | | | | | | |
| (67)m | 46.32 | 41.14 | 33.46 | 25.33 | 18.93 | 15.98 | 17.27 | 22.45 | 30.13 | 38.26 | 44.65 | 47.60 |
| Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 | | | | | | | | | | | | |
| (68)m | 310.16 | 313.38 | 305.27 | 288.00 | 266.21 | 245.72 | 232.04 | 228.82 | 236.93 | 254.20 | 275.99 | 296.48 |
| Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 | | | | | | | | | | | | |
| (69)m | 51.47 | 51.47 | 51.47 | 51.47 | 51.47 | 51.47 | 51.47 | 51.47 | 51.47 | 51.47 | 51.47 | 51.47 |
| Pumps and fans gains (Table 5a) | | | | | | | | | | | | |
| (70)m | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 |
| Losses e.g. evaporation (negative values) (Table 5) | | | | | | | | | | | | |
| (71)m | -94.11 | -94.11 | -94.11 | -94.11 | -94.11 | -94.11 | -94.11 | -94.11 | -94.11 | -94.11 | -94.11 | -94.11 |
| Water heating gains (Table 5) | | | | | | | | | | | | |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (72)m | 82.95 | 80.86 | 76.53 | 70.64 | 66.82 | 61.44 | 56.86 | 62.72 | 64.81 | 70.90 | 77.78 | 80.87 | (72) |

Total internal gains (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (73)m | 547.95 | 543.90 | 523.78 | 492.50 | 460.48 | 431.67 | 414.69 | 422.52 | 440.39 | 471.88 | 506.95 | 533.47 | (73) |

## 6. Solar gains

*Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.*

*Rows (74) to (82) are used 12 times, one for each month, repeating as needed if there is more than one window type.*

*Details for month of January and annual totals are shown below:*

| | Access factor Table 6d | | Area m² | | Solar flux W/m² | | g Specific data or Table 6b | | FF Specific data or Table 6c | | Gains (W) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rooflights | 1.00 | x | 0.72 | x | 26.00 | x 0.9 x | 0.63 | x | 0.70 | = | 7.43 | (82) |
| West | 0.77 | x | 10.43 | x | 19.87 | x 0.9 x | 0.63 | x | 0.70 | = | 63.34 | (80) |
| South | 0.77 | x | 1.62 | x | 47.32 | x 0.9 x | 0.63 | x | 0.70 | = | 23.43 | (78) |
| East | 0.77 | x | 7.35 | x | 19.87 | x 0.9 x | 0.63 | x | 0.70 | = | 44.64 | (76) |

Solar gains in watts, calculated for each month ∑(74)m...(82)m

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (83)m | 138.84 | 262.95 | 408.06 | 591.61 | 712.38 | 741.96 | 720.55 | 631.00 | 482.60 | 316.55 | 171.44 | 115.32 | (83) |

Total gains - internal and solar (73)m + (83)m

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (84)m | 686.79 | 806.85 | 931.83 | 1084.11 | 1172.87 | 1173.62 | 1135.25 | 1053.51 | 922.99 | 788.43 | 678.39 | 648.79 | (84) |

## 7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1(˚C) 21.00 (85)

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Utilisation factor for gains for living area, η1,m (see Table 9a) | | | | | | | | | | | | | |
| (86)m | 0.99 | 0.98 | 0.95 | 0.90 | 0.77 | 0.60 | 0.42 | 0.45 | 0.74 | 0.93 | 0.98 | 0.99 | (86) |
| Mean internal temp of living area T1 (steps 3 to 7 in Table 9c) | | | | | | | | | | | | | |
| (87)m | 19.47 | 19.67 | 20.04 | 20.41 | 20.76 | 20.93 | 20.99 | 20.98 | 20.86 | 20.42 | 19.81 | 19.49 | (87) |
| Temperature during heating periods in the living area from Table 9, Th2(˚C) | | | | | | | | | | | | | |
| (88)m | 19.60 | 19.60 | 19.60 | 19.61 | 19.61 | 19.62 | 19.62 | 19.62 | 19.61 | 19.61 | 19.61 | 19.60 | (88) |
| Utilisation factor for gains for rest of dwelling η2,m (see Table 9a) | | | | | | | | | | | | | |
| (89)m | 0.99 | 0.97 | 0.94 | 0.86 | 0.70 | 0.49 | 0.28 | 0.31 | 0.63 | 0.89 | 0.98 | 0.99 | (89) |
| Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) | | | | | | | | | | | | | |
| (90)m | 17.64 | 17.94 | 18.46 | 18.97 | 19.40 | 19.58 | 19.62 | 19.61 | 19.52 | 19.01 | 18.15 | 17.67 | (90) |

Living area fraction fLA 25.60 ÷ (4) = 0.34 (91)

