

### **156 West End Lane**

FHP Energy Strategy - Appendices

March 2022 0001-L-FHP-DES-058-0001 Rev – P7



Inspiring Built Environments

MEP Sustainability & Building Physics Digital Engineering





### **Appendices**

Please refer to the separate appendices as follows:

- Appendix A Renewable Technology Considerations
- Appendix B CO<sub>2</sub> Emission Factors
- Appendix C Air Source Heat Pump Documentation
- Appendix D Site Compliance Report
- Appendix E Sample SAP/SBEM Results
- Appendix F PV Specification

FHP Energy Strategy Page 43



### **Appendix A – Renewable Technology Considerations**

#### **Combined Heat and Power**

CHP is the concurrent generation of both thermal (heat) energy and power (electricity) from one single source, usually natural gas. The power is generated via a reciprocating engine or turbine and generator and the thermal energy is recovered from the hot exhaust gases. The London Plan's Energy Hierarchy identifies combined heat and power (CHP) as a method of producing heat and electricity with much lower emissions than separate heat and power. The CHP would be implemented as part of a development wide heat network, comprising CHP supplemented by alternative heat sources such as gas boilers.

The implementation of a CHP strategy should be decided according to good practice design. Key factors to be considered for the efficient implementation of the CHP system are:

- Development with high heat demand load for the majority of the year.
- CHP operation based on maximum heat load for minimum 10 hours per day.
- CHP operation at maximum capacity of 90% of its operating period.

To ensure that CHP is financially viable it is essential that the unit is selected to meet the base heat load and that this load is maintained over a large proportion of the day to ensure that the additional costs (maintenance) associated with running a CHP unit can be recovered.

The need to run the CHP plant, as far as possible continuously makes the building load profile of prime importance when reviewing the viability of such solutions and in particular the summer time heat load profile. CHP systems only make financial sense to operate when the waste heat associated with generating the electricity is usefully used. To enable the CHP plant to run continuously when it is operating, a thermal store is often used so that excess CHP capacity can be used to generate hot water for use at a later time.

For this scheme the CHP has been discounted as it is no longer a viable technology with the new SAP10 carbon factors and the GLAs guidance.

#### **Wind Energy**

Wind energy is the energy captured by wind turbines and harnessed to generate electricity. There are two types of wind turbines, the horizontal axis turbine and the vertical axis turbine. Most of the wind turbines used for electricity generation are horizontal axis turbines. Wind turbines can be found in many sizes and outputs, from small battery charging turbines (say a rotor diameter of 1 or 2 metres with an output of a few hundred Watts) to the largest machines used to supply electricity to the grid (Rotor diameters in excess of 70m and output powers of over two MW). Wind turbines can be grid-connected in the same way as photovoltaic panels.

Due to buildings obstructing the path of wind within built environments the wind within urban areas is generally very turbulent. Wind in inner-city environments is usually gusty and at low speeds. Large scale wind turbines need a considerable wind speed to even start operating and should be installed on the ground and therefore the use of large wind turbines is not deemed possible for this site.

Small-scale wind turbines are more common in an inner-city environment; however, it has been shown that these wind turbines are not particularly effective unless installed above the surrounding buildings.

There are two main concerns with wind turbines, the aesthetic considerations and the limited output in an urban environment. It is considered that in this location the visual impact of even a modest-sized unit would be unacceptable and the buildings nearby would create unsatisfactory wind conditions therefore Wind Energy is considered unsuitable for the scheme.



### **Solar Thermal Energy**

Solar energy is the harnessing of energy from sun light and using it to raise the temperature of water. This is generally via a flat plate or evacuated tubes located on the roof space and orientated towards the sun.

Depending on the type of solar collector used, the weather conditions, and the hot water demand, the temperature of the water heated can vary from tepid to nearly boiling. Most solar systems are meant to furnish 20 to 85% of the annual demand for hot water, the remainder being met by conventional heating sources, which either raise the temperature of the water further or provide hot water when the solar water heating system cannot meet demand.

Allocation of the hot water to specific dwellings from the solar thermal hot water system is difficult on multiple dwelling buildings and is more suited to individual dwellings such as houses. There would also be a requirement for a large central water store increasing plant space within the building, therefore this technology has been discounted.

#### **Bio Energy**

In the UK at present the commercial bio-fuels that can be used in the context of emissions reduction are confined to either wood pellets or wood chips (biomass) or in special cases glycerine for CHP. Bio-diesel is not an acceptable fuel as it is easily replaced by petro-diesel so does not qualify under the applicable regulations.

Biomass is available from materials derived from biological sources. Biomass is any organic material which has stored sunlight in the form of chemical energy. As a fuel it may include wood, wood waste, straw, manure, sugar cane, and many other by products from a variety of agricultural processes. Energy from biomass is produced by burning organic matter. Biomass is carbon-based so when used as fuel it also generates carbon emissions. However, the carbon that is released

during combustion is equivalent to the amount that was absorbed during growth, and so the technology is carbon-neutral.

Biomass is dependent on a large store on site for the fuel and a requirement for regular deliveries to maintain fuel levels. Due to these requirements biomass is not deemed economic to the development. The burning of the fuels also gives off large quantities of  $NO_x$  and this is judged to be unacceptable in this location and has been discounted for his and other practical constraints associated with this type of system.

#### **Geothermal Energy (Ground Source Heat Pumps)**

Geothermal energy is the heat from the Earth. It's clean and sustainable. Resources of geothermal energy range from the shallow ground to hot water and hot rock found a few miles beneath the Earth's surface. Almost everywhere, the shallow ground or upper 10 feet of the Earth's surface maintains a nearly constant temperature between 10° and 16°C. GSHPs can tap into this resource to heat and cool buildings. A GSHP consists of a heat pump, distribution system and a heat exchanger-a system of pipes buried in the shallow ground near the building. In the winter, the heat pump removes heat from the heat exchanger and pumps it into the indoor air delivery system. In the summer, the process is reversed, and the heat pump moves heat from the indoor air into the heat exchanger. The heat removed from the indoor air during the summer can also be used to provide a free source of hot water.

Ground source energy can be gathered via horizontal ground loops, vertical bore holes or pipework within the building's piles. Horizontal ground loops require a large surface area, which is not available on the site and bore holes are not considered cost effective for the project it has therefore been discounted.



### Micro-Hydroelectricity

Large hydroelectric schemes are important energy sources in many countries, although in the UK only 0.8% of the electricity demand is produced in this way, mainly because there are very few suitable sites. The Government estimates that if all the rivers and streams in the UK could be harnessed the output would still only be 3% of the total demand, so while local schemes can be important, strategically, this is one of the less important technologies.

Micro-hydro is the term used for very small schemes, although it is applied to any scheme producing less than 1 MW. On-site micro-hydro is clearly totally dependent on the availability of a suitable river or stream that could be utilised in an environmentally acceptable way, and produce a worthwhile output, and such availability is so limited in typical urban sites as to make this a technology generally of no relevance.

The extraction of energy from flowing water will, by definition, reduce its velocity and change water levels, and introducing such changes even to a canalised urban river can have both upstream and downstream impacts. And where the site has a natural ecology the local impacts can be far greater and the necessary mitigation difficult to achieve. So, in conclusion, the most likely instance where a microhydro installation might be possible is one where an existing or historical site can be utilised, but these are very rare.

Micro-Hydroelectricity is clearly not suitable for this development.



### Appendix B - CO<sub>2</sub> Emission Factors

The GLA has decided that from January 2019 and until central Government updates Part L with the latest carbon emission factors, planning applicants are encouraged to use the SAP10 emission factors for referable applications when estimating  $CO_2$  emission performance against London Plan policies. This will ensure that the assessment of new developments better reflects the actual carbon emissions associated with their expected operation. This approach will remain in place until Government adopts new Building Regulations with updated emission factors. The timeline for this has not been confirmed but Part L is now in consultation.

Fuel	CO <sub>2</sub> emission factor kgCO <sub>2</sub> /kWh
Natural gas	0.210
Grid supplied electricity	0.233
Grid displaced electricity	0.233

### **Energy Strategy**



### Appendix C – Air Source Heat Pump Documentation

The following documents are included to support the inclusion of the air source heat pumps:

• Air Source Heat Pump Documentation



### **Heat Pump Sizing Assessment**

Project Ref SAV/HP/114544/RS(MD)/09 Nov 2021

Project Name West End Lane 156 (Rev 5)

Proposal 5no CAHV 43kW Heat Pump + Gas Boiler

Assessor Megan De Nysschen







### **Headlines**

Source of emission factors:

**SAP 10.1** 

**Project Region:** 

1 Thames

**Annual Heat Demand** 

746,039 kWh

**Site Temperatures** 

Flow: 60°C

Return: 30°C

Heat Pump
Max Outlet Temperature

**51°C** 

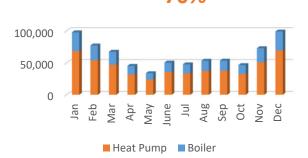
**COP & SCOP** 





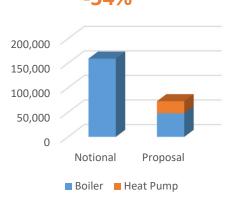
### **Heat Pump Share**

### 70%



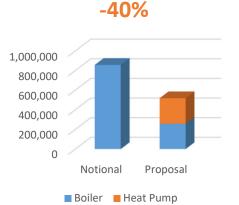
### Carbon Footprint (kg/CO<sub>2</sub>)

### -54%



# Comparison with Notional Building Primary Energy kWh

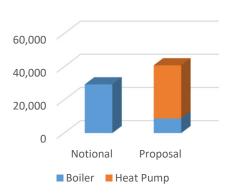
#### Timory Energy



<sup>\*</sup> Notional building with gas boiler

### Operating Cost (£)

+39%



### **Report**

### NOTE: This assessment is specific to the CAHV Heat Pump only - As supplied by SAV Systems

Number of 43 kW CAHV heat pumps

Minimum HP Thermal Store Capacity

Type of Building

Data reference

5

2000 litres

Multi-residential & Mixed Commercial

BRUKL & SAP data from FHP Energy Strategy - Appendices dated October 2021 Ref 0001-L-FHP-DES-058-0001 Rev 4-P4. Data taken

from 'Be Green' iterations of BRUKL & SAP

### 1.0 Summary of Usage:

Annual heat demand	746,039 kWh	See Appendix Table 1
Site flow temperature	60°C	
Site return temperature	30°C	
Heat pump flow temperature	51°C	
Gas tariff	3.87 p/kWh	As PCDB Fuel prices (From January 2021)
Electricity tariff	18.9 p/kWh	As PCDB Fuel prices (From January 2021)

#### 1.1 CO2 Emission Factors used:

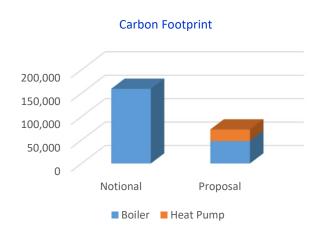
Source of emission factors used  $CO_2$  Emmission Factor for Gas  $CO_2$  Emission factor for Grid Electricity

SAP 10.1

0.210 kg CO2/kWh 0.146 kg CO2/kWh

### 2.0 Carbon Footprint Comparison:

Notional Building (Gas Boiler)	159,378 kg CO <sub>2</sub> pa (See Appendix Table 6)
Heat Pump Solution	72,529 kg CO <sub>2</sub> pa (See Appendix Table 3)
Reduction	86,849 kg CO <sub>2</sub> pa

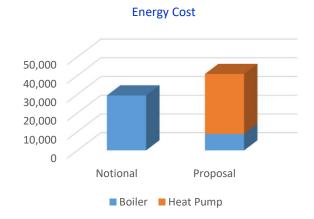


Carbon reduction due to proposed Heat Pump:

87 tonnes (compared with notional building) 86,849 / 159,378 = 54% reduction

### 3.0 Energy Cost Comparison:

Notional Building (Gas Boiler)	£29,371 (See Appendix Table 6)
Heat Pump Solution	£40,868 (See Appendix Table 4)
Increase	£11,497

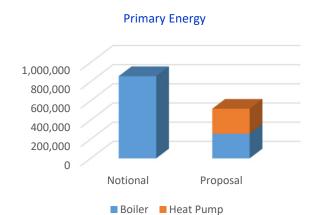


Energy cost increase due to proposed Heat Pump:

£11,497 (compared with notional building) £11,497 / £29,371 = 39% increase

### **4.0 Primary Energy Comparison:**

Notional Building (Gas Boiler)	857,603 kWh pa (See Appendix Table 6)
Heat Pump Solution	518,307 kWh pa (See Appendix Table 5)
Reduction	339,297 kWh pa

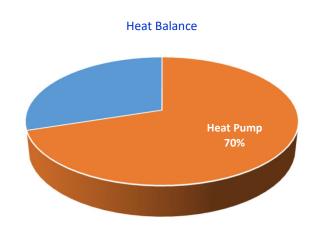


Primary Energy reduction due to proposed Heat Pump:

339,297 kWh (compared with notional building) 339,297 / 857,603 = 40% reduction

### 5.0 Heat Pump Share Of Heat

Building Heat Demand	746,039 kWh pa
Heat Pump Output	522,227 kWh pa (See Appendix Table 2)
Boiler Heat Output	223,812 kWh pa (See Appendix Table 2)
Heat Pump Share	70.0%
Boiler Heat Share	30.0%



### 6.0 Seasonal Coefficient of Performance - SCOP

Heat Pump SCOP

**3.08**See Appendix Table 2

COP = Instantaneous

= Power In / Power Out

SCOP\* = Seasonal

= Energy In / Energy Out

\* or SPF - Seasonal Performance Factor



### 7.0 Appendix

#### TABLE 1 - Heating & DHW Demands

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Project Space Heating Demand kW	/h 35,218	31,086	32,754	29,510	29,027	26,091	25,204	27,454	27,343	30,593	32,163	34,420	360,864
Project DHW Demand kW	<b>/h</b> 62,765	46,251	34,787	15,875	4,892	24,375	22,587	25,919	26,228	15,980	40,809	64,707	385,175
Total Heat Demand kW	/h 97,983	77,338	67,541	45,385	33,919	50,465	47,791	53,373	53,571	46,573	72,972	99,127	746,039

### TABLE 2 - Heat Pump / Boiler Share

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Project Heat Demand	kWh	97,983	77,338	67,541	45,385	33,919	50,465	47,791	53,373	53,571	46,573	72,972	99,127	746,039
Heat Pump Heat Output	kWh	68,588	54,136	47,279	31,770	23,743	35,326	33,453	37,361	37,500	32,601	51,081	69,389	522,227
СОР		2.71	2.71	2.91	3.13	3.30	3.65	3.80	3.77	3.58	3.27	3.00	2.79	3.08
Heat Pump Energy Input (Electric)	kWh	25,300	19,967	16,274	10,149	7,184	9,683	8,806	9,914	10,478	9,957	17,020	24,877	169,611
Supplimentary Boiler Heat Output	kWh	29,395	23,201	20,262	13,616	10,176	15,140	14,337	16,012	16,071	13,972	21,892	29,738	223,812
Boiler Efficiency		98%	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%	
Boiler Energy Input (Gas)	kWh	29,903	23,603	20,613	13,851	10,352	15,401	14,585	16,289	16,349	14,214	22,270	30,252	227,682
Share Of Heat From Heat Pump		70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%
Share Of Heat From Boiler		30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%

### TABLE 3 - CO<sub>2</sub> Calculations

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Heat Pump Energy Input (Electric) kWh	25,300	19,967	16,274	10,149	7,184	9,683	8,806	9,914	10,478	9,957	17,020	24,877	169,611
CO <sub>2</sub> Factor Electric	0.163	0.160	0.153	0.143	0.132	0.120	0.111	0.112	0.122	0.136	0.151	0.163	0.146
Carbon Emission for Heat Pump kg CO <sub>2</sub>	4,124	3,195	2,490	1,451	948	1,162	978	1,110	1,278	1,354	2,570	4,055	24,716
Boiler Energy Input (Gas) kWh	29,903	23,603	20,613	13,851	10,352	15,401	14,585	16,289	16,349	14,214	22,270	30,252	227,682
CO <sub>2</sub> Factor Gas	0.210	0.210	0.210	0.210	0.210	0.210	0.210	0.210	0.210	0.210	0.210	0.210	0.210
Carbon Emission for Gas Boilers kg CO <sub>2</sub>	6,280	4,957	4,329	2,909	2,174	3,234	3,063	3,421	3,433	2,985	4,677	6,353	47,813
Carbon Emission for Proposal kg CO <sub>2</sub>	10,404	8,151	6,819	4,360	3,122	4,396	4,040	4,531	4,712	4,339	7,247	10,408	72,529

#### **TABLE 4 - Energy Cost Calculations**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Heat Pump Energy Input (Electric) kWh	25,300	19,967	16,274	10,149	7,184	9,683	8,806	9,914	10,478	9,957	17,020	24,877	169,611
Fuel Tariff for Heat Pump Electric p/kWh	18.90	18.90	18.90	18.90	18.90	18.90	18.90	18.90	18.90	18.90	18.90	18.90	18.90
Heat Pump Energy Cost	£4,782	£3,774	£3,076	£1,918	£1,358	£1,830	£1,664	£1,874	£1,980	£1,882	£3,217	£4,702	£32,057
Boiler Energy Input (Gas) kWh	29,903	23,603	20,613	13,851	10,352	15,401	14,585	16,289	16,349	14,214	22,270	30,252	227,682
Fuel Tariff for Boiler Gas p/kWh	3.87	3.87	3.87	3.87	3.87	3.87	3.87	3.87	3.87	3.87	3.87	3.87	3.87
Boiler Energy Cost	£1,157	£913	£798	£536	£401	£596	£564	£630	£633	£550	£862	£1,171	£8,811
Energy Cost for Proposal	£5,939	£4,687	£3,873	£2,454	£1,758	£2,426	£2,229	£2,504	£2,613	£2,432	£4,079	£5,873	£40,868

TABLE 5 - Primary Energy Calculations

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Heat Pump Energy Input (Electric) k	cWh 25	5,300	19,967	16,274	10,149	7,184	9,683	8,806	9,914	10,478	9,957	17,020	24,877	169,611
Primary Energy Factor Electric	1	.602	1.593	1.568	1.530	1.487	1.441	1.410	1.413	1.449	1.504	1.558	1.604	1.539
Primary Energy Input for Heat Pump k	<b>cWh</b> 40	0,531	31,807	25,517	15,528	10,683	13,953	12,417	14,009	15,183	14,976	26,518	39,903	261,026
Boiler Energy Input (Gas) k	cWh 29	9,903	23,603	20,613	13,851	10,352	15,401	14,585	16,289	16,349	14,214	22,270	30,252	227,682
Primary Energy Factor Gas	1	.130	1.130	1.130	1.130	1.130	1.130	1.130	1.130	1.130	1.130	1.130	1.130	1.130
Primary Energy Input for Gas Boilers k	cWh 33	3,791	26,671	23,293	15,652	11,697	17,404	16,481	18,406	18,475	16,061	25,165	34,185	257,281
Primary Energy for Proposal k	c <b>Wh</b> 74	4,322	58,478	48,810	31,180	22,381	31,356	28,898	32,415	33,657	31,037	51,683	74,089	518,307

### TABLE 6 - Notional Building

		Jan	Feb	iviar	Apr	iviay	Jun	Jui	Aug	Sep	Oct	NOV	Dec	Teal
Boiler Heat Output	kWh	97,983	77,338	67,541	45,385	33,919	50,465	47,791	53,373	53,571	46,573	72,972	99,127	746,039
Boiler Efficiency		98%	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%	
Boiler Energy Input Gas	kWh	99,678	78,675	68,710	46,170	34,506	51,338	48,617	54,296	54,497	47,379	74,234	100,841	758,941
CO <sub>2</sub> Factor Gas		0.210	0.210	0.210	0.210	0.210	0.210	0.210	0.210	0.210	0.210	0.210	0.210	0.210
Carbon Emission for Boilers	kg CO <sub>2</sub>	20,932	16,522	14,429	9,696	7,246	10,781	10,210	11,402	11,444	9,950	15,589	21,177	159,378
Fuel Tariff for Boiler Gas	p/kWh	3.87	3.87	3.87	3.87	3.87	3.87	3.87	3.87	3.87	3.87	3.87	3.87	3.87
Boiler Energy Cost		£3,858	£3,045	£2,659	£1,787	£1,335	£1,987	£1,881	£2,101	£2,109	£1,834	£2,873	£3,903	£29,371
Primary Energy Factor Gas		1.130	1.130	1.130	1.130	1.130	1.130	1.130	1.130	1.130	1.130	1.130	1.130	1.13
Primary Energy Input for Boilers	kWh	112,636	88,903	77,642	52,172	38,992	58,012	54,937	61,355	61,582	53,538	83,885	113,951	857,603

### 8.0 References

Total DHW

TOTAL DHVV													
Quantity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total DHW
180	35,217.96	31,086.47	32,754.48	29,510.31	29,026.69	26,090.77	25,204.05	27,454.48	27,342.78	30,593.29	32,162.94	34,420.27	360,864.48
Total Heating													
Quantity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total DHW
180	62,765.39	46,251.14	34,786.98	15,874.90	4,892.49	0.00	0.00	0.00	0.00	15,980.04	40,809.23	64,706.61	286,066.78





**Appendix D - Site Compliance Report** 

**Be Lean Compliance** 



## **Block Compliance WorkSheet: East Block**

User Details

Assessor Name: Stroma Number:

Software Name: Stroma FSAP Software Version: Version: 1.0.5.12

Calculation Details

Dwelling	DER	TER	DFEE	TFEE	TFA
EB1-01	18.25	19.07	55.5	58.6	81.9
EB1-02	19.61	21.44	53.6	56.5	50.1
EB1-03	17.04	17.84	50.3	50.4	76.8
EB1-04	16.2	17.33	46.1	46.2	72.7
EB1-05	16.03	17.13	45.1	45.5	72.9
EB1-06	17.72	19.17	45.1	44.4	50.4
EB1-07	18.14	19.08	53.4	54.4	69.7
EB1-08	18.56	19.79	54.7	57.2	69.9
EB1-09	19.93	21.58	54.5	57.1	49.7
EB1-10	17.48	18.91	51.2	54.3	75
E0-01	18.79	20.11	56	60.3	71
E0-02	18.74	19.71	49.8	47.9	50.4
E0-03	19.69	20.73	53.6	53.3	50.3
E0-04	17.15	18.72	52.8	56.5	83.6
E0-05	18.27	19.41	48.5	47	50.1
E0-06	15.29	17.48	35.3	37.1	50.2
E0-07	17.6	19.98	45.5	49.9	50.2
E0-08	19.92	20.89	56.8	57.2	55.3
E0-09	17.24	19.27	43.3	45.5	50.1
E0-10	14.93	16.77	32.8	32.5	50.3
E0-11	15.18	16.97	41.8	44.1	72.2
E0-12	14.65	16.51	39	41.6	71.1
E0-13	15.14	17.01	33.5	33.4	49.6
E0-14	15.32	17.22	35.4	36.2	51.9
E0-15	14.42	16.33	38.4	41.2	71.2
E0-16	15.4	17.75	42.5	46.7	70.1



# Block Compliance WorkSheet: East BlockCont... Built environments

Dwelling	DER	TER	DFEE	TFEE	TFA
E0-17	17.35	19.72	44.5	49	50.5
E0-18	18.83	20.19	50.4	51.3	50.5
E0-19	14.77	17.29	32.6	35.2	50.2
E0-20	16.94	19.78	42.2	48.2	50.2
E1-01	16.43	18.11	46.1	49.9	70.1
E1-02	16.43	17.79	39.2	37.7	49.8
E1-03	16.82	18.67	43	45.4	54.5
E1-04	13.62	16.19	34.5	38.6	70.1
E1-05	19.69	20.69	54.4	53.6	50.1
E1-06	15.17	17.47	34.8	37.3	50.3
E1-07	16.31	18.39	40	42	50.3
E1-08	17.11	19.74	43.5	48.2	50.8
E1-09	15.9	17.79	44.4	48.1	70.1
E1-10	15.16	16.92	34.9	34.5	52.6
E1-11	15.49	17.26	36	35.7	51.6
E1-12	13.77	15.49	36.5	38.3	76.7
E1-13	13.57	15.29	35.8	37.8	78.2
E1-14	16.04	17.8	37.7	37.4	49.5
E1-15	15.58	17.45	35.8	36.4	50.3
E1-16	13.98	15.7	36.6	38.7	73.1
E1-17	13.88	16.17	35.4	39.3	69.5
E1-18	15.7	17.93	36.7	39.3	50
E1-19	17.07	18.5	42.7	42.6	50.3
E1-20	14.93	17.49	33.1	36.2	50.2
E1-21	17.06	19.2	43.2	46.1	50.2
E2-01	19.7	21.06	59.7	65.2	70.1
E2-02	19.02	20.35	50.2	51	49.8
E2-03	20.71	21.94	59.3	62.2	54.5
E2-04	16.7	18.94	47.5	52.7	70.1
E2-05	22.97	23.39	67.2	67.6	50.1



# Block Compliance WorkSheet: East BlockCont... Built environments

Dwelling	DER	TER	DFEE	TFEE	TFA
E2-06	17.52	19.85	45.2	49.5	50.3
E2-07	16.71	18.91	41.7	44.7	50.3
E2-08	15.16	17.68	34.8	37.6	50.8
E2-09	13.87	15.87	35.6	38.3	70.1
E2-10	14.61	16.39	32.3	31.7	52.6
E2-11	14.94	16.72	33.5	32.9	51.6
E2-12	13.24	14.97	34.1	35.6	76.7
E2-13	13.06	14.81	33.6	35.3	78.2
E2-14	15.3	17.08	34.3	33.6	49.5
E2-15	15.12	16.86	33.6	33.3	50.3
E2-16	13.55	15.5	34.7	37.6	73.1
E2-17	14.65	16.73	38.8	42.2	69.5
E2-18	20.41	22.07	56.9	60.8	50
E2-19	22.22	23.07	64.3	66.3	50.3
E2-20	18.37	20.4	48.2	51.3	50.2
E2-21	17.19	18.34	42.9	41	50.2
E3-01	14.91	16.71	41.6	46.2	80.2
E3-02	16.43	16.63	42.9	42.6	70.9
E3-03	13.85	15.83	35.7	38.4	70.9
E3-04	14.64	16.4	32.4	31.8	52.6
E3-05	14.99	16.74	33.6	33	51.5
E3-06	13.24	14.97	34.1	35.6	76.7
E3-07	13.07	14.81	33.6	35.3	78.2
E3-08	15.3	17.08	34.3	33.6	49.5
E3-09	15.26	16.93	34.3	33.7	50.3
E3-10	13.75	15.5	34.7	37.6	73.1
E3-11	15.44	18.05	37.3	41.8	53.4
E3-12	15.21	17.25	41.6	46.8	73.9
E4-01	17.23	18.39	51.3	54.9	80.2
E4-02	17.68	19.24	51.4	55.9	70.9



# Block Compliance WorkSheet: East BlockCont... BUILT ENVIRONMENTS

Dwelling	DER	TER	DFEE	TFEE	TFA
E4-03	15.95	17.86	44.8	48.7	70.9
E4-04	15.32	17.13	35.7	35.7	52.6
E4-05	15.57	17.38	36.4	36.4	51.5
E4-06	15.22	16.83	42.7	45.2	76.7
E4-07	16.19	17.66	47	50.1	78.2
E4-08	18.14	19.6	47	46.8	49.5
E4-09	18.19	19.48	47.4	47	50.3
E4-10	17.66	18.88	51.4	55.1	73.1
E4-11	20.02	22.07	56.5	62.2	53.4
E4-12	19.39	20.87	58.9	65.4	73.9
E5-01	22.85	24.18	68.2	73.3	53.9
E5-02	22.01	22.7	64.3	65.3	52.3
E5-03	17.51	18.44	51.7	53.1	74.5
E5-04	18.23	19.53	47.9	49.4	54.9
E5-05	19.06	20.1	57.8	61.4	73.4

#### Calculation Summary

Total Floor Area	6126.10
Average TER	18.18
Average DER	16.52
Average DFEE	43.98
Average TFEE	46.11
Compliance	Pass
% Improvement DER TER	9.13
% Improvement DFEE TFEE	4.62



## **Block Compliance WorkSheet: West Block**

User Details

Assessor Name: Stroma Number:

Software Name: Stroma FSAP Software Version: 1.0.5.12

Calculation Details

Dwelling	DER	TER	DFEE	TFEE	TFA
W1-01	18.39	20.51	48.6	52.6	50.8
W1-02	15.93	17.99	46.6	52.1	79.4
W1-03	14.95	16.96	43.7	49	86.4
W1-04	17.45	19.77	44.9	48.3	50.7
W1-05	15	16.94	41.9	46.3	76.9
W1-06	17.06	20.01	43.7	50.2	51.8
W1-07	17.89	20.85	47.1	54.6	51.8
W1-08	17.92	20.85	47.2	54.6	51.8
W1-09	16.95	19.07	50.2	56.7	75.1
W1-10	17.67	19.72	49.7	55.2	62.8
W1-11	18.18	20.88	48.7	55.8	51.8
W1-12	19.96	22.67	55.9	64.1	50.7
W2-01	14.53	17.28	43.6	53.1	94.3
W2-02	18.21	20.8	54.2	62.2	70.5
W2-03	17.28	18.69	48.1	50.6	64.7
W2-04	15.41	17.13	46.4	51	89.2
W2-05	15.9	17.79	48	53.2	86.1
W2-06	14.66	16.04	44	47.5	96.6
W2-07	15.7	17.66	36.7	37.7	50.8
W2-08	13.37	15.28	35.6	38.1	79.4
W2-09	12.55	14.35	33.1	35.5	86.4
W2-10	14.78	16.84	32.7	33.2	50.7
W2-11	12.71	14.47	31.7	33.5	76.9
W2-12	14.38	17.18	31.6	35.5	51.8
W2-13	14.37	17.16	31.5	35.4	51.8
W2-14	14.37	17.16	31.5	35.4	51.8



