

# PREDICTED ENERGY ASSESSMENT



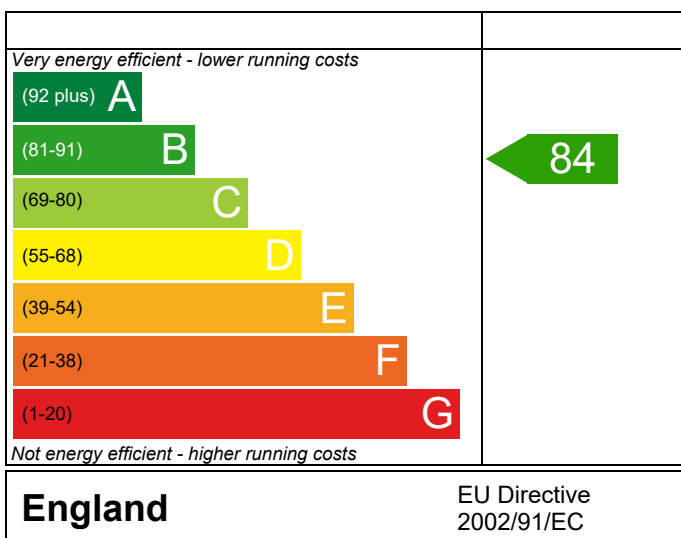
Plot 121, Grasmere Gardens,  
Chestfield,  
Kent

Dwelling type: House, Semi-Detached  
Date of assessment: 06/10/2022  
Produced by: Sean Wells  
Total floor area: 79.92 m<sup>2</sup>  
DRRN: 9106-2190-0520

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

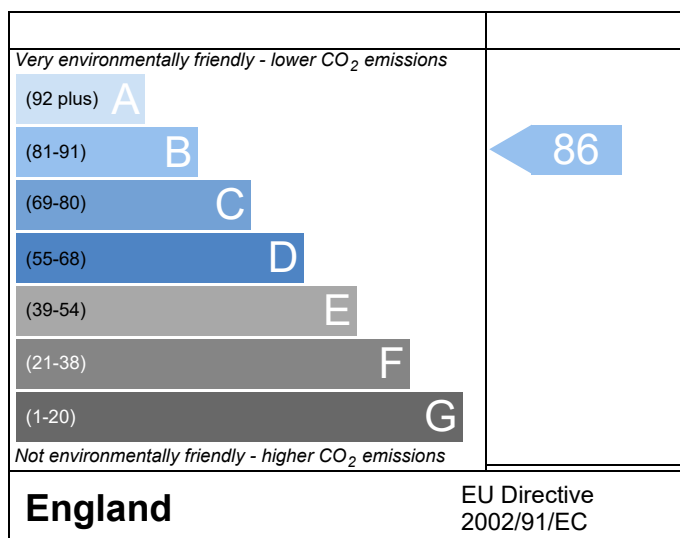
The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO<sub>2</sub>) emissions.

## Energy Efficiency Rating



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

## Environmental Impact (CO<sub>2</sub>) Rating



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO<sub>2</sub>) emissions. The higher the rating the less impact it has on the environment.

This report has been produced by an accredited Elmhurst member whose work is subject to quality assurance audits. The data used to produce the report has been verified by the Elmhurst members' portal.



# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)



|                                    |                                                                        |             |               |                    |                |            |
|------------------------------------|------------------------------------------------------------------------|-------------|---------------|--------------------|----------------|------------|
| Property Reference                 | 4227-121F                                                              |             |               |                    | Issued on Date | 06/10/2022 |
| Assessment Reference               | As Designed Final                                                      |             | Prop Type Ref | Type A - A1/B1 Adj |                |            |
| Property                           | Plot 121, Grasmere Gardens, Chestfield, Kent                           |             |               |                    |                |            |
|                                    |                                                                        |             |               |                    |                |            |
| SAP Rating                         | 84 B                                                                   | DER         | 17.61         | TER                | 19.21          |            |
| Environmental                      | 86 B                                                                   | % DER<TER   | 8.34          |                    |                |            |
| CO <sub>2</sub> Emissions (t/year) | 1.16                                                                   | DFEE        | 47.45         | TFEE               | 56.40          |            |
| General Requirements Compliance    | Pass                                                                   | % DFEE<TFEE | 15.86         |                    |                |            |
|                                    |                                                                        |             |               |                    |                |            |
| Assessor Details                   | Mr. Sean Wells, Energytest, Tel: 01892577562, swells@energy-test.co.uk |             |               |                    | Assessor ID    | T220-0001  |
| Client                             |                                                                        |             |               |                    |                |            |

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)



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

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

#### DWELLING AS DESIGNED

Semi-Detached House, total floor area 80 m<sup>2</sup>

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

#### 1a TER and DER

Fuel for main heating:Mains gas  
Fuel factor:1.00 (mains gas)  
Target Carbon Dioxide Emission Rate (TER) 19.21 kgCO<sub>2</sub>/m<sup>2</sup>  
Dwelling Carbon Dioxide Emission Rate (DER) 17.61 kgCO<sub>2</sub>/m<sup>2</sup>OK

#### 1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)56.4 kWh/m<sup>2</sup>/yr  
Dwelling Fabric Energy Efficiency (DFEE)47.5 kWh/m<sup>2</sup>/yrOK

#### 2 Fabric U-values

| Element       | Average          | Highest          |    |
|---------------|------------------|------------------|----|
| External wall | 0.19 (max. 0.30) | 0.20 (max. 0.70) | OK |
| Party wall    | 0.00 (max. 0.20) | -                | OK |
| Floor         | 0.12 (max. 0.25) | 0.12 (max. 0.70) | OK |
| Roof          | 0.11 (max. 0.20) | 0.11 (max. 0.35) | OK |
| Openings      | 1.42 (max. 2.00) | 1.60 (max. 3.30) | OK |

#### 2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

#### 3 Air permeability

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

#### 4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas  
Data from database  
Vaillant ecoFIT sustain 830 VUW 306/6-3 (H-GB)  
Combi boiler  
Efficiency: 89.3% SEDBUK2009  
Minimum: 88.0% OK

Secondary heating system: None

#### 5 Cylinder insulation

Hot water storage No cylinder

#### 6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls: No cylinder

Boiler interlock Yes OK

#### 7 Low energy lights

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

#### 8 Mechanical ventilation

Not applicable

#### 9 Summertime temperature

Overheating risk (Thames Valley): Not significant OK  
Based on:  
Overshading:  
Average  
Windows facing East: 9.15 m<sup>2</sup>, No overhang  
Windows facing South: 0.63 m<sup>2</sup>, No overhang  
Windows facing West: 5.10 m<sup>2</sup>, No overhang  
Air change rate: 8.00 ach  
Blinds/curtains: Light-coloured curtain or roller blind, closed 100% of daylight hours

#### 10 Key features

Party wall U-value 0.00 W/m<sup>2</sup>K  
Roof U-value 0.11 W/m<sup>2</sup>K  
Floor U-value 0.12 W/m<sup>2</sup>K

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)



### CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

#### 1. Overall dwelling dimensions

|                                                        | Area<br>(m <sup>2</sup> ) | Storey height<br>(m)              | Volume<br>(m <sup>3</sup> ) |
|--------------------------------------------------------|---------------------------|-----------------------------------|-----------------------------|
| Ground floor                                           | 39.9600 (1b)              | x 2.4000 (2b)                     | = 95.9040 (1b) - (3b)       |
| First floor                                            | 39.9600 (1c)              | x 2.7000 (2c)                     | = 107.8920 (1c) - (3c)      |
| Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) | 79.9200                   |                                   | (4)                         |
| Dwelling volume                                        |                           | (3a)+(3b)+(3c)+(3d)+(3e)...(3n) = | 203.7960 (5)                |

#### 2. Ventilation rate

|                                                                           | main<br>heating | secondary<br>heating | other | total                       | m3 per hour                |
|---------------------------------------------------------------------------|-----------------|----------------------|-------|-----------------------------|----------------------------|
| Number of chimneys                                                        | 0               | +                    | 0     | =                           | 0 * 40 = 0.0000 (6a)       |
| Number of open flues                                                      | 0               | +                    | 0     | =                           | 0 * 20 = 0.0000 (6b)       |
| Number of intermittent fans                                               |                 |                      |       |                             | 4 * 10 = 40.0000 (7a)      |
| Number of passive vents                                                   |                 |                      |       |                             | 0 * 10 = 0.0000 (7b)       |
| Number of flueless gas fires                                              |                 |                      |       |                             | 0 * 40 = 0.0000 (7c)       |
| Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = |                 |                      |       |                             | 40.0000 / (5) = 0.1963 (8) |
| Pressure test                                                             |                 |                      |       |                             | Yes                        |
| Measured/design AP50                                                      |                 |                      |       |                             | 5.0000                     |
| Infiltration rate                                                         |                 |                      |       |                             | 0.4463 (18)                |
| Number of sides sheltered                                                 |                 |                      |       |                             | 3 (19)                     |
| Shelter factor                                                            |                 |                      |       | (20) = 1 - [0.075 x (19)] = | 0.7750 (20)                |
| Infiltration rate adjusted to include shelter factor                      |                 |                      |       | (21) = (18) x (20) =        | 0.3459 (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 | 0.4410 | 0.4323 | 0.4237 | 0.3804 | 0.3718 | 0.3286 | 0.3286 | 0.3199 | 0.3459 | 0.3718 | 0.3891 | 0.4064 (22b) |
| Effective ac    | 0.5972 | 0.5935 | 0.5898 | 0.5724 | 0.5691 | 0.5540 | 0.5540 | 0.5512 | 0.5598 | 0.5691 | 0.5757 | 0.5826 (25)  |

#### 3. Heat losses and heat loss parameter

| Element                                                        | Gross<br>m <sup>2</sup> | Openings<br>m <sup>2</sup> | NetArea<br>m <sup>2</sup> | U-value<br>W/m <sup>2</sup> K | A x U<br>W/K | K-value<br>kJ/m <sup>2</sup> K | A x K<br>kJ/K |
|----------------------------------------------------------------|-------------------------|----------------------------|---------------------------|-------------------------------|--------------|--------------------------------|---------------|
| window (Uw = 1.40)                                             |                         |                            | 14.8800                   | 1.3258                        | 19.7273      |                                | (27)          |
| external door                                                  |                         |                            | 1.8900                    | 1.6000                        | 3.0240       |                                | (26a)         |
| ground floor                                                   |                         |                            | 39.9600                   | 0.1200                        | 4.7952       |                                | (28a)         |
| external wall - brick                                          | 50.9800                 | 11.1900                    | 39.7900                   | 0.2000                        | 7.9580       |                                | (29a)         |
| external wall - weatherboard                                   | 57.3500                 | 5.5800                     | 51.7700                   | 0.1800                        | 9.3186       |                                | (29a)         |
| pitch cold roof                                                | 39.9600                 |                            | 39.9600                   | 0.1100                        | 4.3956       |                                | (30)          |
| Total net area of external elements Aum(A, m <sup>2</sup> )    |                         |                            | 188.2500                  |                               |              |                                | (31)          |
| Fabric heat loss, W/K = Sum (A x U)                            |                         |                            | (26)...(30) + (32) =      |                               | 49.2187      |                                | (33)          |
| Party Wall 1                                                   |                         |                            | 28.5600                   | 0.0000                        | 0.0000       |                                | (32)          |
| Thermal mass parameter (TMP = Cm / TFA) in kJ/m <sup>2</sup> K |                         |                            |                           |                               |              |                                | 174.0000 (35) |
| Thermal bridges (Sum(L x Psi) calculated using Appendix K)     |                         |                            |                           |                               |              |                                | 8.1321 (36)   |
| Total fabric heat loss                                         |                         |                            |                           |                               |              | (33) + (36) =                  | 57.3508 (37)  |

|                                                                     | Jan     | Feb     | Mar     | Apr     | May     | Jun     | Jul     | Aug     | Sep     | Oct     | Nov     | Dec          |
|---------------------------------------------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|--------------|
| Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) |         |         |         |         |         |         |         |         |         |         |         |              |
| (38)m                                                               | 40.1653 | 39.9114 | 39.6625 | 38.4935 | 38.2748 | 37.2566 | 37.2566 | 37.0680 | 37.6488 | 38.2748 | 38.7172 | 39.1798 (38) |
| Heat transfer coeff                                                 | 97.5161 | 97.2621 | 97.0133 | 95.8442 | 95.6255 | 94.6073 | 94.6073 | 94.4188 | 94.9995 | 95.6255 | 96.0680 | 96.5306 (39) |
| Average = Sum(39)m / 12 =                                           |         |         |         |         |         |         |         |         |         |         |         | 95.8432 (39) |
| HLP                                                                 | 1.2202  | 1.2170  | 1.2139  | 1.1993  | 1.1965  | 1.1838  | 1.1838  | 1.1814  | 1.1887  | 1.1965  | 1.2021  | 1.2078 (40)  |
| HLP (average)                                                       |         |         |         |         |         |         |         |         |         |         |         | 1.1992 (40)  |
| Days in month                                                       | 31      | 28      | 31      | 30      | 31      | 30      | 31      | 31      | 30      | 31      | 30      | 31 (41)      |

