



elmhurst
energy



SAP Report Submission for Building Regulations Compliance

Client:

Project: Abbey Road Retail Park
Barking

Contact: Paul Pasifull
Paul Pasifull
paul@sestesting.com

Report Issue Date: 24/02/2022

EXCELLENCE
IN ENERGY
ASSESSMENT

PREDICTED ENERGY ASSESSMENT

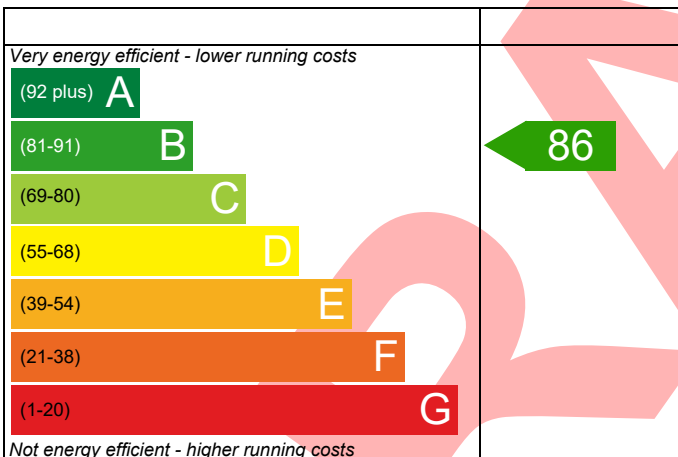
Abbey Road Retail Park,
Barking

Dwelling type: Flat, End-Terrace
Date of assessment: 24/02/2022
Produced by: Paul Pasifull
Total floor area: 69.19 m²

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

The energy performance has been assessed using the Government approved 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 (CO₂) emissions.

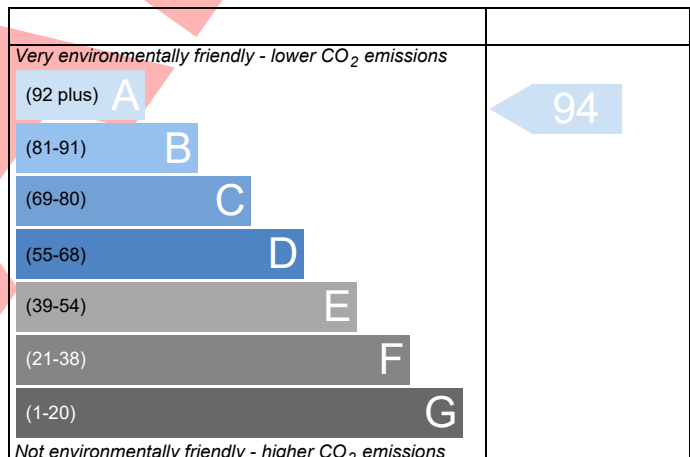
Energy Efficiency Rating



England EU Directive 2002/91/EC

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

Environmental Impact (CO₂) Rating



England EU Directive 2002/91/EC

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

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

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Designed)

| | | | | | |
|------------------------------------|---|---------------|------------------|-------------|-----------|
| Property Reference | WH190 Plot 330 | | Issued on Date | 24/02/2022 | |
| Assessment Reference | Plot 330 | Prop Type Ref | Flat Type B1N-07 | | |
| Property | Abbey Road Retail Park, Barking | | | | |
| SAP Rating | 86 B | DER | 8.02 | TER | 14.59 |
| Environmental | 94 A | % DER<TER | 45.04 | | |
| CO ₂ Emissions (t/year) | 0.45 | DFEE | 31.85 | TFEE | 33.90 |
| General Requirements Compliance | Pass | % DFEE<TFEE | 6.06 | | |
| Assessor Details | Mr. Paul Pasifull, Stansted Environmental Services, Tel: 01277225709, paul@sestesting.com | | | Assessor ID | Q133-0001 |
| Client | | | | | |

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 (c) | | |
| Fuel factor | 1.00 (mains gas) | | |
| Target Carbon Dioxide Emission Rate (TER) | 14.59 | kgCO ₂ /m ² | |
| Dwelling Carbon Dioxide Emission Rate (DER) | 8.02 | kgCO ₂ /m ² | Pass |
| | -6.57 (-45.0%) | kgCO ₂ /m ² | |

1b TFEE and DFEE

| | | | |
|--|--------------|------------------------|------|
| Target Fabric Energy Efficiency (TFEE) | 33.90 | kWh/m ² /yr | |
| Dwelling Fabric Energy Efficiency (DFEE) | 31.85 | kWh/m ² /yr | |
| | -2.1 (-6.2%) | kWh/m ² /yr | Pass |

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

| Element | Average | Highest | |
|---------------|------------------|------------------|------|
| External wall | 0.17 (max. 0.30) | 0.27 (max. 0.70) | Pass |
| Party wall | 0.00 (max. 0.20) | - | Pass |
| Openings | 1.40 (max. 2.00) | 1.40 (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 | 3.00 (design value) | m ³ /(h.m ²) @ 50 Pa | |
| Maximum | 10.0 | m ³ /(h.m ²) @ 50 Pa | Pass |

Limiting System Efficiencies

4 Heating efficiency

| | | |
|--------------------------|--------------------------|---|
| Main heating system | Community heating scheme | - |
| Secondary heating system | None | |

5 Cylinder insulation

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BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Designed)

| | | |
|----------------------------|---|------|
| Hot water storage | Measured cylinder loss: 0.40 kWh/day Permitted by DBSCG 0.50 | Pass |
| Primary pipework insulated | No primary pipework | |

6 Controls

| | | |
|------------------------|--|------|
| Space heating controls | Charging system linked to use of community heating, programmer and at least two room stats | Pass |
| Hot water controls | No cylinderstat | |

7 Low energy lights

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

8 Mechanical ventilation

| | | |
|---------------------------|------|------|
| Continuous extract system | | |
| Specific fan power | 0.16 | |
| Maximum | 0.7 | Pass |

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

| | | |
|----------------------------------|------------------------------------|------|
| Overheating risk (Thames Valley) | Slight | Pass |
| Based on: | | |
| Overshading | Average | |
| Windows facing South | 2.39 m ² , No overhang | |
| Windows facing West | 10.97 m ² , No overhang | |
| Air change rate | 4.00 ach | |
| Blinds/curtains | None | |

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

| Type | U-value | | |
|---------------------------------|---------|--------------------|------|
| Solid Wall | 0.00 | W/m ² K | Pass |
| Filled Cavity with Edge Sealing | 0.00 | W/m ² K | Pass |

Air permeability and pressure testing

3 Air permeability

| | | | |
|--------------------------------|---------------------|---|------|
| Air permeability at 50 pascals | 3.00 (design value) | m ³ /(h.m ²) @ 50 Pa | |
| Maximum | 10.0 | m ³ /(h.m ²) @ 50 Pa | Pass |

10 Key features

| | | |
|--------------------------|--------|----------------------------------|
| External wall U-value | 0.14 | W/m ² K |
| External wall U-value | 0.14 | W/m ² K |
| Party wall U-value | 0.00 | W/m ² K |
| Party wall U-value | 0.00 | W/m ² K |
| Air permeability | 3.0 | m ³ /m ² h |
| Community CHP, Mains gas | N/A | |
| Photovoltaic array | 265.00 | kWh/Year |

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RECOMMENDATIONS

| | Typical cost | Typical savings per year | Energy efficiency | Environmental impact | Result |
|---------------------|--------------|--------------------------|-------------------|----------------------|-------------------|
| Low energy lights | | | 0 | 0 | Already installed |
| Solar water heating | | | 0 | 0 | Not applicable |
| Photovoltaic | | | 0 | 0 | Not applicable |
| Wind turbine | | | 0 | 0 | Not applicable |
| Totals | £0 | £0 | B 86 | A 94 | |

DRAFT

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THERMAL BRIDGING

Calculation Type: New Build (As Designed)

| | | | | |
|----------------------|---------------------------------|---------------|------------------|------------|
| Property Reference | WH190 Plot 330 | | Issued on Date | 24/02/2022 |
| Assessment Reference | Plot 330 | Prop Type Ref | Flat Type B1N-07 | |
| Property | Abbey Road Retail Park, Barking | | | |

| | | | | | |
|------------------------------------|------|-------------|-------|------|-------|
| SAP Rating | 86 B | DER | 8.02 | TER | 14.59 |
| Environmental | 94 A | % DER<TER | 45.04 | | |
| CO ₂ Emissions (t/year) | 0.45 | DFEE | 31.85 | TFEE | 33.90 |
| General Requirements Compliance | Pass | % DFEE<TFEE | 6.06 | | |

| | | | |
|------------------|---|-------------|-----------|
| Assessor Details | Mr. Paul Pasifull, Stansted Environmental Services, Tel: 01277225709, paul@sestesting.com | Assessor ID | Q133-0001 |
|------------------|---|-------------|-----------|

| | |
|--------|--|
| Client | |
|--------|--|

| | Junction detail | Source Type | Psi (W/mK) | Length (m) | Result | Reference |
|---------------|---|---------------------|------------|------------|--------|-----------|
| External wall | E2 Other lintels (including other steel lintels) | Table K1 - Approved | 0.300 | 6.34 | 1.90 | |
| External wall | E4 Jamb | Table K1 - Approved | 0.050 | 16.88 | 0.84 | |
| External wall | E7 Party floor between dwellings (in blocks of flats) | Table K1 - Approved | 0.070 | 11.83 | 0.83 | |
| External wall | E7 Party floor between dwellings (in blocks of flats) | Table K1 - Approved | 0.070 | 19.75 | 1.38 | |
| External wall | E16 Corner (normal) | Table K1 - Approved | 0.090 | 5.50 | 0.50 | |
| External wall | E18 Party wall between dwellings | Table K1 - Approved | 0.060 | 2.75 | 0.17 | |
| External wall | E25 Staggered party wall between dwellings | Table K1 - Default | 0.120 | 2.75 | 0.33 | |
| Party wall | P3 Party wall - Intermediate floor between dwellings (in blocks of flats) | Table K1 - Default | 0.000 | 16.30 | 0.00 | |
| Party wall | P3 Party wall - Intermediate floor between dwellings (in blocks of flats) | Table K1 - Default | 0.000 | 16.30 | 0.00 | |
| External wall | E8 Balcony within a dwelling, wall insulation continuous | Table K1 - Approved | 0.000 | 7.92 | 0.00 | |

Total: **5.95** W/mK:
 Y-Value: **0.110** W/m²K:

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

| | | | | | |
|------------------------------------|---|---------------|------------------|----------------|------------|
| Property Reference | WH190 Plot 330 | | | Issued on Date | 24/02/2022 |
| Assessment Reference | Plot 330 | Prop Type Ref | Flat Type B1N-07 | | |
| Property | Abbey Road Retail Park, Barking | | | | |
| SAP Rating | 86 B | DER | 8.02 | TER | 14.59 |
| Environmental | 94 A | % DER<TER | 45.04 | | |
| CO ₂ Emissions (t/year) | 0.45 | DFEE | 31.85 | TFEE | 33.90 |
| General Requirements Compliance | Pass | % DFEE<TFEE | 6.06 | | |
| Assessor Details | Mr. Paul Pasifull, Stansted Environmental Services, Tel: 01277225709, paul@sestesting.com | | | Assessor ID | Q133-0001 |
| 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

Mid-floor flat, total floor area 69 m²

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

1a TER and DER

Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 14.59 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 8.02 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)33.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)31.8 kWh/m²/yrOK

2 Fabric U-values

| Element | Average | Highest | |
|---------------|------------------|------------------|----|
| External wall | 0.17 (max. 0.30) | 0.27 (max. 0.70) | OK |
| Party wall | 0.00 (max. 0.20) | - | OK |
| Floor | (no floor) | | |
| Roof | (no roof) | | |
| Openings | 1.40 (max. 2.00) | 1.40 (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: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -
Secondary heating system: None

5 Cylinder insulation

Hot water storage Measured cylinder loss: 0.40 kWh/day
Permitted by DBSCG 0.50 OK
Primary pipework insulated: No primary pipework

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK
Hot water controls: No cylinderstat

7 Low energy lights

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

8 Mechanical ventilation

Continuous extract system
Specific fan power: 0.16
Maximum 0.7 OK

9 Summertime temperature

Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing South: 2.39 m², No overhang
Windows facing West: 10.97 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

External wall U-value 0.14 W/m²K
External wall U-value 0.14 W/m²K
Party wall U-value 0.00 W/m²K
Party wall U-value 0.00 W/m²K
Air permeability 3.0 m³/m²h
Community CHP, Mains gas
Photovoltaic array 265.00 kWh/Year

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 (m2) | Storey height (m) | Volume (m3) |
|--|--------------|---------------------------------|----------------------|
| Ground floor | 69.1900 (1b) | 2.5000 (2b) | 172.9750 (1b) - (3b) |
| Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) | 69.1900 | | (4) |
| Dwelling volume | | (3a)+(3b)+(3c)+(3d)+(3e)...(3n) | 172.9750 (5) |

2. Ventilation rate

| | main heating | secondary heating | other | total | m3 per hour |
|---|--------------|-------------------|-------|-----------------------------|-------------|
| Number of chimneys | 0 | 0 | 0 | 0 * 40 = | 0.0000 (6a) |
| Number of open flues | 0 | 0 | 0 | 0 * 20 = | 0.0000 (6b) |
| Number of intermittent fans | | | | 0 * 10 = | 0.0000 (7a) |
| Number of passive vents | | | | 0 * 10 = | 0.0000 (7b) |
| Number of flueless gas fires | | | | 0 * 40 = | 0.0000 (7c) |
| Air changes per hour | | | | | |
| Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = | | | | 0.0000 / (5) = | 0.0000 (8) |
| Pressure test | | | | | Yes |
| Measured/design AP50 | | | | | 3.0000 |
| Infiltration rate | | | | | 0.1500 (18) |
| Number of sides sheltered | | | | | 2 (19) |
| Shelter factor | | | | (20) = 1 - [0.075 x (19)] = | 0.8500 (20) |
| Infiltration rate adjusted to include shelter factor | | | | (21) = (18) x (20) = | 0.1275 (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 | | | | 0.1403 | 0.1371 | 0.1211 | 0.1211 | 0.1179 | 0.1275 | 0.1371 | 0.1434 | 0.1498 (22b) |
| Mechanical extract ventilation - centralised | | | | | | | | | | | | 0.5000 (23a) |
| If mechanical ventilation: | | | | | | | | | | | | |
| Effective ac | 0.5000 | 0.5000 | 0.5000 | 0.5000 | 0.5000 | 0.5000 | 0.5000 | 0.5000 | 0.5000 | 0.5000 | 0.5000 | 0.5000 (25) |

3. Heat losses and heat loss parameter

| Element | Gross m2 | Openings m2 | NetArea m2 | U-value W/m2K | A x U W/K | K-value kJ/m2K | A x K kJ/K |
|--|----------|-------------|------------|---------------|----------------------|----------------|--|
| Windows (Uw = 1.40) | | | 9.0700 | 1.3258 | 12.0246 | | (27) |
| Full glazed door (Uw = 1.40) | | | 4.2900 | 1.3258 | 5.6875 | | (27) |
| 2. Column wall | 10.8300 | | 10.8300 | 0.2700 | 2.9241 | 150.0000 | 1624.5000 (29a) |
| 3. Uni panel cladding | 8.6900 | 4.7800 | 3.9100 | 0.1400 | 0.5474 | 14.0000 | 54.7400 (29a) |
| 1. Uni panel brick | 34.7800 | 8.5800 | 26.2000 | 0.1400 | 3.6680 | 14.0000 | 366.8000 (29a) |
| Total net area of external elements Aum(A, m2) | | | 54.3000 | | | | (31) |
| Fabric heat loss, W/K = Sum (A x U) | | | | | (26)...(30) + (32) = | 24.8516 | (33) |
| Party Wall 1 | | | 1.1300 | 0.0000 | 0.0000 | 180.0000 | 203.4000 (32) |
| Party Wall 2 | | | 43.7000 | 0.0000 | 0.0000 | 70.0000 | 3059.0000 (32) |
| Party Floor | | | 69.1900 | | | 40.0000 | 2767.6000 (32d) |
| Party Ceilings | | | 69.1900 | | | 40.0000 | 2767.6000 (32b) |
| Internal Wall - SFS | | | 116.0000 | | | 9.0000 | 1044.0000 (32c) |
| Heat capacity Cm = Sum(A x k) | | | | | | | (28)...(30) + (32) + (32a)...(32e) = 11887.6400 (34) |
| Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K | | | | | | | 171.8115 (35) |
| Thermal bridges (Sum(L x Psi) calculated using Appendix K) | | | | | | | 5.9466 (36) |
| Total fabric heat loss | | | | | | | (33) + (36) = 30.7982 (37) |

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

| (38)m | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|--------------|
| Heat transfer coeff | 59.3391 | 59.3391 | 59.3391 | 59.3391 | 59.3391 | 59.3391 | 59.3391 | 59.3391 | 59.3391 | 59.3391 | 59.3391 | 59.3391 (39) |
| Average = Sum(39)m / 12 = | | | | | | | | | | | | 59.3391 (39) |
| HLP | 0.8576 | 0.8576 | 0.8576 | 0.8576 | 0.8576 | 0.8576 | 0.8576 | 0.8576 | 0.8576 | 0.8576 | 0.8576 | 0.8576 (40) |
| HLP (average) | | | | | | | | | | | | 0.8576 (40) |
| Days in month | 31 | 28 | 31 | 30 | 31 | 30 | 31 | 31 | 30 | 31 | 30 | 31 (41) |

4. Water heating energy requirements (kWh/year)

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|--|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|--------------|
| Assumed occupancy | | | | | | | | | | | | 2.2263 (42) |
| Average daily hot water use (litres/day) | | | | | | | | | | | | 87.0746 (43) |
| Daily hot water use | 95.7821 | 92.2991 | 88.8161 | 85.3331 | 81.8501 | 78.3672 | 78.3672 | 81.8501 | 85.3331 | 88.8161 | 92.2991 | 95.7821 (44) |

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

| | | | | | | | | | | | | |
|---|--------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------------|
| Energy content (annual) | 142.0421 | 124.2309 | 128.1952 | 111.7636 | 107.2399 | 92.5399 | 85.7518 | 98.4014 | 99.5767 | 116.0470 | 126.6744 | 137.5602 (45) |
| Energy content (annual) | Total = Sum(45)m = | | | | | | | | | | | 1370.0229 (45) |
| Distribution loss (46)m = 0.15 x (45)m | 21.3063 | 18.6346 | 19.2293 | 16.7645 | 16.0860 | 13.8810 | 12.8628 | 14.7602 | 14.9365 | 17.4070 | 19.0012 | 20.6340 (46) |
| Water storage loss: | | | | | | | | | | | | |
| Store volume | | | | | | | | | | | | 10.0000 (47) |
| a) If manufacturer declared loss factor is known (kWh/day): | | | | | | | | | | | | 0.4000 (48) |
| Temperature factor from Table 2b | | | | | | | | | | | | 1.0000 (49) |
| Enter (49) or (54) in (55) | | | | | | | | | | | | 0.4000 (55) |
| Total storage loss | 12.4000 | 11.2000 | 12.4000 | 12.0000 | 12.4000 | 12.0000 | 12.4000 | 12.4000 | 12.0000 | 12.4000 | 12.0000 | 12.4000 (56) |
| If cylinder contains dedicated solar storage | 12.4000 | 11.2000 | 12.4000 | 12.0000 | 12.4000 | 12.0000 | 12.4000 | 12.4000 | 12.0000 | 12.4000 | 12.0000 | 12.4000 (57) |
| Primary loss | 23.2624 | 21.0112 | 23.2624 | 22.5120 | 23.2624 | 22.5120 | 23.2624 | 23.2624 | 22.5120 | 23.2624 | 22.5120 | 23.2624 (59) |
| Total heat required for water heating calculated for each month | 177.7045 | 156.4421 | 163.8576 | 146.2756 | 142.9023 | 127.0519 | 121.4142 | 134.0638 | 134.0887 | 151.7094 | 161.1864 | 173.2226 (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 | 177.7045 | 156.4421 | 163.8576 | 146.2756 | 142.9023 | 127.0519 | 121.4142 | 134.0638 | 134.0887 | 151.7094 | 161.1864 | 173.2226 (64) |
| Heat gains from water heating, kWh/month | 75.7589 | 67.0757 | 71.1548 | 64.7710 | 64.1872 | 58.3791 | 57.0424 | 61.2484 | 60.7188 | 67.1155 | 69.7288 | 74.2687 (65) |
| Total per year (kWh/year) = Sum(64)m = 1789.9189 (64) | | | | | | | | | | | | |

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 | 111.3150 | 111.3150 | 111.3150 | 111.3150 | 111.3150 | 111.3150 | 111.3150 | 111.3150 | 111.3150 | 111.3150 | 111.3150 | 111.3150 (66) |
| Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 | 17.6138 | 15.6444 | 12.7229 | 9.6321 | 7.2001 | 6.0786 | 6.5682 | 8.5375 | 11.4591 | 14.5499 | 16.9819 | 18.1034 (67) |
| Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 | 195.3992 | 197.4269 | 192.3173 | 181.4396 | 167.7085 | 154.8032 | 146.1817 | 144.1541 | 149.2636 | 160.1413 | 173.8724 | 186.7777 (68) |
| Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 | 34.1315 | 34.1315 | 34.1315 | 34.1315 | 34.1315 | 34.1315 | 34.1315 | 34.1315 | 34.1315 | 34.1315 | 34.1315 | 34.1315 (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) | -89.0520 | -89.0520 | -89.0520 | -89.0520 | -89.0520 | -89.0520 | -89.0520 | -89.0520 | -89.0520 | -89.0520 | -89.0520 | -89.0520 (71) |
| Water heating gains (Table 5) | 101.8265 | 99.8151 | 95.6382 | 89.9597 | 86.2731 | 81.0821 | 76.6699 | 82.3231 | 84.3317 | 90.2091 | 96.8456 | 99.8235 (72) |
| Total internal gains | 371.2340 | 369.2809 | 357.0729 | 337.4259 | 317.5762 | 298.3584 | 285.8142 | 291.4092 | 301.4489 | 321.2948 | 344.0944 | 361.0990 (73) |

