**EPS Group**
Unit 4, The Glade Business Centre
Forum Road
Nottingham, NG5 9RW
0115 7270599

***Project Information***

Building type Detached house

| | | | |
|---|---|---|---|
| Reference | 1396 | | |
| Date | 19 January 2016 | | |
| Client | Michalis Vasiliou<br>North London Property Services<br>3 Wells Terrace<br>London<br>N4 3JU | Project | 110 Tottenham High Road<br>London<br>N15 6JR |

***SAP 2012 worksheet for New dwelling as designed - calculation of energy ratings***

***1. Overall dwelling dimensions***

| | Area ($m^2$) | Av. Storey height (m) | Volume ($m^3$) | |
|---|---|---|---|---|
| Ground floor (1) | 32.22 | 2.60 | 83.77 | (3a) |
| First floor | 32.22 | 2.70 | 86.99 | (3b) |
| Total floor area | 64.44 | | | (4) |
| Dwelling volume ($m^3$) | | | 170.77 | (5) |



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### *2. Ventilation rate*

| | main + seondary + other heating | | $m^3$ per hour | |
|---|---|---|---|---|
| Number of chimneys | 0 + 0 + 0 | x 40 | 0.00 | (6a) |
| Number of open flues | 0 + 0 + 0 | x 20 | 0.00 | (6b) |
| Number of intermittent fans | 3 | x 10 | 30.00 | (7a) |
| Number of passive vents | 0 | x 10 | 0.00 | (7b) |
| Number of flueless gas fires | 0 | x 40 | 0.00 | (7c) |

| | | Air changes per hour | |
|---|---|---|---|
| Infiltration due to chimneys, fans and flues | | 0.18 | (8) |
| Pressure test, result q50 | 5.00 | | (17) |
| Air permeability | | 0.43 | (18) |
| Number of sides on which sheltered | | 2.00 | (19) |
| Shelter factor | | 0.85 | (20) |
| Infiltration rate incorporating shelter factor | | 0.36 | (21) |

Infiltration rate modified for monthly wind speed

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5.10 | 5.00 | 4.90 | 4.40 | 4.30 | 3.80 | 3.80 | 3.70 | 4.00 | 4.30 | 4.50 | 4.70 | |
| | | | | | | | | | | | | 52.50 (22) |

Wind Factor

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.27 | 1.25 | 1.23 | 1.10 | 1.07 | 0.95 | 0.95 | 0.93 | 1.00 | 1.07 | 1.13 | 1.18 | |
| | | | | | | | | | | | | 13.13 (22a) |

Adjusted infiltration rate (allowing for shelter and wind speed)

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.46 | 0.45 | 0.44 | 0.40 | 0.39 | 0.34 | 0.34 | 0.33 | 0.36 | 0.39 | 0.41 | 0.43 | |
| | | | | | | | | | | | | 4.75 (22b) |

Ventilation : natural ventilation, intermittent extract fans

Effective air change rate

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.61 | 0.60 | 0.60 | 0.58 | 0.58 | 0.56 | 0.56 | 0.56 | 0.57 | 0.58 | 0.58 | 0.59 | (25) |



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

| Element | Gross area, m² | Openings m² | Net area A, m² | U-value W/m²K | A x U W/K | kappa-value kJ/m²K | A x K kJ/K | |
|---|---|---|---|---|---|---|---|---|
| Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (North) | | | **1.710** | **1.33 (1.40)** | 2.27 | | | (27) |
| Window 1 | | | | | | | | |
| Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthWest) | | | **1.710** | **1.33 (1.40)** | 2.27 | | | (27) |
| Window 2 | | | | | | | | |
| Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) | | | **1.400** | **1.33 (1.40)** | 1.86 | | | (27) |
| Window 3 | | | | | | | | |
| Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) | | | **3.780** | **1.33 (1.40)** | 5.01 | | | (27) |
| Window 4 - french doors | | | | | | | | |
| Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthEast) | | | **1.400** | **1.33 (1.40)** | 1.86 | | | (27) |
| Window 5 | | | | | | | | |
| Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthWest) | | | **1.710** | **1.33 (1.40)** | 2.27 | | | (27) |
| Window 6 | | | | | | | | |
| Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (North) | | | **1.710** | **1.33 (1.40)** | 2.27 | | | (27) |
| Window 7 | | | | | | | | |
| Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthWest) | | | **1.710** | **1.33 (1.40)** | 2.27 | | | (27) |
| Window 8 | | | | | | | | |
| Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthEast) | | | **1.400** | **1.33 (1.40)** | 1.86 | | | (27) |
| Window 9 | | | | | | | | |
| Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthEast) | | | **1.400** | **1.33 (1.40)** | 1.86 | | | (27) |
| Window 10 | | | | | | | | |
| Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthEast) | | | **1.400** | **1.33 (1.40)** | 1.86 | | | (27) |
| Window 11 | | | | | | | | |
| Half glazed door - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthWest) | | | **1.890** | **1.40** | 2.65 | | | (26) |
| Front door | | | | | | | | |
| Walls | | | 100.98 | 0.24 | 24.24 | 60.00 | 6058.80 | (29) |
| Ground floors | | | 32.22 | 0.12 | 3.87 | 110.00 | 3544.20 | (28) |
| Flat roofs | | | 32.22 | 0.15 | 4.83 | 9.00 | 289.98 | (30) |