#### 4. Water heating energy requirements (kWh/year)

| Assumed occupancy                        |          |          |          |          |          |         |         |          |          |          |              | 2.4613 (42)                       |
|------------------------------------------|----------|----------|----------|----------|----------|---------|---------|----------|----------|----------|--------------|-----------------------------------|
| Average daily hot water use (litres/day) |          |          |          |          |          |         |         |          |          |          |              | 92.6569 (43)                      |
|                                          | Jan      | Feb      | Mar      | Apr      | May      | Jun     | Jul     | Aug      | Sep      | Oct      | Nov          | Dec                               |
| Daily hot water use                      | 101.9225 | 98.2163  | 94.5100  | 90.8037  | 87.0974  | 83.3912 | 83.3912 | 87.0974  | 90.8037  | 94.5100  | 98.2163      | 101.9225 (44)                     |
| Energy conte                             | 151.1482 | 132.1952 | 136.4136 | 118.9287 | 114.1149 | 98.4725 | 91.2492 | 104.7098 | 105.9604 | 123.4866 | 134.7953     | 146.3790 (45)                     |
| Energy content (annual)                  |          |          |          |          |          |         |         |          |          |          |              | Total = Sum(45)m = 1457.8532 (45) |
| Distribution loss (46)m = 0.15 x (45)m   |          |          |          |          |          |         |         |          |          |          |              |                                   |
| 22.6722                                  | 19.8293  | 20.4620  | 17.8393  | 17.1172  | 14.7709  | 13.6874 | 15.7065 | 15.8941  | 18.5230  | 20.2193  | 21.9568 (46) |                                   |
| Water storage loss:                      |          |          |          |          |          |         |         |          |          |          |              |                                   |
| Total storage loss                       |          |          |          |          |          |         |         |          |          |          |              |                                   |

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)



### CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

|                                                                 |          |          |          |          |          |         |         |          |          |          |          |               |
|-----------------------------------------------------------------|----------|----------|----------|----------|----------|---------|---------|----------|----------|----------|----------|---------------|
| 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)   |
| Combi loss                                                      | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000  | 0.0000  | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000 (57)   |
| Total heat required for water heating calculated for each month | 1.7096   | 1.4931   | 1.4826   | 1.2419   | 1.1430   | 0.9443  | 0.8751  | 1.0488   | 1.1065   | 1.3421   | 1.5225   | 1.6556 (61)   |
| Solar input                                                     | 152.8578 | 133.6883 | 137.8962 | 120.1706 | 115.2579 | 99.4168 | 92.1243 | 105.7586 | 107.0669 | 124.8287 | 136.3178 | 148.0346 (62) |
| Output from w/h                                                 | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000  | 0.0000  | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000 (63)   |
| Heat gains from water heating, kWh/month                        | 152.8578 | 133.6883 | 137.8962 | 120.1706 | 115.2579 | 99.4168 | 92.1243 | 105.7586 | 107.0669 | 124.8287 | 136.3178 | 148.0346 (64) |
|                                                                 | 50.6842  | 44.3282  | 45.7282  | 39.8543  | 38.2289  | 32.9782 | 30.5591 | 35.0782  | 35.5084  | 41.3948  | 45.2001  | 49.0849 (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                                                                               | 123.0671 | 123.0671 | 123.0671 | 123.0671 | 123.0671 | 123.0671 | 123.0671 | 123.0671 | 123.0671 | 123.0671 | 123.0671 | 123.0671 | (66) |
| Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5     | 19.8634  | 17.6425  | 14.3479  | 10.8622  | 8.1197   | 6.8550   | 7.4070   | 9.6279   | 12.9226  | 16.4082  | 19.1508  | 20.4155  | (67) |
| Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 | 219.2733 | 221.5486 | 215.8148 | 203.6081 | 188.1993 | 173.7172 | 164.0423 | 161.7669 | 167.5008 | 179.7075 | 195.1163 | 209.5983 | (68) |
| Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5    | 35.3067  | 35.3067  | 35.3067  | 35.3067  | 35.3067  | 35.3067  | 35.3067  | 35.3067  | 35.3067  | 35.3067  | 35.3067  | 35.3067  | (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)                                 | -98.4537 | -98.4537 | -98.4537 | -98.4537 | -98.4537 | -98.4537 | -98.4537 | -98.4537 | -98.4537 | -98.4537 | -98.4537 | -98.4537 | (71) |
| Water heating gains (Table 5)                                                       | 68.1239  | 65.9645  | 61.4626  | 55.3531  | 51.3830  | 45.8030  | 41.0741  | 47.1481  | 49.3173  | 55.6382  | 62.7779  | 65.9743  | (72) |
| Total internal gains                                                                | 370.1807 | 368.0758 | 354.5453 | 332.7436 | 310.6221 | 289.2953 | 275.4435 | 281.4631 | 292.6608 | 314.6740 | 339.9650 | 358.9083 | (73) |

#### 6. Solar gains

| [Jan]       |          |          |          | Area<br>m2 | Solar flux<br>Table 6a<br>W/m2 | g<br>Specific data<br>or Table 6b | FF<br>Specific data<br>or Table 6c | Access<br>factor<br>Table 6d | Gains<br>W   |          |          |               |
|-------------|----------|----------|----------|------------|--------------------------------|-----------------------------------|------------------------------------|------------------------------|--------------|----------|----------|---------------|
| East        |          |          |          | 9.1500     | 19.6403                        | 0.6300                            | 0.7000                             | 0.7700                       | 54.9212 (76) |          |          |               |
| South       |          |          |          | 0.6300     | 46.7521                        | 0.6300                            | 0.7000                             | 0.7700                       | 9.0015 (78)  |          |          |               |
| West        |          |          |          | 5.1000     | 19.6403                        | 0.6300                            | 0.7000                             | 0.7700                       | 30.6118 (80) |          |          |               |
|             |          |          |          |            |                                |                                   |                                    |                              |              |          |          |               |
| Solar gains | 94.5345  | 182.0629 | 294.3323 | 423.1025   | 514.6339                       | 525.4633                          | 500.7950                           | 432.5079                     | 340.0968     | 214.4410 | 117.3195 | 78.1163 (83)  |
| Total gains | 464.7152 | 550.1387 | 648.8777 | 755.8461   | 825.2560                       | 814.7586                          | 776.2386                           | 713.9710                     | 632.7576     | 529.1150 | 457.2845 | 437.0246 (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                                                                         | 39.6119 | 39.7153 | 39.8172 | 40.3029 | 40.3951 | 40.8298 | 40.8298 | 40.9113 | 40.6613                   | 40.3951 | 40.2090 | 40.0163 |              |
| alpha                                                                       | 3.6408  | 3.6477  | 3.6545  | 3.6869  | 3.6930  | 3.7220  | 3.7220  | 3.7274  | 3.7108                    | 3.6930  | 3.6806  | 3.6678  |              |
| util living area                                                            | 0.9925  | 0.9856  | 0.9672  | 0.9170  | 0.8153  | 0.6593  | 0.5104  | 0.5670  | 0.8014                    | 0.9520  | 0.9872  | 0.9940  | (86)         |
| MIT                                                                         | 19.2243 | 19.4415 | 19.8131 | 20.2866 | 20.6688 | 20.8951 | 20.9692 | 20.9547 | 20.7725                   | 20.2492 | 19.6495 | 19.1885 | (87)         |
| Th 2                                                                        | 19.9039 | 19.9064 | 19.9089 | 19.9206 | 19.9228 | 19.9330 | 19.9330 | 19.9349 | 19.9291                   | 19.9228 | 19.9184 | 19.9137 | (88)         |
| util rest of house                                                          | 0.9907  | 0.9821  | 0.9589  | 0.8954  | 0.7675  | 0.5750  | 0.3977  | 0.4524  | 0.7323                    | 0.9352  | 0.9834  | 0.9926  | (89)         |
| MIT 2                                                                       | 17.5393 | 17.8566 | 18.3946 | 19.0709 | 19.5801 | 19.8520 | 19.9181 | 19.9108 | 19.7262                   | 19.0340 | 18.1691 | 17.4934 | (90)         |
| Living area fraction                                                        |         |         |         |         |         |         |         |         | fLA = Living area / (4) = |         |         | 0.3779  | (91)         |
| MIT                                                                         | 18.1760 | 18.4555 | 18.9306 | 19.5303 | 19.9915 | 20.2462 | 20.3153 | 20.3052 | 20.1216                   | 19.4932 | 18.7285 | 18.1340 | (92)         |
| Temperature adjustment                                                      |         |         |         |         |         |         |         |         |                           |         |         | -0.1500 |              |
| adjusted MIT                                                                | 18.0260 | 18.3055 | 18.7806 | 19.3803 | 19.8415 | 20.0962 | 20.1653 | 20.1552 | 19.9716                   | 19.3432 | 18.5785 | 17.9840 | (93)         |

#### 8. Space heating requirement

|                      |           |           |           |           |          |          |          |          |          |              |           |           |       |
|----------------------|-----------|-----------|-----------|-----------|----------|----------|----------|----------|----------|--------------|-----------|-----------|-------|
| Utilisation          | Jan       | Feb       | Mar       | Apr       | May      | Jun      | Jul      | Aug      | Sep      | Oct          | Nov       | Dec       |       |
| Useful gains         | 0.9860    | 0.9747    | 0.9475    | 0.8822    | 0.7634   | 0.5889   | 0.4233   | 0.4775   | 0.7355   | 0.9233       | 0.9767    | 0.9886    | (94)  |
| Ext temp.            | 458.2216  | 536.2262  | 614.7893  | 666.7914  | 630.0109 | 479.8017 | 328.5580 | 340.9294 | 465.3912 | 488.5118     | 446.6266  | 432.0528  | (95)  |
| Heat loss rate W     | 4.3000    | 4.9000    | 6.5000    | 8.9000    | 11.7000  | 14.6000  | 16.6000  | 16.4000  | 14.1000  | 10.6000      | 7.1000    | 4.2000    | (96)  |
| Month fracti         | 1338.5074 | 1303.8476 | 1191.3823 | 1004.4736 | 778.5373 | 519.9815 | 337.3023 | 354.5657 | 557.7997 | 836.0722     | 1102.7184 | 1330.5745 | (97)  |
| Space heating kWh    | 1.0000    | 1.0000    | 1.0000    | 1.0000    | 1.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 1.0000       | 1.0000    | 1.0000    | (97a) |
| Space heating per m2 | 654.9327  | 515.8416  | 428.9852  | 243.1312  | 110.5036 | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 258.5849     | 472.3861  | 668.5001  | (98)  |
|                      |           |           |           |           |          |          |          |          |          |              |           | 3352.8654 | (98)  |
|                      |           |           |           |           |          |          |          |          |          | (98) / (4) = |           | 41.9528   | (99)  |

#### 8c. Space cooling requirement

Not applicable

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)



### CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

|                                                                       |          |          |          |          |          |          |          |          |          |          |          |           |                 |
|-----------------------------------------------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|-----------------|
| Fraction of space heat from secondary/supplementary system (Table 11) |          |          |          |          |          |          |          |          |          |          |          |           | 0.0000 (201)    |
| Fraction of space heat from main system(s)                            |          |          |          |          |          |          |          |          |          |          |          |           | 1.0000 (202)    |
| Efficiency of main space heating system 1 (in %)                      |          |          |          |          |          |          |          |          |          |          |          |           | 90.2000 (206)   |
| Efficiency of secondary/supplementary heating system, %               |          |          |          |          |          |          |          |          |          |          |          |           | 0.0000 (208)    |
| Space heating requirement                                             |          |          |          |          |          |          |          |          |          |          |          |           | 3717.1457 (211) |
|                                                                       | Jan      | Feb      | Mar      | Apr      | May      | Jun      | Jul      | Aug      | Sep      | Oct      | Nov      | Dec       |                 |
| Space heating requirement                                             | 654.9327 | 515.8416 | 428.9852 | 243.1312 | 110.5036 | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 258.5849 | 472.3861 | 668.5001  | (98)            |
| Space heating efficiency (main heating system 1)                      | 90.2000  | 90.2000  | 90.2000  | 90.2000  | 90.2000  | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 90.2000  | 90.2000  | 90.2000   | (210)           |
| Space heating fuel (main heating system)                              | 726.0894 | 571.8864 | 475.5933 | 269.5468 | 122.5096 | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 286.6795 | 523.7097 | 741.1310  | (211)           |
| Water heating requirement                                             | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000    | (215)           |
| Water heating requirement                                             | 152.8578 | 133.6883 | 137.8962 | 120.1706 | 115.2579 | 99.4168  | 92.1243  | 105.7586 | 107.0669 | 124.8287 | 136.3178 | 148.0346  | (64)            |
| Efficiency of water heater (217)m                                     | 87.1694  | 86.9133  | 86.3412  | 85.0324  | 82.4649  | 76.2000  | 76.2000  | 76.2000  | 76.2000  | 85.1091  | 86.6354  | 76.2000   | (216)           |
| Fuel for water heating, kWh/month                                     | 175.3571 | 153.8179 | 159.7108 | 141.3233 | 139.7659 | 130.4683 | 120.8980 | 138.7908 | 140.5077 | 146.6691 | 157.3466 | 169.5848  | (219)           |
| Water heating fuel used                                               |          |          |          |          |          |          |          |          |          |          |          | 1774.2402 | (219)           |
| Annual totals kWh/year                                                |          |          |          |          |          |          |          |          |          |          |          |           |                 |
| Space heating fuel - main system                                      |          |          |          |          |          |          |          |          |          |          |          | 3717.1457 | (211)           |
| Space heating fuel - secondary                                        |          |          |          |          |          |          |          |          |          |          |          | 0.0000    | (215)           |
| Electricity for pumps and fans:                                       |          |          |          |          |          |          |          |          |          |          |          |           |                 |
| central heating pump                                                  |          |          |          |          |          |          |          |          |          |          |          | 30.0000   | (230c)          |
| main heating flue fan                                                 |          |          |          |          |          |          |          |          |          |          |          | 45.0000   | (230e)          |
| Total electricity for the above, kWh/year                             |          |          |          |          |          |          |          |          |          |          |          | 75.0000   | (231)           |
| Electricity for lighting (calculated in Appendix L)                   |          |          |          |          |          |          |          |          |          |          |          | 350.7941  | (232)           |
| Total delivered energy for all uses                                   |          |          |          |          |          |          |          |          |          |          |          | 5917.1800 | (238)           |

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

|                                             | Energy<br>kWh/year | Emission factor<br>kg CO2/kWh | Emissions<br>kg CO2/year |
|---------------------------------------------|--------------------|-------------------------------|--------------------------|
| Space heating - main system 1               | 3717.1457          | 0.2160                        | 802.9035 (261)           |
| Space heating - secondary                   | 0.0000             | 0.0000                        | 0.0000 (263)             |
| Water heating (other fuel)                  | 1774.2402          | 0.2160                        | 383.2359 (264)           |
| Space and water heating                     |                    |                               | 1186.1394 (265)          |
| Pumps and fans                              | 75.0000            | 0.5190                        | 38.9250 (267)            |
| Energy for lighting                         | 350.7941           | 0.5190                        | 182.0621 (268)           |
| Total CO2, kg/year                          |                    |                               | 1407.1265 (272)          |
| Dwelling Carbon Dioxide Emission Rate (DER) |                    |                               | 17.6100 (273)            |

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

|                                                                                 |     |         |     |
|---------------------------------------------------------------------------------|-----|---------|-----|
| DER                                                                             |     | 17.6100 | ZC1 |
| Total Floor Area                                                                | TFA | 79.9200 |     |
| Assumed number of occupants                                                     | N   | 2.4613  |     |
| CO2 emission factor in Table 12 for electricity displaced from grid             | EF  | 0.5190  |     |
| CO2 emissions from appliances, equation (L14)                                   |     | 16.2583 | ZC2 |
| CO2 emissions from cooking, equation (L16)                                      |     | 2.2281  | ZC3 |
| Total CO2 emissions                                                             |     | 36.0965 | ZC4 |
| Residual CO2 emissions offset from biofuel CHP                                  |     | 0.0000  | ZC5 |
| Additional allowable electricity generation, kWh/m²/year                        |     | 0.0000  | ZC6 |
| Resulting CO2 emissions offset from additional allowable electricity generation |     | 0.0000  | ZC7 |
| Net CO2 emissions                                                               |     | 36.0965 | ZC8 |

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)



### CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

#### 1. Overall dwelling dimensions

|                                                        | Area<br>(m <sup>2</sup> ) | Storey height<br>(m)            | Volume<br>(m <sup>3</sup> ) |
|--------------------------------------------------------|---------------------------|---------------------------------|-----------------------------|
| Ground floor                                           | 39.9600 (1b)              | x 2.4000 (2b)                   | = 95.9040 (1b) - (3b)       |
| First floor                                            | 39.9600 (1c)              | x 2.7000 (2c)                   | = 107.8920 (1c) - (3c)      |
| Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) | 79.9200                   |                                 | (4)                         |
| Dwelling volume                                        |                           | (3a)+(3b)+(3c)+(3d)+(3e)...(3n) | = 203.7960 (5)              |

#### 2. Ventilation rate

|                                                      |                              |        |        |        | main<br>heating | +      | secondary<br>heating | +      | other  | =      | total                       | m3 per hour          |
|------------------------------------------------------|------------------------------|--------|--------|--------|-----------------|--------|----------------------|--------|--------|--------|-----------------------------|----------------------|
| Number of chimneys                                   |                              |        |        |        | 0               | +      | 0                    | +      | 0      | =      | 0 * 40 =                    | 0.0000 (6a)          |
| Number of open flues                                 |                              |        |        |        | 0               | +      | 0                    | +      | 0      | =      | 0 * 20 =                    | 0.0000 (6b)          |
| Number of intermittent fans                          |                              |        |        |        |                 |        |                      |        |        |        | 3 * 10 =                    | 30.0000 (7a)         |
| Number of passive vents                              |                              |        |        |        |                 |        |                      |        |        |        | 0 * 10 =                    | 0.0000 (7b)          |
| Number of flueless gas fires                         |                              |        |        |        |                 |        |                      |        |        |        | 0 * 40 =                    | 0.0000 (7c)          |
|                                                      |                              |        |        |        |                 |        |                      |        |        |        |                             | Air changes per hour |
| Infiltration due to chimneys, flues and fans         | = (6a)+(6b)+(7a)+(7b)+(7c) = |        |        |        |                 |        |                      |        |        |        | 30.0000 / (5) =             | 0.1472 (8)           |
| Pressure test                                        |                              |        |        |        |                 |        |                      |        |        |        | Yes                         |                      |
| Measured/design AP50                                 |                              |        |        |        |                 |        |                      |        |        |        | 5.0000                      |                      |
| Infiltration rate                                    |                              |        |        |        |                 |        |                      |        |        |        | 0.3972 (18)                 |                      |
| Number of sides sheltered                            |                              |        |        |        |                 |        |                      |        |        |        | 3 (19)                      |                      |
| Shelter factor                                       |                              |        |        |        |                 |        |                      |        |        |        | (20) = 1 - [0.075 x (19)] = | 0.7750 (20)          |
| Infiltration rate adjusted to include shelter factor |                              |        |        |        |                 |        |                      |        |        |        | (21) = (18) x (20) =        | 0.3078 (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                                      | 0.3925                       | 0.3848 | 0.3771 | 0.3386 | 0.3309          | 0.2924 | 0.2924               | 0.2847 | 0.3078 | 0.3309 | 0.3463                      | 0.3617 (22b)         |
| Effective ac                                         | 0.5770                       | 0.5740 | 0.5711 | 0.5573 | 0.5548          | 0.5428 | 0.5428               | 0.5405 | 0.5474 | 0.5548 | 0.5600                      | 0.5654 (25)          |

#### 3. Heat losses and heat loss parameter

| Element                                                             | Gross<br>m2    | Openings<br>m2 | NetArea<br>m2        | U-value<br>W/m2K | A x U<br>W/K   | K-value<br>kJ/m2K | A x K<br>kJ/K  |                |                |                |                |                |      |
|---------------------------------------------------------------------|----------------|----------------|----------------------|------------------|----------------|-------------------|----------------|----------------|----------------|----------------|----------------|----------------|------|
| TER Semi-glazed door                                                |                |                | 1.8900               | 1.2000           | 2.2680         |                   |                | (26a)          |                |                |                |                |      |
| TER Opening Type (Uw = 1.40)                                        |                |                | 14.8800              | 1.3258           | 19.7273        |                   |                | (27)           |                |                |                |                |      |
| ground floor                                                        |                |                | 39.9600              | 0.1300           | 5.1948         |                   |                | (28a)          |                |                |                |                |      |
| external wall - brick                                               | 50.9800        | 11.1900        | 39.7900              | 0.1800           | 7.1622         |                   |                | (29a)          |                |                |                |                |      |
| external wall - weatherboard                                        | 57.3500        | 5.5800         | 51.7700              | 0.1800           | 9.3186         |                   |                | (29a)          |                |                |                |                |      |
| pitch cold roof                                                     | 39.9600        |                | 39.9600              | 0.1300           | 5.1948         |                   |                | (30)           |                |                |                |                |      |
| Total net area of external elements Aum(A, m2)                      |                |                | 188.2500             |                  |                |                   |                | (31)           |                |                |                |                |      |
| Fabric heat loss, W/K = Sum (A x U)                                 |                |                | (26)...(30) + (32) = |                  | 48.8657        |                   |                | (33)           |                |                |                |                |      |
| Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K                   |                |                |                      |                  |                |                   | 250.0000       | (35)           |                |                |                |                |      |
| Thermal bridges (Sum(L x Psi) calculated using Appendix K)          |                |                |                      |                  |                |                   | 9.8668         | (36)           |                |                |                |                |      |
| Total fabric heat loss                                              |                |                |                      |                  |                | (33) + (36) =     | 58.7325        | (37)           |                |                |                |                |      |
| Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) |                |                |                      |                  |                |                   |                |                |                |                |                |                |      |
| (38)m                                                               | Jan<br>38.8064 | Feb<br>38.6053 | Mar<br>38.4081       | Apr<br>37.4820   | May<br>37.3087 | Jun<br>36.5022    | Jul<br>36.5022 | Aug<br>36.3528 | Sep<br>36.8128 | Oct<br>37.3087 | Nov<br>37.6593 | Dec<br>38.0257 | (38) |
| Heat transfer coeff                                                 | 97.5389        | 97.3377        | 97.1406              | 96.2145          | 96.0412        | 95.2346           | 95.2346        | 95.0853        | 95.5453        | 96.0412        | 96.3917        | 96.7582        | (39) |
| Average = Sum(39)m / 12 =                                           |                |                |                      |                  |                |                   |                |                |                |                |                | 96.2137        | (39) |
| HLP                                                                 | Jan<br>1.2205  | Feb<br>1.2179  | Mar<br>1.2155        | Apr<br>1.2039    | May<br>1.2017  | Jun<br>1.1916     | Jul<br>1.1916  | Aug<br>1.1898  | Sep<br>1.1955  | Oct<br>1.2017  | Nov<br>1.2061  | Dec<br>1.2107  | (40) |
| HLP (average)                                                       |                |                |                      |                  |                |                   |                |                |                |                |                | 1.2039         | (40) |
| Days in month                                                       | 31             | 28             | 31                   | 30               | 31             | 30                | 31             | 31             | 30             | 31             | 30             | 31             | (41) |