6. Solar gains

| | | | | | | | | | | | | |
|-------------|----------|------------|---------------|---------------|----------|--------------|----------|----------|----------|----------|----------|---------------|
| [Jan] | Area | Solar flux | g | FF | Access | Gains | | | | | | |
| | m2 | Table 6a | Specific data | Specific data | factor | W | | | | | | |
| | | W/m2 | or Table 6b | or Table 6c | Table 6d | | | | | | | |
| South | 2.3900 | 46.7521 | 0.4200 | 0.7000 | 0.7700 | 22.7656 (78) | | | | | | |
| West | 6.6800 | 19.6403 | 0.4200 | 0.7000 | 0.7700 | 26.7303 (80) | | | | | | |
| West | 4.2900 | 19.6403 | 0.4200 | 0.7000 | 0.7700 | 17.1666 (80) | | | | | | |
| Solar gains | 66.6626 | 123.1560 | 188.9120 | 259.9285 | 308.7035 | 312.5834 | 298.9389 | 262.6829 | 214.0882 | 142.1086 | 81.7194 | 55.7703 (83) |
| Total gains | 437.8966 | 492.4369 | 545.9849 | 597.3544 | 626.2797 | 610.9418 | 584.7532 | 554.0921 | 515.5371 | 463.4034 | 425.8138 | 416.8694 (84) |

7. Mean internal temperature (heating season)

| | | | | | | | | | | | | |
|---|---------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|--------------|
| Temperature during heating periods in the living area from Table 9, Th1 (C) | | | | | | | | | | | | 21.0000 (85) |
| Utilisation factor for gains for living area, nil,m (see Table 9a) | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| tau | 55.6483 | 55.6483 | 55.6483 | 55.6483 | 55.6483 | 55.6483 | 55.6483 | 55.6483 | 55.6483 | 55.6483 | 55.6483 | 55.6483 |
| alpha | 4.7099 | 4.7099 | 4.7099 | 4.7099 | 4.7099 | 4.7099 | 4.7099 | 4.7099 | 4.7099 | 4.7099 | 4.7099 | 4.7099 |
| util living area | 0.9880 | 0.9781 | 0.9536 | 0.8913 | 0.7690 | 0.5948 | 0.4409 | 0.4836 | 0.7187 | 0.9197 | 0.9780 | 0.9904 (86) |
| MIT | 19.9166 | 20.0808 | 20.3407 | 20.6399 | 20.8637 | 20.9682 | 20.9936 | 20.9903 | 20.9245 | 20.6295 | 20.2076 | 19.8667 (87) |
| Th 2 | 20.2037 | 20.2037 | 20.2037 | 20.2037 | 20.2037 | 20.2037 | 20.2037 | 20.2037 | 20.2037 | 20.2037 | 20.2037 | 20.2037 (88) |
| util rest of house | 0.9854 | 0.9736 | 0.9439 | 0.8690 | 0.7259 | 0.5297 | 0.3637 | 0.4038 | 0.6568 | 0.8982 | 0.9726 | 0.9883 (89) |
| MIT 2 | 18.7479 | 18.9853 | 19.3573 | 19.7727 | 20.0615 | 20.1783 | 20.2003 | 20.1981 | 20.1367 | 19.7670 | 19.1708 | 18.6756 (90) |
| Living area fraction | fLA = Living area / (4) = | | | | | | | | | | | 0.4681 (91) |
| MIT | 19.2950 | 19.4981 | 19.8177 | 20.1787 | 20.4370 | 20.5481 | 20.5717 | 20.5689 | 20.5055 | 20.1708 | 19.6561 | 19.2332 (92) |
| Temperature adjustment | | | | | | | | | | | | 0.0000 |
| adjusted MIT | 19.2950 | 19.4981 | 19.8177 | 20.1787 | 20.4370 | 20.5481 | 20.5717 | 20.5689 | 20.5055 | 20.1708 | 19.6561 | 19.2332 (93) |

8. Space heating requirement

| | | | | | | | | | | | | |
|-------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------------|
| Utilisation | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| | 0.9817 | 0.9686 | 0.9384 | 0.8682 | 0.7391 | 0.5585 | 0.3997 | 0.4409 | 0.6814 | 0.8972 | 0.9680 | 0.9850 (94) |
| Useful gains | 429.8703 | 476.9595 | 512.3351 | 518.6527 | 462.9082 | 341.1947 | 233.7176 | 244.2804 | 351.2728 | 415.7677 | 412.1698 | 410.6170 (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 | 889.7904 | 866.2408 | 790.2581 | 669.2668 | 518.4482 | 352.9544 | 235.6760 | 247.3807 | 380.0962 | 567.9220 | 745.0703 | 892.0547 (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 | 342.1806 | 261.5970 | 206.7747 | 108.4422 | 41.3218 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 113.2028 | 239.6884 | 358.1896 (98) |
| Space heating | | | | | | | | | | | | 1671.3970 (98) |

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating per m2 (98) / (4) = 24.1566 (99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

| | |
|---|------------------|
| Fraction of space heat from secondary/supplementary system (Table 11) | 0.0000 (301) |
| Fraction of space heat from community system | 1.0000 (302) |
| Fraction of heat from community Boilers | 0.1740 (303a) |
| Fraction of heat from community Combined Heat and Power | 0.8260 (303b) |
| Fraction of total space heat from community Boilers | 0.1740 (304a) |
| Fraction of total space heat from community Combined Heat and Power | 0.8260 (304b) |
| Factor for control and charging method (Table 4c(3)) for community space heating | 1.0000 (305) |
| Factor for control and charging method (Table 4c(3)) for community water heating | 1.0000 (305a) |
| Distribution loss factor (Table 12c) for community heating system | 1.0500 (306) |
| Space heating: | |
| Annual space heating requirement | 1671.3970 (98) |
| Space heat from Boilers = (98) x 0.17 x 1.00 x 1.05 | 305.3642 (307a) |
| Space heat from Combined Heat and Power = (98) x 0.83 x 1.00 x 1.05 | 1449.6026 (307b) |
| Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) | 0.0000 (308) |
| Space heating fuel for secondary/supplementary system | 0.0000 (309) |
| Water heating | |
| Annual water heating requirement | 1789.9189 (64) |
| Water heat from Boilers = (64) x 0.17 x 1.00 x 1.05 | 327.0182 (310a) |
| Water heat from Combined Heat and Power = (64) x 0.83 x 1.00 x 1.05 | 1552.3967 (310b) |
| Electricity used for heat distribution | 36.3438 (313) |
| Annual totals kWh/year | |
| Electricity for pumps and fans: | |
| (MEV)Centralised, Database: in-use factor = 1.3000, SFP = 0.2080) | |
| mechanical ventilation fans (SFP = 0.2080) | 43.8941 (330a) |
| Total electricity for the above, kWh/year | 43.8941 (331) |
| Electricity for lighting (calculated in Appendix L) | 311.0656 (332) |
| Energy saving/generation technologies (Appendices M ,N and Q) | |
| Total delivered energy for all uses | 3989.3414 (338) |

12b. Carbon dioxide emissions - Community heating scheme

| | Energy kWh/year | Emission factor kg CO2/kWh | Emissions kg CO2/year |
|---|-----------------|----------------------------|-----------------------|
| Efficiency of heat source Boilers | | | 91.4000 (367a) |
| Space heating from Boilers | 691.8845 | 0.2160 | 149.4470 (367) |
| Electrical efficiency of CHP unit | | | 33.2000 (361) |
| Heat efficiency of CHP unit | | | 38.6000 (362) |
| Space heating from Combined Heat and Power | 3755.4472 | 0.2160 | 811.1766 (363) |
| less credit emissions for electricity | -1246.8085 | 0.5190 | -647.0936 (364) |
| Water heating from Combined Heat and Power | 4021.7531 | 0.2160 | 868.6987 (365) |
| less credit emissions for electricity | -1335.2220 | 0.5190 | -692.9802 (366) |
| Electrical energy for heat distribution | 36.3438 | 0.5190 | 18.8624 (372) |
| Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE) | | | 508.1109 (373) |
| Space and water heating | | | 508.1109 (376) |
| Pumps and fans | 43.8941 | 0.5190 | 22.7811 (378) |
| Energy for lighting | 311.0656 | 0.5190 | 161.4430 (379) |
| Energy saving/generation technologies | | | |
| PV Unit | -265.0000 | 0.5190 | -137.5350 (380) |
| Total CO2, kg/year | | | 554.8000 (383) |
| Dwelling Carbon Dioxide Emission Rate (DER) | | | 8.0200 (384) |

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

| | | | |
|---|--|-----|-------------|
| DER | | | 8.0200 ZC1 |
| Total Floor Area | | TFA | 69.1900 |
| Assumed number of occupants | | N | 2.2263 |
| CO2 emission factor in Table 12 for electricity displaced from grid | | EF | 0.5190 |
| CO2 emissions from appliances, equation (L14) | | | 16.7350 ZC2 |
| CO2 emissions from cooking, equation (L16) | | | 2.4921 ZC3 |
| Total CO2 emissions | | | 27.2471 ZC4 |
| Residual CO2 emissions offset from biofuel CHP | | | 0.0000 ZC5 |
| Additional allowable electricity generation, kWh/m ² /year | | | 0.0000 ZC6 |
| Resulting CO2 emissions offset from additional allowable electricity generation | | | 0.0000 ZC7 |
| Net CO2 emissions | | | 27.2471 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 (m2) | Storey height (m) | Volume (m3) |
|--|--------------|---------------------------------|----------------------|
| Ground floor | 69.1900 (1b) | 2.5000 (2b) | 172.9750 (1b) - (3b) |
| Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) | 69.1900 | | (4) |
| Dwelling volume | | (3a)+(3b)+(3c)+(3d)+(3e)...(3n) | 172.9750 (5) |