Mean internal temperature for the whole dwelling fLA x T1 +(1 - fLA) x T2

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (92)m | 18.26 | 18.53 | 19.00 | 19.46 | 19.87 | 20.04 | 20.09 | 20.08 | 19.98 | 19.49 | 18.72 | 18.29 | (92) |

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (93)m | 18.11 | 18.38 | 18.85 | 19.31 | 19.72 | 19.89 | 19.94 | 19.93 | 19.83 | 19.34 | 18.57 | 18.14 | (93) |

## 8. Space heating requirement

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that tim = (93)m and recalculate the utilisation factor for gains using Table 9a)

Utilisation factor for gains, ηm

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (94)m | 0.98 | 0.96 | 0.93 | 0.85 | 0.71 | 0.52 | 0.32 | 0.34 | 0.65 | 0.88 | 0.97 | 0.98 | (94) |

Useful gains, ηmGm, W = (94)m x (84)m

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (95)m | 672.89 | 778.26 | 864.27 | 925.89 | 831.98 | 604.98 | 359.39 | 358.35 | 598.14 | 697.59 | 656.24 | 636.81 | (95) |

Monthly average external temperature from Table 8

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (96)m | 4.50 | 5.00 | 6.80 | 8.70 | 11.70 | 14.60 | 16.90 | 16.90 | 14.30 | 10.80 | 7.00 | 4.90 | (96) |

Heat loss rate for mean internal temperature, Lm, W

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (97)m | 1653.06 | 1619.05 | 1457.98 | 1276.08 | 960.43 | 632.70 | 362.29 | 362.08 | 662.51 | 1026.98 | 1395.12 | 1602.28 | (97) |

Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (98)m | 729.25 | 565.01 | 441.72 | 252.13 | 95.56 | 0.00 | 0.00 | 0.00 | 0.00 | 245.07 | 531.99 | 718.31 | |

Total per year (kWh/year) = ∑(98)1...5, 10...12 = 3579.05 (98)

Space heating requirement in kWh/m²/year (98) ÷ (4) 47.97 (99)

## 9a. Energy Requirements - Individual heating systems including micro-CHP

**Space heating:**

| | | |
|---|---|---|
| Fraction of space heating from secondary/supplementary system (Table 11) | 0.10 | (201) |
| Fraction of space heating from main system(s) 1 - (201) | 0.90 | (202) |
| Fraction of main heating from main system 2 | 0.00 | (203) |
| Fraction of total space heat from main system 1 (202) x [1 - (203)] | 0.90 | (204) |
| Fraction of total space heat from main system 2 (202) x (203) | 0.00 | (205) |
| Efficiency of main space heating system 1 (%) | 92.90 | (206) |

*(from database or Table 4a/4b, adjusted where appropriate by the amount shown in the 'space efficiency adjustment' column of Table 4c)*

| | | |
|---|---|---|
| Efficiency of secondary/supplementary heating system, from Table 4a or Appendix E (%) | 65.00 | (208) |

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Space heating requirement, kWh/month (as calculated above) | | | | | | | | | | | | |
| (98)m | 729.25 | 565.01 | 441.72 | 252.13 | 95.56 | 0.00 | 0.00 | 0.00 | 0.00 | 245.07 | 531.99 | 718.31 |
| Space heating fuel (main heating system 1), kWh/month = (98)m x (204) x 100 ÷ (206) | | | | | | | | | | | | |
| (211)m | 706.49 | 547.37 | 427.93 | 244.26 | 92.58 | 0.00 | 0.00 | 0.00 | 0.00 | 237.42 | 515.38 | 695.89 |

Total per year (kWh/year) = ∑(211)1...5, 10...12 = 3467.32 (211)

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Space heating fuel (secondary), kWh/month = (98)m x (201) x 100 ÷ (208) | | | | | | | | | | | | |
| (215)m | 112.19 | 86.92 | 67.96 | 38.79 | 14.70 | 0.00 | 0.00 | 0.00 | 0.00 | 37.70 | 81.84 | 110.51 |

Total per year (kWh/year) = ∑(215)1...5, 10...12 = 550.62 (215)

**Water heating:**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Output from water heater, kWh/month (calculated above) | | | | | | | | | | | | |
| (64)m | 198.25 | 174.85 | 183.89 | 165.21 | 162.16 | 145.27 | 139.88 | 153.00 | 152.57 | 171.29 | 180.67 | 193.60 |

∑(64)1...12 = 2020.63 (64)

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Efficiency of water heater per month | | | | | | | | | | | | |
| (217)m | 87.34 | 87.08 | 86.44 | 85.35 | 83.03 | 79.80 | 79.80 | 79.80 | 79.80 | 85.19 | 86.89 | 87.35 |
| Fuel for water heating, kWh/month = (64)m x 100 ÷ (217)m | | | | | | | | | | | | |
| (219)m | 227.00 | 200.79 | 212.74 | 193.57 | 195.30 | 182.05 | 175.29 | 191.72 | 191.19 | 201.08 | 207.93 | 221.63 |