# Block Compliance WorkSheet: West BlockContinuous Built environments

Dwelling	DER	TER	DFEE	TFEE	TFA
W2-15	18.72	19.54	57.5	59.1	75.1
W2-16	17.98	19.16	51	52.3	62.8
W2-17	14.63	17.29	33.1	37.3	51.8
W2-18	16.65	19.39	42	47.3	50.7
W3-01	12.78	14.81	36.2	40.6	94.3
W3-02	14.95	17.74	40.8	46.5	70.5
W3-03	14.95	16.13	38.1	37.3	64.7
W3-04	12.97	14.52	36	37.6	89.2
W3-05	13.36	15.07	37.2	39.4	86.1
W3-06	12.33	13.55	34.3	34.8	96.6
W3-07	15.49	17.46	35.8	36.7	50.8
W3-08	13.37	15.28	35.7	38.1	79.4
W3-09	12.55	14.35	33.1	35.5	86.4
W3-10	14.78	16.84	32.7	33.2	50.7
W3-11	12.71	14.47	31.7	33.5	76.9
W3-12	14.37	17.16	31.5	35.4	51.8
W3-13	14.37	17.16	31.5	35.4	51.8
W3-14	16.9	18.72	42.9	42.9	50.3
W3-15	16.52	18.82	41.6	45.1	52.1
W3-16	14.31	17.09	31.2	35	51.8
W3-17	16.65	19.39	42	47.3	50.7
W4-01	14.51	16.23	43.5	47.8	94.3
W4-02	14.92	17.71	40.7	46.3	70.5
W4-03	17	18.03	47	47.1	64.7
W4-04	13.77	15.27	39.5	41.4	89.2
W4-05	14.14	15.8	40.6	43.1	86.1
W4-06	14.26	15.18	42.7	43.1	96.6
W4-07	16.7	18.54	41.3	42.4	50.8
W4-08	14.88	16.41	42.2	43.9	79.4
W4-09	14.38	15.83	41	43.1	86.4



# Block Compliance WorkSheet: West BlockContinuous Built ENVIRONMENTS

Dwelling	DER	TER	DFEE	TFEE	TFA
W4-10	15.91	17.82	38.1	38.3	50.7
W4-11	14.26	15.72	39	40	76.9
W4-12	14.37	17.16	31.5	35.4	51.8
W4-13	14.37	17.16	31.5	35.4	51.8
W4-14	21.12	21.83	60.2	58.9	50.3
W4-15	21.64	22.48	62.9	64.1	52.1
W4-16	14.37	17.15	31.5	35.3	51.8
W4-17	16.66	19.4	42.1	47.4	50.7
W5-01	15.66	17.06	47.3	50.6	90.3
W5-02	20.14	22.23	59.5	66.5	61.8
W5-03	20.61	20.91	56.9	53.8	48.7
W5-04	16.21	17.77	49.3	53.5	87.1
W5-05	16.47	17.66	49.4	51.9	82.5
W5-06	17.44	18.76	51.7	54.3	73.6
W5-07	18.7	20.33	49.2	50.4	48.9
W5-08	19.55	20.48	56.8	57.6	60.9
W5-09	17.95	19.08	51.4	53.8	68
W5-10	18.59	20.11	49.6	50.1	51.6
W5-11	20.54	20.84	57.8	55.3	51.4
W5-12	17.88	20.18	47.1	51.1	51.8
W5-13	20.41	21.06	61.8	62.5	64.2
W5-14	20.74	20.77	65.3	64.3	72.4
W5-15	19.69	22.08	54.8	61	50.7

### Calculation Summary

Total Floor Area	5253.50



# Block Compliance WorkSheet: West BlockContinuous Built ENVIRONMENTS

Average TER	17.71
Average DER	15.86
Average DFEE	43.37
Average TFEE	46.50
Compliance	Pass
% Improvement DER TER	10.45
% Improvement DFEE TFEE	6.73

Energy Strategy



**Be Green Compliance** 



## **Block Compliance WorkSheet: East Block**

User Details

Assessor Name: Stroma Number:

Software Name: Stroma FSAP Software Version: 1.0.5.12

Calculation Details

Dwelling	DER	TER	DFEE	TFEE	TFA
EB1-01	-105.95	19.07	55.5	58.6	81.9
EB1-02	17.86	21.44	53.6	56.5	50.1
EB1-03	15.55	17.84	50.3	50.4	76.8
EB1-04	14.81	17.33	46.1	46.2	72.7
EB1-05	14.65	17.13	45.1	45.5	72.9
EB1-06	16.18	19.17	45.1	44.4	50.4
EB1-07	16.54	19.08	53.4	54.4	69.7
EB1-08	16.93	19.79	54.7	57.2	69.9
EB1-09	18.15	21.58	54.5	57.1	49.7
EB1-10	15.96	18.91	51.2	54.3	75
E0-01	17.11	20.11	56	60.3	71
E0-02	17.08	19.71	49.8	47.9	50.4
E0-03	17.92	20.73	53.6	53.3	50.3
E0-04	15.65	18.72	52.8	56.5	83.6
E0-05	16.65	19.41	48.5	47	50.1
E0-06	14.01	17.48	35.3	37.1	50.2
E0-07	16.07	19.98	45.5	49.9	50.2
E0-08	18.13	20.89	56.8	57.2	55.3
E0-09	15.75	19.27	43.3	45.5	50.1
E0-10	13.69	16.77	32.8	32.5	50.3
E0-11	13.89	16.97	41.8	44.1	72.2
E0-12	13.42	16.51	39	41.6	71.1
E0-13	13.87	17.01	33.5	33.4	49.6
E0-14	14.03	17.22	35.4	36.2	51.9
E0-15	13.22	16.33	38.4	41.2	71.2
E0-16	14.11	17.75	42.5	46.7	70.1



# Block Compliance WorkSheet: East BlockCont... Built environments

Dwelling	DER	TER	DFEE	TFEE	TFA
E0-17	15.84	19.72	44.5	49	50.5
E0-18	17.16	20.19	50.4	51.3	50.5
E0-19	13.56	17.29	32.6	35.2	50.2
E0-20	15.49	19.78	42.2	48.2	50.2
E1-01	15.01	18.11	46.1	49.9	70.1
E1-02	15.02	17.79	39.2	37.7	49.8
E1-03	15.37	18.67	43	45.4	54.5
E1-04	12.52	16.19	34.5	38.6	70.1
E1-05	17.92	20.69	54.4	53.6	50.1
E1-06	13.9	17.47	34.8	37.3	50.3
E1-07	14.91	18.39	40	42	50.3
E1-08	15.64	19.74	43.5	48.2	50.8
E1-09	14.54	17.79	44.4	48.1	70.1
E1-10	13.89	16.92	34.9	34.5	52.6
E1-11	14.18	17.26	36	35.7	51.6
E1-12	12.64	15.49	36.5	38.3	76.7
E1-13	12.45	15.29	35.8	37.8	78.2
E1-14	14.67	17.8	37.7	37.4	49.5
E1-15	14.26	17.45	35.8	36.4	50.3
E1-16	12.83	15.7	36.6	38.7	73.1
E1-17	12.74	16.17	35.4	39.3	69.5
E1-18	14.37	17.93	36.7	39.3	50
E1-19	15.59	18.5	42.7	42.6	50.3
E1-20	13.7	17.49	33.1	36.2	50.2
E1-21	15.59	19.2	43.2	46.1	50.2
E2-01	17.92	21.06	59.7	65.2	70.1
E2-02	17.33	20.35	50.2	51	49.8
E2-03	18.83	21.94	59.3	62.2	54.5
E2-04	15.26	18.94	47.5	52.7	70.1
E2-05	20.85	23.39	67.2	67.6	50.1



# Block Compliance WorkSheet: East BlockCont... Built environments

Dwelling	DER	TER	DFEE	TFEE	TFA
E2-06	16	19.85	45.2	49.5	50.3
E2-07	15.27	18.91	41.7	44.7	50.3
E2-08	13.9	17.68	34.8	37.6	50.8
E2-09	12.73	15.87	35.6	38.3	70.1
E2-10	13.4	16.39	32.3	31.7	52.6
E2-11	13.7	16.72	33.5	32.9	51.6
E2-12	12.17	14.97	34.1	35.6	76.7
E2-13	12.01	14.81	33.6	35.3	78.2
E2-14	14.02	17.08	34.3	33.6	49.5
E2-15	13.85	16.86	33.6	33.3	50.3
E2-16	12.44	15.5	34.7	37.6	73.1
E2-17	13.43	16.73	38.8	42.2	69.5
E2-18	18.57	22.07	56.9	60.8	50
E2-19	20.18	23.07	64.3	66.3	50.3
E2-20	16.76	20.4	48.2	51.3	50.2
E2-21	15.7	18.34	42.9	41	50.2
E3-01	13.66	16.71	41.6	46.2	80.2
E3-02	15.03	16.63	42.9	42.6	70.9
E3-03	12.72	15.83	35.7	38.4	70.9
E3-04	13.43	16.4	32.4	31.8	52.6
E3-05	13.74	16.74	33.6	33	51.5
E3-06	12.16	14.97	34.1	35.6	76.7
E3-07	12.01	14.81	33.6	35.3	78.2
E3-08	14.02	17.08	34.3	33.6	49.5
E3-09	13.98	16.93	34.3	33.7	50.3
E3-10	12.63	15.5	34.7	37.6	73.1
E3-11	14.14	18.05	37.3	41.8	53.4
E3-12	13.94	17.25	41.6	46.8	73.9
E4-01	15.73	18.39	51.3	54.9	80.2
E4-02	16.14	19.24	51.4	55.9	70.9



# Block Compliance WorkSheet: East BlockCont... BUILT ENVIRONMENTS

Dwelling	DER	TER	DFEE	TFEE	TFA
E4-03	14.58	17.86	44.8	48.7	70.9
E4-04	14.03	17.13	35.7	35.7	52.6
E4-05	14.26	17.38	36.4	36.4	51.5
E4-06	13.93	16.83	42.7	45.2	76.7
E4-07	14.79	17.66	47	50.1	78.2
E4-08	16.55	19.6	47	46.8	49.5
E4-09	16.59	19.48	47.4	47	50.3
E4-10	16.12	18.88	51.4	55.1	73.1
E4-11	18.22	22.07	56.5	62.2	53.4
E4-12	17.66	20.87	58.9	65.4	73.9
E5-01	20.74	24.18	68.2	73.3	53.9
E5-02	19.99	22.7	64.3	65.3	52.3
E5-03	15.97	18.44	51.7	53.1	74.5
E5-04	16.64	19.53	47.9	49.4	54.9
E5-05	17.35	20.1	57.8	61.4	73.4

#### Calculation Summary

Total Floor Area	6126.10
Average TER	18.18
Average DER	13.46
Average DFEE	43.98
Average TFEE	46.11
Compliance	Pass
% Improvement DER TER	25.96
% Improvement DFEE TFEE	4.62



## **Block Compliance WorkSheet: West Block**

User Details

Assessor Name: Stroma Number:

Software Name: Stroma FSAP Software Version: 1.0.5.12

Calculation Details

Dwelling	DER	TER	DFEE	TFEE	TFA
W1-01	-865.54	20.51	48.6	52.6	50.8
W1-02	14.56	17.99	46.6	52.1	79.4
W1-03	13.69	16.96	43.7	49	86.4
W1-04	15.94	19.77	44.9	48.3	50.7
W1-05	13.74	16.94	41.9	46.3	76.9
W1-06	15.6	20.01	43.7	50.2	51.8
W1-07	16.35	20.85	47.1	54.6	51.8
W1-08	16.37	20.85	47.2	54.6	51.8
W1-09	15.48	19.07	50.2	56.7	75.1
W1-10	16.13	19.72	49.7	55.2	62.8
W1-11	16.59	20.88	48.7	55.8	51.8
W1-12	18.17	22.67	55.9	64.1	50.7
W2-01	13.31	17.28	43.6	53.1	94.3
W2-02	16.62	20.8	54.2	62.2	70.5
W2-03	15.78	18.69	48.1	50.6	64.7
W2-04	14.09	17.13	46.4	51	89.2
W2-05	14.53	17.79	48	53.2	86.1
W2-06	13.43	16.04	44	47.5	96.6
W2-07	14.37	17.66	36.7	37.7	50.8
W2-08	12.28	15.28	35.6	38.1	79.4
W2-09	11.56	14.35	33.1	35.5	86.4
W2-10	13.55	16.84	32.7	33.2	50.7
W2-11	11.7	14.47	31.7	33.5	76.9
W2-12	13.21	17.18	31.6	35.5	51.8
W2-13	14.36	18.81	37.6	44	51.8
W2-14	13.2	17.16	31.5	35.4	51.8



# Block Compliance WorkSheet: West BlockContinuous Built environments

Dwelling	DER	TER	DFEE	TFEE	TFA
W2-15	17.06	19.54	57.5	59.1	75.1
W2-16	16.4	19.16	51	52.3	62.8
W2-17	13.42	17.29	33.1	37.3	51.8
W2-18	15.23	19.39	42	47.3	50.7
W3-01	11.75	14.81	36.2	40.6	94.3
W3-02	13.71	17.74	40.8	46.5	70.5
W3-03	13.71	16.13	38.1	37.3	64.7
W3-04	11.91	14.52	36	37.6	89.2
W3-05	12.26	15.07	37.2	39.4	86.1
W3-06	11.35	13.55	34.3	34.8	96.6
W3-07	14.19	17.46	35.8	36.7	50.8
W3-08	12.29	15.28	35.7	38.1	79.4
W3-09	11.56	14.35	33.1	35.5	86.4
W3-10	13.55	16.84	32.7	33.2	50.7
W3-11	11.7	14.47	31.7	33.5	76.9
W3-12	13.2	17.16	31.5	35.4	51.8
W3-13	13.2	17.16	31.5	35.4	51.8
W3-14	15.45	18.72	42.9	42.9	50.3
W3-15	15.11	18.82	41.6	45.1	52.1
W3-16	13.15	17.09	31.2	35	51.8
W3-17	15.23	19.39	42	47.3	50.7
W4-01	13.29	16.23	43.5	47.8	94.3
W4-02	13.68	17.71	40.7	46.3	70.5
W4-03	15.53	18.03	47	47.1	64.7
W4-04	12.63	15.27	39.5	41.4	89.2
W4-05	12.96	15.8	40.6	43.1	86.1
W4-06	13.06	15.18	42.7	43.1	96.6
W4-07	15.27	18.54	41.3	42.4	50.8
W4-08	13.63	16.41	42.2	43.9	79.4
W4-09	13.18	15.83	41	43.1	86.4



# Block Compliance WorkSheet: West BlockCont BUILT ENVIRONMENTS

Dwelling	DER	TER	DFEE	TFEE	TFA
W4-10	14.57	17.82	38.1	38.3	50.7
W4-11	13.08	15.72	39	40	76.9
W4-12	13.2	17.16	31.5	35.4	51.8
W4-13	13.2	17.16	31.5	35.4	51.8
W4-14	19.21	21.83	60.2	58.9	50.3
W4-15	19.67	22.48	62.9	64.1	52.1
W4-16	13.2	17.15	31.5	35.3	51.8
W4-17	15.24	19.4	42.1	47.4	50.7
W5-01	15.33	17.06	51.9	50.6	90.3
W5-02	18.34	22.23	59.5	66.5	61.8
W5-03	18.76	20.91	56.9	53.8	48.7
W5-04	14.81	17.77	49.3	53.5	87.1
W5-05	15.05	17.66	49.4	51.9	82.5
W5-06	15.92	18.76	51.7	54.3	73.6
W5-07	17.05	20.33	49.2	50.4	48.9
W5-08	17.8	20.48	56.8	57.6	60.9
W5-09	16.38	19.08	51.4	53.8	68
W5-10	16.97	20.11	49.6	50.1	51.6
W5-11	18.69	20.84	57.8	55.3	51.4
W5-12	16.33	20.18	47.1	51.1	51.8
W5-13	18.57	21.06	61.8	62.5	64.2
W5-14	18.86	20.77	65.3	64.3	72.4
W5-15	17.94	22.08	54.8	61	50.7

#### Calculation Summary

Total Floor Area	5253.50



# Block Compliance WorkSheet: West BlockContinuous Built ENVIRONMENTS

Average TER	17.72
Average DER	6.01
Average DFEE	43.51
Average TFEE	46.58
Compliance	Pass
% Improvement DER TER	66.08
% Improvement DFEE TFEE	6.59

### Energy Strategy



### **Appendix E - SAMPLE SAP/SBEM Results**

All areas of the site have been assessed in either SAP or SBEM. Therefore, certification is extensive, so sample dwelling reports are provided.

Energy Strategy



Be Lean & Baseline BRUKL

# **BRUKL Output Document**



Compliance with England Building Regulations Part L 2013

Project name Shell and Core

### 156 West End Lane

As built

Date: Wed Aug 19 09:10:53 2020

### Administrative information

**Building Details** 

Address: 156 West End Lane, London, Postcode

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.6.a.2

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.12

BRUKL compliance check version: v5.6.a.1

#### **Owner Details**

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

### Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

### Criterion 1: The calculated CO₂ emission rate for the building must not exceed the target

The building does not comply with England Building Regulations Part L 2013

CO <sub>2</sub> emission rate from the notional building, kgCO <sub>2</sub> /m <sup>2</sup> .annum	13.9	
Target CO <sub>2</sub> emission rate (TER), kgCO <sub>2</sub> /m <sup>2</sup> .annum	13.9	
Building CO <sub>2</sub> emission rate (BER), kgCO <sub>2</sub> /m <sup>2</sup> .annum	21.8	
Are emissions from the building less than or equal to the target?	BER > TER	
Are as built details the same as used in the BER calculations?	Separate submission	

# Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

#### **Building fabric**

Element	U <sub>a-Limit</sub>	Ua-Calc	U <sub>i-Calc</sub>	Surface where the maximum value occurs*
Wall**	0.35	0.35	0.35	SP00000C_W1
Floor	0.25	0.25	0.25	SP00000C_F
Roof	0.25	0.25	0.25	SP000010_C
Windows***, roof windows, and rooflights	2.2	2.2	2.2	SP00000C_W3_O0
Personnel doors	2.2	1.4	1.4	SP000034_W9_O0
Vehicle access & similar large doors	1.5	-	-:	"No external vehicle access doors"
High usage entrance doors	3.5	,a <del>t</del> a	-	"No external high usage entrance doors"

U<sub>a-Limit</sub> = Limiting area-weighted average U-values [W/(m<sup>2</sup>K)]

U<sub>a-Calc</sub> = Calculated area-weighted average U-values [W/(m<sup>2</sup>K)]

U<sub>i-Calc</sub> = Calculated maximum individual element U-values [W/(m<sup>2</sup>K)]

N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
m³/(h.m²) at 50 Pa	10	3

<sup>\*</sup> There might be more than one surface where the maximum U-value occurs.

<sup>\*\*</sup> Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

<sup>\*\*\*</sup> Display windows and similar glazing are excluded from the U-value check.

### **Building services**

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	<0.9

### 1- Main system (Copy)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency
This system	0.81	-	<b>1</b> -3		-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic moni	toring & targeting w	ith alarms for out-of	-range values for th	is HVAC syster	m NO
	for gas single boiler system any individual boiler in a n		ple boiler systems >2 MW of efficiency is 0.82.	r multi-boiler systen	ns, (overall) limiting

### 2- Main system Office

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency
This system	2	2.5	<del>-</del> 2	p.=	-
Standard value	2.5*	2.6	N/A	N/A	N/A
Automatic moni	toring & targeting w	ith alarms for out-of	-range values for th	is HVAC syster	m NO
* Standard shown is to for limiting standards.		, except absorption and gas	s engine heat pumps. For t	ypes <=12 kW outp	ut, refer to EN 1482

### 1- SYST0001-DHW

Water heating efficiency		Storage loss factor [kWh/litre per day]
This building	1	-
Standard value	1	N/A

#### 2- SYST0002-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	0.91	
Standard value	1	N/A

### Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
Α	Local supply or extract ventilation units serving a single area
В	Zonal supply system where the fan is remote from the zone
С	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
Е	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
Н	Fan coil units
1	Zonal extract system where the fan is remote from the zone with grease filter

Zone name		SFP [W/(I/s)]							UD - ffi - l		
ID of system type	Α	В	C	D	D E	E F	G	Н	I	HKE	efficiency
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
SBEM - Startup 04	0.3	-	-		-	-		-		-	N/A
SBEM - Community Room	0.3	-	,( <del>)(1</del> )	(F)					-		N/A
SBEM - Startup 03	0.3	-	-	<b>.</b>	-	-	-	-	÷	-	N/A

Zone name		SFP [W/(I/s)]							LID.	IID CC	
ID of system type Standard value	Α	В	ВС	C D	D E	E F	G	Н	ı	HR efficiency	
	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
SBEM - Flex Space	0.3	-	-	-	-	-	-	-	-		N/A
SBEM - Startup 01	0.3	-	-	-	-	1.	-	-	-	-	N/A
SBEM - Startup 02	0.3	-	-	-	-	-	-	-	-	-	N/A
SBEM - Flexible Employment Space	0.4	-	(2)	_	-	-	-	_	_	4	N/A

### Shell and core configuration

Zone	Excluded from calculation?
SBEM - Startup 04	NO
SBEM - Community Room	NO
SBEM - Startup 03	NO
SBEM - Flex Space	NO
SBEM - Startup 01	NO
SBEM - Startup 02	NO
SBEM - Flexible Employment Space	NO

General lighting and display lighting	Lumino	ous effic	acy [lm/W]	
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
SBEM - Startup 04	16 <b>2</b>	55	·	1231
SBEM - Community Room		55	~	361
SBEM - Startup 03	-	55	-	447
SBEM - Flex Space	82	55	<b>=</b>	3535
SBEM - Startup 01	9. 10 <del>.4</del> .	55	-	508
SBEM - Startup 02	-	55		652
SBEM - Flexible Employment Space	28	-	,=	10058

# Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
SBEM - Flexible Employment Space	NO (-59.6%)	NO

# Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

# Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

### EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	NO

### Technical Data Sheet (Actual vs. Notional Building)

### **Building Global Parameters**

	Actual	Notional
Area [m²]	1691	1691
External area [m²]	2122	2122
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	3	3
Average conductance [W/K]	1019.8	780.59
Average U-value [W/m²K]	0.48	0.37
Alpha value* [%]	11.44	12.36

<sup>\*</sup> Percentage of the building's average heat transfer coefficient which is due to thermal bridging

### **Building Use**

% Are	ea Building Type
72	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
28	B1 Offices and Workshop businesses

B2 to B7 General Industrial and Special Industrial Groups

B8 Storage or Distribution

C1 Hotels

C2 Residential Institutions: Hospitals and Care Homes

C2 Residential Institutions: Residential schools

C2 Residential Institutions: Universities and colleges

C2A Secure Residential Institutions

Residential spaces

D1 Non-residential Institutions: Community/Day Centre

D1 Non-residential Institutions: Libraries, Museums, and Galleries

D1 Non-residential Institutions: Education

D1 Non-residential Institutions: Primary Health Care Building

D1 Non-residential Institutions: Crown and County Courts

D2 General Assembly and Leisure, Night Clubs, and Theatres

Others: Passenger terminals Others: Emergency services

Others: Miscellaneous 24hr activities

Others: Car Parks 24 hrs Others: Stand alone utility block

### Energy Consumption by End Use [kWh/m<sup>2</sup>]

	Actual	Notional
Heating	28.95	22.94
Cooling	8.08	2.72
Auxiliary	2.97	2.23
Lighting	17.28	11.56
Hot water	0.88	0.92
Equipment*	17.54	17.54
TOTAL**	58.16	40.38

<sup>\*</sup> Energy used by equipment does not count towards the total for consumption or calculating emissions.

\*\* Total is net of any electrical energy displaced by CHP generators, if applicable.

### Energy Production by Technology [kWh/m<sup>2</sup>]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

### Energy & CO, Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m <sup>2</sup> ]	183.47	167.29
Primary energy* [kWh/m²]	127.2	80.39
Total emissions [kg/m²]	21.8	13.9

<sup>\*</sup> Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

Sy	stem Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen
[S	T] Central h	eating using	water: rad	iators, [HS]	LTHW boi	ler, [HFT] N	latural Gas	, [CFT] Ele	ctricity	
	Actual	100	85.6	38.4	0	3.7	0.72	0	0.81	0
	Notional	89.1	80.2	30.2	0	2.6	0.82	0		Section .
[S	T] Split or m	ulti-split sy	stem, [HS]	Heat pump	(electric):	air source,	[HFT] Elec	ricity, [CF]	[] Electricity	100
	Actual	28.8	149.2	4.3	29.2	1.1	1.86	1.42	2	2
	Notional	34.6	127.4	4	9.8	1.1	2.43	3.6		

#### Key to terms

Heat dem [MJ/m2] = Heating energy demand
Cool dem [MJ/m2] = Cooling energy demand
Heat con [kWh/m2] = Heating energy consumption
Cool con [kWh/m2] = Cooling energy consumption
Aux con [kWh/m2] = Auxiliary energy consumption

Heat SSEFF = Heating system seasonal efficiency (for notional building, value depends on activity glazing class)

Cool SSEER = Cooling system seasonal energy efficiency ratio

Heat gen SSEFF = Heating generator seasonal efficiency

Cool gen SSEER = Cooling generator seasonal energy efficiency ratio

ST = System type
HS = Heat source
HFT = Heating fuel type
CFT = Cooling fuel type

### **Key Features**

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

#### **Building fabric**

Element	U <sub>i-Typ</sub>	U <sub>i-Min</sub>	Surface where the minimum value occurs*
Wall	0.23	0.35	SP00000C_W1
Floor	0.2	0.25	SP00000C_F
Roof	0.15	0.25	SP000010_C
Windows, roof windows, and rooflights	1.5	2.2	SP00000C_W3_O0
Personnel doors	1.5	1.4	SP000034_W9_O0
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"
High usage entrance doors	1.5	-	"No external high usage entrance doors"
U <sub>I-Typ</sub> = Typical individual element U-values [W/(m²h	()]		U <sub>I-Min</sub> = Minimum individual element U-values [W/(m²K)]

\* There might be more than one surface where the minimum U-value occurs.

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3

## **BRUKL Output Document**



Compliance with England Building Regulations Part L 2013

Project name Shell and Core

### 156 West End Lane

As built

Date: Wed Aug 19 09:19:29 2020

#### Administrative information

**Building Details** 

Address: 156 West End Lane, London, Postcode

**Certification tool** 

Calculation engine: SBEM

Calculation engine version: v5.6.a.2

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.12

BRUKL compliance check version: v5.6.a.1

#### **Owner Details**

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

#### Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

#### Criterion 1: The calculated CO<sub>2</sub> emission rate for the building must not exceed the target

#### The building does not comply with England Building Regulations Part L 2013

CO <sub>2</sub> emission rate from the notional building, kgCO <sub>2</sub> /m <sup>2</sup> .annum	13.3	
Target CO <sub>2</sub> emission rate (TER), kgCO <sub>2</sub> /m <sup>2</sup> .annum	13.3	
Building CO <sub>2</sub> emission rate (BER), kgCO <sub>2</sub> /m <sup>2</sup> .annum	19.4	
Are emissions from the building less than or equal to the target?	BER > TER	
Are as built details the same as used in the BER calculations?	Separate submission	

## Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

#### **Building fabric**

Element	U <sub>a-Limit</sub>	Ua-Calc	U <sub>i-Calc</sub>	Surface where the maximum value occurs*
Wall**	0.35	0.16	0.16	SP00000C_W1
Floor	0.25	0.12	0.12	SP00000C_F
Roof	0.25	0.12	0.12	SP000010_C
Windows***, roof windows, and rooflights	2.2	1.2	1.2	SP00000C_W3_O0
Personnel doors	2.2	1.4	1.4	SP000034_W9_O0
Vehicle access & similar large doors	1.5	-	-:	"No external vehicle access doors"
High usage entrance doors	3.5	,a <del>t</del> a	-	"No external high usage entrance doors"

U<sub>a-Limit</sub> = Limiting area-weighted average U-values [W/(m<sup>2</sup>K)]

U<sub>a-Calc</sub> = Calculated area-weighted average U-values [W/(m<sup>2</sup>K)]

U<sub>i-Calc</sub> = Calculated maximum individual element U-values [W/(m<sup>2</sup>K)]

N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
m³/(h.m²) at 50 Pa	10	3

<sup>\*</sup> There might be more than one surface where the maximum U-value occurs.

<sup>\*\*</sup> Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

<sup>\*\*\*</sup> Display windows and similar glazing are excluded from the U-value check.

#### **Building services**

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	<0.9

#### 1- Main system (Copy)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency
This system	0.81	-	<b>1</b> -3		-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic moni	toring & targeting w	ith alarms for out-of	-range values for th	is HVAC syster	m NO
	for gas single boiler system any individual boiler in a n		ple boiler systems >2 MW of efficiency is 0.82.	r multi-boiler systen	ns, (overall) limiting

#### 2- Main system Office

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency
This system	2	2.5	<b>=</b> 3		-
Standard value	2.5*	2.6	N/A	N/A	N/A
Automatic moni	itoring & targeting w	ith alarms for out-of	-range values for th	is HVAC syster	m NO
* Standard shown is to for limiting standards.		, except absorption and gas	s engine heat pumps. For t	ypes <=12 kW outp	ut, refer to EN 1482

#### 1- SYST0001-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	-
Standard value	1	N/A

#### 2- SYST0002-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	
Standard value	1	N/A

<sup>&</sup>quot;No zones in project where local mechanical ventilation, exhaust, or terminal unit is applicable"

#### Shell and core configuration

Zone	Excluded from calculation?	
SBEM - Startup 04	NO	
SBEM - Community Room	NO	
SBEM - Startup 03	NO	
SBEM - Flex Space	NO	
SBEM - Startup 01	NO	
SBEM - Startup 02	NO	
SBEM - Flexible Employment Space	NO	

General lighting and display lighting	Luminous efficacy [lm/W]				
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]	
Standard value	60	60	22		
SBEM - Startup 04	£=:	55		1231	
SBEM - Community Room	(n <del>-</del> )	55	.=	361	
SBEM - Startup 03	-	55	-	447	

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
SBEM - Flex Space		55	-	3535
SBEM - Startup 01	-	55	-	508
SBEM - Startup 02	-	55	-	652
SBEM - Flexible Employment Space	28	2		10058

## Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
SBEM - Flexible Employment Space	NO (-60.3%)	NO

## Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

## Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

#### EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	NO

### Technical Data Sheet (Actual vs. Notional Building)

#### **Building Global Parameters**

	Actual	Notional
Area [m²]	1691	1691
External area [m²]	2122	2122
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	3	3
Average conductance [W/K]	522.01	780.59
Average U-value [W/m²K]	0.25	0.37
Alpha value* [%]	22.34	12.36

<sup>\*</sup> Percentage of the building's average heat transfer coefficient which is due to thermal bridging

#### **Building Use**

% Ar	ea Building Type
72	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
28	B1 Offices and Workshop businesses

B2 to B7 General Industrial and Special Industrial Groups

B8 Storage or Distribution

C1 Hotels

C2 Residential Institutions: Hospitals and Care Homes

C2 Residential Institutions: Residential schools

C2 Residential Institutions: Universities and colleges

C2A Secure Residential Institutions

Residential spaces

D1 Non-residential Institutions: Community/Day Centre

D1 Non-residential Institutions: Libraries, Museums, and Galleries

D1 Non-residential Institutions: Education

D1 Non-residential Institutions: Primary Health Care Building

D1 Non-residential Institutions: Crown and County Courts

D2 General Assembly and Leisure, Night Clubs, and Theatres

Others: Passenger terminals Others: Emergency services

Others: Miscellaneous 24hr activities

Others: Car Parks 24 hrs Others: Stand alone utility block

### Energy Consumption by End Use [kWh/m<sup>2</sup>]

	Actual	Notional
Heating	18.67	22.94
Cooling	9.34	2.72
Auxiliary	1.9	0.9
Lighting	17.28	11.56
Hot water	0.8	0.92
Equipment*	17.54	17.54
TOTAL**	47.99	39.06

<sup>\*</sup> Energy used by equipment does not count towards the total for consumption or calculating emissions.