2. Ventilation rate

| | main heating | secondary heating | other | total | m3 per hour |
|---|--------------|-------------------|-----------------------------|-----------------|--------------|
| Number of chimneys | 0 | 0 | 0 | 0 * 40 = | 0.0000 (6a) |
| Number of open flues | 0 | 0 | 0 | 0 * 20 = | 0.0000 (6b) |
| Number of intermittent fans | | | | 2 * 10 = | 20.0000 (7a) |
| Number of passive vents | | | | 0 * 10 = | 0.0000 (7b) |
| Number of flueless gas fires | | | | 0 * 40 = | 0.0000 (7c) |
| Air changes per hour | | | | | |
| Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = | | | | 20.0000 / (5) = | 0.1156 (8) |
| Pressure test | | | | Yes | |
| Measured/design AP50 | | | | | 5.0000 |
| Infiltration rate | | | | | 0.3656 (18) |
| Number of sides sheltered | | | | | 2 (19) |
| Shelter factor | | | (20) = 1 - [0.075 x (19)] = | | 0.8500 (20) |
| Infiltration rate adjusted to include shelter factor | | | (21) = (18) x (20) = | | 0.3108 (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 | | | | | | | | | | | | |
| Effective ac | 0.3962 | 0.3885 | 0.3807 | 0.3419 | 0.3341 | 0.2952 | 0.2952 | 0.2875 | 0.3108 | 0.3341 | 0.3496 | 0.3652 (22b) |
| Effective ac | 0.5785 | 0.5755 | 0.5725 | 0.5584 | 0.5558 | 0.5436 | 0.5436 | 0.5413 | 0.5483 | 0.5558 | 0.5611 | 0.5667 (25) |

3. Heat losses and heat loss parameter

| Element | Gross m2 | Openings m2 | NetArea m2 | U-value W/m2K | A x U W/K | K-value kJ/m2K | A x K kJ/K | | | | | |
|---|----------|-------------|------------|---------------|------------------------------|----------------|---------------|---------|---------|---------|---------|--------------|
| TER Opening Type (Uw = 1.40) | | | 13.3600 | 1.3258 | 17.7121 | | (27) | | | | | |
| 2. Column wall | 10.8300 | | 10.8300 | 0.1800 | 1.9494 | | (29a) | | | | | |
| 3. Uni panel cladding | 8.6900 | 4.7800 | 3.9100 | 0.1800 | 0.7038 | | (29a) | | | | | |
| 1. Uni panel brick | 34.7800 | 8.5800 | 26.2000 | 0.1800 | 4.7160 | | (29a) | | | | | |
| Total net area of external elements Aum(A, m2) | | | 54.3000 | | | | (31) | | | | | |
| Fabric heat loss, W/K = Sum (A x U) | | | | | (26)...(30) + (32) = 25.0813 | | (33) | | | | | |
| Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K | | | | | | | 250.0000 (35) | | | | | |
| Thermal bridges (Sum(L x Psi) calculated using Appendix K) | | | | | | | 4.1966 (36) | | | | | |
| Total fabric heat loss | | | | | | (33) + (36) = | 29.2779 (37) | | | | | |
| Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) | | | | | | | | | | | | |
| (38)m | 33.0221 | 32.8481 | 32.6775 | 31.8764 | 31.7265 | 31.0287 | 31.0287 | 30.8995 | 31.2975 | 31.7265 | 32.0297 | 32.3467 (38) |
| Heat transfer coeff | 62.3000 | 62.1260 | 61.9554 | 61.1543 | 61.0044 | 60.3066 | 60.3066 | 60.1774 | 60.5754 | 61.0044 | 61.3076 | 61.6246 (39) |
| Average = Sum(39)m / 12 = | | | | | | | | | | | | 61.1536 (39) |
| HLP | 0.9004 | 0.8979 | 0.8954 | 0.8839 | 0.8817 | 0.8716 | 0.8716 | 0.8697 | 0.8755 | 0.8817 | 0.8861 | 0.8907 (40) |
| HLP (average) | | | | | | | | | | | | 0.8838 (40) |
| Days in month | 31 | 28 | 31 | 30 | 31 | 30 | 31 | 31 | 30 | 31 | 30 | 31 (41) |

4. Water heating energy requirements (kWh/year)

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|----------|----------|----------|----------|----------|---------|---------|---------|---------|----------|----------|-----------------------------------|
| Assumed occupancy | | | | | | | | | | | | |
| Average daily hot water use (litres/day) | | | | | | | | | | | | 2.2263 (42) |
| Daily hot water use | 95.7821 | 92.2991 | 88.8161 | 85.3331 | 81.8501 | 78.3672 | 78.3672 | 81.8501 | 85.3331 | 88.8161 | 92.2991 | 95.7821 (44) |
| Energy conte | 142.0421 | 124.2309 | 128.1952 | 111.7636 | 107.2399 | 92.5399 | 85.7518 | 98.4014 | 99.5767 | 116.0470 | 126.6744 | 137.5602 (45) |
| Energy content (annual) | | | | | | | | | | | | Total = Sum(45)m = 1370.0229 (45) |
| Distribution loss (46)m = 0.15 x (45)m | | | | | | | | | | | | |
| | 21.3063 | 18.6346 | 19.2293 | 16.7645 | 16.0860 | 13.8810 | 12.8628 | 14.7602 | 14.9365 | 17.4070 | 19.0012 | 20.6340 (46) |
| Water storage loss: | | | | | | | | | | | | |
| Store volume | | | | | | | | | | | | 10.0000 (47) |
| a) If manufacturer declared loss factor is known (kWh/day): | | | | | | | | | | | | 0.3712 (48) |
| Temperature factor from Table 2b | | | | | | | | | | | | 0.5400 (49) |
| Enter (49) or (54) in (55) | | | | | | | | | | | | 0.2005 (55) |
| Total storage loss | | | | | | | | | | | | |

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

| | | | | | | | | | | | | |
|---|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|---------------|
| If cylinder contains dedicated solar storage | 6.2141 | 5.6127 | 6.2141 | 6.0136 | 6.2141 | 6.0136 | 6.2141 | 6.2141 | 6.0136 | 6.2141 | 6.0136 | 6.2141 (56) |
| Primary loss | 23.2624 | 21.0112 | 23.2624 | 22.5120 | 23.2624 | 22.5120 | 23.2624 | 23.2624 | 22.5120 | 23.2624 | 22.5120 | 23.2624 (57) |
| Total heat required for water heating calculated for each month | 171.5186 | 150.8548 | 157.6717 | 140.2893 | 136.7164 | 121.0655 | 115.2283 | 127.8779 | 128.1023 | 145.5235 | 155.2000 | 167.0367 (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 | 171.5186 | 150.8548 | 157.6717 | 140.2893 | 136.7164 | 121.0655 | 115.2283 | 127.8779 | 128.1023 | 145.5235 | 155.2000 | 167.0367 (64) |
| Heat gains from water heating, kWh/month | 70.8102 | 62.6059 | 66.2061 | 59.9819 | 59.2385 | 53.5900 | 52.0937 | 56.2997 | 55.9298 | 62.1668 | 64.9397 | 69.3200 (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) |
| (66)m | 111.3150 | 111.3150 | 111.3150 | 111.3150 | 111.3150 | 111.3150 | 111.3150 | 111.3150 | 111.3150 | 111.3150 | 111.3150 | 111.3150 | 111.3150 (66) |
| Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 | 17.6138 | 15.6444 | 12.7229 | 9.6321 | 7.2001 | 6.0786 | 6.5682 | 8.5375 | 11.4591 | 14.5499 | 16.9819 | 18.1034 | (67) |
| Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 | 195.3992 | 197.4269 | 192.3173 | 181.4396 | 167.7085 | 154.8032 | 146.1817 | 144.1541 | 149.2636 | 160.1413 | 173.8724 | 186.7777 | (68) |
| Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 | 34.1315 | 34.1315 | 34.1315 | 34.1315 | 34.1315 | 34.1315 | 34.1315 | 34.1315 | 34.1315 | 34.1315 | 34.1315 | 34.1315 | (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) | -89.0520 | -89.0520 | -89.0520 | -89.0520 | -89.0520 | -89.0520 | -89.0520 | -89.0520 | -89.0520 | -89.0520 | -89.0520 | -89.0520 | (71) |
| Water heating gains (Table 5) | 95.1750 | 93.1636 | 88.9867 | 83.3082 | 79.6216 | 74.4306 | 70.0184 | 75.6716 | 77.6802 | 83.5576 | 90.1941 | 93.1720 | (72) |
| Total internal gains | 367.5825 | 365.6294 | 353.4214 | 333.7744 | 313.9247 | 294.7069 | 282.1627 | 287.7577 | 297.7974 | 317.6433 | 340.4429 | 357.4475 | (73) |

6. Solar gains

| | | | | | | | | | | | | | |
|-------------|----------|------------|--------------------------------|-----------------------------------|------------------------------------|------------------------------|------------|----------|----------|----------|----------|----------|------|
| [Jan] | | Area m2 | Solar flux Table 6a W/m2 | g Specific data or Table 6b | FF Specific data or Table 6c | Access factor Table 6d | Gains W | (78) | | | | | |
| South | | 2.3900 | 46.7521 | 0.6300 | 0.7000 | 0.7700 | 34.1484 | (78) | | | | | |
| West | | 10.9700 | 19.6403 | 0.6300 | 0.7000 | 0.7700 | 65.8454 | (80) | | | | | |
| Solar gains | 99.9939 | 184.7340 | 283.3681 | 389.8927 | 463.0553 | 468.8750 | 448.4084 | 394.0244 | 321.1323 | 213.1629 | 122.5790 | 83.6555 | (83) |
| Total gains | 467.5764 | 550.3634 | 636.7895 | 723.6672 | 776.9800 | 763.5820 | 730.5712 | 681.7821 | 618.9297 | 530.8062 | 463.0219 | 441.1030 | (84) |

7. Mean internal temperature (heating season)

| | | | | | | | | | | | | | |
|---|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|--------------|
| Temperature during heating periods in the living area from Table 9, T _{hl} (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 | 77.1246 | 77.3406 | 77.5535 | 78.5695 | 78.7625 | 79.6738 | 79.6738 | 79.8449 | 79.3203 | 78.7625 | 78.3730 | 77.9698 | |
| alpha | 6.1416 | 6.1560 | 6.1702 | 6.2380 | 6.2508 | 6.3116 | 6.3116 | 6.3230 | 6.2880 | 6.2508 | 6.2249 | 6.1980 | |
| util living area | 0.9959 | 0.9885 | 0.9619 | 0.8712 | 0.6994 | 0.5021 | 0.3628 | 0.4052 | 0.6556 | 0.9262 | 0.9896 | 0.9971 | (86) |
| MIT | 20.1827 | 20.3510 | 20.5932 | 20.8438 | 20.9659 | 20.9963 | 20.9996 | 20.9992 | 20.9826 | 20.7962 | 20.4383 | 20.1517 | (87) |
| Th 2 | 20.1671 | 20.1693 | 20.1714 | 20.1812 | 20.1831 | 20.1917 | 20.1917 | 20.1933 | 20.1884 | 20.1831 | 20.1794 | 20.1754 | (88) |
| util rest of house | 0.9947 | 0.9850 | 0.9510 | 0.8404 | 0.6475 | 0.4402 | 0.2964 | 0.3346 | 0.5864 | 0.9000 | 0.9859 | 0.9962 | (89) |
| MIT 2 | 19.0770 | 19.3222 | 19.6680 | 20.0105 | 20.1530 | 20.1894 | 20.1916 | 20.1930 | 20.1761 | 19.9597 | 19.4581 | 19.0381 | (90) |
| Living area fraction | 19.5946 | 19.8038 | 20.1011 | 20.4006 | 20.5336 | 20.5671 | 20.5698 | 20.5704 | 20.5536 | 20.3513 | 19.9169 | 19.5594 | (92) |
| Temperature adjustment | | | | | | | | | | | | 0.0000 | |
| adjusted MIT | 19.5946 | 19.8038 | 20.1011 | 20.4006 | 20.5336 | 20.5671 | 20.5698 | 20.5704 | 20.5536 | 20.3513 | 19.9169 | 19.5594 | (93) |