#### 4. Water heating energy requirements (kWh/year)

|                                          |              |             |             |             |             |             |             |             |             |                    |             |                   |
|------------------------------------------|--------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|--------------------|-------------|-------------------|
| Assumed occupancy                        |              |             |             |             |             |             |             |             |             |                    |             | 2.4613 (42)       |
| Average daily hot water use (litres/day) |              |             |             |             |             |             |             |             |             |                    |             | 92.6569 (43)      |
| Daily hot water use                      | Jan 101.9225 | Feb 98.2163 | Mar 94.5100 | Apr 90.8037 | May 87.0974 | Jun 83.3912 | Jul 83.3912 | Aug 87.0974 | Sep 90.8037 | Oct 94.5100        | Nov 98.2163 | Dec 101.9225 (44) |
| Energy conte                             | 151.1482     | 132.1952    | 136.4136    | 118.9287    | 114.1149    | 98.4725     | 91.2492     | 104.7098    | 105.9604    | 123.4866           | 134.7953    | 146.3790 (45)     |
| Energy content (annual)                  |              |             |             |             |             |             |             |             |             | Total = Sum(45)m = |             | 1457.8532 (45)    |
| Distribution loss (46)m = 0.15 x (45)m   | 22.6722      | 19.8293     | 20.4620     | 17.8393     | 17.1172     | 14.7709     | 13.6874     | 15.7065     | 15.8941     | 18.5230            | 20.2193     | 21.9568 (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)       |

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)



### CALCULATION OF TARGET EMISSIONS 09 Jan 2014

|                                                                 |          |          |          |          |          |          |          |          |          |          |          |               |
|-----------------------------------------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|---------------|
| If cylinder contains dedicated solar storage                    | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000 (57)   |
| Combi loss                                                      | 50.9589  | 45.2064  | 48.1613  | 44.7799  | 44.3839  | 41.1244  | 42.4952  | 44.3839  | 44.7799  | 48.1613  | 48.4354  | 50.9589 (61)  |
| Total heat required for water heating calculated for each month | 202.1071 | 177.4016 | 184.5748 | 163.7086 | 158.4988 | 139.5969 | 133.7444 | 149.0937 | 150.7403 | 171.6479 | 183.2307 | 197.3379 (62) |
| Solar input                                                     | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000 (63)   |
| Output from w/h                                                 | 202.1071 | 177.4016 | 184.5748 | 163.7086 | 158.4988 | 139.5969 | 133.7444 | 149.0937 | 150.7403 | 171.6479 | 183.2307 | 197.3379 (64) |
| Heat gains from water heating, kWh/month                        | 62.9965  | 55.2565  | 57.3978  | 50.7388  | 49.0392  | 43.0232  | 40.9642  | 45.9120  | 46.4268  | 53.0996  | 56.9283  | 61.4107 (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                                                                               | 123.0671 | 123.0671 | 123.0671 | 123.0671 | 123.0671 | 123.0671 | 123.0671 | 123.0671 | 123.0671 | 123.0671 | 123.0671 | 123.0671 (66) |
| Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5     | 19.8634  | 17.6425  | 14.3479  | 10.8622  | 8.1197   | 6.8550   | 7.4070   | 9.6279   | 12.9226  | 16.4082  | 19.1508  | 20.4155 (67)  |
| Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 | 219.2733 | 221.5486 | 215.8148 | 203.6081 | 188.1993 | 173.7172 | 164.0423 | 161.7669 | 167.5008 | 179.7075 | 195.1163 | 209.5983 (68) |
| Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5    | 35.3067  | 35.3067  | 35.3067  | 35.3067  | 35.3067  | 35.3067  | 35.3067  | 35.3067  | 35.3067  | 35.3067  | 35.3067  | 35.3067 (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)                                 | -98.4537 | -98.4537 | -98.4537 | -98.4537 | -98.4537 | -98.4537 | -98.4537 | -98.4537 | -98.4537 | -98.4537 | -98.4537 | -98.4537 (71) |
| Water heating gains (Table 5)                                                       | 84.6727  | 82.2269  | 77.1476  | 70.4705  | 65.9129  | 59.7544  | 55.0594  | 61.7097  | 64.4817  | 71.3704  | 79.0671  | 82.5413 (72)  |
| Total internal gains                                                                | 386.7295 | 384.3382 | 370.2304 | 347.8609 | 325.1519 | 303.2467 | 289.4288 | 296.0246 | 307.8252 | 330.4062 | 356.2542 | 375.4752 (73) |

#### 6. Solar gains

| [Jan]       |          |          |          | Area<br>m2 | Solar flux<br>Table 6a<br>W/m2 | g<br>Specific data<br>or Table 6b | FF<br>Specific data<br>or Table 6c | Access<br>factor<br>Table 6d | Gains<br>W   |          |          |               |
|-------------|----------|----------|----------|------------|--------------------------------|-----------------------------------|------------------------------------|------------------------------|--------------|----------|----------|---------------|
| East        |          |          |          | 9.1500     | 19.6403                        | 0.6300                            | 0.7000                             | 0.7700                       | 54.9212 (76) |          |          |               |
| South       |          |          |          | 0.6300     | 46.7521                        | 0.6300                            | 0.7000                             | 0.7700                       | 9.0015 (78)  |          |          |               |
| West        |          |          |          | 5.1000     | 19.6403                        | 0.6300                            | 0.7000                             | 0.7700                       | 30.6118 (80) |          |          |               |
|             |          |          |          |            |                                |                                   |                                    |                              |              |          |          |               |
| Solar gains | 94.5345  | 182.0629 | 294.3323 | 423.1025   | 514.6339                       | 525.4633                          | 500.7950                           | 432.5079                     | 340.0968     | 214.4410 | 117.3195 | 78.1163 (83)  |
| Total gains | 481.2640 | 566.4011 | 664.5627 | 770.9635   | 839.7858                       | 828.7100                          | 790.2238                           | 728.5325                     | 647.9220     | 544.8472 | 473.5737 | 453.5916 (84) |

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

|                                                                             |              |         |         |         |         |         |         |         |         |         |         |              |
|-----------------------------------------------------------------------------|--------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|--------------|
| Temperature during heating periods in the living area from Table 9, Th1 (C) | 21.0000 (85) |         |         |         |         |         |         |         |         |         |         |              |
| Utilisation factor for gains for living area, nil,m (see Table 9a)          | Jan          | Feb     | Mar     | Apr     | May     | Jun     | Jul     | Aug     | Sep     | Oct     | Nov     | Dec          |
| tau                                                                         | 56.9004      | 57.0180 | 57.1337 | 57.6836 | 57.7877 | 58.2771 | 58.2771 | 58.3687 | 58.0876 | 57.7877 | 57.5776 | 57.3595      |
| alpha                                                                       | 4.7934       | 4.8012  | 4.8089  | 4.8456  | 4.8525  | 4.8851  | 4.8851  | 4.8912  | 4.8725  | 4.8525  | 4.8385  | 4.8240       |
| util living area                                                            | 0.9980       | 0.9952  | 0.9856  | 0.9496  | 0.8536  | 0.6836  | 0.5188  | 0.5796  | 0.8368  | 0.9753  | 0.9958  | 0.9985 (86)  |
| MIT                                                                         | 19.6673      | 19.8352 | 20.1249 | 20.4972 | 20.7948 | 20.9499 | 20.9894 | 20.9823 | 20.8636 | 20.4558 | 19.9900 | 19.6371 (87) |
| Th 2                                                                        | 19.9037      | 19.9057 | 19.9076 | 19.9169 | 19.9186 | 19.9267 | 19.9267 | 19.9282 | 19.9236 | 19.9186 | 19.9151 | 19.9115 (88) |
| util rest of house                                                          | 0.9973       | 0.9935  | 0.9803  | 0.9310  | 0.8025  | 0.5893  | 0.3981  | 0.4548  | 0.7610  | 0.9628  | 0.9940  | 0.9979 (89)  |
| MIT 2                                                                       | 18.1329      | 18.3791 | 18.8005 | 19.3336 | 19.7218 | 19.8943 | 19.9230 | 19.9212 | 19.8155 | 19.2870 | 18.6126 | 18.0941 (90) |
| Living area fraction                                                        | 18.7127      | 18.9294 | 19.3010 | 19.7733 | 20.1273 | 20.2932 | 20.3259 | 20.3221 | 20.2115 | 19.7287 | 19.1331 | 18.6772 (92) |
| Temperature adjustment                                                      | 18.7127      | 18.9294 | 19.3010 | 19.7733 | 20.1273 | 20.2932 | 20.3259 | 20.3221 | 20.2115 | 19.7287 | 19.1331 | 18.6772 (93) |

#### 8. Space heating requirement

|                   |                           |           |           |           |          |          |          |          |          |          |           |                |
|-------------------|---------------------------|-----------|-----------|-----------|----------|----------|----------|----------|----------|----------|-----------|----------------|
| Utilisation       | Jan                       | Feb       | Mar       | Apr       | May      | Jun      | Jul      | Aug      | Sep      | Oct      | Nov       | Dec            |
| Useful gains      | 479.4030                  | 561.5247  | 648.9479  | 715.4305  | 683.1512 | 516.4778 | 350.8903 | 365.9207 | 507.9008 | 522.9894 | 469.8796  | 452.2580 (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  | 1405.8028                 | 1365.5859 | 1243.4928 | 1046.1670 | 809.3635 | 542.1896 | 354.8386 | 372.9384 | 583.9297 | 876.7309 | 1159.8877 | 1400.7852 (97) |
| Month fracti      | 1.0000                    | 1.0000    | 1.0000    | 1.0000    | 1.0000   | 1.0000   | 1.0000   | 1.0000   | 1.0000   | 1.0000   | 1.0000    | 1.0000 (97a)   |
| Space heating kWh | 689.2414                  | 540.3291  | 442.3414  | 238.1302  | 93.9020  | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 263.1837 | 496.8058  | 705.7043 (98)  |
| Space heating     | (98) / (4) = 43.4139 (99) |           |           |           |          |          |          |          |          |          |           |                |

#### 8c. Space cooling requirement

Not applicable

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)



### CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

|                                                                       |          |          |          |          |          |          |          |          |          |          |          |          |                 |
|-----------------------------------------------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------------|
| Fraction of space heat from secondary/supplementary system (Table 11) |          |          |          |          |          |          |          |          |          |          |          |          | 0.0000 (201)    |
| Fraction of space heat from main system(s)                            |          |          |          |          |          |          |          |          |          |          |          |          | 1.0000 (202)    |
| Efficiency of main space heating system 1 (in %)                      |          |          |          |          |          |          |          |          |          |          |          |          | 93.4000 (206)   |
| Efficiency of secondary/supplementary heating system, %               |          |          |          |          |          |          |          |          |          |          |          |          | 0.0000 (208)    |
| Space heating requirement                                             |          |          |          |          |          |          |          |          |          |          |          |          | 3714.8158 (211) |
|                                                                       | Jan      | Feb      | Mar      | Apr      | May      | Jun      | Jul      | Aug      | Sep      | Oct      | Nov      | Dec      |                 |
| Space heating requirement                                             | 689.2414 | 540.3291 | 442.3414 | 238.1302 | 93.9020  | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 263.1837 | 496.8058 | 705.7043 | (98)            |
| Space heating efficiency (main heating system 1)                      | 93.4000  | 93.4000  | 93.4000  | 93.4000  | 93.4000  | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 93.4000  | 93.4000  | 93.4000  | (210)           |
| Space heating fuel (main heating system)                              | 737.9459 | 578.5108 | 473.5990 | 254.9574 | 100.5374 | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 281.7813 | 531.9120 | 755.5720 | (211)           |
| Water heating requirement                                             | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | (215)           |
| Water heating requirement                                             | 202.1071 | 177.4016 | 184.5748 | 163.7086 | 158.4988 | 139.5969 | 133.7444 | 149.0937 | 150.7403 | 171.6479 | 183.2307 | 197.3379 | (64)            |
| Efficiency of water heater (217)m                                     | 87.8933  | 87.6743  | 87.1719  | 85.9935  | 83.7825  | 80.3000  | 80.3000  | 80.3000  | 80.3000  | 86.1239  | 87.4368  | 87.9818  | (216)           |
| Fuel for water heating, kWh/month                                     | 229.9459 | 202.3415 | 211.7366 | 190.3731 | 189.1789 | 173.8442 | 166.5560 | 185.6709 | 187.7214 | 199.3034 | 209.5580 | 224.2941 | (219)           |
| Water heating fuel used                                               |          |          |          |          |          |          |          |          |          |          |          |          | (219)           |
| Annual totals kWh/year                                                |          |          |          |          |          |          |          |          |          |          |          |          |                 |
| Space heating fuel - main system                                      |          |          |          |          |          |          |          |          |          |          |          |          | 3714.8158 (211) |
| Space heating fuel - secondary                                        |          |          |          |          |          |          |          |          |          |          |          |          | 0.0000 (215)    |
| Electricity for pumps and fans:                                       |          |          |          |          |          |          |          |          |          |          |          |          |                 |
| central heating pump                                                  |          |          |          |          |          |          |          |          |          |          |          |          | 30.0000 (230c)  |
| main heating flue fan                                                 |          |          |          |          |          |          |          |          |          |          |          |          | 45.0000 (230e)  |
| Total electricity for the above, kWh/year                             |          |          |          |          |          |          |          |          |          |          |          |          | 75.0000 (231)   |
| Electricity for lighting (calculated in Appendix L)                   |          |          |          |          |          |          |          |          |          |          |          |          | 350.7941 (232)  |
| Total delivered energy for all uses                                   |          |          |          |          |          |          |          |          |          |          |          |          | 6511.1338 (238) |