\*\* Total is net of any electrical energy displaced by CHP generators, if applicable.

### Energy Production by Technology [kWh/m<sup>2</sup>]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

### Energy & CO, Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m <sup>2</sup> ]	164.68	167.29
Primary energy* [kWh/m²]	113.97	76.41
Total emissions [kg/m²]	19.4	13.3

<sup>\*</sup> Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

Sy	stem Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen
[S	T] Central h	eating using	water: rad	iators, [HS]	LTHW boi	ler, [HFT] N	latural Gas	, [CFT] Ele	ctricity	
	Actual	64.9	90.9	24.9	0	2.6	0.72	0	0.81	0
	Notional	89.1	80.2	30.2	0	1.2	0.82	0		
[S	T] Split or m	ulti-split sy	stem, [HS]	Heat pump	(electric):	air source,	[HFT] Elec	tricity, [CF]	[] Electricity	100
	Actual	15.6	172.3	2.3	33.7	0	1.86	1.42	2	2
	Notional	34.6	127.4	4	9.8	0	2.43	3.6		

#### Key to terms

Heat dem [MJ/m2] = Heating energy demand
Cool dem [MJ/m2] = Cooling energy demand
Heat con [kWh/m2] = Heating energy consumption
Cool con [kWh/m2] = Cooling energy consumption
Aux con [kWh/m2] = Auxiliary energy consumption

Heat SSEFF = Heating system seasonal efficiency (for notional building, value depends on activity glazing class)

Cool SSEER = Cooling system seasonal energy efficiency ratio

Heat gen SSEFF = Heating generator seasonal efficiency

Cool gen SSEER = Cooling generator seasonal energy efficiency ratio

 ST
 = System type

 HS
 = Heat source

 HFT
 = Heating fuel type

 CFT
 = Cooling fuel type

### **Key Features**

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

#### **Building fabric**

Element	U <sub>i-Тур</sub>	U <sub>i-Min</sub>	Surface where the minimum value occurs*
Wall	0.23	0.16	SP00000C_W1
Floor	0.2	0.12	SP00000C_F
Roof	0.15	0.12	SP000010_C
Windows, roof windows, and rooflights	1.5	1.2	SP00000C_W3_O0
Personnel doors	1.5	1.4	SP000034_W9_O0
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"
High usage entrance doors	1.5	-	"No external high usage entrance doors"
U <sub>I-Typ</sub> = Typical individual element U-values [W/(m²h	<)]		U <sub>I-Min</sub> = Minimum individual element U-values [W/(m²K)]

\* There might be more than one surface where the minimum U-value occurs.

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3

Energy Strategy



Be Green BRUKL

## **BRUKL Output Document**



Compliance with England Building Regulations Part L 2013

Project name Shell and Core

### 156 West End Lane

As built

Date: Wed Aug 19 10:25:22 2020

#### Administrative information

**Building Details** 

Address: 156 West End Lane, London, Postcode

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.6.a.2

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.12

BRUKL compliance check version: v5.6.a.1

#### Owner Details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

#### Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

#### Criterion 1: The calculated CO<sub>2</sub> emission rate for the building must not exceed the target

#### The building does not comply with England Building Regulations Part L 2013

CO <sub>2</sub> emission rate from the notional building, kgCO <sub>2</sub> /m <sup>2</sup> .annum	14.4	
Target CO <sub>2</sub> emission rate (TER), kgCO <sub>2</sub> /m <sup>2</sup> .annum	14.4	
Building CO <sub>2</sub> emission rate (BER), kgCO <sub>2</sub> /m <sup>2</sup> .annum	16.5	
Are emissions from the building less than or equal to the target?	BER > TER	
Are as built details the same as used in the BER calculations?	Separate submission	

## Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

#### **Building fabric**

Element	U <sub>a-Limit</sub>	Ua-Calc	U <sub>i-Calc</sub>	Surface where the maximum value occurs*
Wall**	0.35	0.16	0.16	SP00000C_W1
Floor	0.25	0.12	0.12	SP00000C_F
Roof	0.25	0.12	0.12	SP000010_C
Windows***, roof windows, and rooflights	2.2	1.2	1.2	SP00000C_W3_O0
Personnel doors	2.2	1.4	1.4	SP000034_W9_O0
Vehicle access & similar large doors	1.5	-	-:	"No external vehicle access doors"
High usage entrance doors	3.5	(57)	-	"No external high usage entrance doors"

U<sub>a-Limit</sub> = Limiting area-weighted average U-values [W/(m<sup>2</sup>K)]

U<sub>a-Calc</sub> = Calculated area-weighted average U-values [W/(m<sup>2</sup>K)]

U<sub>i-Calc</sub> = Calculated maximum individual element U-values [W/(m<sup>2</sup>K)]

N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
m³/(h.m²) at 50 Pa	10	4.05

<sup>\*</sup> There might be more than one surface where the maximum U-value occurs.

<sup>\*\*</sup> Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

<sup>\*\*\*</sup> Display windows and similar glazing are excluded from the U-value check.

#### **Building services**

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	<0.9

#### 1- Main system

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficier
This system	2.6	4	I=8	;; <del>=</del>	-
Standard value	2.5*	2.6	N/A	N/A	N/A
Automatic monit	toring & targeting w	ith alarms for out-of	-range values for thi	s HVAC system	n NO

#### 1- SYST0000-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	-
Standard value	1	N/A

#### Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
Α	Local supply or extract ventilation units serving a single area
В	Zonal supply system where the fan is remote from the zone
С	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
Е	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
Н	Fan coil units
1	Zonal extract system where the fan is remote from the zone with grease filter

Zone name		SFP [W/(I/s)]							LID.	UD -ffi-i	
ID of system type	Α	В	С	D	Е	F	G	Н	I	HK	efficiency
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
SBEM - Startup 04	1.2	-	-	1.2	-	-	-	-	E	0.85	0.5
SBEM - Community Room	1.2	-	-	1.2	-	-	-	-	-	0.85	0.5
SBEM - Startup 03	1.2	-	-	1.2	-	-	-	-	_	0.85	0.5
SBEM - Flex Space	1.2	-	-	1.2	-	-	-	1	2	0.85	0.5
SBEM - Startup 01	1.2	-	-	1.2	-	-	-	-	-	0.85	0.5
SBEM - Startup 02	1.2	-	-	1.2	-	-	-	-	-	0.85	0.5
SBEM - Flexible Employment Space	1.2	-	-	1.2	-	-	-	-	-	0.85	0.5

#### Shell and core configuration

Zone	Excluded from calculation?		
SBEM - Startup 04	NO		
SBEM - Community Room	NO		
SBEM - Startup 03	NO		
SBEM - Flex Space	NO		
SBEM - Startup 01	NO		
SBEM - Startup 02	NO		
SBEM - Flexible Employment Space	NO		

General lighting and display lighting	Lumino	ous effic			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W	
Standard value	60	60	22		
SBEM - Startup 04	)s=	100	-	677	
SBEM - Community Room	j.=	100	. =	198	
SBEM - Startup 03	jas.	100		246	
SBEM - Flex Space	-	100	-	1944	
SBEM - Startup 01	( ·	100	-	280	
SBEM - Startup 02		100	-	358	
SBEM - Flexible Employment Space	50		.=	5532	

# Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
SBEM - Startup 04	YES (+10.4%)	NO
SBEM - Community Room	NO (-50.7%)	NO
SBEM - Startup 03	NO (-21.8%)	NO
SBEM - Flex Space	YES (+10%)	NO
SBEM - Startup 01	YES (+15.3%)	NO
SBEM - Startup 02	YES (+4.8%)	NO
SBEM - Flexible Employment Space	NO (-60.3%)	NO

## Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

# Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

### EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

### Technical Data Sheet (Actual vs. Notional Building)

#### **Building Global Parameters**

	Actual	Notional
Area [m²]	1691	1691
External area [m²]	2122	2122
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	4	3
Average conductance [W/K]	522.01	780.59
Average U-value [W/m²K]	0.25	0.37
Alpha value* [%]	22.34	12.36

<sup>\*</sup> Percentage of the building's average heat transfer coefficient which is due to thermal bridging

#### **Building Use**

% Ar	ea Building Type
72	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
28	B1 Offices and Workshop businesses

B2 to B7 General Industrial and Special Industrial Groups

B8 Storage or Distribution

C1 Hotels

C2 Residential Institutions: Hospitals and Care Homes

C2 Residential Institutions: Residential schools

C2 Residential Institutions: Universities and colleges

C2A Secure Residential Institutions

Residential spaces

D1 Non-residential Institutions: Community/Day Centre

D1 Non-residential Institutions: Libraries, Museums, and Galleries

D1 Non-residential Institutions: Education

D1 Non-residential Institutions: Primary Health Care Building

D1 Non-residential Institutions: Crown and County Courts

D2 General Assembly and Leisure, Night Clubs, and Theatres

Others: Passenger terminals Others: Emergency services

Others: Miscellaneous 24hr activities

Others: Car Parks 24 hrs Others: Stand alone utility block

#### Energy Consumption by End Use [kWh/m<sup>2</sup>]

	Actual	Notional
Heating	1.59	3.51
Cooling	10.94	7.32
Auxiliary	10.5	5.45
Lighting	7.96	11.56
Hot water	0.8	0.92
Equipment*	17.54	17.54
TOTAL**	31.77	28.76

<sup>\*</sup> Energy used by equipment does not count towards the total for consumption or calculating emissions.

\*\* Total is net of any electrical energy displaced by CHP generators, if applicable.

### Energy Production by Technology [kWh/m<sup>2</sup>]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

### Energy & CO, Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m <sup>2</sup> ]	125.66	125.49
Primary energy* [kWh/m²]	97.55	84.35
Total emissions [kg/m²]	16.5	14.4

<sup>\*</sup> Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

ŀ	IVAC Sys	stems Per	formanc	е							
System Type M		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER	
[S]	[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	13.8	111.8	1.6	10.9	10.5	2.42	2.84	2.6	4	
	Notional	30.7	94.8	3.5	7.3	5.5	2.43	3.6	( <del>-277)-</del>	U-11111	

#### Key to terms

Heat dem [MJ/m2] = Heating energy demand Cool dem [MJ/m2] = Cooling energy demand Heat con [kWh/m2] = Heating energy consumption Cool con [kWh/m2] = Cooling energy consumption Aux con [kWh/m2] = Auxiliary energy consumption

Heat SSEFF = Heating system seasonal efficiency (for notional building, value depends on activity glazing class)

Cool SSEER = Cooling system seasonal energy efficiency ratio

Heat gen SSEFF = Heating generator seasonal efficiency

Cool gen SSEER = Cooling generator seasonal energy efficiency ratio

 ST
 = System type

 HS
 = Heat source

 HFT
 = Heating fuel type

 CFT
 = Cooling fuel type

### **Key Features**

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

#### **Building fabric**

Element	U <sub>i-Тур</sub>	U <sub>i-Min</sub>	Surface where the minimum value occurs*
Wall	0.23	0.16	SP00000C_W1
Floor	0.2	0.12	SP00000C_F
Roof	0.15	0.12	SP000010_C
Windows, roof windows, and rooflights	1.5	1.2	SP00000C_W3_O0
Personnel doors	1.5	1.4	SP000034_W9_O0
Vehicle access & similar large doors	1.5		"No external vehicle access doors"
High usage entrance doors	1.5	-	"No external high usage entrance doors"
U <sub>I-Typ</sub> = Typical individual element U-values [W/(m²H	97	tes: es	U <sub>I-Min</sub> = Minimum individual element U-values [W/(m²K)]

<sup>\*</sup> There might be more than one surface where the minimum U-value occurs.

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	4.05

Energy Strategy



**Be Lean TER** 



User Details: **Assessor Name:** Stroma Number: Stroma FSAP 2012 **Software Version: Software Name:** Version: 1.0.5.12 Property Address: E0-01 Address: 1. Overall dwelling dimensions Av. Height(m) Area(m²) Volume(m³) Ground floor 71 (1a) x 2.7 (2a) =191.7 (3a) Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)(4)71 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =191.7 (5) total m³ per hour main secondary other heating heating x 40 =Number of chimneys (6a) 0 0 x 20 =Number of open flues 0 0 0 (6b) Number of intermittent fans x 10 =(7a) 3 30 x 10 =Number of passive vents (7b) 0 0 x 40 =Number of flueless gas fires 0 (7c)Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = $\div (5)$ 0.16 (8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9)0 Additional infiltration [(9)-1]x0.1 =0 (10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)0 if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12)If no draught lobby, enter 0.05, else enter 0 (13)O Percentage of windows and doors draught stripped (14)0 Window infiltration  $0.25 - [0.2 \times (14) \div 100] =$ 0 (15)Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =O (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)5 If based on air permeability value, then  $(18) = [(17) \div 20] + (8)$ , otherwise (18) = (16)0.41 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)1  $(20) = 1 - [0.075 \times (19)] =$ Shelter factor (20)0.92  $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.38 Infiltration rate modified for monthly wind speed Jan Feb Jul Sep Mar Apr May Jun Aug Oct Nov Dec Monthly average wind speed from Table 7 (22)m =5.1 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor  $(22a)m = (22)m \div 4$ (22a)m 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18



Adjusted infiltration rate (allowing for shelter and wind speed	d) = (21a) x (22a)m
0.48 0.47 0.46 0.41 0.4 0.36 0.3	
Calculate effective air change rate for the applicable case	
If mechanical ventilation:	0 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation of the leader	()
If balanced with heat recovery: efficiency in % allowing for in-use factor	(=33)
a) If balanced mechanical ventilation with heat recovery ((24a)m= 0 0 0 0 0 0	
` '	
b) If balanced mechanical ventilation without heat recover	
` '	, ,
c) If whole house extract ventilation or positive input venti if $(22b)m < 0.5 \times (23b)$ , then $(24c) = (23b)$ ; otherwise	
(24c)m= 0 0 0 0 0 0 0 0	
d) If natural ventilation or whole house positive input venti	lation from loft
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)n	
(24d)m= 0.61 0.61 0.61 0.59 0.58 0.56 0.5	66 0.56 0.57 0.58 0.59 0.6 (24d)
Effective air change rate - enter (24a) or (24b) or (24c) or	(24d) in box (25)
(25)m= 0.61 0.61 0.61 0.59 0.58 0.56 0.5	66 0.56 0.57 0.58 0.59 0.6 (25)
3. Heat losses and heat loss parameter:	
<b>ELEMENT</b> Gross Openings Net Area	U-value A X U k-value A X k
are <mark>a (m²</mark> )	W/m2K (W/K) kJ/m²-K kJ/K
Doors 1.89	
Windows Type 1 5.68	$\chi 1/[1/(1.4) + 0.04] = 7.53$ (27)
	$x^{1/[1/(1.4) + 0.04]} =                                   $
Windows Type 2	$x^{1/[1/(1.4)+0.04]} = 7.53$ $x^{1/[1/(1.4)+0.04]} = 2.7$ (27)
Windows Type 2  Windows Type 3  2.04  2.04	
	$x^{1/[1/(1.4) + 0.04]} = 2.7$ (27)
Windows Type 3	$x^{1/[1/(1.4) + 0.04]} = 2.7$ (27) $x^{1/[1/(1.4) + 0.04]} = 2.7$ (27)
Windows Type 3  Windows Type 4  2.04  2.04	$x^{1/[1/(1.4) + 0.04]} = 2.7$ (27) $x^{1/[1/(1.4) + 0.04]} = 2.7$ (27) $x^{1/[1/(1.4) + 0.04]} = 2.7$ (27)
Windows Type 3         2.04           Windows Type 4         2.04           Floor         71	$x^{1/[1/(1.4) + 0.04]} = 2.7$ (27) $x^{1/[1/(1.4) + 0.04]} = 2.7$ (27) $x^{1/[1/(1.4) + 0.04]} = 2.7$ (27) x = 0.13 = 9.23 (28)
Windows Type 3       2.04         Windows Type 4       2.04         Floor       71         Walls Type 1       65.34       15.88       49.46	$x^{1/[1/(1.4) + 0.04]} = 2.7$ (27) $x^{1/[1/(1.4) + 0.04]} = 2.7$ (27) $x^{1/[1/(1.4) + 0.04]} = 2.7$ (27) x = 0.13 = 9.23 (28) x = 0.18 = 8.9 (29)
Windows Type 3       2.04         Windows Type 4       2.04         Floor       71         Walls Type1       65.34       15.88       49.46         Walls Type2       4.32       1.89       2.43	$x^{1/[1/(1.4) + 0.04]} = 2.7$ (27) $x^{1/[1/(1.4) + 0.04]} = 2.7$ (27) $x^{1/[1/(1.4) + 0.04]} = 2.7$ (27) x = 0.13 = 9.23 (28) x = 0.18 = 8.9 (29) x = 0.18 = 0.44 (29)
Windows Type 3       2.04         Windows Type 4       2.04         Floor       71         Walls Type1       65.34       15.88       49.46         Walls Type2       4.32       1.89       2.43         Walls Type3       7.29       0       7.29	$x^{1/[1/(1.4) + 0.04]} = 2.7$ (27) $x^{1/[1/(1.4) + 0.04]} = 2.7$ (27) $x^{1/[1/(1.4) + 0.04]} = 2.7$ (27) x = 0.13 = 9.23 (28) x = 0.18 = 8.9 (29) x = 0.18 = 0.44 (29) x = 0.18 = 1.31 (29)
Windows Type 3       2.04         Windows Type 4       2.04         Floor       71         Walls Type1       65.34       15.88       49.46         Walls Type2       4.32       1.89       2.43         Walls Type3       7.29       0       7.29         Roof       6       0       6	$x^{1/[1/(1.4) + 0.04]} = 2.7$ (27) $x^{1/[1/(1.4) + 0.04]} = 2.7$ (27) $x^{1/[1/(1.4) + 0.04]} = 2.7$ (27) x = 0.13 = 9.23 (28) x = 0.18 = 8.9 (29) x = 0.18 = 0.44 (29) x = 0.18 = 1.31 (29) x = 0.13 = 0.78 (30)
Windows Type 3       2.04         Windows Type 4       2.04         Floor       71         Walls Type1       65.34       15.88       49.46         Walls Type2       4.32       1.89       2.43         Walls Type3       7.29       0       7.29         Roof       6       0       6         Total area of elements, m²       153.95	$x^{1/[1/(1.4) + 0.04]} = 2.7$ (27) $x^{1/[1/(1.4) + 0.04]} = 2.7$ (27) $x^{1/[1/(1.4) + 0.04]} = 2.7$ (27) x = 0.13 = 9.23 (28) x = 0.18 = 8.9 (29) x = 0.18 = 0.44 (29) x = 0.18 = 1.31 (29) x = 0.13 = 0.78 (30)
Windows Type 3       2.04         Windows Type 4       2.04         Floor       71         Walls Type1       65.34       15.88       49.46         Walls Type2       4.32       1.89       2.43         Walls Type3       7.29       0       7.29         Roof       6       0       6         Total area of elements, m²       153.95         Party wall       19.17	$x^{1/[1/(1.4) + 0.04]} = 2.7$ (27) $x^{1/[1/(1.4) + 0.04]} = 2.7$ (27) $x^{1/[1/(1.4) + 0.04]} = 2.7$ (27) x = 0.13 = 9.23 (28) x = 0.18 = 8.9 (29) x = 0.18 = 0.44 (29) x = 0.18 = 1.31 (29) x = 0.13 = 0.78 (30) x = 0.13 = 0.78 (31) x = 0.13 = 0.78 (32)
Windows Type 3       2.04         Windows Type 4       2.04         Floor       71         Walls Type1       65.34       15.88       49.46         Walls Type2       4.32       1.89       2.43         Walls Type3       7.29       0       7.29         Roof       6       0       6         Total area of elements, m²       153.95         Party wall       19.17         Party ceiling       65         * for windows and roof windows, use effective window U-value calculated to the control of the control	$x^{1/[1/(1.4) + 0.04]} = 2.7$ (27) $x^{1/[1/(1.4) + 0.04]} = 2.7$ (27) $x^{1/[1/(1.4) + 0.04]} = 2.7$ (27) x = 0.13 = 9.23 (28) x = 0.18 = 8.9 (29) x = 0.18 = 0.44 (29) x = 0.18 = 1.31 (29) x = 0.13 = 0.78 (30) x = 0.13 = 0.78 (31) x = 0.13 = 0.78 (32)
Windows Type 3       2.04         Windows Type 4       2.04         Floor       71         Walls Type1       65.34       15.88       49.46         Walls Type2       4.32       1.89       2.43         Walls Type3       7.29       0       7.29         Roof       6       0       6         Total area of elements, m²       153.95         Party wall       19.17         Party ceiling       65         * for windows and roof windows, use effective window U-value calculated at include the areas on both sides of internal walls and partitions	$x^{1/[1/(1.4) + 0.04]} = 2.7$ $x^{1/[1/(1.4) + 0.04]} = 2.7$ $x^{1/[1/(1.4) + 0.04]} = 2.7$ $x = 0.13 = 9.23$ $x = 0.18 = 8.9$ $x = 0.18 = 0.44$ $x = 0.18 = 1.31$ $x = 0.13 = 0.78$ $x = 0.13$
Windows Type 3       2.04         Windows Type 4       2.04         Floor       71         Walls Type1       65.34       15.88       49.46         Walls Type2       4.32       1.89       2.43         Walls Type3       7.29       0       7.29         Roof       6       0       6         Total area of elements, m²       153.95         Party wall       19.17         Party ceiling       65         * for windows and roof windows, use effective window U-value calculated of the include the areas on both sides of internal walls and partitions         Fabric heat loss, W/K = S (A x U)	x1/[1/(1.4) + 0.04] = 2.7 $x1/[1/(1.4) + 0.04] = 2.7$ $x1/[1/(1.4) + 0.04] = 2.7$ $x$
Windows Type 3  Windows Type 4  Floor  Floor  Walls Type1  65.34  15.88  49.46  Walls Type2  4.32  1.89  2.43  Walls Type3  7.29  Roof  6  0  6  Total area of elements, m²  Party wall  Party ceiling  * for windows and roof windows, use effective window U-value calculated of the include the areas on both sides of internal walls and partitions  Fabric heat loss, W/K = S (A x U)  Heat capacity Cm = S(A x k)  Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K  For design assessments where the details of the construction are not known.	$x^{1/[1/(1.4) + 0.04]} = 2.7$ $x^{1/[1/(1.4) + 0.04]} = 2.7$ $x^{1/[1/(1.4) + 0.04]} = 2.7$ $x                                    $
Windows Type 3  Windows Type 4  Floor  Floor  Walls Type1  65.34  15.88  49.46  Walls Type2  4.32  1.89  2.43  Walls Type3  7.29  Roof  6  0  6  Total area of elements, m²  Party wall  Party ceiling  * for windows and roof windows, use effective window U-value calculated of the include the areas on both sides of internal walls and partitions  Fabric heat loss, W/K = S (A x U)  Heat capacity Cm = S(A x k)  Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K	$x^{1/[1/(1.4) + 0.04]} = 2.7$ $x^{1/[1/(1.4) + 0.04]} = 2.7$ $x^{1/[1/(1.4) + 0.04]} = 2.7$ $x                                    $



f details of therma Fotal fabric hea	0 0	are not kn	own (36) =	= 0.05 x (3	1)			(33) ±	(36) =			00.07	(37)
/entilation hea		alculated	l monthly	,						25)m x (5)		60.07	(37)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
38)m= 38.9	38.62	38.34	37.04	36.8	35.67	35.67	35.46	36.1	36.8	37.29	37.8		(38)
ىـــــــــ Heat transfer c	coefficier	nt. W/K			<u>[</u>	!		(39)m	= (37) + (37)	1 38)m	<u> </u>		
39)m= 98.97	98.69	98.41	97.11	96.87	95.74	95.74	95.53	96.18	96.87	97.36	97.88		
								,	Average =	Sum(39) <sub>1</sub>	12 /12=	97.11	(39)
Heat loss para	<u> </u>				1			` ,	= (39)m ÷	<del>`</del>		l	
40)m= 1.39	1.39	1.39	1.37	1.36	1.35	1.35	1.35	1.35	1.36	1.37	1.38	4.07	7,40
Number of day	s in mor	nth (Tabl	le 1a)					,	Average =	Sum(40) <sub>1</sub>	12 /12=	1.37	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
					•	•	•				•	!	
4. Water heat	ing ener	gy requi	rement:								kWh/ye	ear:	
\		\1										1	
ssumed occu if TFA > 13.9			[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	013 x (	ΓFA -13.		.27		(42
if TFA £ 13.9	0, N = 1				·			,					
Ann <mark>ual averag</mark> Reduce the annua									se target o		3.12		(43
ot more that 125	_		_		_	-			io target e				
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
lot water usage in	n litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
44)m= 96.93	93.4	89.88	86.35	82.83	79.3	79.3	82.83	86.35	89.88	93.4	96.93		_
Energy content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	m x nm x D	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1		1057.39	(44
45)m= 143.74	125.72	129.73	113.1	108.52	93.65	86.78	99.58	100.77	117.44	128.19	139.21		
	120112	12011								m(45) <sub>112</sub> =	L	1386.41	(45
instantaneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)	to (61)					_
46)m= 21.56	18.86	19.46	16.97	16.28	14.05	13.02	14.94	15.12	17.62	19.23	20.88		(46
Vater storage Storage volum		includin	na anv eo	olar or M	////HRS	etorana	within sa	ma vas	امء		450		(47
f community h	, ,					_		iiie ves	361		150		(41
Otherwise if no	•			•			` '	ers) ente	er '0' in (	47)			
Vater storage	loss:		`					,	`	,			
a) If manufact	urer's de	eclared l	oss facto	or is kno	wn (kWł	n/day):				1.	.39		(48
emperature fa	actor fro	m Table	2b							0.	.54		(49
Energy lost fro		_	-			lea access	(48) x (49)	=		0.	.75		(50
b) If manufact lot water stora			-								0		(5′
	•			( •		,,					~		,,,
f community h													<b>/</b> E′
/olume factor	from Tal										0		(32
f community h /olume factor Femperature fa	from Tal		2b							-	0		(52 (53
olume factor	from Tal actor fro m water	m Table storage		ear			(47) x (51)	x (52) x (	53) =				



(56)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 (57)  If cylinder contains dedicated solar storage, (57)m = (56)m x ((50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H  (57)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 (57)  Primary circuit loss (annual) from Table 3
(57)m= 23.33
Primary circuit loss (annual) from Table 3  Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m  (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)  (59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26 (59)  Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m  (61)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)  (59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 23.26 23.26 22.51 23.26 22.51 23.26 (59)  Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m  (61)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)  (59)m= 23.26
(59) m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26 (59) Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m  (61)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m  (61)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
(61)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m (62)m = 190.34
(62)m= 190.34 167.8 176.32 158.19 155.12 138.74 133.37 146.17 145.86 164.03 173.28 185.8 (62)  Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating) (add additional lines if FGHRS and/or WWHRS applies, see Appendix G)  (63)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating) (add additional lines if FGHRS and/or WWHRS applies, see Appendix G) (63)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G) (63)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
(63)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Output from water heater  (64)m= 190.34 167.8 176.32 158.19 155.12 138.74 133.37 146.17 145.86 164.03 173.28 185.8  Output from water heater (annual) 112 1935.03 (64)  Heat gains from water heating, kWh/month 0.25 [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]  (65)m= 85.07 75.47 80.41 73.68 73.36 67.21 66.13 70.39 69.58 76.32 78.7 83.56 (65)  include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating  5. Internal gains (see Table 5 and 5a):
(64)m= 190.34 167.8 176.32 158.19 155.12 138.74 133.37 146.17 145.86 164.03 173.28 185.8  Output from water heater (annual) 112 1935.03 (64)  Heat gains from water heating, kWh/month 0.25 [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m]  (65)m= 85.07 75.47 80.41 73.68 73.36 67.21 66.13 70.39 69.58 76.32 78.7 83.56 (65)  include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating  5. Internal gains (see Table 5 and 5a):
Output from water heater (annual) 112 1935.03 (64)  Heat gains from water heating, kWh/month 0.25 [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m]  (65)m= 85.07 75.47 80.41 73.68 73.36 67.21 66.13 70.39 69.58 76.32 78.7 83.56 (65)  include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating  5. Internal gains (see Table 5 and 5a):
Heat gains from water heating, kWh/month 0.25 \[ [0.85 \times (45)m + (61)m] + 0.8 \times [(46)m + (57)m + (59)m] \] (65)m= \[ 85.07 \] 75.47 \[ 80.41 \] 73.68 \[ 73.36 \] 67.21 \[ 66.13 \] 70.39 \[ 69.58 \] 76.32 \[ 78.7 \] 83.56 \] include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. Internal gains (see Table 5 and 5a):
(65)m= 85.07 75.47 80.41 73.68 73.36 67.21 66.13 70.39 69.58 76.32 78.7 83.56 include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. Internal gains (see Table 5 and 5a):
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating  5. Internal gains (see Table 5 and 5a):
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= 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
(67)m= 17.8 15.81 12.85 9.73 7.27 6.14 6.64 8.63 11.58 14.7 17.16 18.29 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
(68)m= 199.62 201.69 196.47 185.36 171.33 158.15 149.34 147.27 152.49 163.6 177.63 190.81 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
(69)m= 34.35 34.35 34.35 34.35 34.35 34.35 34.35 34.35 34.35 34.35 34.35 (69)
Pumps and fans gains (Table 5a)
(70)m= 3 3 3 3 3 3 3 3 3 3 3 (70)
Losses e.g. evaporation (negative values) (Table 5)
(71)m= -90.81 -90.81 -90.81 -90.81 -90.81 -90.81 -90.81 -90.81 -90.81 -90.81 (71)
(71)m= -90.81 -90.81 -90.81 -90.81 -90.81 -90.81 -90.81 -90.81 -90.81 -90.81 -90.81 -90.81 (71)
(71)m= -90.81 -90.81 -90.81 -90.81 -90.81 -90.81 -90.81 -90.81 -90.81 -90.81 -90.81 -90.81 (71)  Water heating gains (Table 5)
(71)m=