8. Space heating requirement

| | | | | | | | | | | | | | |
|----------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|-------|
| Utilisation | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | (94) |
| Useful gains | 464.5517 | 541.0609 | 604.8848 | 614.5702 | 520.8472 | 358.2027 | 239.2657 | 250.6782 | 382.6283 | 480.9369 | 455.7949 | 439.0201 | (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 | 952.8535 | 925.9129 | 842.6637 | 703.3118 | 538.8863 | 359.8585 | 239.4066 | 250.9640 | 390.9307 | 594.8708 | 785.7745 | 946.5168 | (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 | 363.2965 | 258.6205 | 176.9075 | 63.8940 | 13.4211 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 84.7668 | 237.5853 | 377.5775 | (98) |
| Space heating | | | | | | | | | | | | 1576.0693 | (99) |
| Space heating per m2 | | | | | | | | | | | | 22.7789 | (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

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | |
|---|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------------|
| Fraction of space heat from secondary/supplementary system (Table 11) | | | | | | | | | | | | | 0.0000 (201) |
| Fraction of space heat from main system(s) | | | | | | | | | | | | | 1.0000 (202) |
| Efficiency of main space heating system 1 (in %) | | | | | | | | | | | | | 93.5000 (206) |
| Efficiency of secondary/supplementary heating system, % | | | | | | | | | | | | | 0.0000 (208) |
| Space heating requirement | | | | | | | | | | | | | 1685.6357 (211) |
| Space heating requirement | 363.2965 | 258.6205 | 176.9075 | 63.8940 | 13.4211 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 84.7668 | 237.5853 | 377.5775 | (98) |
| Space heating efficiency (main heating system 1) | 93.5000 | 93.5000 | 93.5000 | 93.5000 | 93.5000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 93.5000 | 93.5000 | 93.5000 | (210) |
| Space heating fuel (main heating system) | 388.5525 | 276.5995 | 189.2059 | 68.3358 | 14.3541 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 90.6597 | 254.1020 | 403.8262 | (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 | 171.5186 | 150.8548 | 157.6717 | 140.2893 | 136.7164 | 121.0655 | 115.2283 | 127.8779 | 128.1023 | 145.5235 | 155.2000 | 167.0367 | (64) |
| Efficiency of water heater (217)m | 86.7688 | 86.2399 | 85.1213 | 82.8658 | 80.6524 | 79.8000 | 79.8000 | 79.8000 | 79.8000 | 83.4309 | 85.9465 | 86.9252 | (216) |
| Fuel for water heating, kWh/month | 197.6732 | 174.9247 | 185.2317 | 169.2969 | 169.5131 | 151.7112 | 144.3964 | 160.2480 | 160.5292 | 174.4240 | 180.5775 | 192.1613 | (219) |
| Water heating fuel used | | | | | | | | | | | | | 2060.6870 (219) |
| Annual totals kWh/year | | | | | | | | | | | | | |
| Space heating fuel - main system | | | | | | | | | | | | | 1685.6357 (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) | | | | | | | | | | | | | 311.0656 (232) |
| Total delivered energy for all uses | | | | | | | | | | | | | 4132.3882 (238) |

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

| | Energy kWh/year | Emission factor kg CO2/kWh | Emissions kg CO2/year |
|---|--------------------|-------------------------------|--------------------------|
| Space heating - main system 1 | 1685.6357 | 0.2160 | 364.0973 (261) |
| Space heating - secondary | 0.0000 | 0.0000 | 0.0000 (263) |
| Water heating (other fuel) | 2060.6870 | 0.2160 | 445.1084 (264) |
| Space and water heating | | | 809.2057 (265) |
| Pumps and fans | 75.0000 | 0.5190 | 38.9250 (267) |
| Energy for lighting | 311.0656 | 0.5190 | 161.4430 (268) |
| Total CO2, kg/m2/year | | | 1009.5737 (272) |
| Emissions per m2 for space and water heating | | | 11.6954 (272a) |
| Fuel factor (mains gas) | | | 1.0000 |
| Emissions per m2 for lighting | | | 2.3333 (272b) |
| Emissions per m2 for pumps and fans | | | 0.5626 (272c) |
| Target Carbon Dioxide Emission Rate (TER) = (11.6954 * 1.00) + 2.3333 + 0.5626, rounded to 2 d.p. | | | 14.5900 (273) |

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

| | Area (m2) | Storey height (m) | Volume (m3) |
|--|--------------|---------------------------------|----------------------|
| Ground floor | 69.1900 (1b) | 2.5000 (2b) | 172.9750 (1b) - (3b) |
| Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) | 69.1900 | | (4) |
| Dwelling volume | | (3a)+(3b)+(3c)+(3d)+(3e)...(3n) | 172.9750 (5) |

2. Ventilation rate

| | main heating | secondary heating | other | total | m3 per hour |
|---|--------------|-------------------|-------|-----------------------------|--------------|
| Number of chimneys | 0 | 0 | 0 | 0 * 40 = | 0.0000 (6a) |
| Number of open flues | 0 | 0 | 0 | 0 * 20 = | 0.0000 (6b) |
| Number of intermittent fans | | | | 2 * 10 = | 20.0000 (7a) |
| Number of passive vents | | | | 0 * 10 = | 0.0000 (7b) |
| Number of flueless gas fires | | | | 0 * 40 = | 0.0000 (7c) |
| Air changes per hour | | | | | |
| Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = | | | | 20.0000 / (5) = | 0.1156 (8) |
| Pressure test | | | | Yes | |
| Measured/design AP50 | | | | | 3.0000 |
| Infiltration rate | | | | | 0.2656 (18) |
| Number of sides sheltered | | | | | 2 (19) |
| Shelter factor | | | | (20) = 1 - [0.075 x (19)] = | 0.8500 (20) |
| Infiltration rate adjusted to include shelter factor | | | | (21) = (18) x (20) = | 0.2258 (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 | | | | | | | | | | | | |
| Effective ac | 0.2879 | 0.2822 | 0.2766 | 0.2484 | 0.2427 | 0.2145 | 0.2145 | 0.2088 | 0.2258 | 0.2427 | 0.2540 | 0.2653 (22b) |
| Effective ac | 0.5414 | 0.5398 | 0.5382 | 0.5308 | 0.5295 | 0.5230 | 0.5230 | 0.5218 | 0.5255 | 0.5295 | 0.5323 | 0.5352 (25) |

3. Heat losses and heat loss parameter

| Element | Gross m2 | Openings m2 | NetArea m2 | U-value W/m2K | A x U W/K | K-value kJ/m2K | A x K kJ/K |
|--|----------|-------------|------------|----------------------|-----------|----------------|-----------------|
| Windows (Uw = 1.40) | | | 9.0700 | 1.3258 | 12.0246 | | (27) |
| Full glazed door (Uw = 1.40) | | | 4.2900 | 1.3258 | 5.6875 | | (27) |
| 2. Column wall | 10.8300 | | 10.8300 | 0.2700 | 2.9241 | 150.0000 | 1624.5000 (29a) |
| 3. Uni panel cladding | 8.6900 | 4.7800 | 3.9100 | 0.1400 | 0.5474 | 14.0000 | 54.7400 (29a) |
| 1. Uni panel brick | 34.7800 | 8.5800 | 26.2000 | 0.1400 | 3.6680 | 14.0000 | 366.8000 (29a) |
| Total net area of external elements Aum(A, m2) | | | 54.3000 | | | | (31) |
| Fabric heat loss, W/K = Sum (A x U) | | | | (26)...(30) + (32) = | 24.8516 | | (33) |
| Party Wall 1 | | | 1.1300 | 0.0000 | 0.0000 | 180.0000 | 203.4000 (32) |
| Party Wall 2 | | | 43.7000 | 0.0000 | 0.0000 | 70.0000 | 3059.0000 (32) |
| Party Floor | | | 69.1900 | | | 40.0000 | 2767.6000 (32d) |
| Party Ceilings | | | 69.1900 | | | 30.0000 | 2075.7000 (32b) |
| Internal Wall - SFS | | | 116.0000 | | | 9.0000 | 1044.0000 (32c) |

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 11195.7400 (34)
 Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 161.8115 (35)
 Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.9466 (36)
 Total fabric heat loss (33) + (36) = 30.7982 (37)

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

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|--------------|
| (38)m | 30.9060 | 30.8142 | 30.7242 | 30.3013 | 30.2222 | 29.8539 | 29.8539 | 29.7857 | 29.9958 | 30.2222 | 30.3823 | 30.5496 (38) |
| Heat transfer coeff | 61.7042 | 61.6124 | 61.5224 | 61.0995 | 61.0204 | 60.6522 | 60.6522 | 60.5840 | 60.7940 | 61.0204 | 61.1805 | 61.3478 (39) |
| Average = Sum(39)m / 12 = | | | | | | | | | | | | 61.0992 (39) |
| HLP | 0.8918 | 0.8905 | 0.8892 | 0.8831 | 0.8819 | 0.8766 | 0.8766 | 0.8756 | 0.8787 | 0.8819 | 0.8842 | 0.8867 (40) |
| HLP (average) | | | | | | | | | | | | 0.8831 (40) |
| Days in month | 31 | 28 | 31 | 30 | 31 | 30 | 31 | 31 | 30 | 31 | 30 | 31 (41) |

4. Water heating energy requirements (kWh/year)

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|--|----------|----------|----------|----------|----------|---------|---------|---------|---------|----------|----------|-----------------------------------|
| Assumed occupancy | | | | | | | | | | | | 2.2263 (42) |
| Average daily hot water use (litres/day) | | | | | | | | | | | | 87.0746 (43) |
| Daily hot water use | 95.7821 | 92.2991 | 88.8161 | 85.3331 | 81.8501 | 78.3672 | 78.3672 | 81.8501 | 85.3331 | 88.8161 | 92.2991 | 95.7821 (44) |
| Energy conte | 142.0421 | 124.2309 | 128.1952 | 111.7636 | 107.2399 | 92.5399 | 85.7518 | 98.4014 | 99.5767 | 116.0470 | 126.6744 | 137.5602 (45) |
| Energy content (annual) | | | | | | | | | | | | Total = Sum(45)m = 1370.0229 (45) |
| Distribution loss (46)m = 0.15 x (45)m | | | | | | | | | | | | |