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

|                                                                                                   | Energy<br>kWh/year | Emission factor<br>kg CO2/kWh | Emissions<br>kg CO2/year |
|---------------------------------------------------------------------------------------------------|--------------------|-------------------------------|--------------------------|
| Space heating - main system 1                                                                     | 3714.8158          | 0.2160                        | 802.4002 (261)           |
| Space heating - secondary                                                                         | 0.0000             | 0.0000                        | 0.0000 (263)             |
| Water heating (other fuel)                                                                        | 2370.5239          | 0.2160                        | 512.0332 (264)           |
| Space and water heating                                                                           |                    |                               | 1314.4334 (265)          |
| Pumps and fans                                                                                    | 75.0000            | 0.5190                        | 38.9250 (267)            |
| Energy for lighting                                                                               | 350.7941           | 0.5190                        | 182.0621 (268)           |
| Total CO2, kg/m2/year                                                                             |                    |                               | 1535.4205 (272)          |
| Emissions per m2 for space and water heating                                                      |                    |                               | 16.4469 (272a)           |
| Fuel factor (mains gas)                                                                           |                    |                               | 1.0000                   |
| Emissions per m2 for lighting                                                                     |                    |                               | 2.2781 (272b)            |
| Emissions per m2 for pumps and fans                                                               |                    |                               | 0.4870 (272c)            |
| Target Carbon Dioxide Emission Rate (TER) = (16.4469 * 1.00) + 2.2781 + 0.4870, rounded to 2 d.p. |                    |                               | 19.2100 (273)            |

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)



|                                    |                                                                        |                |                    |
|------------------------------------|------------------------------------------------------------------------|----------------|--------------------|
| Property Reference                 | 4227-121F                                                              | Issued on Date | 06/10/2022         |
| Assessment Reference               | As Designed Final                                                      | Prop Type Ref  | Type A - A1/B1 Adj |
| Property                           | Plot 121, Grasmere Gardens, Chestfield, Kent                           |                |                    |
| SAP Rating                         | 84 B                                                                   | DER            | 17.61              |
| Environmental                      | 86 B                                                                   | % DER<TER      | 8.34               |
| CO <sub>2</sub> Emissions (t/year) | 1.16                                                                   | DFEE           | 47.45              |
| General Requirements Compliance    | Pass                                                                   | % DFEE<TFEE    | 15.86              |
| Assessor Details                   | Mr. Sean Wells, Energytest, Tel: 01892577562, swells@energy-test.co.uk | Assessor ID    | T220-0001          |
| Client                             |                                                                        |                |                    |

### CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

#### 1. Overall dwelling dimensions

|                                                        | Area (m <sup>2</sup> ) | Storey height (m)               | Volume (m <sup>3</sup> ) |
|--------------------------------------------------------|------------------------|---------------------------------|--------------------------|
| Ground floor                                           | 39.9600 (1b)           | x 2.4000 (2b)                   | = 95.9040 (1b) - (3b)    |
| First floor                                            | 39.9600 (1c)           | x 2.7000 (2c)                   | = 107.8920 (1c) - (3c)   |
| Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) | 79.9200                |                                 | (4)                      |
| Dwelling volume                                        |                        | (3a)+(3b)+(3c)+(3d)+(3e)...(3n) | = 203.7960 (5)           |

#### 2. Ventilation rate

|                                                      | main heating                 |        | secondary heating |        | other  |        | total                       | m3 per hour  |        |        |        |              |
|------------------------------------------------------|------------------------------|--------|-------------------|--------|--------|--------|-----------------------------|--------------|--------|--------|--------|--------------|
| Number of chimneys                                   | 0                            | +      | 0                 | +      | 0      | =      | 0 * 40 =                    | 0.0000 (6a)  |        |        |        |              |
| Number of open flues                                 | 0                            | +      | 0                 | +      | 0      | =      | 0 * 20 =                    | 0.0000 (6b)  |        |        |        |              |
| Number of intermittent fans                          |                              |        |                   |        |        |        | 3 * 10 =                    | 30.0000 (7a) |        |        |        |              |
| Number of passive vents                              |                              |        |                   |        |        |        | 0 * 10 =                    | 0.0000 (7b)  |        |        |        |              |
| Number of flueless gas fires                         |                              |        |                   |        |        |        | 0 * 40 =                    | 0.0000 (7c)  |        |        |        |              |
| Air changes per hour                                 |                              |        |                   |        |        |        |                             |              |        |        |        |              |
| Infiltration due to chimneys, flues and fans         | = (6a)+(6b)+(7a)+(7b)+(7c) = |        |                   |        |        |        | 30.0000 / (5) =             | 0.1472 (8)   |        |        |        |              |
| Pressure test                                        |                              |        |                   |        |        |        | Yes                         |              |        |        |        |              |
| Measured/design AP50                                 |                              |        |                   |        |        |        | 5.0000                      |              |        |        |        |              |
| Infiltration rate                                    |                              |        |                   |        |        |        | 0.3972 (18)                 |              |        |        |        |              |
| Number of sides sheltered                            |                              |        |                   |        |        |        | 3 (19)                      |              |        |        |        |              |
| Shelter factor                                       |                              |        |                   |        |        |        | (20) = 1 - [0.075 x (19)] = | 0.7750 (20)  |        |        |        |              |
| Infiltration rate adjusted to include shelter factor |                              |        |                   |        |        |        | (21) = (18) x (20) =        | 0.3078 (21)  |        |        |        |              |
| Wind speed                                           | Jan                          | Feb    | Mar               | Apr    | May    | Jun    | Jul                         | Aug          | Sep    | Oct    | Nov    | Dec          |
| 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                                      | 0.3925                       | 0.3848 | 0.3771            | 0.3386 | 0.3309 | 0.2924 | 0.2924                      | 0.2847       | 0.3078 | 0.3309 | 0.3463 | 0.3617 (22b) |
| Effective ac                                         | 0.5770                       | 0.5740 | 0.5711            | 0.5573 | 0.5548 | 0.5428 | 0.5428                      | 0.5405       | 0.5474 | 0.5548 | 0.5600 | 0.5654 (25)  |

#### 3. Heat losses and heat loss parameter

| Element                                                             | Gross<br>m2    | Openings<br>m2 | NetArea<br>m2  | U-value<br>W/m2K       | A x U<br>W/K   | K-value<br>kJ/m2K | A x K<br>kJ/K  |                |                |                |                |                |      |
|---------------------------------------------------------------------|----------------|----------------|----------------|------------------------|----------------|-------------------|----------------|----------------|----------------|----------------|----------------|----------------|------|
| window (Uw = 1.40)                                                  |                |                | 14.8800        | 1.3258                 | 19.7273        |                   |                | (27)           |                |                |                |                |      |
| external door                                                       |                |                | 1.8900         | 1.6000                 | 3.0240         |                   |                | (26a)          |                |                |                |                |      |
| ground floor                                                        |                |                | 39.9600        | 0.1200                 | 4.7952         |                   |                | (28a)          |                |                |                |                |      |
| external wall - brick                                               | 50.9800        | 11.1900        | 39.7900        | 0.2000                 | 7.9580         |                   |                | (29a)          |                |                |                |                |      |
| external wall - weatherboard                                        | 57.3500        | 5.5800         | 51.7700        | 0.1800                 | 9.3186         |                   |                | (29a)          |                |                |                |                |      |
| pitch cold roof                                                     | 39.9600        |                | 39.9600        | 0.1100                 | 4.3956         |                   |                | (30)           |                |                |                |                |      |
| Total net area of external elements Aum(A, m2)                      |                |                | 188.2500       |                        |                |                   |                | (31)           |                |                |                |                |      |
| Fabric heat loss, W/K = Sum (A x U)                                 |                |                |                | (26) ... (30) + (32) = | 49.2187        |                   |                | (33)           |                |                |                |                |      |
| Party Wall 1                                                        |                |                | 28.5600        | 0.0000                 | 0.0000         |                   |                | (32)           |                |                |                |                |      |
| Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K                   |                |                |                |                        |                |                   |                | 174.0000 (35)  |                |                |                |                |      |
| Thermal bridges (Sum(L x Psi) calculated using Appendix K)          |                |                |                |                        |                |                   |                | 8.1321 (36)    |                |                |                |                |      |
| Total fabric heat loss                                              |                |                |                |                        |                | (33) + (36) =     | 57.3508        | (37)           |                |                |                |                |      |
| Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) |                |                |                |                        |                |                   |                |                |                |                |                |                |      |
| (38)m                                                               | Jan<br>38.8064 | Feb<br>38.6053 | Mar<br>38.4081 | Apr<br>37.4820         | May<br>37.3087 | Jun<br>36.5022    | Jul<br>36.5022 | Aug<br>36.3528 | Sep<br>36.8128 | Oct<br>37.3087 | Nov<br>37.6593 | Dec<br>38.0257 | (38) |
| Heat transfer coeff                                                 | 96.1572        | 95.9560        | 95.7589        | 94.8328                | 94.6595        | 93.8529           | 93.8529        | 93.7036        | 94.1636        | 94.6595        | 95.0100        | 95.3765        | (39) |
| Average = Sum(39)m / 12 =                                           |                |                |                |                        |                |                   |                |                |                |                |                | 94.8320        | (39) |

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)



### CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

|                                       | Jan<br>1.2032 | Feb<br>1.2007 | Mar<br>1.1982 | Apr<br>1.1866 | May<br>1.1844 | Jun<br>1.1743 | Jul<br>1.1743 | Aug<br>1.1725 | Sep<br>1.1782 | Oct<br>1.1844 | Nov<br>1.1888 | Dec<br>1.1934 (40)<br>1.1866 (40) |
|---------------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|-----------------------------------|
| HLP<br>HLP (average)<br>Days in month |               |               |               |               |               |               |               |               |               |               |               |                                   |
|                                       | 31            | 28            | 31            | 30            | 31            | 30            | 31            | 31            | 30            | 31            | 30            | 31 (41)                           |

#### 4. Water heating energy requirements (kWh/year)

| Assumed occupancy                            | 2.4613 (42)                       |          |          |          |          |         |         |          |          |          |          |               |
|----------------------------------------------|-----------------------------------|----------|----------|----------|----------|---------|---------|----------|----------|----------|----------|---------------|
| Average daily hot water use (litres/day)     | 92.6569 (43)                      |          |          |          |          |         |         |          |          |          |          |               |
|                                              | Jan                               | Feb      | Mar      | Apr      | May      | Jun     | Jul     | Aug      | Sep      | Oct      | Nov      | Dec           |
| Daily hot water use                          | 101.9225                          | 98.2163  | 94.5100  | 90.8037  | 87.0974  | 83.3912 | 83.3912 | 87.0974  | 90.8037  | 94.5100  | 98.2163  | 101.9225 (44) |
| Energy conte                                 | 151.1482                          | 132.1952 | 136.4136 | 118.9287 | 114.1149 | 98.4725 | 91.2492 | 104.7098 | 105.9604 | 123.4866 | 134.7953 | 146.3790 (45) |
| Energy content (annual)                      | Total = Sum(45)m = 1457.8532 (45) |          |          |          |          |         |         |          |          |          |          |               |
| Distribution loss (46)m = 0.15 x (45)m       | 0.0000                            | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000  | 0.0000  | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000 (46)   |
| Water storage loss:                          |                                   |          |          |          |          |         |         |          |          |          |          |               |
| Total storage loss                           | 0.0000                            | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000  | 0.0000  | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000 (56)   |
| If cylinder contains dedicated solar storage | 0.0000                            | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000  | 0.0000  | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000 (57)   |
| Primary loss                                 | 0.0000                            | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000  | 0.0000  | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000 (59)   |
| Heat gains from water heating, kWh/month     | 32.1190                           | 28.0915  | 28.9879  | 25.2723  | 24.2494  | 20.9254 | 19.3905 | 22.2508  | 22.5166  | 26.2409  | 28.6440  | 31.1055 (65)  |