Total per year (kWh/year) = ∑(219)1...12 = 2400.28 (219)

| **Annual Totals Summary:** | **kWh/year** | **kWh/year** | |
|---|---|---|---|
| **Space heating fuel used, main system 1** | | 3467.32 | (211) |
| **Space heating fuel used, secondary** | | 550.62 | (215) |
| **Water heating fuel used** | | 2400.28 | (219) |
| **Electricity for pumps, fans and electric keep-hot (Table 4f):** | | | |
| mechanical ventilation fans - balanced, extract or positive input from outside | 0.00 | | (230a) |
| warm air heating system fans | 0.00 | | (230b) |
| central heating pump | 130.00 | | (230c) |
| oil boiler pump | 0.00 | | (230d) |
| boiler flue fan | 45.00 | | (230e) |
| maintaining electric keep-hot facility for gas combi boiler | 0.00 | | (230f) |
| pump for solar water heating | 0.00 | | (230g) |
| Total electricity for the above | ∑(230a)...(230g) | 175.00 | (231) |
| **Electricity for lighting (calculated in Appendix L):** | | 327.18 | (232) |

## 10a. Fuel costs - Individual heating systems including micro-CHP

| | **Fuel kWh/year** | | **Fuel price (Table 12)** | | **Fuel cost £/year** | |
|---|---|---|---|---|---|---|
| Space heating - main system 1 | 3467.32 | x | 3.10 | x 0.01 = | 107.49 | (240) |

| | | | | | | |
|---|---|---|---|---|---|---|
| Space heating - secondary | 550.62 | x | 3.42 | x 0.01 = | 18.83 | (242) |
| Water heating cost (other fuel) | 2400.28 | x | 3.10 | x 0.01 = | 74.41 | (247) |
| Pumps, fans and electric keep-hot | 175.00 | x | 11.46 | x 0.01 = | 20.06 | (249) |
| Energy for lighting | 327.18 | x | 11.46 | x 0.01 = | 37.49 | (250) |
| Additional standing charges (Table 12) | | | | | 106.00 | (251) |
| Total energy cost | | | | (240)...(242) + (245)...(254) | 364.28 | (255) |

## 11a. SAP rating - Individual heating systems including micro-CHP

| | | |
|---|---|---|
| Energy cost deflator (Table 12) | 0.47 | (256) |
| Energy cost factor (ECF) | 1.43 | (257) |
| SAP value | 80.03 | |
| SAP rating | 80 | (258) |
| SAP band | C | |

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

| | Energy kWh/year | | Emissions Factor | | Emissions (kgCO2/year) | |
|---|---|---|---|---|---|---|
| Space heating - main system 1 | 3467.32 | x | 0.198 | = | 686.53 | (261) |
| Space heating - secondary | 550.62 | x | 0.008 | = | 4.40 | (263) |
| Water heating | 2400.28 | x | 0.198 | = | 475.25 | (264) |
| Space and water heating | | | | (261) + (262) + (263) + (264) = | 1166.19 | (265) |
| Pumps, fans and electric keep-hot | 175.00 | x | 0.517 | = | 90.48 | (267) |
| Lighting | 327.18 | x | 0.517 | = | 169.15 | (268) |
| Total carbon dioxide emissions | | | | ∑(261)...(271) = | 1425.82 | (272) |
| Dwelling carbon dioxide emissions rate | | | | (272) ÷ (4) = | 19.11 | (273) |
| EI value | | | | | 84.03 | |
| EI rating (see section 14) | | | | | 84 | (274) |
| EI band | | | | | B | |

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

| | Energy kWh/year | | Primary Energy Factor | | Primary Energy | |
|---|---|---|---|---|---|---|
| Space heating - main system 1 | 3467.32 | x | 1.02 | = | 3536.67 | (261*) |
| Space heating - secondary | 550.62 | x | 1.05 | = | 578.15 | (263*) |
| Water heating | 2400.28 | x | 1.02 | = | 2448.28 | (264*) |
| Space and water heating | | | | (261*) + (262*) + (263*) + (264*) = | 6563.10 | (265*) |
| Pumps, fans and electric keep-hot | 175.00 | x | 2.92 | = | 511.00 | (267*) |
| Lighting | 327.18 | x | 2.92 | = | 955.37 | (268*) |
| Total primary energy kWh/year | | | | ∑(261*)...(271*) = | 8029.47 | (272*) |
| Primary energy kWh/m2/year | | | | (272*) ÷ (4) = | 107.62 | (273*) |