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

| | | | | | | | | | | | | | |
|--|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|------|
| 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) |
| 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 | 30.1839 | 26.3991 | 27.2415 | 23.7498 | 22.7885 | 19.6647 | 18.2223 | 20.9103 | 21.1600 | 24.6600 | 26.9183 | 29.2315 | (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 | 111.3150 | 111.3150 | 111.3150 | 111.3150 | 111.3150 | 111.3150 | 111.3150 | 111.3150 | 111.3150 | 111.3150 | 111.3150 | 111.3150 | (66) |
| Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 | 17.6138 | 15.6444 | 12.7229 | 9.6321 | 7.2001 | 6.0786 | 6.5682 | 8.5375 | 11.4591 | 14.5499 | 16.9819 | 18.1034 | (67) |
| Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 | 195.3992 | 197.4269 | 192.3173 | 181.4396 | 167.7085 | 154.8032 | 146.1817 | 144.1541 | 149.2636 | 160.1413 | 173.8724 | 186.7777 | (68) |
| Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 | 34.1315 | 34.1315 | 34.1315 | 34.1315 | 34.1315 | 34.1315 | 34.1315 | 34.1315 | 34.1315 | 34.1315 | 34.1315 | 34.1315 | (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) | -89.0520 | -89.0520 | -89.0520 | -89.0520 | -89.0520 | -89.0520 | -89.0520 | -89.0520 | -89.0520 | -89.0520 | -89.0520 | -89.0520 | (71) |
| Water heating gains (Table 5) | 40.5698 | 39.2843 | 36.6149 | 32.9858 | 30.6297 | 27.3121 | 24.4923 | 28.1052 | 29.3889 | 33.1451 | 37.3865 | 39.2897 | (72) |
| Total internal gains | 309.9774 | 308.7501 | 298.0496 | 280.4520 | 261.9328 | 244.5885 | 233.6366 | 237.1913 | 246.5061 | 264.2309 | 284.6353 | 300.5653 | (73) |

6. Solar gains

| [Jan] | Area m2 | Solar flux Table 6a W/m2 | g Specific data or Table 6b | FF Specific data or Table 6c | Access factor Table 6d | Gains W | | | | | | | |
|-------------|------------|--------------------------------|-----------------------------------|------------------------------------|------------------------------|--------------|----------|----------|----------|----------|----------|----------|------|
| South | 2.3900 | 46.7521 | 0.4200 | 0.7000 | 0.7700 | 22.7656 (78) | | | | | | | |
| West | 6.6800 | 19.6403 | 0.4200 | 0.7000 | 0.7700 | 26.7303 (80) | | | | | | | |
| West | 4.2900 | 19.6403 | 0.4200 | 0.7000 | 0.7700 | 17.1666 (80) | | | | | | | |
| Solar gains | 66.6626 | 123.1560 | 188.9120 | 259.9285 | 308.7035 | 312.5834 | 298.9389 | 262.6829 | 214.0882 | 142.1086 | 81.7194 | 55.7703 | (83) |
| Total gains | 376.6399 | 431.9061 | 486.9616 | 540.3805 | 570.6363 | 557.1718 | 532.5756 | 499.8743 | 460.5943 | 406.3395 | 366.3547 | 356.3356 | (84) |

7. Mean internal temperature (heating season)

| Temperature during heating periods in the living area from Table 9, Thl (C) | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | |
|---|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|------|
| Utilisation factor for gains for living area, nil,m (see Table 9a) | 50.4005 | 50.4757 | 50.5495 | 50.8994 | 50.9653 | 51.2748 | 51.2748 | 51.3325 | 51.1552 | 50.9653 | 50.8320 | 50.6934 | (85) |
| alpha | 4.3600 | 4.3650 | 4.3700 | 4.3933 | 4.3977 | 4.4183 | 4.4183 | 4.4222 | 4.4103 | 4.3977 | 4.3888 | 4.3796 | |
| util living area | 0.9921 | 0.9848 | 0.9665 | 0.9168 | 0.8125 | 0.6469 | 0.4890 | 0.5381 | 0.7752 | 0.9443 | 0.9857 | 0.9937 | (86) |
| MIT | 19.6775 | 19.8587 | 20.1508 | 20.5077 | 20.7903 | 20.9439 | 20.9870 | 20.9803 | 20.8738 | 20.4935 | 20.0128 | 19.6358 | (87) |
| Th 2 | 20.1745 | 20.1756 | 20.1767 | 20.1819 | 20.1829 | 20.1874 | 20.1874 | 20.1883 | 20.1857 | 20.1829 | 20.1809 | 20.1789 | (88) |
| util rest of house | 0.9904 | 0.9817 | 0.9592 | 0.8986 | 0.7730 | 0.5798 | 0.4039 | 0.4511 | 0.7166 | 0.9284 | 0.9822 | 0.9924 | (89) |
| MIT 2 | 18.9532 | 19.1338 | 19.4225 | 19.7707 | 20.0284 | 20.1554 | 20.1824 | 20.1801 | 20.1051 | 19.7640 | 19.2922 | 18.9153 | (90) |
| Living area fraction | 19.2923 | 19.4732 | 19.7634 | 20.1157 | 20.3851 | 20.5245 | 20.5591 | 20.5547 | 20.4649 | 20.1055 | 19.6295 | 19.2526 | (91) |
| MIT | 19.2923 | 19.4732 | 19.7634 | 20.1157 | 20.3851 | 20.5245 | 20.5591 | 20.5547 | 20.4649 | 20.1055 | 19.6295 | 19.2526 | (92) |
| Temperature adjustment | | | | | | | | | | | | 0.0000 | |
| adjusted MIT | 19.2923 | 19.4732 | 19.7634 | 20.1157 | 20.3851 | 20.5245 | 20.5591 | 20.5547 | 20.4649 | 20.1055 | 19.6295 | 19.2526 | (93) |

8. Space heating requirement

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | |
|----------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|--------------|---------|------|
| Utilisation | 0.9881 | 0.9783 | 0.9549 | 0.8969 | 0.7834 | 0.6086 | 0.4434 | 0.4912 | 0.7381 | 0.9267 | 0.9792 | 0.9905 | (94) | |
| Useful gains | 372.1641 | 422.5342 | 465.0149 | 484.6689 | 447.0471 | 339.0814 | 236.1673 | 245.5470 | 339.9430 | 376.5348 | 358.7235 | 352.9351 | (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 | 925.0875 | 897.8882 | 815.9972 | 685.2739 | 529.9656 | 359.3350 | 240.1252 | 251.7102 | 386.9508 | 580.0273 | 766.5609 | 923.4445 | (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 | 411.3750 | 319.4379 | 261.1309 | 144.4356 | 61.6914 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 151.3985 | 293.6430 | 424.4590 | (98) | |
| Space heating | | | | | | | | | | | | 2067.5712 | (98) | |
| Space heating per m2 | | | | | | | | | | | | (98) / (4) = | 29.8825 | (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 | 570.1303 | 448.8260 | 460.4381 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | (100) |
| Utilisation | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.9019 | 0.9456 | 0.9305 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | (101) |
| Useful loss | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 514.2275 | 424.3924 | 428.4243 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | (102) |

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

| | | | | | | | | | | | | |
|--|--------|--------|--------|--------|--------|----------|----------|----------|--------|--------|--------|----------------|
| Total gains | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 734.0255 | 703.6136 | 666.7465 | 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 | | | | | | | | | | | | |
| Space cooling | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 158.2545 | 207.7406 | 177.3117 | 0.0000 | 0.0000 | 0.0000 | 0.0000 (104) |
| Space cooling | | | | | | | | | | | | 543.3068 (104) |
| Cooled fraction | | | | | | | | | | | | 1.0000 (105) |
| Intermittency factor (Table 10b) | | | | | | | | | | | | |
| Intermittency factor | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.2500 | 0.2500 | 0.2500 | 0.0000 | 0.0000 | 0.0000 | 0.0000 (106) |
| Space cooling kWh | | | | | | | | | | | | |
| Space cooling | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 39.5636 | 51.9351 | 44.3279 | 0.0000 | 0.0000 | 0.0000 | 0.0000 (107) |
| Space cooling | | | | | | | | | | | | 135.8267 (107) |
| Space cooling per m2 | | | | | | | | | | | | 1.9631 (108) |
| Energy for space heating | | | | | | | | | | | | 29.8825 (99) |
| Energy for space cooling | | | | | | | | | | | | 1.9631 (108) |
| Total | | | | | | | | | | | | 31.8456 (109) |
| Dwelling Fabric Energy Efficiency (DFEE) | | | | | | | | | | | | 31.8 (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 (m ²) | Storey height (m) | Volume (m ³) |
|--|------------------------|---------------------------------|--------------------------|
| Ground floor | 69.1900 (1b) | 2.5000 (2b) | 172.9750 (1b) - (3b) |
| Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) | 69.1900 | | (4) |
| Dwelling volume | | (3a)+(3b)+(3c)+(3d)+(3e)...(3n) | 172.9750 (5) |

2. Ventilation rate

| | main heating | secondary heating | other | total | m ³ per hour |
|---|--------------|-------------------|-------|-----------------------------|-------------------------|
| Number of chimneys | 0 | 0 | 0 | 0 * 40 = | 0.0000 (6a) |
| Number of open flues | 0 | 0 | 0 | 0 * 20 = | 0.0000 (6b) |
| Number of intermittent fans | | | | 2 * 10 = | 20.0000 (7a) |
| Number of passive vents | | | | 0 * 10 = | 0.0000 (7b) |
| Number of flueless gas fires | | | | 0 * 40 = | 0.0000 (7c) |
| Air changes per hour | | | | | |
| Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = | | | | 20.0000 / (5) = | 0.1156 (8) |
| Pressure test | | | | Yes | |
| Measured/design AP50 | | | | 5.0000 | |
| Infiltration rate | | | | 0.3656 | (18) |
| Number of sides sheltered | | | | 2 | (19) |
| Shelter factor | | | | (20) = 1 - [0.075 x (19)] = | 0.8500 (20) |
| Infiltration rate adjusted to include shelter factor | | | | (21) = (18) x (20) = | 0.3108 (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 | | | | | | | | | | | | |
| Effective ac | 0.3962 | 0.3885 | 0.3807 | 0.3419 | 0.3341 | 0.2952 | 0.2952 | 0.2875 | 0.3108 | 0.3341 | 0.3496 | 0.3652 (22b) |
| Effective ac | 0.5785 | 0.5755 | 0.5725 | 0.5584 | 0.5558 | 0.5436 | 0.5436 | 0.5413 | 0.5483 | 0.5558 | 0.5611 | 0.5667 (25) |