#### 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                                                    | 123.0671 | 123.0671 | 123.0671 | 123.0671 | 123.0671 | 123.0671 | 123.0671 | 123.0671 | 123.0671 | 123.0671 | 123.0671 | 123.0671 (66) |
| (66)m                                                                               | 123.0671 | 123.0671 | 123.0671 | 123.0671 | 123.0671 | 123.0671 | 123.0671 | 123.0671 | 123.0671 | 123.0671 | 123.0671 | 123.0671 (66) |
| Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5     | 19.8634  | 17.6425  | 14.3479  | 10.8622  | 8.1197   | 6.8550   | 7.4070   | 9.6279   | 12.9226  | 16.4082  | 19.1508  | 20.4155 (67)  |
| Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 | 219.2733 | 221.5486 | 215.8148 | 203.6081 | 188.1993 | 173.7172 | 164.0423 | 161.7669 | 167.5008 | 179.7075 | 195.1163 | 209.5983 (68) |
| Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5    | 35.3067  | 35.3067  | 35.3067  | 35.3067  | 35.3067  | 35.3067  | 35.3067  | 35.3067  | 35.3067  | 35.3067  | 35.3067  | 35.3067 (69)  |
| Pumps, fans                                                                         | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000 (70)   |
| Losses e.g. evaporation (negative values) (Table 5)                                 | -98.4537 | -98.4537 | -98.4537 | -98.4537 | -98.4537 | -98.4537 | -98.4537 | -98.4537 | -98.4537 | -98.4537 | -98.4537 | -98.4537 (71) |
| Water heating gains (Table 5)                                                       | 43.1707  | 41.8028  | 38.9622  | 35.1005  | 32.5933  | 29.0631  | 26.0624  | 29.9070  | 31.2730  | 35.2700  | 39.7833  | 41.8085 (72)  |
| Total internal gains                                                                | 342.2275 | 340.9141 | 329.0450 | 309.4909 | 288.8324 | 269.5553 | 257.4319 | 261.2220 | 271.6165 | 291.3058 | 313.9705 | 331.7425 (73) |

#### 6. Solar gains

| [Jan]       |          |          |          | Area<br>m2 | Solar flux<br>Table 6a<br>W/m2 | g<br>Specific data<br>or Table 6b | FF<br>Specific data<br>or Table 6c | Access<br>factor<br>Table 6d | Gains<br>W   |          |          |               |
|-------------|----------|----------|----------|------------|--------------------------------|-----------------------------------|------------------------------------|------------------------------|--------------|----------|----------|---------------|
| East        |          |          |          | 9.1500     | 19.6403                        | 0.6300                            | 0.7000                             | 0.7700                       | 54.9212 (76) |          |          |               |
| South       |          |          |          | 0.6300     | 46.7521                        | 0.6300                            | 0.7000                             | 0.7700                       | 9.0015 (78)  |          |          |               |
| West        |          |          |          | 5.1000     | 19.6403                        | 0.6300                            | 0.7000                             | 0.7700                       | 30.6118 (80) |          |          |               |
|             |          |          |          |            |                                |                                   |                                    |                              |              |          |          |               |
| Solar gains | 94.5345  | 182.0629 | 294.3323 | 423.1025   | 514.6339                       | 525.4633                          | 500.7950                           | 432.5079                     | 340.0968     | 214.4410 | 117.3195 | 78.1163 (83)  |
| Total gains | 436.7620 | 522.9769 | 623.3773 | 732.5934   | 803.4663                       | 795.0187                          | 758.2269                           | 693.7299                     | 611.7134     | 505.7468 | 431.2900 | 409.8588 (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                                                                         | 40.1717                   | 40.2559 | 40.3388 | 40.7327 | 40.8073 | 41.1580 | 41.1580 | 41.2236 | 41.0222 | 40.8073 | 40.6568 | 40.5006      |
| alpha                                                                       | 3.6781                    | 3.6837  | 3.6893  | 3.7155  | 3.7205  | 3.7439  | 3.7439  | 3.7482  | 3.7348  | 3.7205  | 3.7105  | 3.7000       |
| util living area                                                            | 0.9939                    | 0.9877  | 0.9706  | 0.9224  | 0.8226  | 0.6676  | 0.5176  | 0.5772  | 0.8119  | 0.9574  | 0.9894  | 0.9952 (86)  |
| MIT                                                                         | 19.2103                   | 19.4283 | 19.8019 | 20.2766 | 20.6634 | 20.8925 | 20.9685 | 20.9529 | 20.7648 | 20.2325 | 19.6299 | 19.1714 (87) |
| Th 2                                                                        | 19.9175                   | 19.9195 | 19.9215 | 19.9307 | 19.9325 | 19.9406 | 19.9406 | 19.9421 | 19.9375 | 19.9325 | 19.9290 | 19.9253 (88) |
| util rest of house                                                          | 0.9924                    | 0.9846  | 0.9631  | 0.9019  | 0.7760  | 0.5838  | 0.4045  | 0.4622  | 0.7447  | 0.9422  | 0.9862  | 0.9940 (89)  |
| MIT 2                                                                       | 18.2858                   | 18.5039 | 18.8741 | 19.3399 | 19.6934 | 19.8835 | 19.9301 | 19.9248 | 19.7929 | 19.3082 | 18.7128 | 18.2528 (90) |
| Living area fraction                                                        | fLA = Living area / (4) = |         |         |         |         |         |         |         |         |         |         |              |
| MIT                                                                         | 18.6351                   | 18.8532 | 19.2247 | 19.6939 | 20.0599 | 20.2648 | 20.3225 | 20.3133 | 20.1601 | 19.6575 | 19.0593 | 18.5999 (92) |
| Temperature adjustment                                                      | 0.0000                    |         |         |         |         |         |         |         |         |         |         |              |
| adjusted MIT                                                                | 18.6351                   | 18.8532 | 19.2247 | 19.6939 | 20.0599 | 20.2648 | 20.3225 | 20.3133 | 20.1601 | 19.6575 | 19.0593 | 18.5999 (93) |

#### 8. Space heating requirement

|             | Jan    | Feb    | Mar    | Apr    | May    | Jun    | Jul    | Aug    | Sep    | Oct    | Nov    | Dec         |
|-------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-------------|
| Utilisation | 0.9900 | 0.9807 | 0.9569 | 0.8966 | 0.7821 | 0.6111 | 0.4468 | 0.5046 | 0.7606 | 0.9373 | 0.9828 | 0.9920 (94) |

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)



### CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

|                      |           |           |           |           |          |          |          |          |          |          |              |                |
|----------------------|-----------|-----------|-----------|-----------|----------|----------|----------|----------|----------|----------|--------------|----------------|
| Useful gains         | 432.3880  | 512.8658  | 596.5339  | 656.8489  | 628.4127 | 485.8149 | 338.7399 | 350.0377 | 465.2468 | 474.0151 | 423.8598     | 406.5699 (95)  |
| Ext temp.            | 4.3000    | 4.9000    | 6.5000    | 8.9000    | 11.7000  | 14.6000  | 16.6000  | 16.4000  | 14.1000  | 10.6000  | 7.1000       | 4.2000 (96)    |
| Heat loss rate W     |           |           |           |           |          |          |          |          |          |          |              |                |
| Month fracti         | 1378.4263 | 1338.8938 | 1218.5065 | 1023.6120 | 791.3469 | 531.6587 | 349.3644 | 366.6875 | 570.6438 | 857.3747 | 1136.2581    | 1373.4158 (97) |
| Space heating kWh    | 1.0000    | 1.0000    | 1.0000    | 1.0000    | 1.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 1.0000   | 1.0000       | 1.0000 (97a)   |
| Space heating        | 703.8525  | 555.0908  | 462.7476  | 264.0695  | 121.2230 | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 285.2195 | 512.9268     | 719.3334 (98)  |
| Space heating per m2 |           |           |           |           |          |          |          |          |          |          | (98) / (4) = | 45.3511 (99)   |

#### 8c. Space cooling requirement

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

|                                          | Jan    | Feb    | Mar    | Apr    | May     | Jun       | Jul      | Aug      | Sep     | Oct     | Nov    | Dec            |
|------------------------------------------|--------|--------|--------|--------|---------|-----------|----------|----------|---------|---------|--------|----------------|
| Ext. temp.                               | 4.3000 | 4.9000 | 6.5000 | 8.9000 | 11.7000 | 14.6000   | 16.6000  | 16.4000  | 14.1000 | 10.6000 | 7.1000 | 4.2000         |
| Heat loss rate W                         |        |        |        |        |         |           |          |          |         |         |        |                |
| Utilisation                              | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000  | 882.2176  | 694.5117 | 712.1471 | 0.0000  | 0.0000  | 0.0000 | 0.0000 (100)   |
| Useful loss                              | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000  | 0.8427    | 0.8993   | 0.8714   | 0.0000  | 0.0000  | 0.0000 | 0.0000 (101)   |
| Total gains                              | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000  | 743.4481  | 624.5886 | 620.5894 | 0.0000  | 0.0000  | 0.0000 | 0.0000 (102)   |
| Month fracti                             | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000  | 1021.1140 | 976.2203 | 902.4050 | 0.0000  | 0.0000  | 0.0000 | 0.0000 (103)   |
| Space cooling kWh                        | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000  | 1.0000    | 1.0000   | 1.0000   | 0.0000  | 0.0000  | 0.0000 | 0.0000 (103a)  |
| Space cooling                            | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000  | 199.9194  | 261.6140 | 209.6708 | 0.0000  | 0.0000  | 0.0000 | 0.0000 (104)   |
| Cooled fraction                          |        |        |        |        |         |           |          |          |         |         |        | 671.2042 (104) |
| Intermittency factor (Table 10b)         |        |        |        |        |         |           |          |          |         |         |        | 1.0000 (105)   |
| FC = cooled area / (4) =                 |        |        |        |        |         |           |          |          |         |         |        |                |
| Space cooling kWh                        | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000  | 0.2500    | 0.2500   | 0.2500   | 0.0000  | 0.0000  | 0.0000 | 0.0000 (106)   |
| Space cooling                            | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000  | 49.9799   | 65.4035  | 52.4177  | 0.0000  | 0.0000  | 0.0000 | 0.0000 (107)   |
| Space cooling per m2                     |        |        |        |        |         |           |          |          |         |         |        | 167.8011 (107) |
| Energy for space heating                 |        |        |        |        |         |           |          |          |         |         |        | 2.0996 (108)   |
| Energy for space cooling                 |        |        |        |        |         |           |          |          |         |         |        | 45.3511 (99)   |
| Total                                    |        |        |        |        |         |           |          |          |         |         |        | 2.0996 (108)   |
| Dwelling Fabric Energy Efficiency (DFEE) |        |        |        |        |         |           |          |          |         |         |        | 47.4508 (109)  |
|                                          |        |        |        |        |         |           |          |          |         |         |        | 47.5 (109)     |

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)



### CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

#### 1. Overall dwelling dimensions

|                                                        | Area<br>(m <sup>2</sup> ) | Storey height<br>(m)            | Volume<br>(m <sup>3</sup> ) |
|--------------------------------------------------------|---------------------------|---------------------------------|-----------------------------|
| Ground floor                                           | 39.9600 (1b)              | x 2.4000 (2b)                   | = 95.9040 (1b) - (3b)       |
| First floor                                            | 39.9600 (1c)              | x 2.7000 (2c)                   | = 107.8920 (1c) - (3c)      |
| Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) | 79.9200                   |                                 | (4)                         |
| Dwelling volume                                        |                           | (3a)+(3b)+(3c)+(3d)+(3e)...(3n) | = 203.7960 (5)              |