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

| Element | Gross area, m² | Openings m² | Net area A, m² | U-value W/m²K | A x U W/K | kappa-value kJ/m²K | A x K kJ/K |
|---|---|---|---|---|---|---|---|
| Internal wall | | | 112.34 | 0.00 | 0.00 | 9.00 | 1011.06 |
| Internal floor | | | 32.22 | 0.00 | 0.00 | 18.00 | 579.96 |
| Internal ceiling | | | 32.22 | 0.00 | 0.00 | 9.00 | 289.98 |

| | | |
|---|---|---|
| Total area of external elements Sigma A, m² | 186.64 | (31) |
| Fabric heat loss, W/K | 61.21 | (33) |
| Heat capacity | 11773.98 | (34) |
| Thermal mass parameter, kJ/m²K | 182.71 | (35) |
| Effect of thermal bridges | 9.58 | (36) |
| Total fabric heat loss | 70.79 | (37) |

Ventilation heat loss calculated monthly

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 34.17 | 33.94 | 33.71 | 32.64 | 32.44 | 31.51 | 31.51 | 31.33 | 31.87 | 32.44 | 32.85 | 33.27 | (38) |

Heat transfer coefficient, W/K

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 104.96 | 104.73 | 104.50 | 103.43 | 103.23 | 102.29 | 102.29 | 102.12 | 102.65 | 103.23 | 103.63 | 104.06 | |
| | | | | | | | | | | | 103.43 | (39) |

Heat loss parameter (HLP), W/m²K

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.63 | 1.63 | 1.62 | 1.61 | 1.60 | 1.59 | 1.59 | 1.58 | 1.59 | 1.60 | 1.61 | 1.61 | |
| HLP (average) | | | | | | | | | | | 1.60 | (40) |

Number of days in month (Table 1a)

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 31 | 28 | 31 | 30 | 31 | 30 | 31 | 31 | 30 | 31 | 30 | 31 |


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***4. Water heating energy requirements*** **kWh/year**

Assumed occupancy, N 2.10 (42)

Annual average hot water usage in litres per day Vd,average 84.17 (43)

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hot water usage in litres per day for each month | | | | | | | | | | | | |
| 92.59 | 89.22 | 85.85 | 82.49 | 79.12 | 75.75 | 75.75 | 79.12 | 82.49 | 85.85 | 89.22 | 92.59 | (44) |
| Energy content of hot water used | | | | | | | | | | | | |
| 137.30 | 120.09 | 123.92 | 108.04 | 103.66 | 89.45 | 82.89 | 95.12 | 96.25 | 112.18 | 122.45 | 132.97 | |

Energy content (annual) 1324.32 (45)

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Distribution loss | | | | | | | | | | | | |
| 20.60 | 18.01 | 18.59 | 16.21 | 15.55 | 13.42 | 12.43 | 14.27 | 14.44 | 16.83 | 18.37 | 19.95 | (46) |

store loss determined from EN 13203-2 tests, taken from boiler data record

Hot water storage volume (litres) 0.00 (50)

Hot water cylinder loss factor (kWh/day) 0.0000 (51)

Volume factor 0.0000 (52)

Temperature factor 0.0000 (53)

Energy lost from store (kWh/day) 0.00 (55)