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



Orientatio	on:	Access Facto Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	X	2.04	x	10.63	x	0.63	x	0.7	=	13.26	(74)
North	0.9x	0.77	x	2.04	x	20.32	x	0.63	X	0.7	=	25.34	(74)
North	0.9x	0.77	X	2.04	x	34.53	x	0.63	x	0.7	=	43.06	(74)
North	0.9x	0.77	X	2.04	x	55.46	x	0.63	X	0.7	=	69.16	(74)
North	0.9x	0.77	X	2.04	x	74.72	x	0.63	x	0.7	=	93.16	(74)
North	0.9x	0.77	X	2.04	x	79.99	x	0.63	x	0.7	] =	99.73	(74)
North	0.9x	0.77	X	2.04	x	74.68	x	0.63	x	0.7	] =	93.11	(74)
North	0.9x	0.77	X	2.04	x	59.25	X	0.63	x	0.7	] =	73.87	(74)
North	0.9x	0.77	X	2.04	x	41.52	x	0.63	x	0.7	=	51.77	(74)
North	0.9x	0.77	X	2.04	x	24.19	X	0.63	x	0.7	=	30.16	(74)
North	0.9x	0.77	X	2.04	x	13.12	X	0.63	X	0.7	=	16.36	(74)
North	0.9x	0.77	X	2.04	x	8.86	X	0.63	x	0.7	] =	11.05	(74)
South	0.9x	0.77	X	5.68	X	46.75	X	0.63	X	0.7	=	81.16	(78)
South	0.9x	0.77	X	2.04	x	46.75	X	0.63	X	0.7	=	58.3	(78)
South	0.9x	0.77	X	5.68	x	76.57	X	0.63	X	0.7	=	132.91	(78)
South	0.9x	0.77	X	2.04	X	76.57	X	0.63	X	0.7	] =	95.47	(78)
South	0.9x	0.77	x	5.68	x	97.53	×	0.63	x	0.7	=	169.31	(78)
South	0.9x	0.77	X	2.04	х	97.53	<b>x</b>	0.63	x	0.7	=	121.62	(78)
South	0.9x	0.77	X	5.68	x	110.23	x	0.63	x	0.7	=	191.35	(78)
South	0.9x	0.77	X	2.04	x	110.23	х	0.63	x	0.7	=	137.45	(78)
South	0.9x	0.77	x	5.68	x	114.87	X	0.63	x	0.7	=	199.4	(78)
South	0.9x	0.77	X	2.04	x	114.87	X	0.63	x	0.7	=	143.23	(78)
South	0.9x	0.77	X	5.68	X	110.55	X	0.63	X	0.7	=	191.9	(78)
South	0.9x	0.77	X	2.04	X	110.55	X	0.63	X	0.7	=	137.84	(78)
	0.9x	0.77	X	5.68	x	108.01	X	0.63	X	0.7	=	187.5	(78)
	0.9x	0.77	X	2.04	x	108.01	X	0.63	X	0.7	=	134.68	(78)
	0.9x	0.77	X	5.68	x	104.89	X	0.63	X	0.7	=	182.08	(78)
	0.9x	0.77	X	2.04	X	104.89	x	0.63	X	0.7	=	130.79	(78)
	0.9x	0.77	X	5.68	x	101.89	x	0.63	X	0.7	=	176.86	(78)
	0.9x	0.77	X	2.04	X	101.89	X	0.63	X	0.7	=	127.04	(78)
	0.9x	0.77	X	5.68	X	82.59	X	0.63	X	0.7	=	143.36	(78)
	0.9x	0.77	X	2.04	X	82.59	X	0.63	X	0.7	=	102.98	(78)
	0.9x	0.77	X	5.68	X	55.42	X	0.63	X	0.7	=	96.2	(78)
	0.9x	0.77	X	2.04	X	55.42	X	0.63	X	0.7	=	69.1	(78)
	0.9x		X	5.68	x	40.4	X	0.63	X	0.7	=	70.13	(78)
	0.9x	0.77	X	2.04	x	40.4	x	0.63	x	0.7	] =	50.37	(78)
	0.9x	0.77	X	2.04	x	19.64	x	0.63	X	0.7	=	12.24	(80)
	0.9x		X	2.04	x	38.42	X	0.63	X	0.7	=	23.95	(80)
West	0.9x	0.77	X	2.04	x	63.27	X	0.63	X	0.7	=	39.45	(80)



West	0.9x	0.77	X	2.0	)4	x	9	2.28	x		0.63	x	0.7	=	57.53	(80)
West	0.9x	0.77	X	2.0	)4	x	1	13.09	X		0.63	x	0.7	=	70.51	(80)
West	0.9x	0.77	X	2.0	)4	x	1	15.77	х		0.63	x	0.7	=	72.18	(80)
West	0.9x	0.77	X	2.0	)4	x	1	10.22	х		0.63	x	0.7	=	68.72	(80)
West	0.9x	0.77	х	2.0	)4	x	9	4.68	х		0.63	_ x _	0.7	_ =	59.03	(80)
West	0.9x	0.77	X	2.0	)4	x	7	3.59	х		0.63	_ x [	0.7	=	45.88	(80)
West	0.9x	0.77	X	2.0	)4	x	4	5.59	х		0.63	_ x [	0.7	=	28.42	(80)
West	0.9x	0.77	X	2.0	)4	x	2	4.49	х		0.63	_ x [	0.7		15.27	(80)
West	0.9x	0.77	X	2.0	)4	x	1	6.15	х		0.63	<b>-</b> x -	0.7	╡ -	10.07	(80)
Solar q	ains in w	vatts, ca	alculated	I for eac	h month				(83)m	= Su	m(74)m	(82)m				
(83)m=		277.68	373.43	455.5	506.31		01.65	484.01	445.		401.55	304.92	196.92	141.62	1	(83)
Total g	ains – in	ternal a	nd solar	· (84)m =	= (73)m	+ (8	33)m	, watts	<u> </u>		!		!		1	
(84)m=	556.76	667.53	750.88	812.97	843.57	8	19.34	788.92	756.	.33	722.3	645.86	561.06	523.09	]	(84)
7 Mes	an intern	al temr	erature	(heating	season	)									•	
	erature d			`		<i></i>	araa f	from Tak	مام ۵	Th1	(°C)				21	(85)
•		Ü	٠.			Ŭ			л <del>с</del> э,		( 0)					(00)
Otilisa	tion fact				<del>-                                    </del>	r			Ι		Can	0-4	Nov	Dag	1	
(96)	Jan	Feb	Mar	Apr	May		Jun	Jul		ug	Sep	Oct	Nov	Dec 1		(86)
(86)m=	0.99	0.99	0.97	0.93	0.84		0.68	0.52	0.5	00	0.78	0.94	0.99		j	(00)
Me <mark>an</mark>	internal	temper	ature in	living ar	ea T1 (fo	ollo	w ste	ps 3 to 7	in T	able	9c)				,	
(87)m=	1 <mark>9.61</mark>	19.82	20.11	20.47	20.76	2	0.93	20.98	20.9	98	20.87	20.49	19.98	19.57		(87)
Temp	erature d	during h	eating p	eriods ir	rest of	dw	elling	from Ta	ble 9	, Th	2 (°C)					
(88)m=	19.77	19.77	19.77	19.79	19.79		19.8	19.8	19.8	81	19.8	19.79	19.79	19.78		(88)
Utilisa	tion fact	or for g	ains for	rest of d	welling,	h2,	m (se	e Table	9a)							
(89)m=	0.99	0.98	0.96	0.9	0.78		0.58	0.39	0.4	2	0.69	0.92	0.98	0.99	]	(89)
Mean	internal	tompor	ature in	the rest	of dwall	ina	T2 (f	allow etc	nc 3	to 7	in Tabl	0.00			J	
(90)m=	17.95	18.26	18.69	19.19	19.56	Ť	9.76	19.8	19.	$\overline{}$	19.7	19.24	18.51	17.91	1	(90)
(00)=		10.20	10.00	10.10	10.00	<u> </u>	0.70	10.0					g area ÷ (4	l	0.37	(91)
													<b>5</b> (	,	0.37	(01)
r	internal		· ·	1	i	т —	-		_ `_					ı	1	4
(92)m=	18.56	18.83	19.21	19.66	20		0.19	20.23	20.2		20.13	19.7	19.05	18.52	]	(92)
· · · · r	adjustm			i	<del></del>	_			<del> </del>	$\overline{}$		•	T		1	(00)
(93)m=	18.56	18.83	19.21	19.66	20	2	0.19	20.23	20.2	23	20.13	19.7	19.05	18.52		(93)
	ace heati															
	to the m ilisation f			•		ned	at ste	ep 11 of	Table	e 9b	, so that	t Ti,m=(	76)m an	d re-cal	culate	
	Jan	Feb	Mar	Apr	May	Г	Jun	Jul	Λ,	ug	Sep	Oct	Nov	Dec	1	
] ceilitl l	tion fact			<u> </u>	iviay		Juli	Jui		ug [	oeh [	Oct	1100	Dec	J	
(94)m=	0.99	0.98	0.95	0.9	0.79	1	0.62	0.43	0.4	7	0.72	0.92	0.98	0.99	1	(94)
	I gains, h				<u> </u>	`	3.02	0.10	<u> </u>	<u>.                                     </u>	0.72	0.02	0.00	0.00	J	(- /
(95)m=	<del></del>	652.19	715.81	731.87	670.18	50	03.93	342.53	358.	.17	517.73	591.67	548.88	518.6	1	(95)
L	ıly avera			<u> </u>	l .								1		J	· /
(96)m=	4.3	4.9	6.5	8.9	11.7	_	14.6	16.6	16.	4	14.1	10.6	7.1	4.2	1	(96)
` ' L	oss rate					_			<u> </u>				<u> </u>	<u> </u>	1	. ,
(97)m=	1411.23		1250.71	1044.47	803.92	_	35.09	347.74	365.	<del>_</del>	580.11	881.25	1163.57	1401.54	]	(97)
` ′	-		<u> </u>	<u> </u>	L		-		L		!		L	L	J	* *



Space heating require	ement fo	r each m	nonth k\	Mh/mont	th = 0.02	94 x [(97)	ım – (95	)m] x <i>(4</i> *	1 \m			
(98)m= 640.26 485.81	397.97	225.07	99.5	0	0	0	0	215.45	442.58	656.91		
						Tota	l per year	(kWh/year	) = Sum(9	8) <sub>15,912</sub> =	3163.55	(98)
Space heating require	ement in	kWh/m²	/year								44.56	(99)
9a. Energy requiremen	ts – Indi	vidual h	eating sy	ystems i	ncluding	micro-C	HP)					
Space heating:			/I-		1					İ	_	7(004)
Fraction of space hea		-		mentary	-	(202) = 1 -	(201) -				0	(201)
Fraction of space hea		•	. ,			(202) = 13 (204) = (204)		(203)] =			1	(202)
Fraction of total heatin	•	•				(204) = (20	02) <b>x</b> [1 –	(203)] =			1 00.5	(204)
Efficiency of main spa Efficiency of secondar				a evetom	0/-						93.5	(208)
						۸۰۰۰	Con	Oct	Nov	Doo	_	`` ′
Jan Feb Space heating require	Mar ement (c	Apr alculated	May d above	Jun )	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
640.26 485.81	397.97	225.07	99.5	0	0	0	0	215.45	442.58	656.91		
$(211)$ m = {[(98)m x (20)	4)] } x 1	00 ÷ (20	6)									(211)
684.77 519.58	425.64	240.72	106.42	0	0	0	0	230.42	473.35	702.57		_
						Tota	I (kWh/yea	ar) =Sum(2	211) <sub>15,1012</sub>	F	3383.47	(211)
Space heating fuel (se			month									
$= \{[(98)m \times (201)]\} \times 10^{-1}$ $(215)m = 0 \qquad 0$	00 ÷ (20 0	0	0	0	0	0	0	0	0	0		
				-			I (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>		0	(215)
Water heating												_
Output from water heat				100=1	100.07			121.00	.=			
190.34 167.8 Efficiency of water hea	176.32	158.19	155.12	138.74	133.37	146.17	145.86	164.03	173.28	185.8	70.0	(216)
(217)m= 87.8 87.49	86.92	85.75	83.67	79.8	79.8	79.8	79.8	85.54	87.21	87.9	79.8	(217)
Fuel for water heating,			00.0.		. 0.0		. 0.0	00.0	01.121	01.10		( )
$(219)m = (64)m \times 100$	÷ (217)	m										
(219)m= 216.78 191.8	202.85	184.47	185.4	173.86	167.13	183.17	182.78 I = Sum(2	191.75	198.69	211.37	2000.00	7(040)
Annual totals						rota	r = Odin(2		Nh/year		2290.08 <b>kWh/yea</b> i	(219)
Space heating fuel use	d, main	system	1					K	Willy y Cal		3383.47	7
Water heating fuel use	d										2290.08	Ī
Electricity for pumps, fa	ans and	electric	keep-ho	t								_
central heating pump:										30		(230c)
boiler with a fan-assis	ted flue									45		(230e)
Total electricity for the	above, I	«Wh/yea	r			sum	of (230a).	(230g) =			75	(231)
Electricity for lighting	,	,									314.27	(232)
12a. CO2 emissions -	- Individ	ual heati	na syste	ems inclu	udina mi	cro-CHP						`

12a. CO2 emissions – Individual heating systems including micro-CHP

EnergyEmission factorEmissionskWh/yearkg CO2/kWhkg CO2/year



Space heating (main system 1)	(211) x	0.216	=	730.83	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	494.66	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1225.49	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	163.11	(268)
Total CO2, kg/year	sum	of (265)(271) =		1427.52	(272)

TER = 20.11 (273)



User Details: **Assessor Name:** Stroma Number: Stroma FSAP 2012 **Software Version: Software Name:** Version: 1.0.5.12 Property Address: E1-18 Address: 1. Overall dwelling dimensions Av. Height(m) Area(m²) Volume(m³) Ground floor (1a) x 2.7 (2a) =135 (3a) 50 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)(4)50 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =135 (5) total m³ per hour main secondary other heating heating x 40 = Number of chimneys (6a) 0 0 x 20 =Number of open flues 0 0 0 (6b) Number of intermittent fans x 10 =(7a) 2 20 x 10 =Number of passive vents (7b) 0 0 x 40 =Number of flueless gas fires 0 (7c)Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = $\div (5)$ 0.15 (8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9)0 Additional infiltration (10)[(9)-1]x0.1 =0 Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)0 if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12)If no draught lobby, enter 0.05, else enter 0 (13)O Percentage of windows and doors draught stripped (14)0 Window infiltration  $0.25 - [0.2 \times (14) \div 100] =$ 0 (15)Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =O (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)5 If based on air permeability value, then  $(18) = [(17) \div 20] + (8)$ , otherwise (18) = (16)0.4 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)3  $(20) = 1 - [0.075 \times (19)] =$ Shelter factor (20)0.78  $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.31 Infiltration rate modified for monthly wind speed Jan Feb Jul Sep Mar Apr May Jun Aug Oct Nov Dec Monthly average wind speed from Table 7 (22)m =5.1 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor  $(22a)m = (22)m \div 4$ 

1.1

1.08

0.95

0.95

0.92

1

1.08

1.12

1.18

1.23

(22a)m

1.27

1.25



djusted infiltr	ation rate	(allowi	ng for sh	elter an	d wind s	peed) =	(21a) x	(22a)m				-	
0.39	0.39	0.38	0.34	0.33	0.29	0.29	0.29	0.31	0.33	0.35	0.36		
<i>alculate effed</i> If mechanica		•	rate for t	пе арріі	саріе са	Se						0	(23
If exhaust air he	eat pump u	sing Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b)	) = (23a)			0	(23
If balanced with	heat recov	very: effic	iency in %	allowing f	or in-use f	actor (from	Table 4h	) =				0	(23
a) If balance	d mecha	nical ve	entilation	with he	at recove	ery (MVI	HR) (24a	a)m = (22	2b)m + (2	23b) × [′	1 – (23c)	÷ 100]	
4a)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24
b) If balance	d mecha	nical ve	entilation	without	heat red	covery (N	/IV) (24b	)m = (22	2b)m + (2	23b)		_	
4b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h if (22b)n	ouse exti า < 0.5 x								5 × (23b	o)			
4c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
d) If natural if (22b)n	ventilation n = 1, the			•	•				0.5]			_	
4d)m= 0.58	0.57	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57	]	(2
Effective air	change r	ate - er	nter (24a	) or (24b	o) or (24	c) or (24	d) in box	(25)				_	
5)m= 0.58	0.57	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57		(2
3. Heat losse	s and hea	at loss	paramete	er:								_	
LEMENT	Gross area (		Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/ł	<b>&lt;</b> )	k-value kJ/m²-		A X k kJ/K
oo <mark>rs</mark>					1.89	x	1	= [	1.89				(2
/in <mark>dows</mark> Type	:1				5.3	x1,	/[1/( 1.4 )+	0.04] =	7.03				(2
/indows Type	2				2.66	x1,	/[1/( 1.4 )+	0.04] =	3.53				(2
/indows Type	: 3				2.66	x1,	/[1/( 1.4 )+	0.04] =	3.53				(2
/alls Type1	22.95	5	10.62	2	12.33	3 x	0.18	=	2.22				(2
/alls Type2	20.79	)	1.89		18.9	X	0.18	= [	3.4				(2
otal area of e	lements,	m²			43.74	ļ							(3
arty wall					35.37	X	0	=	0				(3
arty floor					50								(3
arty ceiling					50								(3
or windows and include the area						ated using	formula 1	/[(1/U-valu	e)+0.04] a	ns given in	paragraph	n 3.2	
abric heat los	s, W/K =	S (A x	U)				(26)(30)	) + (32) =				21.59	(3
eat capacity	,	•						((28)	.(30) + (32	2) + (32a).	(32e) =	0	(3
nermal mass	•	•		•					tive Value:			250	(3
or design assess In be used inste	ad of a deta	ailed calc	ulation.			,	ecisely the	indicative	values of	TMP in Ta	able 1f		
nermal bridge	•	•			•	<						4.23	(3
details of therma otal fabric he		are not kn	own (36) =	= 0.05 x (3	11)			(33) +	(36) =			25.82	(3
entilation hea	at loss ca	lculated	l monthly	/				(38)m	= 0.33 × (	25)m x (5)	)		`
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	



(38)m= 25.72	25.59	25.46	24.84	24.73	24.19	24.19	24.09	24.4	24.73	24.96	25.2		(38)
Heat transfer c	oefficier	nt, W/K						(39)m	= (37) + (37)	38)m			
(39)m= 51.54	51.41	51.27	50.66	50.54	50.01	50.01	49.91	50.21	50.54	50.78	51.02		
Heat loss para	meter (H	HP) W/	/m²K						Average = = (39)m ÷	Sum(39) <sub>1.</sub>	12 /12=	50.66	(39)
(40)m= 1.03	1.03	1.03	1.01	1.01	1	1	1	1	1.01	1.02	1.02		
		ļ	!		ļ		ļ	,	Average =	Sum(40) <sub>1</sub> .	12 /12=	1.01	(40)
Number of day		<del>`</del>	<del></del>								_		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(41)
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heat	ing engl	rav regui	iromont:								kWh/ye	var:	
4. Water near	ing ener	igy requi	nement.								KVVII/ye	tai.	
Assumed occu if TFA > 13.9			: [1 - exp	(-0 0003	849 x (TF	- -13 9	1211 + 0 (	0013 x (1	ΓFA -13		69		(42)
if TFA £ 13.9		11.70 %	τι σχρ	( 0.0000	710 X (11	7. 10.0	<i>,</i> 2,] . o.c	) X 010 X	1171 10.				
Annual average Reduce the annual									se target o		.34		(43)
not more that 125	_				_	_	ao domeve	a water ac	ic larger o	,			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in	litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m= 81.77	78.8	75.83	72.85	69.88	66.91	66.91	69.88	72.85	75.83	78.8	81.77		
Energy content of	hot water	used - cal	culated mo	onthly – 4	190 x Vd n	n x nm x F	)Tm / 3600			m(44) <sub>112</sub> =		892.08	(44)
(45)m= 121.27	106.06	109.45	95.42	91.56	79.01	73.21	84.01	85.01	99.08	108.15	117.44		
(10)111= 121.21	100.00	100.10	00.12	01.00	70.01	10.2	0 1.01			m(45) <sub>112</sub> =	l .	1169.66	(45)
If instantaneous wa	ater heatii	ng at point	t of use (no	hot water	r storage),	enter 0 in	boxes (46)			` '	•		
(46)m= 18.19	15.91	16.42	14.31	13.73	11.85	10.98	12.6	12.75	14.86	16.22	17.62		(46)
Water storage Storage volume		includin	na anv sa	olar or W	/WHRS	storage	within sa	ame vess	sel		150		(47)
If community h	` ,		•			ŭ		arric voo.	501		150		(47)
Otherwise if no	_			-			. ,	ers) ente	er '0' in (	47)			
Water storage					4.144	<i>,</i> , , ,							
a) If manufacti				or is kno	wn (kvvr	n/day):					39		(48)
Temperature fa							(40) × (40)				54		(49)
Energy lost from b) If manufactor		•			or is not		(48) x (49)	) =		0.	75		(50)
Hot water stora			-								0		(51)
If community h	_		on 4.3										
Volume factor fa			2h							<b>—</b>	0		(52) (53)
Energy lost from				ear			(47) x (51)	x (52) x (!	53) =		0		(54)
Enter (50) or (		-	,, icvvii, y	Jui			(11) x (01)	/ X (OL) X (	30) —		75		(55)
Water storage	loss cal	culated f	for each	month			((56)m = (	55) × (41)r	m				
(56)m= 23.33	04.07							i	i				(56)
If cylinder contains	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(50)
ii oyiiiladi oontailid												ix H	(50)



Primary circuit loss (annual) from Table 3				(	)		(58)
Primary circuit loss calculated for each month (59	$9)$ m = (58) $\div$ 36	5 × (41)m					
(modified by factor from Table H5 if there is sol		ng and a cyli	inder thermo	stat)			
(59)m= 23.26 21.01 23.26 22.51 23.26 2	22.51 23.26	23.26 22	.51 23.26	22.51	23.26		(59)
Combi loss calculated for each month (61)m = (60	0) ÷ 365 × (41)	m					
(61)m= 0 0 0 0 0	0 0	0	0 0	0	0		(61)
Total heat required for water heating calculated for	or each month	(62)m = $0.8$	5 × (45)m + (	(46)m +	(57)m + (5	9)m + (61)m	
(62)m= 167.86 148.15 156.04 140.51 138.15 1	124.1 119.81	130.61 130	0.11 145.67	153.24	164.04		(62)
Solar DHW input calculated using Appendix G or Appendix H	(negative quantity)	) (enter '0' if no	solar contributi	on to wate	r heating)		
(add additional lines if FGHRS and/or WWHRS ap	pplies, see App	pendix G)					
(63)m= 0 0 0 0	0 0	0	0 0	0	0		(63)
Output from water heater							
(64)m= 167.86 148.15 156.04 140.51 138.15 1	124.1 119.81	130.61 130	0.11 145.67	153.24	164.04		
		Output fro	om water heater	(annual) <sub>1</sub>	12	1718.27	(64)
Heat gains from water heating, kWh/month 0.25 ´	[0.85 × (45)m	+ (61)m] +	0.8 x [(46)m	+ (57)m	+ (59)m ]		
(65)m= 77.6 68.93 73.67 67.8 67.72 6	62.34 61.62	65.21 64	.34 70.22	72.03	76.33		(65)
include (57)m in calculation of (65)m only if cylin	nder is in the d	l <mark>wellin</mark> g or h	ot wate <mark>r is fr</mark>	om comi	munity hea	ating	
5. Internal gains (see Table 5 and 5a):							
Metabolic gains (Table 5), Watts							
Jan Feb Mar Apr May	Jun Jul	Aug S	Sep Oct	Nov	Dec		
(66)m= 84.51 84.51 84.51 84.51 84.51 8	84.51 84.51	84.51 84	.51 84.51	84.51	84.51		(66)
Lighting gains (calculated in Appendix L, equation	n L9 or L9a), al	so see Tabl	e 5				
(67)m= 13.15 11.68 9.5 7.19 5.38	4.54 4.9	6.37 8.	56 10.86	12.68	13.52		(67)
Appliances gains (calculated in Appendix L, equa	ition L13 or L13	Ba), also see	e Table 5				
(68)m= 147.23 148.76 144.91 136.72 126.37 1	116.64 110.15	108.62 112	2.47 120.67	131.01	140.74		(68)
Cooking gains (calculated in Appendix L, equation	n L15 or L15a)	, also see T	able 5				
(69)m= 31.45 31.45 31.45 31.45 3	31.45 31.45	31.45 31	.45 31.45	31.45	31.45		(69)
Pumps and fans gains (Table 5a)		-		_			
(70)m= 3 3 3 3 3	3 3	3 :	3 3	3	3		(70)
Losses e.g. evaporation (negative values) (Table	5)	-					
(71)m= -67.6 -67.6 -67.6 -67.6 -67.6	-67.6 -67.6	-67.6 -6	7.6 -67.6	-67.6	-67.6		(71)
Water heating gains (Table 5)	<u> </u>	•					
(72)m= 104.3 102.58 99.01 94.17 91.02 8	86.59 82.82	87.65 89	.36 94.38	100.05	102.59		(72)
Total internal gains =	(66)m + (67)m	+ (68)m + (69)	)m + (70)m + (7	1)m + (72)	m		
(73)m= 316.04 314.38 304.78 289.43 274.12 2	259.12 249.22	253.99 26	1.74 277.26	295.09	308.19		(73)
6. Solar gains:	'	,					
Solar gains are calculated using solar flux from Table 6a and	d associated equat	ions to conver	t to the applicab	le orientati	ion.		
Orientation: Access Factor Area	Flux	_ g_	o. T	FF		Gains	
Table 6d m²	Table 6a	Table	e 60 Ta	able 6c		(W)	_
South 0.9x 0.77 x 2.66 x	46.75	× 0.6	3 ×	0.7	=	38.01	(78)
South 0.9x 0.77 x 2.66 x	76.57	x 0.6	3 x	0.7	=	62.24	(78)



	_													
South	0.9x	0.77	X	2.66	X		7.53	X	0.63	X	0.7	=	79.29	(78)
South	0.9x	0.77	X	2.66	×	1	10.23	X	0.63	x	0.7	=	89.61	(78)
South	0.9x	0.77	X	2.66	×	1	14.87	X	0.63	x	0.7	=	93.38	(78)
South	0.9x	0.77	X	2.66	×	1	10.55	X	0.63	x	0.7	=	89.87	(78)
South	0.9x	0.77	Х	2.66	х	1	08.01	X	0.63	x	0.7	=	87.81	(78)
South	0.9x	0.77	Х	2.66	х	1	04.89	X	0.63	x	0.7	=	85.27	(78)
South	0.9x	0.77	X	2.66	×	1	01.89	X	0.63	x	0.7	=	82.83	(78)
South	0.9x	0.77	Х	2.66	х		32.59	X	0.63	x	0.7		67.14	(78)
South	0.9x	0.77	X	2.66	X		55.42	X	0.63	x	0.7	=	45.05	(78)
South	0.9x	0.77	Х	2.66	х		40.4	X	0.63	x [	0.7	=	32.84	(78)
West	0.9x	0.77	X	5.3	×	1	9.64	x	0.63	x [	0.7	=	31.81	(80)
West	0.9x	0.77	X	2.66	×	1	9.64	X	0.63	x [	0.7	=	15.97	(80)
West	0.9x	0.77	X	5.3	X	3	88.42	x	0.63	x [	0.7	=	62.23	(80)
West	0.9x	0.77	X	2.66	X	3	88.42	x	0.63	x [	0.7	=	31.23	(80)
West	0.9x	0.77	X	5.3	X	. 6	3.27	x	0.63	x [	0.7	=	102.49	(80)
West	0.9x	0.77	X	2.66	×	. 6	3.27	x	0.63	x [	0.7	=	51.44	(80)
West	0.9x	0.77	X	5.3	X	. 9	2.28	x	0.63	x [	0.7	=	149.47	(80)
West	0.9x	0.77	X	2.66	X	9	2.28	X	0.63	Х	0.7	=	75.02	(80)
West	0.9x	0.77	x	5.3	x	1	13.09	x_	0.63	х	0.7		183.18	(80)
West	0.9x	0.77	x	2.66	x	1	13.09	_ x	0.63	х	0.7	=	91.94	(80)
West	0.9x	0.77	x	5.3	х	1	15.77	x	0.63	х	0.7	=	187.52	(80)
West	0.9x	0.77	X	2.66	×	1	15.77	Х	0.63	х	0.7	=	94.11	(80)
West	0.9x	0.77	x	5.3	×	1	10.22	Х	0.63	х	0.7	=	178.53	(80)
West	0.9x	0.77	X	2.66	×	1	10.22	х	0.63	х	0.7	=	89.6	(80)
West	0.9x	0.77	x	5.3	×	: [	94.68	x	0.63	x	0.7		153.35	(80)
West	0.9x	0.77	X	2.66	×	: 9	94.68	x	0.63	x	0.7		76.96	(80)
West	0.9x	0.77	X	5.3	×	7	'3.59	x	0.63	x [	0.7	=	119.2	(80)
West	0.9x	0.77	x	2.66	x	: 7	'3.59	x	0.63	_ x	0.7		59.82	(80)
West	0.9x	0.77	X	5.3	×	:	15.59	x	0.63	x	0.7	=	73.84	(80)
West	0.9x	0.77	X	2.66	×	:	15.59	x	0.63	x	0.7	=	37.06	(80)
West	0.9x	0.77	X	5.3	×	2	24.49	x	0.63	x [	0.7		39.67	(80)
West	0.9x	0.77	X	2.66	×	2	24.49	x	0.63	x	0.7		19.91	(80)
West	0.9x	0.77	X	5.3	x	: 1	6.15	x	0.63	_ x	0.7		26.16	(80)
West	0.9x	0.77	x	2.66	x	: 1	6.15	x	0.63	×	0.7		13.13	(80)
	_													
Solar g	ains in y	watts, calc	ulated	for each m	onth			(83)m	n = Sum(74)m .	(82)m	_		•	
(83)m=	85.78		233.21		68.5	371.5	355.93	315	.59 261.85	178.04	104.62	72.13		(83)
Total ga				(84)m = $(7$	<del></del>								Ī	
(84)m=	401.82	470.08 5	37.99	603.53 64	2.62	630.62	605.16	569	.58 523.59	455.3	399.72	380.33		(84)
7. Mea	an interr	nal temper	rature (	heating se	ason)									
Tempe	erature	during hea	ating pe	eriods in th	e livin	g area	from Tal	ble 9,	, Th1 (°C)				21	(85)
Utilisa	tion fac	tor for gair	ns for li	ving area,		(see Ta	ble 9a)							
	Jan	Feb	Mar	Apr I	May	Jun	Jul	A	ug Sep	Oct	Nov	Dec		