#### 2. Ventilation rate

|                                                      |        |        |        |        |        |        |        |        |        | main                         | secondary | other        | total | m3 per hour |                 |            |              |
|------------------------------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------------------------------|-----------|--------------|-------|-------------|-----------------|------------|--------------|
|                                                      |        |        |        |        |        |        |        |        |        | heating                      | heating   |              |       |             |                 |            |              |
| Number of chimneys                                   |        |        |        |        |        |        |        |        |        | 0                            | +         | 0            | +     | 0           | =               | 0 * 40 =   | 0.0000 (6a)  |
| Number of open flues                                 |        |        |        |        |        |        |        |        |        | 0                            | +         | 0            | +     | 0           | =               | 0 * 20 =   | 0.0000 (6b)  |
| Number of intermittent fans                          |        |        |        |        |        |        |        |        |        |                              |           |              |       |             |                 | 3 * 10 =   | 30.0000 (7a) |
| Number of passive vents                              |        |        |        |        |        |        |        |        |        |                              |           |              |       |             |                 | 0 * 10 =   | 0.0000 (7b)  |
| Number of flueless gas fires                         |        |        |        |        |        |        |        |        |        |                              |           |              |       |             |                 | 0 * 40 =   | 0.0000 (7c)  |
|                                                      |        |        |        |        |        |        |        |        |        | Air changes per hour         |           |              |       |             |                 |            |              |
| Infiltration due to chimneys, flues and fans         |        |        |        |        |        |        |        |        |        | = (6a)+(6b)+(7a)+(7b)+(7c) = |           |              |       |             | 30.0000 / (5) = | 0.1472 (8) |              |
| Pressure test                                        |        |        |        |        |        |        |        |        |        |                              |           |              |       |             | Yes             |            |              |
| Measured/design AP50                                 |        |        |        |        |        |        |        |        |        |                              |           |              |       |             | 5.0000          |            |              |
| Infiltration rate                                    |        |        |        |        |        |        |        |        |        |                              |           |              |       |             | 0.3972 (18)     |            |              |
| Number of sides sheltered                            |        |        |        |        |        |        |        |        |        |                              |           |              |       |             | 3 (19)          |            |              |
| Shelter factor                                       |        |        |        |        |        |        |        |        |        | (20) = 1 - [0.075 x (19)] =  |           |              |       |             | 0.7750 (20)     |            |              |
| Infiltration rate adjusted to include shelter factor |        |        |        |        |        |        |        |        |        | (21) = (18) x (20) =         |           |              |       |             | 0.3078 (21)     |            |              |
|                                                      |        |        |        |        |        |        |        |        |        |                              |           |              |       |             |                 |            |              |
| Wind speed                                           | Jan    | Feb    | Mar    | Apr    | May    | Jun    | Jul    | Aug    | Sep    | Oct                          | Nov       | Dec          |       |             |                 |            |              |
| Wind factor                                          | 5.1000 | 5.0000 | 4.9000 | 4.4000 | 4.3000 | 3.8000 | 3.8000 | 3.7000 | 4.0000 | 4.3000                       | 4.5000    | 4.7000 (22)  |       |             |                 |            |              |
| Adj infilt rate                                      | 1.2750 | 1.2500 | 1.2250 | 1.1000 | 1.0750 | 0.9500 | 0.9500 | 0.9250 | 1.0000 | 1.0750                       | 1.1250    | 1.1750 (22a) |       |             |                 |            |              |
|                                                      | 0.3925 | 0.3848 | 0.3771 | 0.3386 | 0.3309 | 0.2924 | 0.2924 | 0.2847 | 0.3078 | 0.3309                       | 0.3463    | 0.3617 (22b) |       |             |                 |            |              |
| Effective ac                                         | 0.5770 | 0.5740 | 0.5711 | 0.5573 | 0.5548 | 0.5428 | 0.5428 | 0.5405 | 0.5474 | 0.5548                       | 0.5600    | 0.5654 (25)  |       |             |                 |            |              |

#### 3. Heat losses and heat loss parameter

| Element                                                             | Gross<br>m2    | Openings<br>m2 | NetArea<br>m2  | U-value<br>W/m2K     | A x U<br>W/K   | K-value<br>kJ/m2K | A x K<br>kJ/K  |                |                |                |                |                |      |
|---------------------------------------------------------------------|----------------|----------------|----------------|----------------------|----------------|-------------------|----------------|----------------|----------------|----------------|----------------|----------------|------|
| TER Semi-glazed door                                                |                |                | 1.8900         | 1.2000               | 2.2680         |                   |                | (26a)          |                |                |                |                |      |
| TER Opening Type (Uw = 1.40)                                        |                |                | 14.8800        | 1.3258               | 19.7273        |                   |                | (27)           |                |                |                |                |      |
| ground floor                                                        |                |                | 39.9600        | 0.1300               | 5.1948         |                   |                | (28a)          |                |                |                |                |      |
| external wall - brick                                               | 50.9800        | 11.1900        | 39.7900        | 0.1800               | 7.1622         |                   |                | (29a)          |                |                |                |                |      |
| external wall - weatherboard                                        | 57.3500        | 5.5800         | 51.7700        | 0.1800               | 9.3186         |                   |                | (29a)          |                |                |                |                |      |
| pitch cold roof                                                     | 39.9600        |                | 39.9600        | 0.1300               | 5.1948         |                   |                | (30)           |                |                |                |                |      |
| Total net area of external elements Aum(A, m2)                      |                |                | 188.2500       |                      |                |                   |                | (31)           |                |                |                |                |      |
| Fabric heat loss, W/K = Sum (A x U)                                 |                |                |                | (26)...(30) + (32) = | 48.8657        |                   |                | (33)           |                |                |                |                |      |
| Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K                   |                |                |                |                      |                |                   | 250.0000       | (35)           |                |                |                |                |      |
| Thermal bridges (Sum(L x Psi) calculated using Appendix K)          |                |                |                |                      |                |                   | 9.8668         | (36)           |                |                |                |                |      |
| Total fabric heat loss                                              |                |                |                |                      |                | (33) + (36) =     | 58.7325        | (37)           |                |                |                |                |      |
| Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) |                |                |                |                      |                |                   |                |                |                |                |                |                |      |
| (38)m                                                               | Jan<br>38.8064 | Feb<br>38.6053 | Mar<br>38.4081 | Apr<br>37.4820       | May<br>37.3087 | Jun<br>36.5022    | Jul<br>36.5022 | Aug<br>36.3528 | Sep<br>36.8128 | Oct<br>37.3087 | Nov<br>37.6593 | Dec<br>38.0257 | (38) |
| Heat transfer coeff                                                 | 97.5389        | 97.3377        | 97.1406        | 96.2145              | 96.0412        | 95.2346           | 95.2346        | 95.0853        | 95.5453        | 96.0412        | 96.3917        | 96.7582        | (39) |
| Average = Sum(39)m / 12 =                                           |                |                |                |                      |                |                   |                |                |                |                |                | 96.2137        | (39) |
| HLP                                                                 | Jan<br>1.2205  | Feb<br>1.2179  | Mar<br>1.2155  | Apr<br>1.2039        | May<br>1.2017  | Jun<br>1.1916     | Jul<br>1.1916  | Aug<br>1.1898  | Sep<br>1.1955  | Oct<br>1.2017  | Nov<br>1.2061  | Dec<br>1.2107  | (40) |
| HLP (average)                                                       |                |                |                |                      |                |                   |                |                |                |                |                | 1.2039         | (40) |
| Days in month                                                       | 31             | 28             | 31             | 30                   | 31             | 30                | 31             | 31             | 30             | 31             | 30             | 31             | (41) |

#### 4. Water heating energy requirements (kWh/year)

|                                          |              |             |             |             |             |             |             |             |             |                    |             |                   |
|------------------------------------------|--------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|--------------------|-------------|-------------------|
| Assumed occupancy                        |              |             |             |             |             |             |             |             |             |                    |             | 2.4613 (42)       |
| Average daily hot water use (litres/day) |              |             |             |             |             |             |             |             |             |                    |             | 92.6569 (43)      |
| Daily hot water use                      | Jan 101.9225 | Feb 98.2163 | Mar 94.5100 | Apr 90.8037 | May 87.0974 | Jun 83.3912 | Jul 83.3912 | Aug 87.0974 | Sep 90.8037 | Oct 94.5100        | Nov 98.2163 | Dec 101.9225 (44) |
| Energy conte                             | 151.1482     | 132.1952    | 136.4136    | 118.9287    | 114.1149    | 98.4725     | 91.2492     | 104.7098    | 105.9604    | 123.4866           | 134.7953    | 146.3790 (45)     |
| Energy content (annual)                  |              |             |             |             |             |             |             |             |             | Total = Sum(45)m = |             | 1457.8532 (45)    |
| Distribution loss (46)m = 0.15 x (45)m   |              |             |             |             |             |             |             |             |             |                    |             |                   |
| Water storage loss:                      | 0.0000       | 0.0000      | 0.0000      | 0.0000      | 0.0000      | 0.0000      | 0.0000      | 0.0000      | 0.0000      | 0.0000             | 0.0000      | 0.0000 (46)       |
| Total storage loss                       | 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)       |

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)



### CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

|                                              |         |         |         |         |         |         |         |         |         |         |         |              |
|----------------------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|--------------|
| If cylinder contains dedicated solar storage | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000 (57)  |
| Primary loss                                 | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000 (59)  |
| Heat gains from water heating, kWh/month     | 32.1190 | 28.0915 | 28.9879 | 25.2723 | 24.2494 | 20.9254 | 19.3905 | 22.2508 | 22.5166 | 26.2409 | 28.6440 | 31.1055 (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                                                                               | 123.0671 | 123.0671 | 123.0671 | 123.0671 | 123.0671 | 123.0671 | 123.0671 | 123.0671 | 123.0671 | 123.0671 | 123.0671 | 123.0671 | (66) |
| Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5     | 19.8634  | 17.6425  | 14.3479  | 10.8622  | 8.1197   | 6.8550   | 7.4070   | 9.6279   | 12.9226  | 16.4082  | 19.1508  | 20.4155  | (67) |
| Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 | 219.2733 | 221.5486 | 215.8148 | 203.6081 | 188.1993 | 173.7172 | 164.0423 | 161.7669 | 167.5008 | 179.7075 | 195.1163 | 209.5983 | (68) |
| Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5    | 35.3067  | 35.3067  | 35.3067  | 35.3067  | 35.3067  | 35.3067  | 35.3067  | 35.3067  | 35.3067  | 35.3067  | 35.3067  | 35.3067  | (69) |
| Pumps, fans                                                                         | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | (70) |
| Losses e.g. evaporation (negative values) (Table 5)                                 | -98.4537 | -98.4537 | -98.4537 | -98.4537 | -98.4537 | -98.4537 | -98.4537 | -98.4537 | -98.4537 | -98.4537 | -98.4537 | -98.4537 | (71) |
| Water heating gains (Table 5)                                                       | 43.1707  | 41.8028  | 38.9622  | 35.1005  | 32.5933  | 29.0631  | 26.0624  | 29.9070  | 31.2730  | 35.2700  | 39.7833  | 41.8085  | (72) |
| Total internal gains                                                                | 342.2275 | 340.9141 | 329.0450 | 309.4909 | 288.8324 | 269.5553 | 257.4319 | 261.2220 | 271.6165 | 291.3058 | 313.9705 | 331.7425 | (73) |

#### 6. Solar gains

| [Jan]       |          |          |          |          |          | Area<br>m2 | Solar flux<br>Table 6a<br>W/m2 | g<br>Specific data<br>or Table 6b | FF<br>Specific data<br>or Table 6c | Access<br>factor<br>Table 6d |          | Gains<br>W    |
|-------------|----------|----------|----------|----------|----------|------------|--------------------------------|-----------------------------------|------------------------------------|------------------------------|----------|---------------|
| East        |          |          |          |          |          | 9.1500     | 19.6403                        | 0.6300                            | 0.7000                             | 0.7700                       |          | 54.9212 (76)  |
| South       |          |          |          |          |          | 0.6300     | 46.7521                        | 0.6300                            | 0.7000                             | 0.7700                       |          | 9.0015 (78)   |
| West        |          |          |          |          |          | 5.1000     | 19.6403                        | 0.6300                            | 0.7000                             | 0.7700                       |          | 30.6118 (80)  |
| -----       |          |          |          |          |          |            |                                |                                   |                                    |                              |          |               |
| Solar gains | 94.5345  | 182.0629 | 294.3323 | 423.1025 | 514.6339 | 525.4633   | 500.7950                       | 432.5079                          | 340.0968                           | 214.4410                     | 117.3195 | 78.1163 (83)  |
| Total gains | 436.7620 | 522.9769 | 623.3773 | 732.5934 | 803.4663 | 795.0187   | 758.2269                       | 693.7299                          | 611.7134                           | 505.7468                     | 431.2900 | 409.8588 (84) |