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total storage loss | | | | | | | | | | | | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | (56) |
| Net storage loss | | | | | | | | | | | | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | (57) |
| Primary loss | | | | | | | | | | | | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | (59) |
| Combi loss calculated for each month | | | | | | | | | | | | |
| 23.11 | 20.65 | 22.51 | 21.37 | 21.79 | 20.75 | 21.23 | 21.60 | 21.09 | 22.21 | 21.96 | 22.99 | (61) |
| Total heat required for water heating calculated for each month | | | | | | | | | | | | |
| 160.41 | 140.74 | 146.42 | 129.41 | 125.46 | 110.20 | 104.12 | 116.71 | 117.35 | 134.39 | 144.41 | 155.96 | (62) |
| Output from water heater for each month, kWh/month | | | | | | | | | | | | |
| 160.41 | 140.74 | 146.42 | 129.41 | 125.46 | 110.20 | 104.12 | 116.71 | 117.35 | 134.39 | 144.41 | 155.96 | (64) |

1585.59 (64)

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Heat gains from water heating, kWh/month | | | | | | | | | | | | |
| 51.43 | 45.09 | 46.83 | 41.27 | 39.92 | 34.93 | 32.87 | 37.03 | 37.28 | 42.85 | 46.20 | 49.96 | (65) |



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### *5. Internal gains*

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Metabolic gains, Watts | | | | | | | | | | | | |
| 126.24 | 126.24 | 126.24 | 126.24 | 126.24 | 126.24 | 126.24 | 126.24 | 126.24 | 126.24 | 126.24 | 126.24 | (66) |
| Lighting gains | | | | | | | | | | | | |
| 41.01 | 36.42 | 29.62 | 22.42 | 16.76 | 14.15 | 15.29 | 19.88 | 26.68 | 33.87 | 39.54 | 42.15 | (67) |
| Appliances gains | | | | | | | | | | | | |
| 274.61 | 277.46 | 270.28 | 254.99 | 235.70 | 217.56 | 205.44 | 202.59 | 209.77 | 225.06 | 244.36 | 262.50 | (68) |
| Cooking gains | | | | | | | | | | | | |
| 49.73 | 49.73 | 49.73 | 49.73 | 49.73 | 49.73 | 49.73 | 49.73 | 49.73 | 49.73 | 49.73 | 49.73 | (69) |
| Pumps and fans gains | | | | | | | | | | | | |
| 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | (70) |
| Losses e.g. evaporation (negative values) | | | | | | | | | | | | |
| -84.16 | -84.16 | -84.16 | -84.16 | -84.16 | -84.16 | -84.16 | -84.16 | -84.16 | -84.16 | -84.16 | -84.16 | (71) |
| Water heating gains | | | | | | | | | | | | |
| 69.13 | 67.10 | 62.94 | 57.31 | 53.65 | 48.52 | 44.18 | 49.77 | 51.77 | 57.60 | 64.17 | 67.15 | (72) |
| Total internal gains | | | | | | | | | | | | |
| 479.55 | 475.79 | 457.65 | 429.54 | 400.92 | 375.03 | 359.72 | 367.04 | 383.03 | 411.34 | 442.88 | 466.60 | (73) |

### *6. Solar gains (calculation for January)*

| | Area & Flux | g & FF | Shading | Gains |
|---|---|---|---|---|
| Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (North) | 0.9 x 1.710 10.63 | 0.63 x 0.70 | 0.77 | 5.5570 |
| Window 1 | | | | |
| Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthWest) | 0.9 x 1.710 11.28 | 0.63 x 0.70 | 0.77 | 5.8964 |
| Window 2 | | | | |
| Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) | 0.9 x 1.400 36.79 | 0.63 x 0.70 | 0.77 | 15.7425 |
| Window 3 | | | | |
| Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) | 0.9 x 3.780 36.79 | 0.63 x 0.70 | 0.77 | 42.5049 |
| Window 4 - french doors | | | | |
| Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthEast) | 0.9 x 1.400 36.79 | 0.63 x 0.70 | 0.77 | 15.7425 |
| Window 5 | | | | |
| Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthWest) | 0.9 x 1.710 11.28 | 0.63 x 0.70 | 0.77 | 5.8964 |
| Window 6 | | | | |
| Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (North) | 0.9 x 1.710 10.63 | 0.63 x 0.70 | 0.77 | 5.5570 |
| Window 7 | | | | |
| Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthWest) | 0.9 x 1.710 11.28 | 0.63 x 0.70 | 0.77 | 5.8964 |
| Window 8 | | | | |
| Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthEast) | 0.9 x 1.400 36.79 | 0.63 x 0.70 | 0.77 | 15.7425 |
| Window 9 | | | | |