(86)m=	0.99	0.98	0.95	0.85	0.69	0.5	0.36	0.4	0.64	0.9	0.98	0.99		(86)
Mear	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Table	e 9c)		•			
(87)m=	20.11	20.3	20.55	20.81	20.95	20.99	21	21	20.98	20.78	20.4	20.08		(87)
Temp	erature	during h	eating p	eriods ir	rest of	dwelling	from Ta	able 9, Ti	h2 (°C)		•			
(88)m=	20.06	20.06	20.06	20.07	20.07	20.08	20.08	20.08	20.08	20.07	20.07	20.07		(88)
Utilisa	ation fac	tor for a	ains for	rest of d	welling,	h2,m (se	e Table	9a)			•			
(89)m=	0.99	0.97	0.93	0.82	0.64	0.43	0.29	0.32	0.56	0.87	0.97	0.99		(89)
Mear	interna	l temper	ature in	the rest	of dwelli	na T2 (fo	ollow ste	eps 3 to 7	7 in Tabl	e 9c)	•			
(90)m=	18.89	19.16	19.52	19.87	20.03	20.08	20.08	20.08	20.06	19.84	19.31	18.85		(90)
									f	LA = Livin	g area ÷ (	4) =	0.47	(91)
Mear	interna	l temper	ature (fo	r the wh	ole dwe	llina) = fl	LA × T1	+ (1 – fL	A) x T2			!		
(92)m=	19.47	19.7	20.01	20.32	20.47	20.51	20.52	20.52	20.5	20.28	19.83	19.43		(92)
Apply	adjustr	nent to t	he mear	internal	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	19.47	19.7	20.01	20.32	20.47	20.51	20.52	20.52	20.5	20.28	19.83	19.43		(93)
•		ting requ												
				mperatui using Ta		ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
uie u	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Util <mark>is</mark>		tor for g			May	Juli	Jul	, tag	СОР	001	1101		I	
(94)m=	0.99	0.97	0.93	0.83	0.66	0.47	0.32	0.36	0.6	0.88	0.97	0.99		(94)
Us <mark>ef</mark> u		hmGm	, W = (9	4)m x (84	4)m									
(95)m=	396.7	456.79	501.03	500.42	424.21	293.43	195.65	205.07	312.83	399.27	388.68	376.58		(95)
				perature									ı	(00)
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
(97)m=	781.87	760.6	an intern 692.54	al tempe 578.36	443.14	Lm , vv =	=[(39)m : 195.88	x [(93)m	- (96)m 321.16	489.46	646.16	777.1	1	(97)
` '		ļ		r each m						<u> </u>		///.1		(0.)
(98)m=	286.57	204.16	142.48	56.12	14.09	0	0	0	0	67.1	185.38	297.99		
								Tota	l per year	(kWh/yea	r) = Sum(9	8) <sub>15,912</sub> =	1253.88	(98)
Spac	e heatin	g require	ement in	kWh/m²	/year								25.08	(99)
9a En	erav red	uiremer	nts – Ind	ividual h	eating s	vstems i	ncludina	micro-C	CHP)					
	e heatir	•				, 0101110 11			, ,					
-		_	t from s	econdar	y/supple	mentary	system						0	(201)
Fract	ion of sp	ace hea	at from m	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fract	ion of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) <b>x</b> [1 –	(203)] =			1	(204)
Effici	ency of	main spa	ace heat	ing syste	em 1								93.5	(206)
Effici	ency of	seconda	ry/suppl	ementar	y heating	g system	າ, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/y	 /ear
Spac	e heatin	g require	ement (c	alculate				<u> </u>					,	
	286.57	204.16	142.48	56.12	14.09	0	0	0	0	67.1	185.38	297.99		
(211)n	n = {[(98	)m x (20	4)] } x 1	00 ÷ (20	(6)									(211)
	306.49	218.35	152.39	60.02	15.06	0	0	0	0	71.77	198.27	318.7		
								Tota	l (kWh/yea	ar) =Sum(2	211) <sub>15,1012</sub>	<b>=</b>	1341.05	(211)



Space heating fuel (secondary), kWh/month = $\{[(98)m \times (201)]\} \times 100 \div (208)$								
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	0 0	0	0	0	0	0	7	
		Tota	l (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>	<u>.                                    </u>	0	(215)
Water heating								
Output from water heater (calculated above)		1 400 04	100.11	445.07	150.04	1,04,04	7	
167.86   148.15   156.04   140.51   138.15   1 Efficiency of water heater	124.1 119.81	130.61	130.11	145.67	153.24	164.04	70.0	(216)
	79.8 79.8	79.8	79.8	82.89	85.32	86.39	79.8	(217)
Fuel for water heating, kWh/month	70.0	70.0	7 0.0	02.00	00.02	00.00	_	(= )
$(219)$ m = $(64)$ m x $100 \div (217)$ m					,	,	7	
(219)m= 194.67   172.93   184.51   170.14   171.23   1	55.51 150.13	163.67	163.04	175.74	179.6	189.88		_
		Tota	I = Sum(2				2071.04	(219)
Annual totals Space heating fuel used, main system 1				K	Wh/yeaı		<b>kWh/yea</b>	<u>r</u>
Water heating fuel used							2071.04	╡
Electricity for pumps, fans and electric keep-hot								
central heating pump:						30	1	(230c)
boiler with a fan-assisted flue						45		(230e)
		SIIM	of (230a)	(230g) =		45	75	
Total electricity for the above, kWh/year		Sum	OI (230a).	(2309) =			75	(231)
Electricity for lighting							232.27	(232)
12a. CO2 emissions – Individual heating system	s including m	icro-CHP		-			_	
	Energy				ion fac	tor	Em <mark>issio</mark> n:	
	kWh/year			kg CO	2/kWh		kg CO2/ye	ar —
Space heating (main system 1)	(211) x			0.2	16	=	289.67	(261)
Space heating (secondary)	(215) x			0.5	19	=	0	(263)
Water heating	(219) x			0.2	16	=	447.34	(264)
Space and water heating	(261) + (262)	+ (263) + (	264) =				737.01	(265)
Electricity for pumps, fans and electric keep-hot	(231) x			0.5	19	=	38.93	(267)
Electricity for lighting	(232) x			0.5	19	=	120.55	(268)
Total CO2, kg/year			sum o	f (265)(2	271) =		896.49	(272)
								_



User Details: **Assessor Name:** Stroma Number: Stroma FSAP 2012 **Software Version: Software Name:** Version: 1.0.5.12 Property Address: E2-07 Address: 1. Overall dwelling dimensions Av. Height(m) Area(m²) Volume(m³) Ground floor 50.3 (1a) x 2.7 (2a) =135.81 (3a) Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)(4)50.3 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =135.81 (5) total m³ per hour main secondary other heating heating x 40 = Number of chimneys (6a) 0 0 x 20 =Number of open flues 0 0 0 (6b) Number of intermittent fans x 10 =(7a) 2 20 x 10 =Number of passive vents (7b) 0 0 x 40 =Number of flueless gas fires 0 (7c)Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =÷ (5) 0.15 (8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9)0 Additional infiltration [(9)-1]x0.1 =0 (10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)0 if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12)If no draught lobby, enter 0.05, else enter 0 (13)O Percentage of windows and doors draught stripped (14)0 Window infiltration  $0.25 - [0.2 \times (14) \div 100] =$ 0 (15)Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =O (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)5 If based on air permeability value, then  $(18) = [(17) \div 20] + (8)$ , otherwise (18) = (16)0.4 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)3  $(20) = 1 - [0.075 \times (19)] =$ Shelter factor (20)0.78  $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.31 Infiltration rate modified for monthly wind speed Jan Feb Jul Sep Mar Apr May Jun Aug Oct Nov Dec Monthly average wind speed from Table 7 (22)m =5.1 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor  $(22a)m = (22)m \div 4$ (22a)m 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18



Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m	
0.39	
Calculate effective air change rate for the applicable case	
If mechanical ventilation:  If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a)	0 (2
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	0 (2
	0 (2
a) If balanced mechanical ventilation with heat recovery (MVHR) $(24a)m = (22b)m + (23b) \times [1 - (23c) \div 100]$	ני. 2)
	(=
b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)  (24b)m = 0 0 0 0 0 0 0 0 0 0	(2
	(2
c) If whole house extract ventilation or positive input ventilation from outside if $(22b)m < 0.5 \times (23b)$ , then $(24c) = (23b)$ ; otherwise $(24c) = (22b)m + 0.5 \times (23b)$	
(24c)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(2
d) If natural ventilation or whole house positive input ventilation from loft	
if $(22b)m = 1$ , then $(24d)m = (22b)m$ otherwise $(24d)m = 0.5 + [(22b)m^2 \times 0.5]$	
(24d)m= 0.58 0.57 0.57 0.56 0.55 0.54 0.54 0.54 0.55 0.55 0.56 0.57	(2
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)	
(25)m= 0.58 0.57 0.57 0.56 0.55 0.54 0.54 0.54 0.55 0.55 0.56 0.57	(2
3. Heat losses and heat loss parameter:	
ELEMENT Gross Openings Net Area U-value A X U k-value	ΑXk
area (m²) m² A ,m² W/m2K (W/K) kJ/m²·K	kJ/K
Doors 1.89 x 1 = 1.89	(2
Windows Type 1 $8.01$ $\times 1/[1/(1.4) + 0.04] = 10.62$	(2
Windows Type 2 $2.67$ $x^{1/[1/(1.4) + 0.04]} = 3.54$	(2
Walls Type1 15.93 10.68 5.25 x 0.18 = 0.95	(2
Walls Type2 25.11 1.89 23.22 x 0.18 = 4.18	(2
Walls Type3 13.77 0 13.77 x 0.18 = 2.48	(2
Total area of elements, m <sup>2</sup> 54.81	(3
Party wall 23.49 x 0 = 0	(3
Destribute.	(3
Party ceiling 50.3  * for windows and roof windows use offective window II value calculated using formula 1/(1/II value) v 0.04I as given in paragraph 3.2	(3
* for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2  ** include the areas on both sides of internal walls and partitions	
Fabric heat loss, W/K = S (A x U) $(26)(30) + (32) =$	23.65 (3
Heat capacity $Cm = S(A \times k)$ ((28)(30) + (32) + (32a)(32e) =	0 (3
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Medium	250 (3
For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f	
can be used instead of a detailed calculation.	
Thermal bridges: S (L x Y) calculated using Appendix K	4.35
if details of thermal bridging are not known (36) = $0.05 \times (31)$ Total fabric heat loss (33) + (36) =	28.01 (3
Ventilation heat loss calculated monthly $ (38)m = 0.33 \times (25)m \times (5) $	(0
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	



Assumed occupancy, N														
Salam   Sala	(38)m= 25.86	25.73	25.6	24.98	24.86	24.33	24.33	24.23	24.53	24.86	25.1	25.34		(38)
Heat loss parameter (HLP), W/m²K	Heat transfer	coefficie	nt, W/K						(39)m	= (37) + (37)	38)m			
Heat loss parameter (HLP), Wm/K  (40)me 1.07 1.07 1.07 1.05 1.05 1.05 1.04 1.04 1.04 1.04 1.05 1.05 1.05 1.05 1.05 1.05 1.05 1.05	(39)m= 53.87	53.73	53.6	52.99	52.87	52.33	52.33	52.23	52.54	52.87	53.1	53.35		
Company   Comp	Heat loss para	ameter (F	HP) W/	/m²K						_		12 /12=	52.99	(39)
Number of days in month (Table 1a)    Sep		<del>- `</del>	· ·		1.05	1.04	1.04	1.04	<del>`</del>		r ·	1.06		
Second Community   Second Comm	` '					<u> </u>		<u> </u>	,	Average =	Sum(40) <sub>1</sub> .	12 /12=	1.05	(40)
4. Water heating energy requirement:  **Whylear**  Assumed occupancy, N  If TFA > 1.3, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)  If TFA \$ 1.3, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)  If TFA \$ 1.3, N = 1  Annual average hot water usage in litres per day Vd. average = (25 x N) + 36  Feduce the annual average hot water usage in litres per day Vd. average = (25 x N) + 36  Feduce the annual average hot water usage in litres per day Vd. average = (25 x N) + 36  Feduce the annual average hot water usage in litres per day Vd. average = (25 x N) + 36  Feduce the annual average hot water usage in litres per day Vd. average = (25 x N) + 36  Feduce the annual average hot water usage in litres per day Vd. average = (25 x N) + 36  Table 125 litres per person per day (all water use, hot and cold)  Feduce the annual average hot water usage in litres per day Vd. average = (25 x N) + 36  Total = Sum(elly) = 50  Feduce the annual average hot water usage in litres per day Vd. average = (25 x N) + 36  Total = Sum(elly) = 50  Feduce the annual average hot water usage in litres per day Vd. average = (25 x N) + 36  Total = Sum(elly) = 50  Feduce the annual average hot water usage in litres per day Vd. average = (25 x N) + 36  Total = Sum(elly) = 50  Feduce the annual average hot water usage in litres per day Vd. average = (25 x N) + 36  Total = Sum(elly) = 50  Feduce the annual average hot water usage in litres per day Vd. average = (25 x N) + 36  Total = Sum(elly) = 50  Feduce the annual average hot water usage in litres per day Vd. average average = (25 x N) + 36  Total = Sum(elly) = 50  Feduce the average hot water usage in litres per day Vd. average everage = (25 x N) + 36  Total = Sum(elly) = 50  Feduce the average hot water usage in litres per day Vd. average everage = (25 x N) + 36  Total = Sum(elly) = 50  Feduce the average hot water usage in litres per day Vd. average everage = (25 x N) + 36  Total = Sum(elly) = 50  Feduce the average hot water usage in litre	Number of da	ys in mo	nth (Tab	le 1a)	i	ı		ı			ı		1	
### Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9) if TFA £ 13.9, N = 1  Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 Reduce the annual average hot water usage in litres per day Vd,average = (25 x N) + 36 Reduce the annual average hot water usage in litres per day Vd,average = (25 x N) + 36 Reduce the annual average hot water usage in litres per day Vd,average = (25 x N) + 36 Reduce the annual average hot water usage in litres per day Vd,average = (25 x N) + 36 Reduce the annual average hot water usage in litres per day Vd,average = (25 x N) + 36 Reduce the annual average hot water usage in litres per day Vd,average = (25 x N) + 36 Reduce the annual average hot water usage in litres per day Vd,average = (25 x N) + 36 Reduce the annual average hot water usage in litres per day Vd,average = (25 x N) + 36 Reduce the annual average hot water usage in litres per day Vd,average = (25 x N) + 36 Reduce the annual average hot water storage loss in litres usage in litres per day Vd,average = (25 x N) + 36 Reduce the annual average hot water storage loss in litres usage in litres annual average in litres annual average in litres usage in litre		<del>                                     </del>		·	<del></del>	-		<b>⊢</b> ⊸			<b>-</b>			
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9) if TFA £ 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9) if TFA £ 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9) if TFA £ 13.9, N = 1  Annual average hot water usage in litres per day Vd, average = (25 x N) + 36  Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)	(41)m= 31	28	31	30	31	30	31	31	30	31	30	31	I	(41)
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)  If the valer usage in lives per person per day (all water use, hot and cold)  If user or not not water usage in lives per day for each month \( V = \) \$ 1.90 x \( V \) \$ 1.30 \) \$ 10.8 \( \) \$ 67.09 \( \) \$ 67.09 \( \) \$ 67.09 \( \) \$ 7.00 \( \) \$ 70.08 \( \) \$ 73.06 \( \) \$ 70.04 \( \) \$ 73.06 \( \) \$ 70.04 \( \) \$ 73.06 \( \) \$ 70.04 \( \) \$ 73.06 \( \) \$ 70.04 \( \) \$ 73.06 \( \) \$ 70.08 \( \) \$ 67.09 \( \) \$ 73.42 \( \) \$ 84.25 \( \) \$ 85.25 \( \) \$ 93.5 \( \) 108.46 \( \) 117.77 \\  It is stantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)  If community heating and no tank in dwelling, enter 110 litres in (47)  Otherwise if no stored hot water (this includes instantaneous combi boilers) enter 0 in (47)  Water storage loss:  a) If manufacturer's declared loss factor is known (kWh/day):  1.39														
if TFA £ 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)  Annual average hot water usage in litres per day Vd, average = (25 x N) + 36  Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target or not more that 125 litres per person per day (all water use, hot and cold)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Hot water usage in litres per day for each month Vd,m = faceto from Table 1c x (43)  (44)m= 82 79.02 76.04 73.06 70.08 57.09 67.09 70.08 73.06 75.04 79.02 82  Total = Sumr(44):= 894.6 (44)  Energy content of hot water used - calculated monthly = 4.190 x Vd,m x hm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)  (45)m= 121.61 106.36 103.76 95.69 91.81 79.23 73.42 84.25 85.25 93.35 108.45 117.77  Total = Sumr(45):= 1172.96 (45)  Water Storage olume (litres) including any solar or WWHRS storage within same vessel 150 (47)  If community heating and no tank in dwelling, enter 110 litres in (47)  Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)  Water storage loss:  a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)  Temperature factor from Table 2b (2 kWh/litre/day) 0.54 (49)  Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50)  If community heating see section 4.3  Volume factor from Table 2a 0.75 (50)  Temperature factor from Table 2b 0.75 (50)  Temperature factor from Table 2b 0.75 (50)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0.75 (55)  Water storage loss calculated for each month ((56)m (55) x (41)m (56)) (56) (56)	4. Water hea	iting ene	rgy requi	irement:								kWh/ye	ear:	
if TFA £ 13.9, N = 1  Annual average hot water usage in litres per day Vd.average = (25 x N) + 36						/						.7		(42)
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36  Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target or not more that 126 litres per person per day (all water use, hot and cold)    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec			+ 1.76 x	[1 - exp	(-0.0003	849 x (TF	-A -13.9)	)2)] + 0.0	)013 x (⊺	FA -13.	.9)			
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	Annual averag	ge hot wa										.55		(43)
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec		_				_	_	to achieve	a water us	e target o	f			
Hot water usage in litres per day for each month Vd.m = factor from Table 1c x (43)  (44)m = 82 79.02 76.04 73.06 70.08 67.09 70.08 73.06 76.04 79.02 82  Total = Sum(44)m = 894.6 (44)  Energy content of hot water used - calculated monthly = 4.190 x Vd.m x nm x DTm / 3600 kWh/month (see Tables tb, 1c, 1d)  (45)m = 121.61 106.36 109.76 95.69 91.81 79.23 73.42 84.25 85.25 99.35 108.45 117.77  Total = Sum(44)m = 117.79  Total = Sum(44)m = 894.6 (44)  (45)m = 121.61 106.36 109.76 95.69 91.81 79.23 73.42 84.25 85.25 99.35 108.45 117.77  Total = Sum(45)m = 117.79  Total = Sum(44)m = 894.6 (44)  Introduction of the water Introduction of the water storage, enter 0 in boxes (46) to (61)  If instantaneous water heating at point of use (no hot water storage within same vessel 150 (47)  If community heating and no tank in dwelling, enter 110 litres in (47)  Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)  Water storage loss:  3			,	· ` `				A .	0	0.1	NI.	D		
Community heating and no tank in dwelling, enter 110 litres in (47)   Community heating and no tank in dwelling, enter 110 litres in (47)   Community heating and no tank in dwelling, enter 110 litres in (47)   Community heating and so stactor from Table 2b   Community heating see section 4.3   Community heating see section 6.5   Community heating 6.5					_				Sep	Oct	Nov	Dec		
Total = Sum(44), = 894.6 (44)  Energy content of hot water used - calculated monthly = 4,190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)  (45)m = 121.61 106.36 109.76 95.69 91.81 79.23 73.42 84.25 85.25 99.35 108.45 117.77  Total = Sum(45), = 1172.96 (45)  It instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)  (46)m = 18.24 15.95 16.46 14.35 13.77 11.88 11.01 12.64 12.79 14.9 16.27 17.67 (46)  Water storage loss:  Storage volume (litres) including any solar or WWHRS storage within same vessel 150 (47)  If community heating and no tank in dwelling, enter 110 litres in (47)  Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)  Water storage loss:  a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)  Temperature factor from Table 2b 0.54 (49)  Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50)  b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51)  If community heating see section 4.3  Volume factor from Table 2a 0 (52)  Temperature factor from Table 2b 0 (53)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54)  Enter (50) or (54) in (55) (55)  Water storage loss calculated for each month ((56)m = (55) x (41)m)									73.06	76.04	79.02	82		
Energy content of hot water used - calculated monthly = 4,190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)  (45)n=	(11)= 02	70.02	70.01	70.00	70.00	07.00	07.00	7 0.00					894.6	(44)
Total = Sum(45):u =   1172.96   (45)   (46)   (46)   (46)   (46)   (46)   (46)   (46)   (46)   (46)   (46)   (46)   (46)   (46)   (46)   (46)   (46)   (46)   (46)   (46)   (46)   (46)   (46)   (46)   (46)   (46)   (46)   (46)   (46)   (46)   (46)   (46)   (46)   (46)   (46)   (46)   (46)   (46)   (46)   (47)   (46)   (47)   (48)   (47)   (48)   (47)   (48)   (47)   (48)   (47)   (48)   (47)   (48)   (47)   (48)   (47)   (48)   (48)   (48)   (49)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (48)   (	Ener <mark>gy cont</mark> ent o	f hot wa <mark>ter</mark>	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x C	OTm / 3600			1 1			
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)	(45)m= 121.61	106.36	109.76	95.69	91.81	79.23	73.42	84.25	85.25	99.35	108.45	117.77		
(46)me       18.24       15.95       16.46       14.35       13.77       11.88       11.01       12.64       12.79       14.9       16.27       17.67       (46)         Water storage loss:         Storage volume (litres) including any solar or WWHRS storage within same vessel       150       (47)         If community heating and no tank in dwelling, enter 110 litres in (47)         Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)         Water storage loss:         a) If manufacturer's declared loss factor is known (kWh/day):       1.39       (48)         Temperature factor from Table 2b       0.54       (49)         Energy lost from water storage, kWh/year       (48) x (49) =       0.75       (50)         b) If manufacturer's declared cylinder loss factor is not known:         Hot water storage loss factor from Table 2 (kWh/litre/day)       0       (51)         If community heating see section 4.3         Volume factor from Table 2a       0       (52)         Temperature factor from Table 2b       0       (53)         Energy lost from water storage, kWh/year       (47) x (51) x (52) x (53) =       0       (54)	If instantaneous	votor booti	na ot noint	e of upo (no	hot woto	r otorogo)	antar () in	hayaa (16		Γotal = Su	m(45) <sub>112</sub> =		1172.96	(45)
Water storage loss:       Storage volume (litres) including any solar or WWHRS storage within same vessel       150       (47)         If community heating and no tank in dwelling, enter 110 litres in (47)       Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)         Water storage loss:       a) If manufacturer's declared loss factor is known (kWh/day):       1.39       (48)         Temperature factor from Table 2b       0.54       (49)         Energy lost from water storage, kWh/year       (48) × (49) =       0.75       (50)         b) If manufacturer's declared cylinder loss factor is not known:       0       (51)         Hot water storage loss factor from Table 2 (kWh/litre/day)       0       (51)         If community heating see section 4.3       0       (52)         Volume factor from Table 2a       0       (52)         Temperature factor from Table 2b       0       (53)         Energy lost from water storage, kWh/year       (47) × (51) × (52) × (53) =       0       (54)         Enter (50) or (54) in (55)       (.55)       (.56)         Water storage loss calculated for each month       (.56)m = (.55) × (41)m         (56)m=       23.33       21.07       23.33       22.58       23.33       22.58       23.33       22.58       23.33       22.58       23.33<				,	1				·	110	10.07	47.07		(46)
Storage volume (litres) including any solar or WWHRS storage within same vessel       150       (47)         If community heating and no tank in dwelling, enter 110 litres in (47)       Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)         Water storage loss:       1.39       (48)         a) If manufacturer's declared loss factor is known (kWh/day):       1.39       (48)         Temperature factor from Table 2b       0.54       (49)         Energy lost from water storage, kWh/year       (48) × (49) =       0.75       (50)         b) If manufacturer's declared cylinder loss factor is not known:       0       (51)         Hot water storage loss factor from Table 2 (kWh/litre/day)       0       (51)         If community heating see section 4.3       0       (52)         Temperature factor from Table 2a       0       (52)         Temperature factor from Table 2b       0       (53)         Energy lost from water storage, kWh/year       (47) × (51) × (52) × (53) =       0       (54)         Enter (50) or (54) in (55)       0.75       (55)         Water storage loss calculated for each month       ((56)m = (55) × (41)m         (56)m=       23.33       21.07       23.33       22.58       23.33       22.58       23.33       22.58       23.33       2	\ <i>'</i>		16.46	14.35	13.77	11.88	11.01	12.64	12.79	14.9	16.27	17.67	I	(46)
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)         Water storage loss:         a) If manufacturer's declared loss factor is known (kWh/day):       1.39       (48)         Temperature factor from Table 2b       0.54       (49)         Energy lost from water storage, kWh/year       (48) x (49) =       0.75       (50)         b) If manufacturer's declared cylinder loss factor is not known:       0       (51)         Hot water storage loss factor from Table 2 (kWh/litre/day)       0       (51)         If community heating see section 4.3       0       (52)         Volume factor from Table 2a       0       (52)         Temperature factor from Table 2b       0       (53)         Energy lost from water storage, kWh/year       (47) x (51) x (52) x (53) =       0       (54)         Enter (50) or (54) in (55)       0.75       (55)         Water storage loss calculated for each month       ((56)m = (55) x (41)m         (56)m=       23.33       21.07       23.33       22.58       23.33       23.33       22.58       23.33       22.58       23.33       23.33       22.58       23.33       23.33       22.58       23.33       23.33       22.58       23.33       23.33       22.58       23.33       23.33			) includin	ng any so	olar or W	/WHRS	storage	within sa	ame vess	sel		150		(47)
Water storage loss:       a) If manufacturer's declared loss factor is known (kWh/day):       1.39       (48)         Temperature factor from Table 2b       0.54       (49)         Energy lost from water storage, kWh/year       (48) x (49) =       0.75       (50)         b) If manufacturer's declared cylinder loss factor is not known:       0       (51)         Hot water storage loss factor from Table 2 (kWh/litre/day)       0       (51)         If community heating see section 4.3       0       (52)         Volume factor from Table 2a       0       (52)         Temperature factor from Table 2b       0       (53)         Energy lost from water storage, kWh/year       (47) x (51) x (52) x (53) =       0       (54)         Enter (50) or (54) in (55)       0.75       (55)         Water storage loss calculated for each month       ((56)m = (55) x (41)m         (56)m=       23.33       21.07       23.33       22.58       23.33       22.58       23.33       22.58       23.33       22.58       23.33       22.58       23.33       22.58       23.33       22.58       23.33       22.58       23.33       22.58       23.33       22.58       23.33       22.58       23.33       22.58       23.33       22.58       23.33       22.58	If community I	neating a	and no ta	ınk in dw	elling, e	nter 110	litres in	(47)						
a) If manufacturer's declared loss factor is known (kWh/day):  Temperature factor from Table 2b  Energy lost from water storage, kWh/year b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day)  If community heating see section 4.3  Volume factor from Table 2a  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  Enter (50) or (54) in (55)  Water storage loss calculated for each month  ((56)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 (56)			hot wate	er (this in	icludes i	nstantar	eous co	mbi boil	ers) ente	er '0' in (	47)			
Temperature factor from Table 2b	-		aclared l	oss facto	or ie kna	wo (k\//k	v/dav/):					00		(40)
Energy lost from water storage, kWh/year (48) × (49) = 0.75 (50) b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51) If community heating see section 4.3  Volume factor from Table 2a 0 (52) Temperature factor from Table 2b 0 (53) Energy lost from water storage, kWh/year (47) × (51) × (52) × (53) = 0 (54) Enter (50) or (54) in (55) (55)  Water storage loss calculated for each month ((56)m = (55) × (41)m)  (56)m = 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 (56)	•				JI IS KIIO	wii (Kvvi	i/day).							. ,
b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day)  If community heating see section 4.3  Volume factor from Table 2a  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  Enter (50) or (54) in (55)  Water storage loss calculated for each month  ((56)m = $\begin{bmatrix} 23.33 & 21.07 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22.58 & 23.33 & 22$	-				ear			(48) x (49)	. =					
If community heating see section 4.3         Volume factor from Table 2a       0       (52)         Temperature factor from Table 2b       0       (53)         Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) =$ 0       (54)         Enter (50) or (54) in (55)       0.75       (55)         Water storage loss calculated for each month $((56)m = (55) \times (41)m$ (56)m=       23.33       21.07       23.33       22.58       23.33       22.58       23.33       22.58       23.33       (56)	0,		•			or is not		( ) ( )			0.	73		(00)
Volume factor from Table 2a       0       (52)         Temperature factor from Table 2b       0       (53)         Energy lost from water storage, kWh/year       (47) x (51) x (52) x (53) =       0       (54)         Enter (50) or (54) in (55)       0.75       (55)         Water storage loss calculated for each month       ((56)m = (55) x (41)m       (56)m = (23.33)       21.07       23.33       22.58       23.33       22.58       23.33       22.58       23.33       (56)		_			e 2 (kW	h/litre/da	ıy)					0		(51)
Temperature factor from Table 2b	-	_		on 4.3								0		(E2)
Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) = 0$ (54) Enter (50) or (54) in (55) $0.75$ (55) Water storage loss calculated for each month $((56)m = (55) \times (41)m$ (56) $(56)m = 23.33 \times 21.07 \times 23.33 \times 22.58 \times 23$				2b							<b>—</b>			
Enter (50) or (54) in (55) $0.75$ (55)  Water storage loss calculated for each month $((56)m = (55) \times (41)m$ (56)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 (56)	•				ear			(47) x (51)	x (52) x (5	53) =				
(56)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 (56)	••		_	, 100011/90	Jui			(, (0.)	/	,		-		
	Water storage	loss cal	culated f	for each	month			((56)m = (	55) × (41)r	n				
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H	(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
	If cylinder contain	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	ix H	
(57)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 (57)	(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)