3. Heat losses and heat loss parameter

| Element | Gross m ² | Openings m ² | NetArea m ² | U-value W/m ² K | A x U W/K | K-value kJ/m ² K | A x K kJ/K | | | | | |
|---|----------------------|-------------------------|------------------------|----------------------------|----------------------|-----------------------------|---------------|---------|---------|---------|---------|--------------|
| TER Opening Type (Uw = 1.40) | | | 13.3600 | 1.3258 | 17.7121 | | (27) | | | | | |
| 2. Column wall | 10.8300 | | 10.8300 | 0.1800 | 1.9494 | | (29a) | | | | | |
| 3. Uni panel cladding | 8.6900 | 4.7800 | 3.9100 | 0.1800 | 0.7038 | | (29a) | | | | | |
| 1. Uni panel brick | 34.7800 | 8.5800 | 26.2000 | 0.1800 | 4.7160 | | (29a) | | | | | |
| Total net area of external elements Aum(A, m ²) | | | 54.3000 | | | | (31) | | | | | |
| Fabric heat loss, W/K = Sum (A x U) | | | | | (26)...(30) + (32) = | 25.0813 | (33) | | | | | |
| Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K | | | | | | | 250.0000 (35) | | | | | |
| Thermal bridges (Sum(L x Psi) calculated using Appendix K) | | | | | | | 4.1966 (36) | | | | | |
| Total fabric heat loss | | | | | | (33) + (36) = | 29.2779 (37) | | | | | |
| Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) | | | | | | | | | | | | |
| (38)m | 33.0221 | 32.8481 | 32.6775 | 31.8764 | 31.7265 | 31.0287 | 31.0287 | 30.8995 | 31.2975 | 31.7265 | 32.0297 | 32.3467 (38) |
| Heat transfer coeff | 62.3000 | 62.1260 | 61.9554 | 61.1543 | 61.0044 | 60.3066 | 60.3066 | 60.1774 | 60.5754 | 61.0044 | 61.3076 | 61.6246 (39) |
| Average = Sum(39)m / 12 = | | | | | | | | | | | | 61.1536 (39) |
| HLP | 0.9004 | 0.8979 | 0.8954 | 0.8839 | 0.8817 | 0.8716 | 0.8716 | 0.8697 | 0.8755 | 0.8817 | 0.8861 | 0.8907 (40) |
| HLP (average) | | | | | | | | | | | | 0.8838 (40) |
| Days in month | 31 | 28 | 31 | 30 | 31 | 30 | 31 | 31 | 30 | 31 | 30 | 31 (41) |

4. Water heating energy requirements (kWh/year)

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|--|----------|----------|----------|----------|----------|---------|---------|---------|---------|--------------------|----------|----------------|
| Assumed occupancy | | | | | | | | | | | | 2.2263 (42) |
| Average daily hot water use (litres/day) | | | | | | | | | | | | 87.0746 (43) |
| Daily hot water use | 95.7821 | 92.2991 | 88.8161 | 85.3331 | 81.8501 | 78.3672 | 78.3672 | 81.8501 | 85.3331 | 88.8161 | 92.2991 | 95.7821 (44) |
| Energy conte | 142.0421 | 124.2309 | 128.1952 | 111.7636 | 107.2399 | 92.5399 | 85.7518 | 98.4014 | 99.5767 | 116.0470 | 126.6744 | 137.5602 (45) |
| Energy content (annual) | | | | | | | | | | Total = Sum(45)m = | | 1370.0229 (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 | | | | | | | | | | | | |
| Primary loss | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 (57) |
| | | | | | | | | | | | | 0.0000 (59) |

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Heat gains from water heating, kWh/month
30.1839 26.3991 27.2415 23.7498 22.7885 19.6647 18.2223 20.9103 21.1600 24.6600 26.9183 29.2315 (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 | 111.3150 | 111.3150 | 111.3150 | 111.3150 | 111.3150 | 111.3150 | 111.3150 | 111.3150 | 111.3150 | 111.3150 | 111.3150 | 111.3150 (66) |
| Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 | 17.6138 | 15.6444 | 12.7229 | 9.6321 | 7.2001 | 6.0786 | 6.5682 | 8.5375 | 11.4591 | 14.5499 | 16.9819 | 18.1034 (67) |
| Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 | 195.3992 | 197.4269 | 192.3173 | 181.4396 | 167.7085 | 154.8032 | 146.1817 | 144.1541 | 149.2636 | 160.1413 | 173.8724 | 186.7777 (68) |
| Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 | 34.1315 | 34.1315 | 34.1315 | 34.1315 | 34.1315 | 34.1315 | 34.1315 | 34.1315 | 34.1315 | 34.1315 | 34.1315 | 34.1315 (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) | -89.0520 | -89.0520 | -89.0520 | -89.0520 | -89.0520 | -89.0520 | -89.0520 | -89.0520 | -89.0520 | -89.0520 | -89.0520 | -89.0520 (71) |
| Water heating gains (Table 5) | 40.5698 | 39.2843 | 36.6149 | 32.9858 | 30.6297 | 27.3121 | 24.4923 | 28.1052 | 29.3889 | 33.1451 | 37.3865 | 39.2897 (72) |
| Total internal gains | 309.9774 | 308.7501 | 298.0496 | 280.4520 | 261.9328 | 244.5885 | 233.6366 | 237.1913 | 246.5061 | 264.2309 | 284.6353 | 300.5653 (73) |

6. Solar gains

| [Jan] | Area m2 | Solar flux Table 6a W/m2 | g Specific data or Table 6b | FF Specific data or Table 6c | Access factor Table 6d | Gains W | | | | | | |
|-------------|------------|--------------------------------|-----------------------------------|------------------------------------|------------------------------|--------------|----------|----------|----------|----------|----------|---------------|
| South | 2.3900 | 46.7521 | 0.6300 | 0.7000 | 0.7700 | 34.1484 (78) | | | | | | |
| West | 10.9700 | 19.6403 | 0.6300 | 0.7000 | 0.7700 | 65.8454 (80) | | | | | | |
| Solar gains | 99.9939 | 184.7340 | 283.3681 | 389.8927 | 463.0553 | 468.8750 | 448.4084 | 394.0244 | 321.1323 | 213.1629 | 122.5790 | 83.6555 (83) |
| Total gains | 409.9712 | 493.4841 | 581.4177 | 670.3447 | 724.9881 | 713.4635 | 682.0451 | 631.2157 | 567.6384 | 477.3938 | 407.2144 | 384.2207 (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 | 77.1246 | 77.3406 | 77.5535 | 78.5695 | 78.7625 | 79.6738 | 79.6738 | 79.8449 | 79.3203 | 78.7625 | 78.3730 | 77.9698 |
| alpha | 6.1416 | 6.1560 | 6.1702 | 6.2380 | 6.2508 | 6.3116 | 6.3116 | 6.3230 | 6.2880 | 6.2508 | 6.2249 | 6.1980 |
| util living area | 0.9980 | 0.9934 | 0.9748 | 0.9006 | 0.7383 | 0.5358 | 0.3884 | 0.4372 | 0.7046 | 0.9521 | 0.9947 | 0.9986 (86) |
| MIT | 20.1024 | 20.2744 | 20.5280 | 20.8056 | 20.9542 | 20.9947 | 20.9994 | 20.9988 | 20.9743 | 20.7432 | 20.3625 | 20.0717 (87) |
| Th 2 | 20.1671 | 20.1693 | 20.1714 | 20.1812 | 20.1831 | 20.1917 | 20.1917 | 20.1933 | 20.1884 | 20.1831 | 20.1794 | 20.1754 (88) |
| util rest of house | 0.9974 | 0.9913 | 0.9670 | 0.8739 | 0.6866 | 0.4704 | 0.3174 | 0.3613 | 0.6339 | 0.9329 | 0.9927 | 0.9982 (89) |
| MIT 2 | 19.3429 | 19.5157 | 19.7660 | 20.0328 | 20.1550 | 20.1894 | 20.1915 | 20.1930 | 20.1756 | 19.9843 | 19.6124 | 19.3193 (90) |
| Living area fraction | fLA = Living area / (4) = | | | | | | | | | | | 0.4681 (91) |
| MIT | 19.6984 | 19.8709 | 20.1228 | 20.3946 | 20.5291 | 20.5664 | 20.5697 | 20.5702 | 20.5495 | 20.3396 | 19.9635 | 19.6715 (92) |
| Temperature adjustment | | | | | | | | | | | | 0.0000 |
| adjusted MIT | 19.6984 | 19.8709 | 20.1228 | 20.3946 | 20.5291 | 20.5664 | 20.5697 | 20.5702 | 20.5495 | 20.3396 | 19.9635 | 19.6715 (93) |

8. Space heating requirement

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|----------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|---------------------------|
| Utilisation | 0.9969 | 0.9904 | 0.9665 | 0.8814 | 0.7092 | 0.5010 | 0.3507 | 0.3969 | 0.6663 | 0.9371 | 0.9920 | 0.9979 (94) |
| Useful gains | 408.7004 | 488.7517 | 561.9273 | 590.8625 | 514.1717 | 357.4273 | 239.1912 | 250.5077 | 378.2365 | 447.3514 | 403.9697 | 383.3989 (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 | 959.3218 | 930.0805 | 844.0034 | 702.9418 | 538.6156 | 359.8140 | 239.4010 | 250.9514 | 390.6784 | 594.1578 | 788.6312 | 953.4269 (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 | 409.6623 | 296.5730 | 209.8647 | 80.6971 | 18.1862 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 109.2240 | 276.9563 | 424.1008 (98) |
| Space heating | | | | | | | | | | | | 1825.2644 (98) |
| Space heating per m2 | | | | | | | | | | | | (98) / (4) = 26.3805 (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 | 566.8823 | 446.2690 | 457.3483 | 0.0000 | 0.0000 | 0.0000 | 0.0000 (100) |
| Utilisation | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.9811 | 0.9931 | 0.9888 | 0.0000 | 0.0000 | 0.0000 | 0.0000 (101) |
| Useful loss | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 556.1479 | 443.1886 | 452.2435 | 0.0000 | 0.0000 | 0.0000 | 0.0000 (102) |
| Total gains | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 916.7041 | 878.3181 | 820.2625 | 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 | 259.6005 | 323.7364 | 273.8061 | 0.0000 | 0.0000 | 0.0000 | 0.0000 (104) |
| Space cooling | | | | | | | | | | | | 857.1430 (104) |
| Cooled fraction | | | | | | | | | | | | fC = cooled area / (4) = 1.0000 (105) |
| Intermittency factor (Table 10b) | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.2500 | 0.2500 | 0.2500 | 0.0000 | 0.0000 | 0.0000 | 0.0000 (106) |