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

|                                                                             |         |         |         |         |         |         |         |         |         |         |         |         |              |
|-----------------------------------------------------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|--------------|
| Temperature during heating periods in the living area from Table 9, Th1 (C) |         |         |         |         |         |         |         |         |         |         |         |         | 21.0000 (85) |
| Utilisation factor for gains for living area, nil,m (see Table 9a)          | Jan     | Feb     | Mar     | Apr     | May     | Jun     | Jul     | Aug     | Sep     | Oct     | Nov     | Dec     |              |
| tau                                                                         | 56.9004 | 57.0180 | 57.1337 | 57.6836 | 57.7877 | 58.2771 | 58.2771 | 58.3687 | 58.0876 | 57.7877 | 57.5776 | 57.3595 |              |
| alpha                                                                       | 4.7934  | 4.8012  | 4.8089  | 4.8456  | 4.8525  | 4.8851  | 4.8851  | 4.8912  | 4.8725  | 4.8525  | 4.8385  | 4.8240  |              |
| util living area                                                            | 0.9987  | 0.9966  | 0.9888  | 0.9579  | 0.8699  | 0.7049  | 0.5386  | 0.6044  | 0.8592  | 0.9815  | 0.9972  | 0.9990  | (86)         |
| MIT                                                                         | 19.6162 | 19.7859 | 20.0801 | 20.4619 | 20.7738 | 20.9427 | 20.9876 | 20.9789 | 20.8442 | 20.4151 | 19.9417 | 19.5866 | (87)         |
| Th 2                                                                        | 19.9037 | 19.9057 | 19.9076 | 19.9169 | 19.9186 | 19.9267 | 19.9267 | 19.9282 | 19.9236 | 19.9186 | 19.9151 | 19.9115 | (88)         |
| util rest of house                                                          | 0.9982  | 0.9954  | 0.9847  | 0.9417  | 0.8217  | 0.6104  | 0.4144  | 0.4763  | 0.7882  | 0.9717  | 0.9960  | 0.9987  | (89)         |
| MIT 2                                                                       | 18.6437 | 18.8145 | 19.1080 | 19.4862 | 19.7683 | 19.9010 | 19.9237 | 19.9223 | 19.8370 | 19.4489 | 18.9779 | 18.6203 | (90)         |
| Living area fraction                                                        |         |         |         |         |         |         |         |         |         |         |         |         | (91)         |
| MIT                                                                         | 19.0112 | 19.1816 | 19.4754 | 19.8549 | 20.1483 | 20.2947 | 20.3257 | 20.3216 | 20.2176 | 19.8140 | 19.3421 | 18.9854 | (92)         |
| Temperature adjustment                                                      |         |         |         |         |         |         |         |         |         |         |         | 0.0000  |              |
| adjusted MIT                                                                | 19.0112 | 19.1816 | 19.4754 | 19.8549 | 20.1483 | 20.2947 | 20.3257 | 20.3216 | 20.2176 | 19.8140 | 19.3421 | 18.9854 | (93)         |

#### 8. Space heating requirement

|                      |           |           |           |           |          |          |          |          |          |          |           |              |              |
|----------------------|-----------|-----------|-----------|-----------|----------|----------|----------|----------|----------|----------|-----------|--------------|--------------|
| Utilisation          | Jan       | Feb       | Mar       | Apr       | May      | Jun      | Jul      | Aug      | Sep      | Oct      | Nov       | Dec          |              |
| Useful gains         | 435.7460  | 519.9808  | 612.5299  | 689.0707  | 669.4255 | 512.5919 | 350.1383 | 364.3865 | 495.6745 | 490.8326 | 429.1843  | 409.1550     | (94)         |
| Ext temp.            | 4.3000    | 4.9000    | 6.5000    | 8.9000    | 11.7000  | 14.6000  | 16.6000  | 16.4000  | 14.1000  | 10.6000  | 7.1000    | 4.2000       | (96)         |
| Heat loss rate W     | 1434.9093 | 1390.1340 | 1260.4333 | 1054.0186 | 811.3821 | 542.3290 | 354.8140 | 372.8836 | 584.5090 | 884.9214 | 1180.0370 | 1430.6116    | (97)         |
| Month fracti         | 1.0000    | 1.0000    | 1.0000    | 1.0000    | 1.0000   | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 1.0000   | 1.0000    | 1.0000       | (97a)        |
| Space heating kWh    | 743.3775  | 584.7429  | 482.0401  | 262.7625  | 105.6157 | 0.0000   | 0.0000   | 0.0000   | 0.0000   | 293.2021 | 540.6139  | 759.9638     | (98)         |
| Space heating        |           |           |           |           |          |          |          |          |          |          |           | 3772.3186    | (98)         |
| Space heating per m2 |           |           |           |           |          |          |          |          |          |          |           | (98) / (4) = | 47.2012 (99) |

#### 8c. Space cooling requirement

|                                                     |        |        |        |        |         |           |          |          |         |         |        |        |        |
|-----------------------------------------------------|--------|--------|--------|--------|---------|-----------|----------|----------|---------|---------|--------|--------|--------|
| Calculated for June, July and August. See Table 10b | Jan    | Feb    | Mar    | Apr    | May     | Jun       | Jul      | Aug      | Sep     | Oct     | Nov    | Dec    |        |
| Ext. temp.                                          | 4.3000 | 4.9000 | 6.5000 | 8.9000 | 11.7000 | 14.6000   | 16.6000  | 16.4000  | 14.1000 | 10.6000 | 7.1000 | 4.2000 |        |
| Heat loss rate W                                    | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000  | 895.2056  | 704.7363 | 722.6480 | 0.0000  | 0.0000  | 0.0000 | 0.0000 | (100)  |
| Utilisation                                         | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000  | 0.8797    | 0.9336   | 0.9079   | 0.0000  | 0.0000  | 0.0000 | 0.0000 | (101)  |
| Useful loss                                         | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000  | 787.5385  | 657.9746 | 656.1037 | 0.0000  | 0.0000  | 0.0000 | 0.0000 | (102)  |
| Total gains                                         | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000  | 1021.1140 | 976.2203 | 902.4050 | 0.0000  | 0.0000  | 0.0000 | 0.0000 | (103)  |
| Month fracti                                        | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000  | 1.0000    | 1.0000   | 1.0000   | 0.0000  | 0.0000  | 0.0000 | 0.0000 | (103a) |
| Space cooling kWh                                   | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000  | 168.1744  | 236.7748 | 183.2481 | 0.0000  | 0.0000  | 0.0000 | 0.0000 | (104)  |

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)



### CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

|                                        |        |        |        |        |        |         |         |         |        |        |                |
|----------------------------------------|--------|--------|--------|--------|--------|---------|---------|---------|--------|--------|----------------|
| Space cooling                          |        |        |        |        |        |         |         |         |        |        | 588.1973 (104) |
| Cooled fraction                        |        |        |        |        |        |         |         |         |        |        | 1.0000 (105)   |
| Intermittency factor (Table 10b)       |        |        |        |        |        |         |         |         |        |        |                |
|                                        | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.2500 | 0.2500  | 0.2500  | 0.0000  | 0.0000 | 0.0000 | 0.0000 (106)   |
| Space cooling kWh                      |        |        |        |        |        |         |         |         |        |        |                |
|                                        | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 42.0436 | 59.1937 | 45.8120 | 0.0000 | 0.0000 | 0.0000 (107)   |
| Space cooling                          |        |        |        |        |        |         |         |         |        |        | 147.0493 (107) |
| Space cooling per m2                   |        |        |        |        |        |         |         |         |        |        | 1.8400 (108)   |
| Energy for space heating               |        |        |        |        |        |         |         |         |        |        | 47.2012 (99)   |
| Energy for space cooling               |        |        |        |        |        |         |         |         |        |        | 1.8400 (108)   |
| Total                                  |        |        |        |        |        |         |         |         |        |        | 49.0411 (109)  |
| Target Fabric Energy Efficiency (TFEE) |        |        |        |        |        |         |         |         |        |        | 56.4 (109)     |

# BASIC COMPLIANCE REPORT

## Calculation Type: New Build (As Designed)



|                                    |                                                                        |                |                    |
|------------------------------------|------------------------------------------------------------------------|----------------|--------------------|
| Property Reference                 | 4227-121F                                                              | Issued on Date | 06/10/2022         |
| Assessment Reference               | As Designed Final                                                      | Prop Type Ref  | Type A - A1/B1 Adj |
| Property                           | Plot 121, Grasmere Gardens, Chestfield, Kent                           |                |                    |
| SAP Rating                         | 84 B                                                                   | DER            | 17.61              |
| Environmental                      | 86 B                                                                   | TER            | 19.21              |
| CO <sub>2</sub> Emissions (t/year) | 1.16                                                                   | % DER<TER      | 8.34               |
| General Requirements Compliance    | Pass                                                                   | DFEE           | 47.45              |
|                                    |                                                                        | TFEE           | 56.40              |
|                                    |                                                                        | % DFEE<TFEE    | 15.86              |
| Assessor Details                   | Mr. Sean Wells, Energytest, Tel: 01892577562, swells@energy-test.co.uk |                | Assessor ID        |
| Client                             |                                                                        |                | T220-0001          |

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

#### Criterion 1 – Achieving the TER and TFEE rate

##### 1a TER and DER

|                                             |                  |                                   |      |
|---------------------------------------------|------------------|-----------------------------------|------|
| Fuel for main heating                       | Mains gas        |                                   |      |
| Fuel factor                                 | 1.00 (mains gas) |                                   |      |
| Target Carbon Dioxide Emission Rate (TER)   | 19.21            | kgCO <sub>2</sub> /m <sup>2</sup> |      |
| Dwelling Carbon Dioxide Emission Rate (DER) | 17.61            | kgCO <sub>2</sub> /m <sup>2</sup> | Pass |
|                                             | -1.60 (-8.3%)    | kgCO <sub>2</sub> /m <sup>2</sup> |      |

##### 1b TFEE and DFEE

|                                          |               |                        |      |
|------------------------------------------|---------------|------------------------|------|
| Target Fabric Energy Efficiency (TFEE)   | 56.40         | kWh/m <sup>2</sup> /yr |      |
| Dwelling Fabric Energy Efficiency (DFEE) | 47.45         | kWh/m <sup>2</sup> /yr |      |
|                                          | -8.9 (-15.8%) | kWh/m <sup>2</sup> /yr | Pass |

#### Criterion 2 – Limits on design flexibility

##### Limiting Fabric Standards

##### 2 Fabric U-values

| Element       | Average          | Highest          |      |
|---------------|------------------|------------------|------|
| External wall | 0.19 (max. 0.30) | 0.20 (max. 0.70) | Pass |
| Party wall    | 0.00 (max. 0.20) | -                | Pass |
| Floor         | 0.12 (max. 0.25) | 0.12 (max. 0.70) | Pass |
| Roof          | 0.11 (max. 0.20) | 0.11 (max. 0.35) | Pass |
| Openings      | 1.42 (max. 2.00) | 1.60 (max. 3.30) | Pass |

##### 2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

##### 3 Air permeability

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

##### Limiting System Efficiencies

##### 4 Heating efficiency

|                     |                                                                                                                                                                                                  |      |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| Main heating system | Boiler system with radiators or underfloor - Mains gas<br>Data from database<br>Vaillant ecoFIT sustain 830 VUW 306/6-3 (H-GB)<br>Combi boiler<br>Efficiency: 89.3% SEDBUK2009<br>Minimum: 88.0% | Pass |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|

# BASIC COMPLIANCE REPORT

## Calculation Type: New Build (As Designed)



Secondary heating system

None

### 5 Cylinder insulation

Hot water storage

No cylinder

### 6 Controls

Space heating controls

Time and temperature zone control

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

### 7 Low energy lights

Percentage of fixed lights with low-energy fittings

100

%

Minimum

75

%

Pass

### 8 Mechanical ventilation

Not applicable

## Criterion 3 – Limiting the effects of heat gains in summer

### 9 Summertime temperature

Overheating risk (Thames Valley)

Not significant

Pass

Based on:

Overshading

Average

Windows facing East

9.15 m<sup>2</sup>, No overhang

Windows facing South

0.63 m<sup>2</sup>, No overhang

Windows facing West

5.10 m<sup>2</sup>, No overhang

Air change rate

8.00 ach

Blinds/curtains

Light-coloured curtain or roller blind, closed 100% of daylight hours

## Criterion 4 – Building performance consistent with DER and DFEE rate

### Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m<sup>2</sup>K

Pass

### Air permeability and pressure testing

#### 3 Air permeability

Air permeability at 50 pascals

5.00 (design value)

Maximum

10.0

Pass

### 10 Key features

Party wall U-value

0.00

W/m<sup>2</sup>K

Roof U-value

0.11

W/m<sup>2</sup>K

Floor U-value

0.12

W/m<sup>2</sup>K

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