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### *6. Solar gains (calculation for January)*

| | Area & Flux | g & FF | Shading | Gains | |
|---|---|---|---|---|---|
| Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthEast) Window 10 | 0.9 x 1.400 | 36.79 | 0.63 x 0.70 | 0.77 | 15.7425 | |
| Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthEast) Window 11 | 0.9 x 1.400 | 36.79 | 0.63 x 0.70 | 0.77 | 15.7425 | |
| Half glazed door - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthWest) Front door | 0.9 x 1.890 | 0.00 | 0.63 x 0.70 | 0.77 | 0.0000 | |
| Total solar gains, January | | | | | 150.02 | (83-1) |

Solar gains

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 150.02 | 263.72 | 383.48 | 514.56 | 613.39 | 625.53 | 596.15 | 519.70 | 428.34 | 297.49 | 181.16 | 127.45 | (83) |

Total gains

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 629.58 | 739.52 | 841.13 | 944.10 | 1014.30 | 1000.56 | 955.88 | 886.75 | 811.38 | 708.83 | 624.03 | 594.05 | (84) |

### *Lighting calculations*

| | Area | g | FF x Shading | |
|---|---|---|---|---|
| Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (North) Window 1 | 0.9 x 1.71 | 0.80 | 0.70 x 0.83 | 0.72 |
| Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthWest) Window 2 | 0.9 x 1.71 | 0.80 | 0.70 x 0.83 | 0.72 |
| Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) Window 3 | 0.9 x 1.40 | 0.80 | 0.70 x 0.83 | 0.59 |
| Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) Window 4 - french doors | 0.9 x 3.78 | 0.80 | 0.70 x 0.83 | 1.58 |
| Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthEast) Window 5 | 0.9 x 1.40 | 0.80 | 0.70 x 0.83 | 0.59 |
| Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthWest) Window 6 | 0.9 x 1.71 | 0.80 | 0.70 x 0.83 | 0.72 |
| Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (North) Window 7 | 0.9 x 1.71 | 0.80 | 0.70 x 0.83 | 0.72 |
| Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthWest) Window 8 | 0.9 x 1.71 | 0.80 | 0.70 x 0.83 | 0.72 |
| Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthEast) Window 9 | 0.9 x 1.40 | 0.80 | 0.70 x 0.83 | 0.59 |
| Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthEast) Window 10 | 0.9 x 1.40 | 0.80 | 0.70 x 0.83 | 0.59 |
| Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthEast) Window 11 | 0.9 x 1.40 | 0.80 | 0.70 x 0.83 | 0.59 |


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### *7. Mean internal temperature*

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)

Heating system responsiveness 1.00

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| tau | | | | | | | | | | | | |
| 31.16 | 31.23 | 31.30 | 31.62 | 31.68 | 31.97 | 31.97 | 32.03 | 31.86 | 31.68 | 31.56 | 31.43 | |
| alpha | | | | | | | | | | | | |
| 3.08 | 3.08 | 3.09 | 3.11 | 3.11 | 3.13 | 3.13 | 3.14 | 3.12 | 3.11 | 3.10 | 3.10 | |
| Utilisation factor for gains for living area | | | | | | | | | | | | |
| 0.97 | 0.95 | 0.92 | 0.85 | 0.74 | 0.58 | 0.45 | 0.49 | 0.70 | 0.89 | 0.96 | 0.98 | (86) |
| Mean internal temperature in living area T1 | | | | | | | | | | | | |
| 19.10 | 19.36 | 19.76 | 20.25 | 20.64 | 20.88 | 20.96 | 20.95 | 20.77 | 20.25 | 19.59 | 19.05 | (87) |
| Temperature during heating periods in rest of dwelling Th2 | | | | | | | | | | | | |
| 19.59 | 19.59 | 19.60 | 19.61 | 19.61 | 19.62 | 19.62 | 19.62 | 19.62 | 19.61 | 19.61 | 19.60 | (88) |
| Utilisation factor for gains for rest of dwelling | | | | | | | | | | | | |
| 0.97 | 0.94 | 0.90 | 0.81 | 0.67 | 0.48 | 0.32 | 0.36 | 0.61 | 0.85 | 0.94 | 0.97 | (89) |
| Mean internal temperature in the rest of dwelling T2 | | | | | | | | | | | | |
| 17.16 | 17.54 | 18.10 | 18.78 | 19.27 | 19.54 | 19.61 | 19.60 | 19.44 | 18.80 | 17.87 | 17.09 | (90) |