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

| | | | | | | | | | | | | | |
|--|--------|--------|--------|--------|--------|---------|---------|---------|--------|--------|--------|--------|----------------|
| Space cooling kWh | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 64.9001 | 80.9341 | 68.4515 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | (107) |
| Space cooling | | | | | | | | | | | | | 214.2857 (107) |
| Space cooling per m2 | | | | | | | | | | | | | 3.0971 (108) |
| Energy for space heating | | | | | | | | | | | | | 26.3805 (99) |
| Energy for space cooling | | | | | | | | | | | | | 3.0971 (108) |
| Total | | | | | | | | | | | | | 29.4775 (109) |
| Target Fabric Energy Efficiency (TFEE) | | | | | | | | | | | | | 33.9 (109) |

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

| | | | | | |
|------------------------------------|---|---------------|------------------|-------------|-----------|
| Property Reference | WH190 Plot 330 | | Issued on Date | 24/02/2022 | |
| Assessment Reference | Plot 330 | Prop Type Ref | Flat Type B1N-07 | | |
| Property | Abbey Road Retail Park, Barking | | | | |
| SAP Rating | 86 B | DER | 8.02 | TER | 14.59 |
| Environmental | 94 A | % DER<TER | 45.04 | | |
| CO ₂ Emissions (t/year) | 0.45 | DFEE | 31.85 | TFEE | 33.90 |
| General Requirements Compliance | Pass | % DFEE<TFEE | 6.06 | | |
| Assessor Details | Mr. Paul Pasifull, Stansted Environmental Services, Tel: 01277225709, paul@sestesting.com | | | Assessor ID | Q133-0001 |
| Client | | | | | |

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

| | |
|-----------------------|--------------------|
| Orientation | East |
| Property Tenure | Unknown |
| Transaction Type | New dwelling |
| Terrain Type | Urban |
| 1.0 Property Type | Flat, End-Terrace |
| 2.0 Number of Storeys | 1 |
| 3.0 Date Built | 2022 |
| 4.0 Sheltered Sides | 2 |
| 5.0 Sunlight/Shade | Average or unknown |

| | | | | |
|------------------|---------------|---------------------|----------------------|-----------------------|
| 6.0 Measurements | | Heat Loss Perimeter | Internal Floor Area | Average Storey Height |
| | Ground Floor: | 19.75 m | 69.19 m ² | 2.50 m |

| | | |
|-----------------|-------|----------------|
| 7.0 Living Area | 32.39 | m ² |
|-----------------|-------|----------------|

| | | |
|----------------------------|---------------------|---------------------|
| 8.0 Thermal Mass Parameter | Precise calculation | |
| Thermal Mass | 171.81 | kJ/m ² K |

| 9.0 External Walls | | | | | | |
|-----------------------|-------------|---|------------------------------|-----------------------------|------------------------------|-----------------------------|
| Description | Type | Construction | U-Value (W/m ² K) | Kappa (kJ/m ² K) | Gross Area (m ²) | Nett Area (m ²) |
| 2. Column wall | Solid Wall | Solid wall : plasterboard on dabs, 200 mm dense block, insulated externally | 0.27 | 150.00 | 10.83 | 10.83 |
| 3. Uni panel cladding | Steel Frame | Steel frame wall (warm frame or hybrid construction) | 0.14 | 14.00 | 8.69 | 3.91 |
| 1. Uni panel brick | Steel Frame | Steel frame wall (warm frame or hybrid construction) | 0.14 | 14.00 | 34.78 | 26.20 |

| 9.1 Party Walls | | | | | |
|-----------------|---------------------------------|--|------------------------------|-----------------------------|------------------------|
| Description | Type | Construction | U-Value (W/m ² K) | Kappa (kJ/m ² K) | Area (m ²) |
| Party Wall 1 | Solid Wall | Dense plaster both sides, dense blocks, cavity or cavity fill | 0.00 | 180.00 | 1.13 |
| Party Wall 2 | Filled Cavity with Edge Sealing | Single plasterboard on dabs on both sides, dense blocks, cavity or cavity fill | 0.00 | 70.00 | 43.70 |

| 9.2 Internal Walls | | | | |
|---------------------|--------------|--|-----------------------------|------------------------|
| Description | Construction | | Kappa (kJ/m ² K) | Area (m ²) |
| Internal Wall - SFS | Other | | 9.00 | 116.00 |

10.1 Party Ceilings

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

| Description | Construction | Kappa (kJ/m ² K) | Area (m ²) |
|----------------|---|-----------------------------|------------------------|
| Party Ceilings | Precast concrete planks floor, screed, carpeted | 30.00 | 69.19 |

11.1 Party Floors

| Description | Construction | Kappa (kJ/m ² K) | Area (m ²) |
|-------------|---|-----------------------------|------------------------|
| Party Floor | Precast concrete planks floor, screed, carpeted | 40.00 | 69.19 |

12.0 Opening Types

| Description | Data Source | Type | Glazing | Glazing Gap | Argon Filled | G-value | Frame Type | Frame Factor | U Value (W/m ² K) |
|------------------|--------------|--------|-----------------------|-------------|--------------|---------|------------|--------------|------------------------------|
| Windows | Manufacturer | Window | Double Low-E Hard 0.2 | | | 0.42 | | 0.70 | 1.40 |
| Full glazed door | Manufacturer | Window | Double Low-E Hard 0.2 | | | 0.42 | | 0.70 | 1.40 |

13.0 Openings

| Name | Opening Type | Location | Orientation | Curtain Type | Overhang Ratio | Wide Overhang | Width (m) | Height (m) | Count | Area (m ²) | Curtain Closed |
|------------------|--------------|---------------------------|-------------|--------------|----------------|---------------|-----------|------------|-------|------------------------|----------------|
| Windows West | Window | [2] 3. Uni panel cladding | West | None | 0.00 | | | | | 2.39 | |
| Window West | Window | [3] 1. Uni panel brick | West | None | 0.00 | | | | | 4.29 | |
| Glazed Door West | Window | [3] 1. Uni panel brick | West | None | 0.00 | | | | | 4.29 | |
| Window South | Window | [2] 3. Uni panel cladding | South | None | 0.00 | | | | | 2.39 | |

14.0 Conservatory

15.0 Draught Proofing

 %

16.0 Draught Lobby

17.0 Thermal Bridging

17.1 List of Bridges

| Source Type | Bridge Type | Length | Psi | Imported |
|---------------------|---|--------|-------|----------|
| Table K1 - Approved | E2 Other lintels (including other steel lintels) | 6.34 | 0.300 | Yes |
| Table K1 - Approved | E4 Jamb | 16.88 | 0.050 | Yes |
| Table K1 - Approved | E7 Party floor between dwellings (in blocks of flats) | 11.83 | 0.070 | No |
| Table K1 - Approved | E7 Party floor between dwellings (in blocks of flats) | 19.75 | 0.070 | No |
| Table K1 - Approved | E16 Corner (normal) | 5.50 | 0.090 | No |
| Table K1 - Approved | E18 Party wall between dwellings | 2.75 | 0.060 | No |
| Table K1 - Default | E25 Staggered party wall between dwellings | 2.75 | 0.120 | No |
| Table K1 - Default | P3 Party wall - Intermediate floor between dwellings (in blocks of flats) | 16.30 | 0.000 | No |
| Table K1 - Default | P3 Party wall - Intermediate floor between dwellings (in blocks of flats) | 16.30 | 0.000 | No |
| Table K1 - Approved | E8 Balcony within a dwelling, wall insulation continuous | 7.92 | 0.000 | No |

| | | |
|---------|------------------------------------|--------------------|
| Y-value | <input type="text" value="0.110"/> | W/m ² K |
|---------|------------------------------------|--------------------|

18.0 Pressure Testing

| | | |
|---------------------------|-----------------------------------|---|
| Designed AP ₅₀ | <input type="text" value="3.00"/> | m ³ /(h.m ²) @ 50 Pa |
| Property Tested ? | <input type="text"/> | |
| As Built AP ₅₀ | <input type="text"/> | m ³ /(h.m ²) @ 50 Pa |

19.0 Mechanical Ventilation

Summer Overheating

| | |
|-----------------------------|---|
| Windows open in hot weather | <input type="text" value="Windows fully open"/> |
| Cross ventilation possible | <input type="text" value="No"/> |

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Night Ventilation

Air change rate

Mechanical Ventilation

Mechanical Ventilation System Present

Approved Installation

Mechanical Ventilation data Type

Type

MV Reference Number

Configuration

Manufacturer SFP

Duct Type

Wet Rooms

20.0 Fans, Open Fireplaces, Flues

| | MHS | SHS | Other | Total |
|------------------------------|-----|-----|-------|-------|
| Number of Chimneys | 0 | | 0 | 0 |
| Number of open flues | 0 | | 0 | 0 |
| Number of intermittent fans | | | | 0 |
| Number of passive vents | | | | 0 |
| Number of flueless gas fires | | | | 0 |

21.0 Fixed Cooling System

22.0 Lighting

Internal

Total number of light fittings

Total number of L.E.L. fittings

Percentage of L.E.L. fittings %

External

External lights fitted

23.0 Electricity Tariff

24.0 Main Heating 1

26.0 Community Heating

Community Heating

Space Community Heating

PCDF Index

Distribution Loss

Controls

SAP Code

PCDF Index

| | Heat Source | Fuel Type | Heating Use | Efficiency | Percentage Of Heat | Heat | Heat Power Ratio | Electrical |
|---------------|-------------------------|-----------|-----------------|------------|--------------------|-------|------------------|------------|
| Heat Source 1 | Boilers | Mains Gas | Space and Water | 91.40 | 17.40% | | | |
| Heat Source 2 | Combined Heat and Power | Mains Gas | Space and Water | 91.40 | 82.60% | 38.60 | 1.00 | 33.20 |

28.0 Water Heating

Water Heating

Flue Gas Heat Recovery System

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

| | | |
|--|--|----------|
| Waste Water Heat Recovery Instantaneous System 1 | <input type="text" value="No"/> | |
| Waste Water Heat Recovery Instantaneous System 2 | <input type="text" value="No"/> | |
| Waste Water Heat Recovery Storage System | <input type="text" value="No"/> | |
| Solar Panel | <input type="text" value="No"/> | |
| Water use <= 125 litres/person/day | <input type="text" value="Yes"/> | |
| SAP Code | <input type="text" value="901"/> | |
| <hr/> | | |
| 29.0 Hot Water Cylinder | <input type="text" value="HIU"/> | |
| Insulation Type | <input type="text" value="Measured Loss"/> | |
| Cylinder Volume | <input type="text" value="10.00"/> | L |
| Loss | <input type="text" value="0.40"/> | kWh/day |
| <hr/> | | |
| 32.0 Photovoltaic Unit | <input type="text" value="More Dwellings, One Block"/> | |
| Apportioned | <input type="text" value="265.00"/> | kWh/Year |

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None