Primary circuit loss (annual) from Table 3		(58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m		
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)		
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 23.26 23.26 22.51 23.26 22.51 23.26		(59)
Combi loss calculated for each month (61)m = (60) $\div$ 365 x (41)m		
(61)m= 0 0 0 0 0 0 0 0 0 0 0 0		(61)
Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m + (46)m + (57)m + (46)m$	59)m + (61)m	
(62)m= 168.21 148.45 156.35 140.78 138.41 124.32 120.01 130.84 130.35 145.95 153.55 164.37		(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)		
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)		
(63)m= 0 0 0 0 0 0 0 0 0 0 0 0		(63)
Output from water heater		
(64)m= 168.21 148.45 156.35 140.78 138.41 124.32 120.01 130.84 130.35 145.95 153.55 164.37		
Output from water heater (annual) <sub>112</sub>	1721.58	(64)
Heat gains from water heating, kWh/month 0.25 $'$ [0.85 $\times$ (45)m + (61)m] + 0.8 $\times$ [(46)m + (57)m + (59)m]		
(65)m= 77.71 69.03 73.77 67.89 67.8 62.42 61.69 65.29 64.42 70.31 72.13 76.44		(65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community he	ating	
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= 84.95 84.95 84.95 84.95 84.95 84.95 84.95 84.95 84.95 84.95 84.95 84.95		(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5		
(67)m= 13.22 11.74 9.55 7.23 5.4 4.56 4.93 6.41 8.6 10.92 12.75 13.59		(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5		
(68)m= 148.01 149.55 145.68 137.44 127.04 117.26 110.73 109.2 113.07 121.31 131.71 141.48		(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5		
(69)m= 31.49 31.49 31.49 31.49 31.49 31.49 31.49 31.49 31.49 31.49 31.49 31.49		(69)
Pumps and fans gains (Table 5a)		
(70)m= 3 3 3 3 3 3 3 3 3 3 3 3 3 3		(70)
Losses e.g. evaporation (negative values) (Table 5)		
(71)m= -67.96 -67.96 -67.96 -67.96 -67.96 -67.96 -67.96 -67.96 -67.96 -67.96 -67.96 -67.96		(71)
Water heating gains (Table 5)		
(72)m= 104.45 102.73 99.15 94.29 91.13 86.69 82.91 87.75 89.47 94.5 100.19 102.74		(72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m$		
(73)m= 317.17 315.51 305.87 290.44 275.06 260 250.06 254.84 262.62 278.22 296.12 309.29		(73)
6. Solar gains:		
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.		
Orientation: Access Factor Area Flux g_ FF	Gains	
Table 6d m² Table 6a Table 6b Table 6c	(W)	
East 0.9x 0.77 x 8.01 x 19.64 x 0.63 x 0.7 =	48.08	(76)
East 0.9x 0.77 x 2.67 x 19.64 x 0.63 x 0.7 =	16.03	(76)



East	0.9x	0.77		x	8.0	1	x	3	8.42	x		0.63	x	0.7		=	94.05	(76)
East	0.9x	0.77		x	2.67		x	3	8.42	x		0.63	x	0.7		=	31.35	(76)
East	0.9x	0.77		x	8.01		x	6:	3.27	x		0.63	x	0.7		=	154.89	(76)
East	0.9x	0.77		x	2.67		x	6:	3.27	X		0.63	X	0.7		=	51.63	(76)
East	0.9x	0.77		x	8.01		x	9:	2.28	x		0.63	x	0.7		=	225.9	(76)
East	0.9x	0.77		x	2.6	7	x	9:	2.28	x		0.63	x	0.7		=	75.3	(76)
East	0.9x	0.77		x	8.01		x	113.09		x		0.63	x	0.7		=	276.85	(76)
East	0.9x	0.77		x	2.67		x	11	3.09	X		0.63	x	0.7		=	92.28	(76)
East	0.9x	0.77		x	8.01		x	11	5.77	x		0.63	x	0.7		=	283.4	(76)
East	0.9x	0.77		x	2.67		x	11	5.77	x		0.63	x	0.7		=	94.47	(76)
East	0.9x	0.77		x	8.01		x	11	0.22	X		0.63	x	0.7		=	269.81	(76)
East	0.9x	0.77		x	2.67		x	11	0.22	x		0.63	x	0.7		=	89.94	(76)
East	0.9x	0.77		x	8.01		x	94	4.68	X		0.63	x	0.7		=	231.76	(76)
East	0.9x	0.77		x	2.67		x	94	4.68	x		0.63	x	0.7		=	77.25	(76)
East	0.9x	0.77		x	8.01		x	73.59		X		0.63	X	0.7		=	180.14	(76)
East	0.9x	0.77		x	2.67		x	7:	3.59	x		0.63	x	0.7		=	60.05	(76)
East	0.9x	0.77		x	8.01		x	45.59		X		0.63	X	0.7		=	111.6	(76)
East	0.9x	0.77		X	2.67		X	4:	5.59	X		0.63	X	0.7		=	37.2	(76)
East	0.9x	0.77		x 8.01		1	x	2	4.49	x		0.63	x	0.7		-	59.95	(76)
East	0.9x	0.77		x 2.67		7	x	2	4.49	x		0.63	x	0.7		=	19.98	(76)
East	0.9x	0.77		x	8.01		X	10	6.15	x		0.63	x	0.7		=	39.54	(76)
East	0.9x	0.77		x	2.6	7	x	10	6.15	Х		0.63	x	0.7		=	13.18	(76)
		watts, ca		_		-				È	$\neg$	ım(74)m	, ,					(22)
(83)m=	64.1	125.4 nternal a	206.5		301.2	369.13		77.87	359.75	309	.02	240.19	148.8	79.93	52.	.72		(83)
(84)m=	381.27	440.91	512.3	_	591.64	644.19	·	37.87	609.81	563	86	502.82	427.0	2 376.06	362	2 01		(84)
				_	I		_	37.07	009.01	303	.00	302.02	427.0	370.00	302	01		(04)
		nal temp								1. 0	<b>T</b> . 2	L (0 <b>0</b> )						7,05)
•		during h	_	•			_			oie 9,	, IN1	(°C)					21	(85)
Utilisa	Utilisation factor for gains for living area, h1,m (see Table 9a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec																	
(86)m-	0.99	<del></del>		-	0.88 0.71		-		0.38	<del>                                     </del>	_	0.68	0.93	0.99	<del>                                     </del>			(86)
, ,																		
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 20.01 20.18 20.46 20.77 20.94 20.99 21 21 20.96 20.71 20.3 19.98 (87)															(87)			
					!			!		<u> </u>			20.71	20.3	19.	.90		(07)
-		during h		<del>'</del>			_			i –	T	<u>`</u>		1 00 04			İ	(00)
(88)m=	20.02	20.03	20.03	<u> </u>	20.04	20.04		20.05	20.05	20.	05	20.05	20.04	20.04	20.	.03		(88)
	Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.99 0.98 0.95 0.84 0.65 0.44 0.3 0.34 0.6 0.9 0.98 0.99 (89)																	
(89)m=	0.99	0.98	0.95		0.84	0.65		0.44	0.34		0.6	0.9	0.98	0.9	99		(89)	
Mean		tempera		_		of dwell	Ť			·		in Tabl	e 9c)				•	
(90)m=	18.72	18.97	19.36		19.78	19.99	2	20.04	20.05	20.	05	20.02	19.72	Ļ	18.	.69		(90)
												f	LA = Liv	ring area ÷ (	4) =		0.59	(91)



Mean internal temperature (for the whole dwelling) = [LA x T1 + (1 - (LA) x T2   20.37   20.31   19.83   19.45   19.45   (92)   (92) = [19.48   19.85   20.19   20.36   20.54   20.6   20.61   20.61   20.67   20.3   19.83   19.45   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (93)   (														
Apply adjustment to the mean internal temperature from Table 4e, where appropriate		<del> </del>	<del>`</del>				r	<del>`</del>				1	ſ	4
19.48   19.68   20.01   20.36   20.54   20.6   20.61   20.61   20.67   20.3   18.83   19.45		<u> </u>	l					l			19.83	19.45		(92)
Sepace   Death   Sepace   Death   Sepace   Death   Sepace   Death   Sepace   Death   Sepace   Death   Sepace   Death   Sepace   Death   Sepace   Death   Sepace   Death   Sepace   Death   Death   Sepace   Deat	· · · · · <del>- · · -</del>	1	i e		· ·		i e	i		·	40.00	40.45		(03)
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a.  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm:  [94)m= 0.99 0.98 0.95 0.85 0.85 0.89 0.49 0.34 0.39 0.65 0.91 0.98 0.99 0.98 0.99 0.94 0.94 0.94 0.94 0.94 0.94 0.94			L		20.54	20.6	20.61	20.61	20.57	20.3	19.83	19.45		(93)
the utilisation factor for gains using Table 9a    Jan   Feb   Mar   Apr   May   Jul   Jul   Aug   Sep   Oct   Nov   Dec							44 £	Table O	41	4 T: /	70\		lata	
Jan						ied at ste	ер 11 от	i abie 9i	o, so tna	t 11,m=(	76)m an	a re-caic	culate	
Utilisation factor for gains, hm:  (94)ms		1				Jun	Jul	Aua	Sep	Oct	Nov	Dec		
(94)   (94)   (94)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (98)   (9				<u> </u>					1					
G95 m		<del></del>	i e		0.69	0.49	0.34	0.39	0.65	0.91	0.98	0.99		(94)
Monthly average external temperature from Table 8   (96)m	Useful gains	, hmGm	, W = (94	4)m x (84	4)m								l	
96 me	(95)m= 377.74	432.21	485.82	505.48	441.56	310.58	209.24	218.9	325.78	388.57	368.79	359.38		(95)
Heat loss rate for mean internal temperature, Lm , W = [(39)m x   [(93)m - (96)m ]	Monthly ave	rage exte	rnal tem	perature	from Ta	able 8		•						
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m   (98)m = 327.36   243.38   177.21   73.24   19.37   0   0   0   0   92.5   221.1   337.76   (149)m   (296)m   (2	(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m  (98)m= 327.36 243.38 177.21 73.24 19.37 0 0 0 0 0 92.5 221.1 337.76  Total per year (kWh/year) = Sum(98)	Heat loss rat	e for me	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m	]			1	
Space heating requirement in kWh/m²/year   Space heating requirement in kWh/m²/year   Space heating requirement in kWh/m²/year   Space heating requirement in kWh/m²/year   Space heating requirement in kWh/m²/year   Space heating requirements - Individual heating systems including micro-CHP     Space heating   Space heat from secondary/supplementary system   Space heating from main system   Space heating from main system   Space heating from main system   Space heating from main system   Space heating from main system   Space heating system   Space heating system   Space heating system   Space heating system   Space heating system   Space heating requirement (calculated above)   Space heating requirement (calculated above)   Space heating requirement (calculated above)   Space heating system   Space heating requirement (calculated above)   Space heating fuel (secondary), kWh/month   Space	(97)m= 817.75	794.38	724	607.21	467.59	313.96	209.65	219.69	340.1	512.91	675.87	813.36		(97)
Space heating requirement in kWh/m²/year   29.66   (99)	Space heatir	ng require	ement fo	r each n	nonth, k\	Wh/mon	th = 0.02	24 x [(97	)m – (95	)m] x (4	1)m		ı	
Space heating requirement in kWh/m²/year   29.66   (99)	(98)m= 327.36	243.38	177.21	73.24	19.37	0	0	0	0	92.5	221.1	337.76		
Space heating:								Tota	l per year	(kWh/year	) = Sum(9	8) <sub>15,912</sub> =	1491.92	(98)
Space heating:	Space heatir	ng require	ement in	kWh/m²	²/year								29.66	(99)
Space heating:	9a. Energy re	guiremer	nts – Ind	ividual h	eating sy	vstems i	ncluding	micro-C	HP)					
Fraction of space heat from secondary/supplementary system  Fraction of space heat from main system(s)  Fraction of space heat from main system(s)  Fraction of total heating from main system 1  Efficiency of main space heating system 1  Efficiency of secondary/supplementary heating system, %   Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Space heating requirement (calculated above)  327.36 243.38 177.21 73.24 19.37 0 0 0 0 0 92.5 221.1 337.76  (211)m = {[[(98)m x (204)] } x 100 ÷ (206)  Space heating from requirement (space of the space of th														
Fraction of total heating from main system 1  Efficiency of main space heating system 1  Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec KWh/year  Space heating requirement (calculated above)  327.36 243.38 177.21 73.24 19.37 0 0 0 0 92.5 221.1 337.76  (211)m = {[(98)m × (204)]} × 100 ÷ (206)  Space heating fuel (secondary), kWh/month  = {[(98)m × (201)]} × 100 ÷ (208)  (215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	-	_	at from s	econdar	y/supple	mentary	system						0	(201)
Efficiency of main space heating system 1  Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year  Space heating requirement (calculated above)  327.36 243.38 177.21 73.24 19.37 0 0 0 0 0 92.5 221.1 337.76  (211)m = {[(98)m x (204)] } x 100 ÷ (206)  Total (kWh/year) = Sum(211) <sub>151012</sub> 1595.64 (211)  Space heating fuel (secondary), kWh/month  = {[(98)m x (201)] } x 100 ÷ (208)  (215)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0							-							
Efficiency of main space heating system 1  Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec KWh/year  Space heating requirement (calculated above)  327.36 243.38 177.21 73.24 19.37 0 0 0 0 0 92.5 221.1 337.76  (211)m = {[(98)m x (204)] } x 100 ÷ (206)  Total (kWh/year) = Sum(211) <sub>151012</sub> 1595.64 (211)  Space heating fuel (secondary), kWh/month  = {[(98)m x (201)] } x 100 ÷ (208)  (215)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Fraction of s	pace hea	at from n	nain syst	em(s)				- (201) =					= ' '
Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year  Space heating requirement (calculated above)  327.36 243.38 177.21 73.24 19.37 0 0 0 0 0 92.5 221.1 337.76  (211)m = {[(98)m x (204)] } x 100 ÷ (206)  350.12 260.3 189.53 78.33 20.72 0 0 0 0 98.93 236.47 361.24  Total (kWh/year) = Sum(211) <sub>1k10t2</sub> 1595.64 (211)  Space heating fuel (secondary), kWh/month  = {[(98)m x (201)] } x 100 ÷ (208)  (215)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  Total (kWh/year) = Sum(215) <sub>1k10t2</sub> 0 (215)  Water heating  Output from water heater (calculated above)  [168.21 148.45 156.35 140.78 138.41 124.32 120.01 130.84 130.35 145.95 153.55 164.37  Efficiency of water heater  79.8 (216)								(202) = 1		(203)] =			1	(202)
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	Fraction of to	otal heati	ng from	main sys	stem 1			(202) = 1		(203)] =			1	(202)
Space heating requirement (calculated above)  327.36	Fraction of to	otal heati main spa	ng from ace heat	main syste	stem 1 em 1	n system		(202) = 1		(203)] =			1 1 93.5	(202) (204) (206)
327.36   243.38   177.21   73.24   19.37   0   0   0   0   92.5   221.1   337.76	Fraction of to	main spa	ng from ace heat ry/suppl	main syste	stem 1 em 1 y heating		n, %	(202) = 1 · (204) = (2	02) × [1 –				93.5	(202) (204) (206) (208)
(211)m = {[[(98)m x (204)]] } x 100 ÷ (206)	Fraction of to Efficiency of Efficiency of Jan	main spa seconda	ng from ace heat ry/suppl Mar	main systementar Apr	etem 1 em 1 y heating May	Jun	n, %	(202) = 1 · (204) = (2	02) × [1 –		Nov	Dec	93.5	(202) (204) (206) (208)
350.12 260.3 189.53 78.33 20.72 0 0 0 0 98.93 236.47 361.24  Total (kWh/year) = Sum(211),51012 1595.64 (211)  Space heating fuel (secondary), kWh/month  = {[(98)m x (201)]} x 100 ÷ (208)  (215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0  Total (kWh/year) = Sum(215),51012 0 0 (215)  Water heating  Output from water heater (calculated above)  168.21 148.45 156.35 140.78 138.41 124.32 120.01 130.84 130.35 145.95 153.55 164.37  Efficiency of water heater	Fraction of to Efficiency of Efficiency of Jan Space heatin	main spa seconda Feb	ng from ace heat ry/suppl Mar ement (c	main systementar  Apr  alculate	em 1  y heating  May d above	Jun	n, %	(202) = 1 · (204) = (2	02) × [1 –	Oct			93.5	(202) (204) (206) (208)
	Fraction of to Efficiency of Efficiency of Jan Space heatir 327.36	main spa seconda Feb ng require 243.38	ng from ace heat ry/supple Mar ement (c	main systementar Apr calculated	stem 1 em 1 y heating May d above)	Jun	n, %	(202) = 1 · (204) = (2	02) × [1 –	Oct			93.5	(202) (204) (206) (208)
Space heating fuel (secondary), kWh/month  = {[(98)m x (201)]} x 100 ÷ (208)  (215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0  Total (kWh/year) = Sum(215) <sub>15,1012</sub> = 0 (215)  Water heating  Output from water heater (calculated above)  168.21 148.45 156.35 140.78 138.41 124.32 120.01 130.84 130.35 145.95 153.55 164.37  Efficiency of water heater  79.8 (216)	Fraction of to Efficiency of Efficiency of Jan Space heatin 327.36 (211)m = {[(98)	main spa seconda Feb ng require 243.38 3)m x (20	ng from ace heat ry/supplement (control 177.21 a)] } x 1	main systementar Apr calculated 73.24 00 ÷ (20	stem 1 em 1 y heating May d above) 19.37	Jun ) 0	n, %  Jul  0	(202) = 1 · (204) = (2  Aug	02) × [1 – Sep	Oct 92.5	221.1	337.76	93.5	(202) (204) (206) (208)
= {[(98)m x (201)] } x 100 ÷ (208) (215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Fraction of to Efficiency of Efficiency of Jan Space heatin 327.36 (211)m = {[(98)	main spa seconda Feb ng require 243.38 3)m x (20	ng from ace heat ry/supplement (control 177.21 a)] } x 1	main systementar Apr calculated 73.24 00 ÷ (20	stem 1 em 1 y heating May d above) 19.37	Jun ) 0	n, %  Jul  0	(202) = 1 · (204) = (2  Aug	02) × [1 - Sep 0	Oct 92.5	221.1	337.76 361.24	1 93.5 0 kWh/ye	(202) (204) (206) (208) ear
(215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Fraction of to Efficiency of Efficiency of  Jan Space heatir 327.36 (211)m = {[(98) 350.12	main spa seconda Feb ng require 243.38 3)m x (20 260.3	mg from ace heat ry/supplement (continued from 177.21 [189.53]	main systementar Apr alculated 73.24 00 ÷ (20) 78.33	may heating dabove; 19.37	Jun ) 0	n, %  Jul  0	(202) = 1 · (204) = (2  Aug	02) × [1 - Sep 0	Oct 92.5	221.1	337.76 361.24	1 93.5 0 kWh/ye	(202) (204) (206) (208) ear
Total (kWh/year) =Sum(215) <sub>15,1012</sub> = 0 (215)  Water heating  Output from water heater (calculated above)  168.21 148.45 156.35 140.78 138.41 124.32 120.01 130.84 130.35 145.95 153.55 164.37  Efficiency of water heater (216)	Fraction of to Efficiency of Efficiency of  Jan Space heatin 327.36 (211)m = {[(98) 350.12}	reduire 243.38  3) m x (20 260.3 260.3	mg from ace heat ry/supple Mar ement (con 177.21 189.53 econdar	main systementar Apr calculated 73.24 00 ÷ (20) 78.33	may heating dabove; 19.37	Jun ) 0	n, %  Jul  0	(202) = 1 · (204) = (2  Aug	02) × [1 - Sep 0	Oct 92.5	221.1	337.76 361.24	1 93.5 0 kWh/ye	(202) (204) (206) (208) ear
Water heating Output from water heater (calculated above)  168.21 148.45 156.35 140.78 138.41 124.32 120.01 130.84 130.35 145.95 153.55 164.37  Efficiency of water heater 79.8 (216)	Fraction of to Efficiency of Efficiency of  Jan Space heatin 327.36 (211)m = {[(98) 350.12}  Space heatin = {[(98)m x (2)	reduire 243.38  3) m x (20 260.3 260.3 260.3	mg from ace heat ry/supplement (control of the supplement) and the supplement (control of the supplement) and the suppl	main systementar Apr alculated 73.24 00 ÷ (20 78.33	may heating May dabove; 19.37 D6) 20.72	Jun 0 0	0 0	(202) = 1 · (204) = (2  Aug  0  Tota	02) × [1 –  Sep  0  0  I (kWh/yea	92.5 98.93 ar) =Sum(2	221.1 236.47 211) <sub>15,1012</sub>	337.76	1 93.5 0 kWh/ye	(202) (204) (206) (208) ear
Output from water heater (calculated above)  168.21 148.45 156.35 140.78 138.41 124.32 120.01 130.84 130.35 145.95 153.55 164.37  Efficiency of water heater 79.8 (216)	Fraction of to Efficiency of Efficiency of  Jan Space heatin 327.36 (211)m = {[(98) 350.12}  Space heatin = {[(98)m x (2)	reduire 243.38  3) m x (20 260.3 260.3 260.3	mg from ace heat ry/supplement (control of the supplement) and the supplement (control of the supplement) and the suppl	main systementar Apr alculated 73.24 00 ÷ (20 78.33	may heating May dabove; 19.37 D6) 20.72	Jun 0 0	0 0	(202) = 1 · (204) = (2  Aug  0  Tota	02) × [1 –  Sep  0  0  I (kWh/yea	92.5 98.93 ar) =Sum(2	221.1 236.47 211) <sub>15,1012</sub>	337.76 361.24 =	1 93.5 0 kWh/ye	(202) (204) (206) (208) (211) (211)
168.21     148.45     156.35     140.78     138.41     124.32     120.01     130.84     130.35     145.95     153.55     164.37	Fraction of to Efficiency of Efficiency of Jan Space heatin 327.36 (211)m = {[(98) m x (215)m= 0]}	reduire 243.38  Some (200.3)  The properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of the properties of	mg from ace heat ry/supplement (control of the supplement) and the supplement (control of the supplement) and the suppl	main systementar Apr alculated 73.24 00 ÷ (20 78.33	may heating May dabove; 19.37 D6) 20.72	Jun 0 0	0 0	(202) = 1 · (204) = (2  Aug  0  Tota	02) × [1 –  Sep  0  0  I (kWh/yea	92.5 98.93 ar) =Sum(2	221.1 236.47 211) <sub>15,1012</sub>	337.76 361.24 =	1 93.5 0 kWh/ye	(202) (204) (206) (208) (211) (211)
	Fraction of to Efficiency of Efficiency of Jan Space heatin 327.36 (211)m = {[(98) m x (2(215)m=0]]	reduire 243.38 260.3 260.3 g fuel (s 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	mg from ace heat ry/supplement (continued of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of the secondar of t	main systementar Apr calculated 73.24 00 ÷ (20) 78.33  y), kWh/8) 0	may heating May dabove; 19.37 06) 20.72 month	Jun 0 0	0 0	(202) = 1 · (204) = (2  Aug  0  Tota	02) × [1 –  Sep  0  0  I (kWh/yea	92.5 98.93 ar) =Sum(2	221.1 236.47 211) <sub>15,1012</sub>	337.76 361.24 =	1 93.5 0 kWh/ye	(202) (204) (206) (208) (211) (211)
(217)m= 86.56 86.12 85.15 83.16 80.98 79.8 79.8 79.8 83.64 85.79 86.69 (217)	Fraction of to Efficiency of Efficiency of Jan Space heatin 327.36 (211)m = {[(98 350.12) Space heatin = {[(98)m x (2(215)m= 0) Water heatin Output from weep to see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see t	repuire 243.38  3) m x (20 260.3 260.3 q fuel (s 01)] } x 1 q vater hear	mg from ace heat ry/supplement (color ter (calcondar))   x 1   189.53	main systementar Apr alculated 73.24 00 ÷ (20 78.33  y), kWh/8) 0	may heating May dabove; 19.37 D6) 20.72 month 0	Jun 0 0	0 0	(202) = 1 · (204) = (2  Aug  0  Tota  Tota	02) × [1 –  Sep  0  0  I (kWh/yea	92.5  98.93  ar) =Sum(2	221.1 236.47 211) <sub>15,1012</sub> 0	337.76	1 93.5 0 kWh/ye	(202) (204) (206) (208) (211) (211)
	Fraction of to Efficiency of Efficiency of Jan Space heatin 327.36 (211)m = {[(98) m x (2(215)m=0]]}  Water heatin Output from wing 168.21	repuired 243.38 (260.3) The first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the first part of the fi	mg from ace heat ry/supplement (color of the front from 177.21 and 189.53 are condar on ÷ (20 or of ter (calconder from 156.35	main systementar Apr alculated 73.24 00 ÷ (20 78.33  y), kWh/8) 0	may heating May dabove; 19.37 D6) 20.72 month 0	Jun 0 0	0 0	(202) = 1 · (204) = (2  Aug  0  Tota  Tota	02) × [1 –  Sep  0  0  I (kWh/yea	92.5  98.93  ar) =Sum(2	221.1 236.47 211) <sub>15,1012</sub> 0	337.76	1 93.5 0 kWh/ye	(202) (204) (206) (208) (211) (211) (215)
Fuel for water heating, kWh/month	Fraction of to Efficiency of Efficiency of  Jan Space heatin 327.36  (211)m = {[(98)	repuired 243.38  Secondary February 1243.38  Symmatric 243.38  Symmatric 260.3  The first properties of the secondary 1243.38  The first properties of the secondary 1	mg from ace heat ry/supplement (color ter (calcolor 156.35 ace heat ry/supplement (color 156.35 ace heat ry/supplement (color 156.35 ace heat ry/supplement	main systementar Apr alculated 73.24 00 ÷ (20 78.33  y), kWh/8) 0  ulated al 140.78	month  bove)  138.41	Jun 0 0 0 124.32	0 0 120.01	(202) = 1 · (204) = (2  Aug  0  Tota  130.84	02) × [1 –  Sep  0  0  I (kWh/yea  130.35	Oct  92.5  98.93  ar) =Sum(2  0  145.95	221.1 236.47 211) <sub>15,1012</sub> 0 215) <sub>15,1012</sub>	337.76 361.24 = 0 =	1 93.5 0 kWh/ye	(202) (204) (206) (208) (211) (211) (215)
$(219)$ m = $(64)$ m x $100 \div (217)$ m	Fraction of to Efficiency of Efficiency of Jan Space heatin 327.36 (211)m = {[(98) m x (2(215)m=0]]}  Water heatin Output from w 168.21 Efficiency of w (217)m= 86.56	reportation main spatial secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secondar secon	mg from ace heat ry/supple Mar ement (c 177.21 189.53 econdar 00 ÷ (20 0 ter (calc 156.35 ter 85.15	main systementar Apr calculated 73.24 00 ÷ (20 78.33  y), kWh//8) 0	month  bove)  138.41	Jun 0 0 0 124.32	0 0 120.01	(202) = 1 · (204) = (2  Aug  0  Tota  130.84	02) × [1 –  Sep  0  0  I (kWh/yea  130.35	Oct  92.5  98.93  ar) =Sum(2  0  145.95	221.1 236.47 211) <sub>15,1012</sub> 0 215) <sub>15,1012</sub>	337.76 361.24 = 0 =	1 93.5 0 kWh/ye	(202) (204) (206) (208) (211) (211) (215)
(219)m= 194.32 172.36 183.62 169.28 170.93 155.79 150.39 163.96 163.34 174.51 178.99 189.59	Fraction of to Efficiency of Efficiency of Jan Space heatin 327.36 (211)m = {[(98) m x (2(215)m= 0)]  Water heatin Output from w [168.21]  Efficiency of w (217)m= 86.56  Fuel for water (219)m = (64)	report of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the atio	mg from ace heat ry/supplement (continued of the following states and the following states are states and the following states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are states are s	main systementar Apr calculated 73.24 00 ÷ (20 78.33  y), kWh/8) 0  ulated al 140.78  83.16  onth	month  bove)  138.41	Jun 0 0 124.32 79.8	0 0 120.01	(202) = 1 · (204) = (2  Aug  0  Tota  130.84	02) × [1 –  Sep  0  0  I (kWh/yea  130.35	Oct  92.5  98.93  ar) =Sum(2  0  145.95	221.1 236.47 211) <sub>15,1012</sub> 0 215) <sub>15,1012</sub>	337.76 361.24 = 0 =	1 93.5 0 kWh/ye	(202) (204) (206) (208) (211) (211) (215)
	Fraction of to Efficiency of Efficiency of Jan Space heatin 327.36 (211)m = {[(98) m x (2(215)m= 0)]  Water heatin Output from w [168.21]  Efficiency of w (217)m= 86.56  Fuel for water (219)m = (64)	report of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the atio	mg from ace heat ry/supplement (continue)   Mar	main systementar  Apr Falculated 73.24  00 ÷ (20  78.33  78.33  78.33  y), kWh/78  0  ulated al 140.78  83.16  onth m	May dabove)  19.37  20.72  month  0  bove)  138.41	Jun 0 0 124.32 79.8	0 0 120.01 79.8	(202) = 1 · (204) = (2  Aug  0  Tota  130.84  79.8	02) × [1 –  Sep  0  I (kWh/yea  130.35  79.8	Oct  92.5  98.93  ar) = Sum(2  145.95  83.64	221.1 236.47 211) <sub>15,1012</sub> 0 215) <sub>15,1012</sub> 153.55	337.76 361.24 = 0 = 164.37	1 93.5 0 kWh/ye	(202) (204) (206) (208) (211) (211) (215)
Total = $Sum(219a)_{112}$ = 2067.08 (219)	Fraction of to Efficiency of Efficiency of Jan Space heatin 327.36 (211)m = {[(98) m x (2(215)m= 0)]  Water heatin Output from w [168.21]  Efficiency of w (217)m= 86.56  Fuel for water (219)m = (64)	report of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the ation of the atio	mg from ace heat ry/supplement (continue)   Mar	main systementar  Apr Falculated 73.24  00 ÷ (20  78.33  78.33  78.33  y), kWh/78  0  ulated al 140.78  83.16  onth m	May dabove)  19.37  20.72  month  0  bove)  138.41	Jun 0 0 124.32 79.8	0 0 120.01 79.8	(202) = 1 · (204) = (2  Aug  0  Tota  130.84  79.8	02) × [1 –  Sep  0  0  I (kWh/yea  130.35  79.8	Oct  92.5  98.93  ar) = Sum(2  145.95  83.64	221.1 236.47 211) <sub>15,1012</sub> 0 215) <sub>15,1012</sub> 153.55	337.76 361.24 = 0 = 164.37	1 1 93.5 0 kWh/ye	(202) (204) (206) (208) (211) (211) (215)