Living area fraction (21.97 / 64.44) 0.34 (91)

Mean internal temperature (for the whole dwelling)

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17.82 | 18.16 | 18.67 | 19.28 | 19.74 | 20.00 | 20.07 | 20.06 | 19.89 | 19.30 | 18.46 | 17.76 | (92) |

Apply adjustment to the mean internal temperature, where appropriate

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17.67 | 18.01 | 18.52 | 19.13 | 19.59 | 19.85 | 19.92 | 19.91 | 19.74 | 19.15 | 18.31 | 17.61 | (93) |

### *8. Space heating requirement*

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Utilisation factor for gains | | | | | | | | | | | | |
| 0.95 | 0.93 | 0.88 | 0.80 | 0.67 | 0.50 | 0.35 | 0.39 | 0.62 | 0.83 | 0.93 | 0.96 | (94) |
| Useful gains | | | | | | | | | | | | |
| 598.94 | 684.44 | 741.09 | 753.17 | 678.11 | 498.41 | 330.80 | 345.62 | 502.32 | 590.05 | 578.49 | 569.02 | (95) |
| Monthly average external temperature | | | | | | | | | | | | |
| 4.30 | 4.90 | 6.50 | 8.90 | 11.70 | 14.60 | 16.60 | 16.40 | 14.10 | 10.60 | 7.10 | 4.20 | (96) |
| Heat loss rate for mean internal temperature | | | | | | | | | | | | |
| 1403.23 | 1373.09 | 1256.00 | 1057.87 | 814.51 | 536.72 | 339.48 | 358.39 | 579.39 | 882.40 | 1161.48 | 1395.10 | (97) |
| Fraction of month for heating | | | | | | | | | | | | |
| 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | - | - | - | - | 1.00 | 1.00 | 1.00 | |
| Space heating requirement for each month, kWh/month | | | | | | | | | | | | |
| 598.39 | 462.77 | 383.09 | 219.38 | 101.48 | - | - | - | - | 217.51 | 419.75 | 614.61 | |

Total space heating requirement per year (kWh/year) (October to May) 3016.98 (98)

Space heating requirement per m² (kWh/m²/year) 46.82 (99)

### *8c. Space cooling requirement - not applicable*



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### *9a. Energy requirements*

**kWh/year**

No secondary heating system selected

| | | |
|---|---|---|
| Fraction of space heat from main system(s) | 1.0000 | (202) |
| Efficiency of main heating system | 90.10% | (206) |

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Space heating requirement | | | | | | | | | | | | |
| 598.39 | 462.77 | 383.09 | 219.38 | 101.48 | - | - | - | - | 217.51 | 419.75 | 614.61 | (98) |
| Appendix Q - monthly energy saved (main heating system 1) | | | | | | | | | | | | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | - | - | - | - | 0.00 | 0.00 | 0.00 | (210) |
| Space heating fuel (main heating system 1) | | | | | | | | | | | | |
| 664.14 | 513.62 | 425.18 | 243.49 | 112.63 | - | - | - | - | 241.41 | 465.87 | 682.14 | (211) |
| Appendix Q - monthly energy saved (main heating system 2) | | | | | | | | | | | | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | - | - | - | - | 0.00 | 0.00 | 0.00 | (212) |
| Space heating fuel (main heating system 2) | | | | | | | | | | | | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | - | - | - | - | 0.00 | 0.00 | 0.00 | (213) |
| Appendix Q - monthly energy saved (secondary heating system) | | | | | | | | | | | | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | - | - | - | - | 0.00 | 0.00 | 0.00 | (214) |
| Space heating fuel (secondary) | | | | | | | | | | | | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | - | - | - | - | 0.00 | 0.00 | 0.00 | (215) |
| Water heating | | | | | | | | | | | | |
| Water heating requirement | | | | | | | | | | | | |
| 160.41 | 140.74 | 146.42 | 129.41 | 125.46 | 110.20 | 104.12 | 116.71 | 117.35 | 134.39 | 144.41 | 155.96 | (64) |
| Efficiency of water heater | | | | | | | | | | | 87.30 | (216) |
| 89.49 | 89.43 | 89.31 | 89.04 | 88.53 | 87.30 | 87.30 | 87.30 | 87.30 | 89.01 | 89.37 | 89.52 | (217) |
| Water heating fuel | | | | | | | | | | | | |
| 179.25 | 157.37 | 163.95 | 145.34 | 141.71 | 126.24 | 119.27 | 133.69 | 134.42 | 150.98 | 161.59 | 174.23 | (219) |

| Annual totals | kWh/year | |
|---|---|---|
| Space heating fuel used, main system 1 | 3348.48 | (211) |
| Space heating fuel (secondary) | 0.00 | (215) |
| Water heating fuel | 1788.04 | (219) |
| Electricity for pumps, fans and electric keep-hot | | |
| central heating pump | 30.00 | (230c) |
| boiler with a fan-assisted flue | 45.00 | (230e) |
| Total electricity for the above, kWh/year | 75.00 | (231) |
| Electricity for lighting (100.00% fixed LEL) | 289.68 | (232) |
| Energy saving/generation technologies | | |
| Appendix Q - | | |
| Energy saved or generated (): | 0.000 | (236a) |
| Energy used (): | 0.000 | (237a) |
| Total delivered energy for all uses | 5501.19 | (238) |


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*SAP 2012 worksheet for New dwelling as designed - calculation of energy ratings*

### *10a. Fuel costs using Table 12 prices*

| | kWh/year | Fuel price p/kWh | £/year | |
|---|---|---|---|---|
| Space heating - main system 1 | 3348.478 | 3.480 | 116.53 | (240) |
| Space heating - main system 2 | 0.000 | 0.000 | 0.00 | (241) |
| Water heating | | | | |
| Water heating cost | 1788.04 | 3.480 | 62.22 | (247) |
| Mech vent fans cost | 0.000 | 13.190 | 0.00 | (249) |
| Pump/fan energy cost | 75.000 | 13.190 | 9.89 | (249) |
| Energy for lighting | 289.680 | 13.190 | 38.21 | (250) |
| Additional standing charges | | | 120.00 | (251) |
| Electricity generated - PVs | 0.000 | 0.000 | 0.00 | (252) |
| Appendix Q - | | | | |
| Energy saved or generated (): | 0.000 | 0.000 | 0.00 | (253) |
| Energy used (): | 0.000 | 0.000 | 0.00 | (254) |
| Total energy cost | | | 346.85 | (255) |

### *11a. SAP rating*

| | | |
|---|---|---|
| Energy cost deflator | 0.42 | (256) |
| Energy cost factor (ECF) | 1.33 | (257) |
| SAP value | 81.43 | |
| **SAP rating** | **81** | (258) |
| **SAP band** | **B** | |

### *12a. Carbon dioxide emissions*

| | Energy kWh/year | Emission factor kg CO2/kWh | Emissions kg CO2/year | |
|---|---|---|---|---|
| Space heating, main system 1 | 3348.48 | 0.216 | 723.27 | (261) |
| Space heating, main system 2 | 0.00 | 0.000 | 0.00 | (262) |
| Space heating, secondary | 0.00 | 0.519 | 0.00 | (263) |
| Water heating | 1788.04 | 0.216 | 386.22 | (264) |
| Space and water heating | | | 1109.49 | (265) |
| Electricity for pumps and fans | 75.00 | 0.519 | 38.93 | (267) |
| Electricity for lighting | 289.68 | 0.519 | 150.34 | (268) |
| Electricity generated - PVs | 0.00 | 0.519 | 0.00 | (269) |
| Electricity generated - µCHP | 0.00 | 0.000 | 0.00 | (269) |
| Appendix Q - | | | | |
| Energy saved (): | 0.00 | 0.000 | 0.00 | (270) |
| Energy used (): | 0.00 | 0.000 | 0.00 | (271) |
| Total CO2, kg/year | | | 1298.76 | (272) |

| | kg/m²/year | |
|---|---|---|
| **CO2 emissions per m²** | **20.15** | (273) |
| EI value | 84.10 | (273a) |
| **EI rating** | **84** | (274) |
| **EI band** | **B** | |

**Calculation of stars for heating and DHW**

| | |
|---|---|
| Main heating energy efficiency | (3.48 / 0.9010) x (1 + (0.29 x 0.00)) = 3.8624, stars = 4 |
| Main heating environmental impact | (0.2160 / 0.9010) x (1 + (0.29 x 0.00)) = 0.2397, stars = 4 |
| Water heating energy efficiency | 3.48 / 0.8857 = 3.9289, stars = 4 |
| Water heating environmental impact | 0.2160 / 0.8857 = 0.2439, stars = 4 |


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