Annual totals		1-14/1- 6	1-14/1- 6
Annual totals Space heating fuel used, main system 1		kWh/year	<b>kWh/year</b> 1595.64
Water heating fuel used			2067.08
Electricity for pumps, fans and electric keep-hot			
central heating pump:			30 (230c)
boiler with a fan-assisted flue			45 (230e)
Total electricity for the above, kWh/year	sum of (230a	)(230g) =	75 (231)
Electricity for lighting			233.51 (232)
12a. CO2 emissions – Individual heating systems	including micro-CHP		
	<b>Energy</b> kWh/year	Emission factor	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216	344.66 (261)
Space heating (secondary)	(215) x	0.519	0 (263)
Water heating	(219) x	0.216	446.49 (264)
Space and water heating	(261) + (262) + (263) + (264) =		791.15 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	38.93 (267)
Electricity for lighting	(232) x	0.519	121.19 (268)
Total CO2, kg/year  TER =	sum	of (265)(271) =	951.26 (272) 18.91 (273)



User Details: **Assessor Name:** Stroma Number: Stroma FSAP 2012 **Software Version: Software Name:** Version: 1.0.5.12 Property Address: E5-03 Address: 1. Overall dwelling dimensions Av. Height(m) Area(m²) Volume(m³) Ground floor 74.5 (1a) x 2.7 (2a) =201.15 (3a) Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)(4)74.5 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =201.15 (5) total m³ per hour main secondary other heating heating x 40 = Number of chimneys (6a) 0 0 x 20 =Number of open flues 0 0 0 (6b) Number of intermittent fans x 10 =(7a) 3 30 x 10 =Number of passive vents (7b) 0 0 x 40 =Number of flueless gas fires 0 (7c)Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = $\div (5)$ 0.15 (8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9)0 Additional infiltration [(9)-1]x0.1 =0 (10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)0 if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12)If no draught lobby, enter 0.05, else enter 0 (13)O Percentage of windows and doors draught stripped (14)0 Window infiltration  $0.25 - [0.2 \times (14) \div 100] =$ 0 (15)Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =O (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)5 If based on air permeability value, then  $(18) = [(17) \div 20] + (8)$ , otherwise (18) = (16)0.4 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)2  $(20) = 1 - [0.075 \times (19)] =$ Shelter factor (20)0.85  $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.34 Infiltration rate modified for monthly wind speed Jan Feb Jul Sep Mar Apr May Jun Aug Oct Nov Dec Monthly average wind speed from Table 7 (22)m =5.1 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor  $(22a)m = (22)m \div 4$ (22a)m 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18



Adjusted infiltra	ation rate	(allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m				_	
0.43	0.42	0.42	0.37	0.36	0.32	0.32	0.31	0.34	0.36	0.38	0.4		
Calculate effect If mechanica		•	ate for t	ne appıı	cable ca	se						0	(23
If exhaust air he			endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	wise (23b	) = (23a)			0	(23
If balanced with	heat recove	ery: effici	ency in %	allowing f	or in-use f	actor (from	n Table 4h	) =				0	(23
a) If balance	d mechar	nical ve	ntilation	with he	at recove	ery (MVI	HR) (24a	ı)m = (22	2b)m + (2	23b) <b>×</b> [′	1 – (23c)		
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24
b) If balance	d mechar	nical ve	ntilation	without	heat rec	overy (N	ЛV) (24b	)m = (22	2b)m + (2	23b)		•	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h	ouse extra 1 < 0.5 × (								5 × (23b	o)	-		
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24
d) If natural if (22b)n	ventilation n = 1, ther			•	•				0.5]		•		
24d)m= 0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58	]	(24
Effective air	change ra	ate - en	iter (24a	) or (24b	o) or (24	c) or (24	d) in box	(25)				_	
25)m= 0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58		(25
3. Heat losse	s and hea	it loss p	paramete	er:					_		_	_	_
LEMENT	Gross area (r	;	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/ł	<)	k-value kJ/m²-		A X k kJ/K
)oo <mark>rs</mark>					1.89	x	1	= [	1.89				(26
Vin <mark>dows</mark> Type	: 1				3.72	x1,	/[1/( 1.4 )+	0.04] =	4.93				(27
Vindows Type	2				1.87	x1	/[1/( 1.4 )+	0.04] =	2.48				(27
Vindows Type	3				3.72	x1,	/[1/( 1.4 )+	0.04] =	4.93				(27
Valls Type1	46.17		16.7	5	29.42	<u>x</u>	0.18	=	5.3				(29
Valls Type2	11.07		1.89		9.18	X	0.18	=	1.65				(29
Roof	74.5		0		74.5	X	0.13	=	9.68				(30
otal area of e	lements, ı	m²			131.7	4							(3
Party wall					35.64	X	0	=	0				(32
arty floor					74.5								(32
for windows and * include the area									e)+0.04] a	s given in	paragrapl	1 3.2	
abric heat los	•	•	U)				(26)(30)	+ (32) =				40.73	(33
leat capacity	,	,							.(30) + (32	, , ,	(32e) =	0	(34
hermal mass	•	•		•					tive Value:			250	(3
or design assess an be used instea				construct	ion are not	known pr	ecisely the	indicative	values of	IMP in Ta	able 1f		
hermal bridge				using Ap	pendix ł	<						15.75	(30
details of therma		re not kn	own (36) =	= 0.05 x (3	1)			(33) +	(36) =			56.48	
entilation hea		culated	monthly	/					$= 0.33 \times (3)$	25)m x (5)	)	50.10	\
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	



Bank   38.48   38.48   38.22   37.81   37.6   36.64   36.64   36.46   37.01   37.6   38.02   38.46															
See   95.64   95.41   94.3   94.00   93.12   93.12   93.12   93.94   94.00   94.51   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95   94.95	(38)m=	39.4	39.16	38.92	37.81	37.6	36.64	36.64	36.46	37.01	37.6	38.02	38.46		(38)
Heat loss parameter (HLP), W/m²K	Heat t	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (	38)m		•	
Heat loss parameter (HLP), W/m²K (40)m = (39)m = (4)	(39)m=	95.88	95.64	95.41	94.3	94.09	93.12	93.12	92.94	93.49	94.09	94.51	94.95		
(40)me   1.28   1.28   1.28   1.27   1.26   1.25   1.25   1.25   1.25   1.26   1.27   1.27	Heat I	oss nara	meter (l	HP) W	m²K						•	` '	12 /12=	94.3	(39)
Number of days in month (Table 1a)    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec			<u>`</u>	<del></del>	1	1.26	1.25	1.25	1.25	` ′	. ,	·	1.27		
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	, ,			ļ			<u> </u>	<u> </u>	ļ		L Average =	Sum(40) <sub>1</sub> .	12 /12=	1.27	(40)
4. Water heating energy requirement:  **RWhyear**  Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1  Annual average hot water usage in litres per day Vd.average = (25 x N) + 36  Reduce the annual everage hot water usage by 5% if the dwelling is designed to achieve a water use larget of not more that 125 litres per person per day [d] water use, hot and cottly  **Total Summal everage hot water usage by 5% if the dwelling is designed to achieve a water use larget of not more that 125 litres per person per day [d] water use, hot and cottly  **Hot water usage in litres per day Vd.average = (25 x N) + 36  **Hot water usage in litres per day Vd.average = (25 x N) + 36  **Hot water usage in litres per day Vd.average = (25 x N) + 36  **Leaverage in litres per day Vd.average = (25 x N) + 36  **Leaverage in litres per day Vd.average = (25 x N) + 36  **Leaverage in litres per day Vd.average = (25 x N) + 36  **Leaverage in litres per day Vd.average = (25 x N) + 36  **Leaverage in litres per day Vd.average = (25 x N) + 36  **Leaverage in litres per day Vd.average = (25 x N) + 36  **Leaverage in litres per day Vd.average = (25 x N) + 36  **Leaverage in litres per day Vd.average = (25 x N) + 36  **Leaverage in litres per day Vd.average = (25 x N) + 36  **Leaverage in litres per day Vd.average = (25 x N) + 36  **Leaverage in litres per day Vd.average = (25 x N) + 36  **Leaverage in litres per day Vd.average = (25 x N) + 36  **Leaverage in litres per day Vd.average = (25 x N) + 36  **Leaverage in litres per day Vd.average = (25 x N) + 36  **Leaverage in litres per day Vd.average = (25 x N) + 36  **Leaverage in litres per day Vd.average = (25 x N) + 36  **Leaverage in litres per day Vd.average = (25 x N) + 36  **Leaverage in litres per day Vd.average = (25 x N) + 36  **Leave	Numb	er of day	s in mo	nth (Tab	le 1a)							1	1		
4. Water heating energy requirement:  Assumed occupancy, N  if TFA ≥ 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)  if TFA £ 13.9, N = 1  Annual average hot water usage in litres per day Vd,average = (25 x N) + 36  Reduce the annual average hot water usage in litres per day Vd,average = (25 x N) + 36  Reduce the annual average hot water usage by 5% if the develoring is designed to achieve a water use target of not more that 125 litres per person per day (all values use, hot and cold)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Hot water usage in litres per day for each month Vd.m = factor from Table 1c for (43)  (44)m= 99.02 95.42 91.92 88.22 94.62 81.02 81.02 81.02 84.62 88.22 91.82 95.42 99.02  Energy content of hot water used - calculated monthly = 40.90 x Vd.m x lmm x DTm / 3800 kWh/month (see Tables 1b, 1c, 1d)  (45)m= 148.84 128.43 132.53 115.54 110.87 85.67 88.65 101.73 102.94 119.97 130.96 142.21  Total sum(45): v = 1416.34 (45)  If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)  Water storage loss:  3 (47)  If community heating and no tank in dwelling, enter 110 litres in (47)  Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)  Water storage loss:  a) If manufacturer's declared loss factor is known (kWh/day):  1.39 (48)  Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50)  1.39 (48)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0.0 (53)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0.0 (53)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0.0 (53)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0.0 (53)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0.0 (55)  Water storage loss calculated for each month ((66)m = (65) x (41)m (66)m = (65) x (41)m (66)m = (65) x (41)m (66)m = (65) x (67)m = (66)m x (60)m x (60)m x (60)m x (60)m x (60)m x (60)m x				-	•	<u> </u>	-	<b>-</b>	<del>-</del>			<del>                                     </del>			
Assumed occupancy, N  if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)  if TFA £ 13.9, N = 1  Annual average hot water usage in litres per day Vd, average = (25 x N) + 36  Reduce the annual average hot water usage in litres per day Vd, average = (25 x N) + 36  Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)  Annual average hot water usage in litres per day for each month Vd.m = factor from Table 1c k (43)  (44)	(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
Assumed occupancy, N  if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)  if TFA £ 13.9, N = 1  Annual average hot water usage in litres per day Vd, average = (25 x N) + 36  Reduce the annual average hot water usage in litres per day Vd, average = (25 x N) + 36  Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)  Annual average hot water usage in litres per desormonthy dums and the litres per person per day (all water use, to and cold)  Annual average hot water usage in litres per desormonthy dums and the litres per person per day (all water use, to and cold)  Annual average hot water usage in litres per desormonthy and the litres per person per day (all water use, to and cold)  Annual average hot water usage in litres per day for each month vd.m. and the litres in the litres and the litres person litres per day for each monthly and an annual average hot water usage in litres per day for each monthly and an annual average hot water usage in litres per person per day (all water use, to and cold)  Annual average hot water usage in litres per day for each monthly and an annual average water usage in litres and the litres in the litres in the litres in the litres in the litres in the litres in the litres in the litres in the litres in the litres in the litres in the litres in the litres in the litres in the litres in the litres in the litres in the litres in the litres in the litres in the litres in the litres in the litres in the litres in the litres in the litres in the litres in the litres in the litres in the litres in the litres in the litres in the litres in the litres in the litres in the litres in the litres in the litres in the litres in the litres in the litres in the litres in the litres in the litres in the litres in the litres in the litres in the litres in the litres in the litres in the litres in the litres in the litres in the litre															
if TFA £ 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)  if TFA £ 13.9, N = 1  Annual average hot water usage in litres per day Vd, average = (25 x N) + 36  Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Hot water usage in litres per day for each month Vd.m = factor from Table 1c.x (43)  (44)m= 99.02 95.42 91.82 88.22 84.62 81.02 81.02 81.02 84.62 88.22 91.82 98.42 99.02  Energy content of hot water usage - calculated monthly = 4.90 x Vd.m x nm x DTm / 3000 kW/month (see Tables 1b. fz. 1d)  (45)m= 146.84 128.43 132.53 115.54 110.87 95.67 88.65 101.73 102.94 119.97 130.96 142.21  If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)  (46)m= 22.03 19.26 19.88 17.33 16.63 14.35 13.3 15.26 15.44 18 19.64 21.33 (46)  Water storage loss:  Storage volume (litres) including any solar or WWHRS storage within same vessel 150 (47)  If community heating and no tank in dwelling, enter 110 litres in (47)  Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)  Water storage loss:  a) If manufacturer's declared loss factor is known (kWh/day): 1.39 (48)  Temperature factor from Table 2b 0.054 (47)  Temperature factor from Table 2b 0.055 (50)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (53)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (53)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (55)  Water storage loss calculated for each month ((66)m = (65) x (41)m (65)m x (65)m x (65)m x (65)m x (65)m x (65)m x (65)m x (65)m x (65)m x (65)m x (65)m x (65)m x (65)m x (65)m x (65)m x (65)m x (65)m x (65)m x (65)m x (65)m x (65)m x (65)m x (65)m x (65)m x (65)m x (65)m x (65)m x (65)m x (65)m x (65)m x (65)m x (65)m x (65)m x (65)m x (65)m x (65)m x (65)m x (	4. W	ater heat	ting ene	rgy requi	irement:								kWh/ye	ear:	
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36													35		(42)
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36				+ 1.76 x	[1 - exp	(-0.0003	849 x (TF	FA -13.9	)2)] + 0.(	0013 x (¯	ΓFA -13.	.9)		•	
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec			•	ater usaç	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		90	0.02		(43)
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec			_				_	_	to achieve	a water us	se target o	f		l	
Hot water usage in litres per day for each month \( \frac{Vd,m}{c} = factor, from Table 1c \( \frac{Vd,3}{c} \)  (44) m= \( 99.02 \) 95.42  91.82  88.22  84.62  81.02  81.02  84.62  88.22  91.82  95.42  99.02  \text{(44)} \)  Energy content of hot wafer used - calculated monthly = 4.190 \( \text{Vd,m} \times \text{nm x DTm / 3600 kWh/month (see Tables 1b, cl, cl)} \)  (45) m= \( \frac{146.84}{128.43} \) \( \frac{132.53}{132.53} \) \( \frac{115.54}{110.87} \) \( \frac{110.87}{95.67} \) \( \frac{88.65}{88.65} \) \( \frac{101.73}{101.89} \) \( \frac{10.94}{19.97} \) \( \frac{130.96}{130.96} \) \( \frac{142.21}{1416.34} \)  If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)  (46) m= \( \frac{22.03}{2.03} \) \( \frac{19.26}{19.28} \) \( \frac{19.88}{17.33} \) \( \frac{16.63}{16.63} \) \( \frac{14.35}{13.3} \) \( \frac{15.66}{15.44} \) \( \frac{18}{18} \) \( \frac{19.64}{19.64} \) \( \frac{21.33}{21.07} \) \( \frac{45}{21.33} \)  (47) If community heating and no tank in dwelling, enter 110 litres in (47)  Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)  Water storage loss:  a) If manufacturer's declared loss factor is known (kWh/day):  \[ \frac{1.39}{0.54} \] \( \frac{1.39}{0.54} \) \( \frac{1.39}{0.54} \) \( \frac{1.39}{0.54} \) \( \frac{1.39}{0.54} \) \( \frac{1.39}{0.54} \) \( \frac{1.39}{0.54} \) \( \frac{1.39}{0.54} \) \( \frac{1.39}{0.54} \) \( \frac{1.39}{0.54} \) \( \frac{1.39}{0.54} \) \( \frac{1.39}{0.54} \) \( \frac{1.39}{0.54} \) \( \frac{1.39}{0.54} \) \( \frac{1.39}{0.54} \) \( \frac{1.39}{0.54} \) \( \frac{1.39}{0.54} \) \( \frac{1.39}{0.54} \) \( \frac{1.39}{0.54} \) \( \frac{1.39}{0.54} \) \( \frac{1.39}{0.54} \) \( \frac{1.39}{0.54} \) \( \frac{1.39}{0.54} \) \( \frac{1.39}{0.54} \) \( \frac{1.39}{0.54} \) \( \frac{1.39}{0.54} \) \( \frac{1.39}{0.54} \) \( \frac{1.39}{0.54} \) \( \frac{1.39}{0.54} \) \( \frac{1.39}{0.54} \) \( \frac{1.39}{0.55} \) \(	HOL HIO			,	<u> </u>			<u> </u>			0 1			I	
Community heating and no tank in dwelling, enter 110 litres in (47)   Community heating and no tank in dwelling, enter 110 litres in (47)   Community heating and no tank in dwelling, enter 110 litres in (48)   Community heating and no tank in dwelling, enter 110 litres in (48)   Community heating are section 4.3   Community heating according to the storage loss factor from Table 2b   Community heating see section 4.3   C	Hot wa					_				Sep	Oct	Nov	Dec		
Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)  (45)m= 146.84										88 22	91.82	95.42	99.02		
Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Community   Comm	(44)111=	35.02	33.42	31.02	00.22	04.02	01.02	01.02	04.02					1080.22	(44)
Total = Sum(45)   146.34   145   146.34   145   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34   146.34	Energy	content of	hot wa <mark>ter</mark>	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x C	OTm / 3600			1 1			` ′
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)	(45)m=	146.84	128.43	132.53	115.54	110.87	95.67	88.65	101.73	102.94	119.97	130.96	142.21		
(46)me         22.03         19.26         19.88         17.33         16.63         14.35         13.3         15.26         15.44         18         19.64         21.33         (46)           Water storage loss:           Storage volume (litres) including any solar or WWHRS storage within same vessel         150         (47)           Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)           Water storage loss:           a) If manufacturer's declared loss factor is known (kWh/day):         1.39         (48)           Temperature factor from Table 2b         0.54         (49)           Energy lost from water storage, kWh/year         (48) × (49) =         0.75         (50)           b) If manufacturer's declared cylinder loss factor is not known:         0         (51)           Hot water storage loss factor from Table 2 (kWh/litre/day)         0         (51)           If community heating see section 4.3         0         (52)           Volume factor from Table 2a         0         (52)           Temperature factor from Table 2b         0         (53)           Energy lost from water storage, kWh/year         (47) × (51) × (52) × (53) =         0         (54)           Enter (50) or (54) in (55)         0.75	If in a tax		unda u bandi		-f (n.	hatwata	( )	austau O in	havea (40		Total = Su	m(45) <sub>112</sub> =	=	1416.34	(45)
Water storage loss:         Storage volume (litres) including any solar or WWHRS storage within same vessel         150         (47)           If community heating and no tank in dwelling, enter 110 litres in (47)         Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)         Water storage loss:         a) If manufacturer's declared loss factor is known (kWh/day):         1.39         (48)           Temperature factor from Table 2b         0.54         (49)           Energy lost from water storage, kWh/year         (48) x (49) =         0.75         (50)           b) If manufacturer's declared cylinder loss factor is not known:         Hot water storage loss factor from Table 2 (kWh/litre/day)         0         (51)           If community heating see section 4.3         Volume factor from Table 2a         0         (52)           Temperature factor from Table 2b         0         (53)           Energy lost from water storage, kWh/year         (47) x (51) x (52) x (53) =         0         (54)           Enter (50) or (54) in (55)         0.75         (55)           Water storage loss calculated for each month         ((56)m = (55) x (41)m           (56)m=         23.33         21.07         23.33         22.58         23.33         22.58         23.33         23.33         25.59         23.33         25.59         23.33         25.59<			·		·	·			` ′	, , ,				1	(40)
Storage volume (litres) including any solar or WWHRS storage within same vessel 150 (47)  If community heating and no tank in dwelling, enter 110 litres in (47)  Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)  Water storage loss:  a) If manufacturer's declared loss factor is known (kWh/day):  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  (48) × (49) = 0.75 (50)  b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day)  o (51)  If community heating see section 4.3  Volume factor from Table 2a  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  (47) × (51) × (52) × (53) = 0  (52)  Energy lost from water storage, kWh/year  (47) × (51) × (52) × (53) = 0  (54)  Enter (50) or (54) in (55)  Water storage loss calculated for each month  ((56)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 23.33 22.58 23.33 22.58 23.33 (56)  If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) - (H11)] + (50), else (57)m = (56)m where (H11) is from Appendix H		1		19.88	17.33	16.63	14.35	13.3	15.26	15.44	18	19.64	21.33		(46)
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)  Water storage loss:  a) If manufacturer's declared loss factor is known (kWh/day):  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  (48) × (49) = 0.75  (50)  b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day)  If community heating see section 4.3  Volume factor from Table 2a  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  Energy lost from water storage, kWh/year  Energy lost from water storage, kWh/year  Enter (50) or (54) in (55)  Water storage loss calculated for each month  ((56)m = (23.33				) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day):  Temperature factor from Table 2b  Energy lost from water storage, kWh/year b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day) b) If community heating see section 4.3  Volume factor from Table 2a  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  Enter (50) or (54) in (55)  Water storage loss calculated for each month  ((56)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 (56)  If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) - (H11)] + (50), else (57)m = (56)m where (H11) is from Appendix H	If com	munity h	eating a	and no ta	ınk in dw	elling, e	nter 110	litres in	(47)					ı	
a) If manufacturer's declared loss factor is known (kWh/day):  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day)  If community heating see section 4.3  Volume factor from Table 2a  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  Enter (50) or (54) in (55)  Water storage loss calculated for each month  ((56)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 23.33 22.58 23.33 22.58 23.33 22.58 23.33 (56)  If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H				hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	47)			
Temperature factor from Table 2b		_		oolorod l	ooo foot	or io kno	wo /k\\/k	2/dox/):						Ī	(40)
Energy lost from water storage, kWh/year (48) x (49) = 0.75 (50) b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51) If community heating see section 4.3 Volume factor from Table 2a 0 (52) Temperature factor from Table 2b 0 (53) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Enter (50) or (54) in (55) (55) (55) Water storage loss calculated for each month ((56)m = (55) x (41)m (56)m = $23.33$ $21.07$ $23.33$ $22.58$ $23.33$ $22.58$ $23.33$ $22.58$ $23.33$ $22.58$ $23.33$ $22.58$ $23.33$ $22.59$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.33$ $23.$	•					טו וא פו וכ	wii (Kvvi	i/uay).							` /
b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day)  If community heating see section 4.3  Volume factor from Table 2a  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  Enter (50) or (54) in (55)  Water storage loss calculated for each month $((56)m = 23.33  21.07  23.33  22.58  23.33  22.58  23.33  22.58  23.33  22.58  23.33  22.58  23.33  (56)$ If cylinder contains dedicated solar storage, $(57)m = (56)m \times [(50) - (H11)] \div (50)$ , else $(57)m = (56)m \text{ where (H11) is from Appendix H}$	_					ear			(48) x (49)	) <u>=</u>					
If community heating see section 4.3         Volume factor from Table 2a       0       (52)         Temperature factor from Table 2b       0       (53)         Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) = 0$ 0       (54)         Enter (50) or (54) in (55)       0.75       (55)         Water storage loss calculated for each month $((56)m = (55) \times (41)m$ (56)m = (23.33)       21.07       23.33       22.58       23.33       22.58       23.33       22.58       23.33       22.58       23.33       (56)         If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) - (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H	Ū	•		•			or is not		(10) X (10)	_		0.	13		(30)
Volume factor from Table 2a       0       (52)         Temperature factor from Table 2b       0       (53)         Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) =$ 0       (54)         Enter (50) or (54) in (55)       0.75       (55)         Water storage loss calculated for each month $((56)m = (55) \times (41)m$ (56)m = (23.33)       21.07       23.33       22.58       23.33       22.58       23.33       22.58       23.33       22.58       23.33       (56)         If cylinder contains dedicated solar storage, $(57)m = (56)m \times [(50) - (H11)] \div (50)$ , else $(57)m = (56)m \text{ where (H11) is from Appendix H}   $			_			e 2 (kW	h/litre/da	ay)					0		(51)
Temperature factor from Table 2b $0$ (53)  Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) = 0$ (54)  Enter (50) or (54) in (55) $0.75$ (55)  Water storage loss calculated for each month $((56)m = (55) \times (41)m$ (56)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 (56)  If cylinder contains dedicated solar storage, $(57)m = (56)m \times [(50) - (H11)] \div (50)$ , else $(57)m = (56)m \text{ where (H11) is from Appendix H}$		-	_		on 4.3								0	Ī	(E2)
Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) = 0$ (54) Enter (50) or (54) in (55) $0.75$ (55) Water storage loss calculated for each month $((56)m = (55) \times (41)m$ (56)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 (56) If cylinder contains dedicated solar storage, $(57)m = (56)m \times [(50) - (H11)] \div (50)$ , else $(57)m = (56)m$ where (H11) is from Appendix H					2b										
Enter (50) or (54) in (55) $0.75$ (55)  Water storage loss calculated for each month $((56)m = (55) \times (41)m$ (56)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 (56)  If cylinder contains dedicated solar storage, $(57)m = (56)m \times [(50) - (H11)] \div (50)$ , else $(57)m = (56)m \text{ where (H11) is from Appendix H}$	•					ear			(47) x (51)	) x (52) x (	53) =				
(56)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33 (56)  If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H	_	-		_	,				, , , ,		,	-	-		
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H	Water	storage	loss cal	culated 1	for each	month			((56)m = (	55) × (41)ı	m			•	
	(56)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)
(57)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 (57)	If cylind	ler contains	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	lix H	
	(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)



Primary circuit loss (annual) from Table 3	0	(58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m		
(modified by factor from Table H5 if there is solar water heating and a cylinder therm	ostat)	•
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 23.26 23.26 22.51 23.26	22.51 23.26	(59)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m		
(61)m= 0 0 0 0 0 0 0 0 0	0 0	(61)
Total heat required for water heating calculated for each month (62)m = $0.85 \times (45)$ m +	· (46)m + (57)m +	(59)m + (61)m
(62)m= 193.44 170.52 179.12 160.63 157.46 140.76 135.25 148.32 148.03 166.56	176.05 188.81	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribu	ition to water heating)	
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)		
(63)m= 0 0 0 0 0 0 0 0 0	0 0	(63)
Output from water heater		
(64)m= 193.44 170.52 179.12 160.63 157.46 140.76 135.25 148.32 148.03 166.56	176.05 188.81	
Output from water heat	er (annual) <sub>112</sub>	1964.96 (64)
Heat gains from water heating, kWh/month 0.25 $^{\prime}$ [0.85 $\times$ (45)m + (61)m] + 0.8 $\times$ [(46)m	n + (57)m + (59)m	]
(65)m= 86.1 76.37 81.34 74.49 74.14 67.88 66.75 71.1 70.3 77.17	79.62 84.56	(65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is	from community h	eating
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= 117.51 117.51 117.51 117.51 117.51 117.51 117.51 117.51 117.51 117.51	117.51 117.51	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5		
(67)m= 18.5 16.43 13.36 10.12 7.56 6.39 6.9 8.97 12.04 15.28	17.84 19.02	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5		
(68)m= 207.56 209.72 204.29 192.74 178.15 164.44 155.28 153.13 158.56 170.11	184.7 198.41	(68)
	104.7	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5  (69)m= 34.75 34.75 34.75 34.75 34.75 34.75 34.75 34.75 34.75	34.75 34.75	(69)
	04.70	
Pumps and fans gains (Table 5a)  (70)m= 3 3 3 3 3 3 3 3 3 3 3 3 3	3 3	(70)
	3 3	1 (70)
Losses e.g. evaporation (negative values) (Table 5)		(74)
(71)m=	-94.01 -94.01	(71)
Water heating gains (Table 5)	1	( <del></del> )
(72)m= 115.73 113.65 109.33 103.46 99.65 94.28 89.72 95.57 97.64 103.72	ļ ļ	(72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (68)m + (69)m + (70)m + (68)m	1 1	1
(73)m= 403.05 401.05 388.24 367.57 346.62 326.36 313.16 318.92 329.49 350.37	374.37 392.33	(73)
6. Solar gains:		
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applica		
Orientation: Access Factor Area Flux g_ Table 6d m² Table 6a Table 6b	FF Fable 6c	Gains (W)
		· <i>'</i>
South 0.9x 0.77 x 1.87 x 46.75 x 0.63 x	0.7 =	26.72 (78)
South 0.9x 0.77 x 3.72 x 46.75 x 0.63 x	0.7	106.3 (78)



	_		_											_
South	0.9x	0.77	X	1.87	×	7	6.57	X	0.63	X	0.7	=	43.76	(78)
South	0.9x	0.77	X	3.72	Х	7	6.57	X	0.63	x	0.7	=	174.1	(78)
South	0.9x	0.77	X	1.87	Х	9	7.53	X	0.63	x	0.7	=	55.74	(78)
South	0.9x	0.77	X	3.72	×	9	7.53	X	0.63	x	0.7	=	221.77	(78)
South	0.9x	0.77	X	1.87	Х	1	10.23	X	0.63	×	0.7	=	63	(78)
South	0.9x	0.77	X	3.72	Х	1	10.23	X	0.63	×	0.7	=	250.65	(78)
South	0.9x	0.77	X	1.87	Х	1	14.87	X	0.63	x [	0.7	=	65.65	(78)
South	0.9x	0.77	X	3.72	Х	1	14.87	X	0.63	x	0.7	=	261.19	(78)
South	0.9x	0.77	X	1.87	×	1	10.55	X	0.63	x	0.7	=	63.18	(78)
South	0.9x	0.77	X	3.72	×	1	10.55	X	0.63	x	0.7	=	251.36	(78)
South	0.9x	0.77	X	1.87	Х	1	08.01	X	0.63	x	0.7	=	61.73	(78)
South	0.9x	0.77	X	3.72	Х	1	08.01	X	0.63	×	0.7	=	245.59	(78)
South	0.9x	0.77	X	1.87	Х	1	04.89	x	0.63	x [	0.7	=	59.95	(78)
South	0.9x	0.77	X	3.72	Х	1	04.89	X	0.63	x	0.7	=	238.51	(78)
South	0.9x	0.77	X	1.87	Х	1	01.89	X	0.63	x [	0.7	=	58.23	(78)
South	0.9x	0.77	X	3.72	x	1	01.89	X	0.63	x	0.7	=	231.66	(78)
South	0.9x	0.77	X	1.87	Х	8	2.59	X	0.63	x	0.7	=	47.2	(78)
South	0.9x	0.77	X	3.72	×	8	2.59	Х	0.63	X	0.7	=	187.78	(78)
South	0.9x	0.77	x	1.87	×	5	5.42	x	0.63	x	0.7	=	31.67	(78)
South	0.9x	0.77	X	3.72	Х	5	5.42	x	0.63	x	0.7	=	126.01	(78)
South	0.9x	0.7 <mark>7</mark>	X	1.87	Х		10.4	x	0.63	x	0.7	=	23.09	(78)
South	0.9x	0.77	x	3.72	×		10.4	Х	0.63	x	0.7	=	91.86	(78)
West	0.9x	0.77	X	3.72	×	1	9.64	X	0.63	x	0.7	=	44.66	(80)
West	0.9x	0.77	X	3.72	×	3	8.42	X	0.63	x	0.7	=	87.36	(80)
West	0.9x	0.77	X	3.72	Х	6	3.27	X	0.63	x [	0.7	=	143.87	(80)
West	0.9x	0.77	X	3.72	Х	9	2.28	X	0.63	x	0.7	=	209.82	(80)
West	0.9x	0.77	X	3.72	Х	1	13.09	X	0.63	×	0.7	=	257.15	(80)
West	0.9x	0.77	X	3.72	Х	1	15.77	X	0.63	x [	0.7	=	263.23	(80)
West	0.9x	0.77	X	3.72	Х	1	10.22	X	0.63	x	0.7	=	250.61	(80)
West	0.9x	0.77	X	3.72	Х	9	4.68	X	0.63	×	0.7	=	215.27	(80)
West	0.9x	0.77	X	3.72	Х	7	3.59	X	0.63	x	0.7	=	167.32	(80)
West	0.9x	0.77	X	3.72	Х	4	5.59	X	0.63	x	0.7	=	103.66	(80)
West	0.9x	0.77	X	3.72	Х	2	4.49	X	0.63	x [	0.7	=	55.68	(80)
West	0.9x	0.77	x	3.72	Х	1	6.15	x	0.63	x [	0.7	=	36.72	(80)
<b>—</b>			$\overline{}$	for each mo	_				= Sum(74)m .		,		1	
` ′	77.68		1.38			577.77	557.93	513.	.72 457.22	338.64	213.36	151.67		(83)
				(84)m = $(73)$	<del></del>	` '		I			1		1	(0.1)
(84)m= 5	80.73	706.27 80	9.62	891.04 93	0.6	904.13	871.09	832.	.64 786.7	689	587.73	544		(84)
			`	heating sea										
•		•	•	eriods in the		_		ole 9,	Th1 (°C)				21	(85)
Utilisatio	on fact	or for gains	for li	ving area, h	1,m	(see Ta	ble 9a)							
	Jan	Feb N	Лar	Apr N	1ay	Jun	Jul	_	ug Sep	Oct	Nov	Dec	1	



(86)m=	0.99	0.98	0.96	0.91	0.8	0.62	0.46	0.5	0.73	0.93	0.99	1		(86)
Mear	n interna	temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)				•	
(87)m=		19.96	20.26	20.59	20.84	20.96	20.99	20.99	20.92	20.59	20.09	19.7		(87)
Temp	perature	during h	neating p	eriods ir	rest of	dwelling	from Ta	able 9, T	h2 (°C)	!	!	!	ı	
(88)m=	19.85	19.85	19.86	19.87	19.87	19.88	19.88	19.88	19.88	19.87	19.87	19.86		(88)
Utilis	ation fac	tor for a	ains for	rest of d	wellina.	h2.m (se	e Table	9a)					•	
(89)m=		0.98	0.95	0.88	0.74	0.53	0.35	0.39	0.64	0.91	0.98	0.99		(89)
Mear	n interna	temper	ature in	the rest	of dwelli	na T2 (fa	ollow ste	ens 3 to	7 in Tahl	le 9c)		•	•	
(90)m=	18.2	18.52	18.95	19.41	19.72	19.86	19.88	19.88	19.82	19.42	18.73	18.15		(90)
,			ļ	ļ				ļ	<u> </u>	L fLA = Livin	g area ÷ (4	4) =	0.36	(91)
Magu	. :		atura (fa	ماندر محافس	امیداد ماد	II:a.\ £I	. A <b>T</b> 4	. /4 - £1	Λ) Το					`
(92)m=		19.04	19.42	or the wh	20.12	20.25	20.28	20.28	20.21	19.84	19.22	18.71	]	(92)
			<u> </u>	n internal							10.22	10.71		(02)
(93)m=		19.04	19.42	19.84	20.12	20.25	20.28	20.28	20.21	19.84	19.22	18.71		(93)
	ace hea		uirement											
				mperatur	e obtain	ed at ste	ep 11 of	Table 9	b, so tha	ıt Ti,m=(	76)m an	d re-calc	culate	
				using Ta										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Util <mark>is</mark>	ation fac	tor for g	ains, hm	n:										
(94)m=	0.99	0.98	0.95	0.88	0.75	0.56	0.39	0.43	0.67	0.9	0.98	0.99		(94)
			· ·	4)m x (84	_								1	
	574.49	688.89	765.51	782.02	699.4	508.37	339.96	356.39	529.77	623.02	574.56	539.53		(95)
	_			perature			100	1 40 4	1	400		1	1	(06)
(96)m=		4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
				1031.29		Lm , vv = 526.48	=[(39)m : 342.55	x [(93)m 360.38	- (96)m 571.46	869.33	1145 20	1377.67	]	(97)
			L	or each m								13/7.07		(01)
(98)m=		445.91	347.42	179.47	69.16	0	0.02	0	0	183.26	411	623.57	]	
(00)	-					·	·		l per year				2863.62	(98)
Cnaa	o bootin	a roauir	omont in	. ls\A/b/m2	hioor			. 010	po. you.	(, ) 5 a	<i>)</i> • • • • • • • • • • • • • • • • • • •	715,512		= ` ′
•		· ·		kWh/m²	•								38.44	(99)
			nts – Ind	ividual h	eating sy	ystems i	ncluding	micro-C	CHP)					
•	e heatir	_	at from s	econdary	u/sunnla	mentary	evetem						0	(201)
	•			-		memary	-	(202) = 1	_ (201) _					
	•			nain syst	. ,				, ,	(000)1			1	(202)
			•	main sys				(204) = (2	(02) × [1 –	(203)] =			1	(204)
Effici	ency of r	nain spa	ace heat	ing syste	em 1								93.5	(206)
Effici	ency of s	seconda	ry/suppl	ementar	y heating	g system	າ, %						0	(208)
						Luna	Jul	۸۰۰۰	Sep	Oct	Nov	Dec	kWh/y	/ear
	Jan	Feb	Mar	Apr	May	Jun	Jui	Aug	Seb	Oct	1407	DCC	[ KVVII/ y	
Spac				Apr alculated			Jui	Aug	l Seb		1100	DCC	, , , , , , , , , , , , , , , , , , , ,	, 5 5
Spac				<u> </u>			0	Aug 0	0	183.26	411	623.57		,
·	e heatin 603.83	g require 445.91	ement (c	alculate	d above) 69.16	)				! I	! I	1		(211)
·	e heatin 603.83	g require 445.91	ement (c	alculated	d above) 69.16	)		0		183.26	411 439.57	623.57		



Space heating fuel (secondary), kWh/month  $= \{[(98)m \times (201)]\} \times 100 \div (208)$ (215)m 0 0 0 0 Total (kWh/year) =Sum(215)<sub>1...5,10...12</sub>= (215)Water heating Output from water heater (calculated above) 193.44 170.52 179.12 160.63 157.46 140.76 135.25 148.32 148.03 166.56 176.05 188.81 Efficiency of water heater (216)79.8 (217)m =87.65 87.26 86.55 82.79 79.8 79.8 79.8 79.8 85.07 (217)87.76 Fuel for water heating, kWh/month  $(219)m = (64)m \times 100 \div (217)m$ (219)m =220.7 195.4 206.96 190.2 176.39 169.48 185.87 185.51 195.8 202.35 215.13 Total =  $Sum(219a)_{1...12}$ 2332.52 (219)**Annual totals** kWh/year kWh/year Space heating fuel used, main system 1 3062.69 Water heating fuel used 2332.52 Electricity for pumps, fans and electric keep-hot central heating pump: 30 (230c)boiler with a fan-assisted flue (230e) 45 Total electricity for the above, kWh/year sum of (230a)...(230g) = (231)75 Electricity for lighting 326.75 (232)12a. CO2 emissions - Individual heating systems including micro-CHP **Energy Emission factor Emissions** kg CO2/kWh kg CO2/year kWh/year (211) x Space heating (main system 1) (261)0.216 661.54 (215) x Space heating (secondary) 0.519 0 (263)Water heating (219) x (264)0.216 503.82 Space and water heating (261) + (262) + (263) + (264) =(265)1165.37 Electricity for pumps, fans and electric keep-hot (231) x (267)0.519 38.93 (232) x Electricity for lighting (268)0.519 169.58 sum of (265)...(271) = Total CO2, kg/year 1373.88 (272)

TER =

(273)

18.44



User Details: **Assessor Name:** Stroma Number: Stroma FSAP 2012 **Software Version: Software Name:** Version: 1.0.5.12 Property Address: EB1-04 Address: 1. Overall dwelling dimensions Av. Height(m) Area(m²) Volume(m³) Ground floor 72.7 (1a) x 2.7 (2a) =196.29 (3a) Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)(4)72.7 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =196.29 (5) total m³ per hour main secondary other heating heating x 40 =Number of chimneys (6a) 0 0 x 20 =Number of open flues 0 0 0 (6b) Number of intermittent fans x 10 =(7a) 3 30 x 10 =Number of passive vents (7b) 0 0 x 40 =Number of flueless gas fires 0 (7c)Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = $\div (5)$ 0.15 (8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9)0 Additional infiltration [(9)-1]x0.1 =0 (10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)0 if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12)If no draught lobby, enter 0.05, else enter 0 (13)O Percentage of windows and doors draught stripped (14)0 Window infiltration  $0.25 - [0.2 \times (14) \div 100] =$ 0 (15)Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =O (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)5 If based on air permeability value, then  $(18) = [(17) \div 20] + (8)$ , otherwise (18) = (16)0.4 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)2  $(20) = 1 - [0.075 \times (19)] =$ Shelter factor (20)0.85  $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.34 Infiltration rate modified for monthly wind speed Jan Feb Jul Sep Mar Apr May Jun Aug Oct Nov Dec Monthly average wind speed from Table 7 (22)m =5.1 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor  $(22a)m = (22)m \div 4$ (22a)m 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18



Adjusted infiltration rate (allowing for shelter and wind speed) =	21a) x (22a)m	
0.44 0.43 0.42 0.38 0.37 0.33 0.33	0.32	
Calculate effective air change rate for the applicable case		7
If mechanical ventilation:	0	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N	Foblo (b)	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from		(23c)
a) If balanced mechanical ventilation with heat recovery (MVH		(24a)
(24a)m= 0 0 0 0 0 0 0 0	0 0 0 0 0 0	(24a)
b) If balanced mechanical ventilation without heat recovery (M		(24b)
` '		(240)
c) If whole house extract ventilation or positive input ventilation if $(22b)m < 0.5 \times (23b)$ , then $(24c) = (23b)$ ; otherwise $(24c)$		
(24c)m= 0 0 0 0 0 0 0 0 0	0 0 0 0 0	(24c)
d) If natural ventilation or whole house positive input ventilatio	n from loft	
if $(22b)m = 1$ , then $(24d)m = (22b)m$ otherwise $(24d)m = 0$		
(24d)m= 0.6 0.59 0.59 0.57 0.57 0.55 0.55	0.55 0.56 0.57 0.57 0.58	(24d)
Effective air change rate - enter (24a) or (24b) or (24c) or (24c)	) in box (25)	
(25)m= 0.6 0.59 0.59 0.57 0.55 0.55	0.55 0.56 0.57 0.57 0.58	(25)
3. Heat losses and heat loss parameter:		-
<b>ELEMENT</b> Gross Openings Net Area	U-value A X U k-value A X	k
area (m²) m² A ,m²	$W/m2K$ $(W/K)$ $kJ/m^2\cdot K$ $kJ/h$	(
Doors 1.89 x	1 = 1.89	(26)
1.00	1 = 1.89 /(1.4)+0.04] = 3.38	(26) (27)
Windows Type 1 2.55 x1/l		` '
Windows Type 1 2.55 x1/1 Windows Type 2 2.55 x1/1	/(1.4)+0.04] = 3.38	(27)
Windows Type 1  Windows Type 2  Windows Type 3  2.55  x1/[  2.55]  x1/[   /(1.4)+0.04] = 3.38 /(1.4)+0.04] = 3.38	(27) (27)	
Windows Type 1       2.55       x1/1         Windows Type 2       2.55       x1/1         Windows Type 3       5.07       x1/1         Windows Type 4       2.04       x1/1	$\frac{1}{(1.4) + 0.04} = 3.38$ $\frac{1}{(1.4) + 0.04} = 3.38$ $\frac{1}{(1.4) + 0.04} = 6.72$	(27) (27) (27)
Windows Type 1       2.55       x1/I         Windows Type 2       2.55       x1/I         Windows Type 3       5.07       x1/I         Windows Type 4       2.04       x1/I		(27) (27) (27) (27)
Windows Type 1       2.55       x1/I         Windows Type 2       2.55       x1/I         Windows Type 3       5.07       x1/I         Windows Type 4       2.04       x1/I         Windows Type 5       2.04       x1/I		(27) (27) (27) (27) (27)
Windows Type 1       2.55       x1/I         Windows Type 2       2.55       x1/I         Windows Type 3       5.07       x1/I         Windows Type 4       2.04       x1/I         Windows Type 5       2.04       x1/I         Floor       72.7       x		(27) (27) (27) (27) (27) (27)
Windows Type 1       2.55       x1/I         Windows Type 2       2.55       x1/I         Windows Type 3       5.07       x1/I         Windows Type 4       2.04       x1/I         Windows Type 5       2.04       x1/I         Floor       72.7       x         Walls       43.2       18.18       25.02       x		(27) (27) (27) (27) (27) (27) (28) (29)
Windows Type 1       2.55       x1/I         Windows Type 2       2.55       x1/I         Windows Type 3       5.07       x1/I         Windows Type 4       2.04       x1/I         Windows Type 5       2.04       x1/I         Floor       72.7       x         Walls       43.2       18.18       25.02       x         Total area of elements, m²       115.9		(27) (27) (27) (27) (27) (27) (28) (29) (31)
Windows Type 1       2.55       x1/I         Windows Type 2       2.55       x1/I         Windows Type 3       5.07       x1/I         Windows Type 4       2.04       x1/I         Windows Type 5       2.04       x1/I         Floor       72.7       x [         Walls       43.2       18.18       25.02       x [         Total area of elements, m²       115.9       49.14       x [		(27) (27) (27) (27) (27) (27) (28) (29) (31) (32)
Windows Type 1  Windows Type 2  Windows Type 3  Windows Type 4  Windows Type 5  Floor  Walls  43.2  Total area of elements, m²  Party wall  Party ceiling  * for windows and roof windows, use effective window U-value calculated using the include the areas on both sides of internal walls and partitions  * include the areas on both sides of internal walls and partitions	$ \frac{1}{(1.4) + 0.04} = 3.38 $ $ \frac{1}{(1.4) + 0.04} = 6.72 $ $ \frac{1}{(1.4) + 0.04} = 2.7 $ $ \frac{1}{(1.4) + 0.04} = 2.7 $ $ \frac{1}{(1.4) + 0.04} = 2.7 $ $ \frac{1}{(0.13)} = 9.450999 $ $ \frac{1}{(0.18)} = 4.5 $ $ \frac{1}{(0.16)} = 0 $ $ \frac{1}{(0.16)} = 0 $ $ \frac{1}{(0.16)} = 0 $ $ \frac{1}{(0.16)} = 0 $ $ \frac{1}{(0.16)} = 0 $ $ \frac{1}{(0.16)} = 0 $ $ \frac{1}{(0.16)} = 0 $ $ \frac{1}{(0.16)} = 0 $ $ \frac{1}{(0.16)} = 0 $ $ \frac{1}{(0.16)} = 0 $ $ \frac{1}{(0.16)} = 0 $ $ \frac{1}{(0.16)} = 0 $ $ \frac{1}{(0.16)} = 0 $ $ \frac{1}{(0.16)} = 0 $ $ \frac{1}{(0.16)} = 0 $ $ \frac{1}{(0.16)} = 0 $ $ \frac{1}{(0.16)} = 0 $ $ \frac{1}{(0.16)} = 0 $ $ \frac{1}{(0.16)} = 0 $ $ \frac{1}{(0.16)} = 0 $ $ \frac{1}{(0.16)} = 0 $ $ \frac{1}{(0.16)} = 0 $ $ \frac{1}{(0.16)} = 0 $ $ \frac{1}{(0.16)} = 0 $ $ \frac{1}{(0.16)} = 0 $ $ \frac{1}{(0.16)} = 0 $ $ \frac{1}{(0.16)} = 0 $ $ \frac{1}{(0.16)} = 0 $ $ \frac{1}{(0.16)} = 0 $ $ \frac{1}{(0.16)} = 0 $ $ \frac{1}{(0.16)} = 0 $ $ \frac{1}{(0.16)} = 0 $ $ \frac{1}{(0.16)} = 0 $ $ \frac{1}{(0.16)} = 0 $ $ \frac{1}{(0.16)} = 0 $ $ \frac{1}{(0.16)} = 0 $ $ \frac{1}{(0.16)} = 0 $ $ \frac{1}{(0.16)} = 0 $ $ \frac{1}{(0.16)} = 0 $ $ \frac{1}{(0.16)} = 0 $ $\frac{1}{(0.16)} = 0$ $\frac{1}{(0.$	(27) (27) (27) (27) (27) (28) (29) (31) (32)
Windows Type 2  Windows Type 3  Windows Type 3  Windows Type 4  Windows Type 5  Floor  Walls  43.2  Total area of elements, m²  Party wall  Party ceiling  * for windows and roof windows, use effective window U-value calculated using the include the areas on both sides of internal walls and partitions  Fabric heat loss, W/K = S (A x U)		(27) (27) (27) (27) (27) (27) (28) (29) (31) (32)
Windows Type 1  Windows Type 2  Windows Type 3  Windows Type 4  Windows Type 5  Floor  Walls  43.2  Total area of elements, m²  Party wall  Party ceiling  * for windows and roof windows, use effective window U-value calculated using the include the areas on both sides of internal walls and partitions  Fabric heat loss, W/K = S (A x U)  Heat capacity Cm = S(A x k)	$ \frac{1}{(1.4) + 0.04} = 3.38 $ $ \frac{1}{(1.4) + 0.04} = 6.72 $ $ \frac{1}{(1.4) + 0.04} = 2.7 $ $ \frac{1}{(1.4) + 0.04} = 2.7 $ $ \frac{1}{(1.4) + 0.04} = 4.5 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $ $ 0 = 0 $	(27) (27) (27) (27) (27) (28) (29) (31) (32)
Windows Type 1  Windows Type 2  Windows Type 3  Windows Type 4  Windows Type 5  Floor  Walls  43.2  Total area of elements, m²  Party wall  Party ceiling  * for windows and roof windows, use effective window U-value calculated using ** include the areas on both sides of internal walls and partitions  Fabric heat loss, W/K = S (A x U)  Heat capacity Cm = S(A x k)  Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K	(1.4) + 0.04  = 3.38 $ (1.4) + 0.04  = 6.72$ $ (1.4) + 0.04  = 2.7$ $ (1.4) + 0.04  = 2.7$ $ (1.4) + 0.04  = 2.7$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  =$	(27) (27) (27) (27) (27) (28) (29) (31) (32) (32b)
Windows Type 1  Windows Type 2  Windows Type 3  Windows Type 4  Windows Type 5  Floor  Walls  43.2  Total area of elements, m²  Party wall  Party ceiling  * for windows and roof windows, use effective window U-value calculated using the include the areas on both sides of internal walls and partitions  Fabric heat loss, W/K = S (A x U)  Heat capacity Cm = S(A x k)	(1.4) + 0.04  = 3.38 $ (1.4) + 0.04  = 6.72$ $ (1.4) + 0.04  = 2.7$ $ (1.4) + 0.04  = 2.7$ $ (1.4) + 0.04  = 2.7$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  =$	(27) (27) (27) (27) (27) (28) (29) (31) (32) (32b)
Windows Type 2  Windows Type 3  Windows Type 4  Windows Type 5  Floor  Walls  43.2  Total area of elements, m²  Party wall  Party ceiling  * for windows and roof windows, use effective window U-value calculated using the include the areas on both sides of internal walls and partitions  Fabric heat loss, W/K = S (A x U)  Heat capacity Cm = S(A x k)  Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K  For design assessments where the details of the construction are not known presented.	(1.4) + 0.04  = 3.38 $ (1.4) + 0.04  = 6.72$ $ (1.4) + 0.04  = 2.7$ $ (1.4) + 0.04  = 2.7$ $ (1.4) + 0.04  = 2.7$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  = 3.7$ $ (1.4) + 0.04  =$	(27) (27) (27) (27) (27) (28) (29) (31) (32) (32b)
Windows Type 1  Windows Type 2  Windows Type 3  Windows Type 4  Windows Type 5  Floor  Walls  43.2  Total area of elements, m²  Party wall  Party ceiling  * for windows and roof windows, use effective window U-value calculated using * include the areas on both sides of internal walls and partitions  Fabric heat loss, W/K = S (A x U)  Heat capacity Cm = S(A x k)  Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K  For design assessments where the details of the construction are not known precan be used instead of a detailed calculation.	(1.4) + 0.04  = 3.38 $ (1.4) + 0.04  = 6.72$ $ (1.4) + 0.04  = 2.7$ $ (1.4) + 0.04  = 2.7$ $ (1.4) + 0.04  = 2.7$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 3.38$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  = 4.5$ $ (1.4) + 0.04  =$	(27) (27) (27) (27) (27) (28) (29) (31) (32) (32b)  (33) (34) (35)



Vantilation has	nt loce or	alculated	l monthly	ı				(38)m	_ 0 22 × /	25)m v (5)			
Ventilation hea	Feb	Mar			Jun	Jul	Aug		Oct	25)m x (5) Nov	Dec		
(38)m= 38.56	38.32	38.09	Apr 36.98	May 36.78	35.81	35.81	35.64	Sep 36.19	36.78	37.19	37.63		(38)
Heat transfer of			00.00	00.70	00.01	00.01	00.01		= (37) + (	<u> </u>	01.00		()
(39)m= 84.85	84.61	84.37	83.27	83.06	82.1	82.1	81.92	82.47	83.06	83.48	83.91		
(39)1112	04.01	04.37	05.21	03.00	02.1	02.1	01.92			Sum(39) <sub>1</sub> .	$\sqcup$	83.27	(39)
Heat loss para	meter (H	HLP), W/	′m²K						$= (39)m \div$				` ′
(40)m= 1.17	1.16	1.16	1.15	1.14	1.13	1.13	1.13	1.13	1.14	1.15	1.15		
Number of day	s in moi	nth (Tabl	le 1a)						Average =	Sum(40) <sub>1</sub> .	12 /12=	1.15	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heat	ting ener	rgy requi	rement:								kWh/ye	ear:	
Assumed occu	inancy I	N								2	31		(42)
if TFA > 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	A -13.9	)2)] + 0.0	0013 x (	ΓFA -13		31		(42)
if TFA £ 13.9	•		a ta Pro-				(O.F. N.I)	. 00					
Annual averag Reduce the annua									se target o		.06		(43)
not more that 125					_	-							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage ii	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x		·					
(44)m= 97.96	94.4	90.84	87.28	83.72	80.15	80.15	83.72	87.28	90.84	94.4	97.96		
Energy content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	m x nm x E	)Tm / 3600			m(44) <sub>112</sub> = ables 1b, 1		1068.71	(44)
(45)m= 145.28	127.06	131.12	114.31	109.68	94.65	87.71	100.64	101.85	118.69	129.56	140.69		
									Γotal = Su	m(45) <sub>112</sub> =	-	1401.24	(45)
If instantaneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46 <sub>)</sub>	) to (61)					
(46)m= 21.79	19.06	19.67	17.15	16.45	14.2	13.16	15.1	15.28	17.8	19.43	21.1		(46)
Water storage		includin	va 201/ 6/	olar or M	/\//LDC	ctorogo	within co	mo voc	col		450		(47)
Storage volum  If community h	` ,		•			•		ame ves	sei		150		(47)
Otherwise if no Water storage	stored			•			` '	ers) ente	er '0' in (	47)			
a) If manufact		eclared l	oss facto	or is kno	wn (kWł	n/dav):				1	39		(48)
Temperature fa					`	, ,					54		(49)
Energy lost fro				ear			(48) x (49)	) =			75		(50)
b) If manufact		-	-		or is not		, , , ,			0.	75		(00)
Hot water stora	-			e 2 (kW	h/litre/da	ıy)					0		(51)
If community h	•		on 4.3										
Volume factor			2h							-	0		(52)
Temperature fa							(47) (54)	(50) (	<b>-</b> 0)		0		(53)
Energy lost fro Enter (50) or (		-	, KVVh/ye	ear			(47) x (51)	x (52) x (	53) =		0 75		(54) (55)
Water storage	, , ,	,	or each	month			((56)m = (	55) <b>~</b> (41):	m	0.	75		(55)
					20.50					20.50	20.00		(EC)
(56)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(56)



If cylinder contains dedicated solar storage, $(57)$ m = $(56)$ m x $[(50) - (H11)] \div (50)$ , else $(57)$ m = $(56)$ m where $(H11)$ is from Appendix H	
(57)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33	(57)
Primary circuit loss (annual) from Table 3	(58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m	
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26	(59)
Combi loss calculated for each month (61)m = (60) ÷ 365 x (41)m	
(61)m= 0 0 0 0 0 0 0 0 0 0 0 0 0	(61)
Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m + (46)m + (57)m + (59)m + (61)m$	
(62)m= 191.87 169.15 177.71 159.4 156.28 139.74 134.3 147.24 146.94 165.29 174.65 187.29	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)	
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	
(63)m= 0 0 0 0 0 0 0 0 0 0 0 0 0	(63)
Output from water heater	
(64)m= 191.87 169.15 177.71 159.4 156.28 139.74 134.3 147.24 146.94 165.29 174.65 187.29	
Output from water heater (annual) <sub>112</sub> 1949.86	(64)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 x (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]	
(65)m= 85.58 75.92 80.87 74.08 73.75 67.54 66.44 70.74 69.94 76.74 79.15 84.06	(65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating	
5. Internal gains (see Table 5 and 5a):	
Metabolic gains (Table 5), Watts	
Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	(66)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	(66)
Jan         Feb         Mar         Apr         May         Jun         Jul         Aug         Sep         Oct         Nov         Dec           (66)m=         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49	(66) (67)
Jan         Feb         Mar         Apr         May         Jun         Jul         Aug         Sep         Oct         Nov         Dec           (66)m=         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49	` '
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115	` '
Jan         Feb         Mar         Apr         May         Jun         Jul         Aug         Sep         Oct         Nov         Dec           (66)m=         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49	(67)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115	(67)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115	(67) (68)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115	(67) (68)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115	(67) (68) (69)
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	(67) (68) (69)
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	(67) (68) (69) (70)
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	(67) (68) (69) (70)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115	(67) (68) (69) (70)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115	(67) (68) (69) (70)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115	(67) (68) (69) (70) (71)

Flux

Table 6a

Table 6b

Table 6c

Area

m²

Orientation: Access Factor

Table 6d

Gains

(W)



North	0.9x	0.77	X	2.55	x	10.63	X	0.63	x	0.7	=	8.29	(74)
North	0.9x	0.77	X	2.04	x	10.63	X	0.63	x	0.7	=	6.63	(74)
North	0.9x	0.77	X	2.55	x	20.32	x	0.63	x	0.7	=	15.84	(74)
North	0.9x	0.77	X	2.04	x	20.32	x	0.63	x	0.7	=	12.67	(74)
North	0.9x	0.77	X	2.55	x	34.53	x	0.63	x	0.7	=	26.91	(74)
North	0.9x	0.77	X	2.04	x	34.53	X	0.63	x	0.7	=	21.53	(74)
North	0.9x	0.77	X	2.55	X	55.46	X	0.63	X	0.7	=	43.22	(74)
North	0.9x	0.77	X	2.04	X	55.46	X	0.63	X	0.7	] =	34.58	(74)
North	0.9x	0.77	X	2.55	X	74.72	X	0.63	X	0.7	=	58.23	(74)
North	0.9x	0.77	X	2.04	x	74.72	X	0.63	X	0.7	=	46.58	(74)
North	0.9x	0.77	X	2.55	x	79.99	X	0.63	X	0.7	=	62.33	(74)
North	0.9x	0.77	X	2.04	x	79.99	X	0.63	X	0.7	=	49.87	(74)
North	0.9x	0.77	X	2.55	x	74.68	X	0.63	X	0.7	=	58.2	(74)
North	0.9x	0.77	X	2.04	x	74.68	X	0.63	X	0.7	=	46.56	(74)
North	0.9x	0.77	X	2.55	x	59.25	X	0.63	X	0.7	=	46.17	(74)
North	0.9x	0.77	X	2.04	x	59.25	X	0.63	X	0.7	=	36.94	(74)
North	0.9x	0.77	X	2.55	X	41.52	X	0.63	X	0.7	=	32.35	(74)
North	0.9x	0.77	X	2.04	X	41.52	X	0.63	X	0.7	-	25.88	(74)
North	0.9x	0.77	x	2.55	х	24.19	X	0.63	x	0.7	=	18.85	(74)
North	0.9x	0.77	x	2.04	x	24.19	×	0.63	x	0.7	=	15.08	(74)
North	0.9x	0.77	X	2.55	X	13.12	X	0.63	X	0.7	=	10.22	(74)
North	0.9x	0.77	X	2.04	X	13.12	Х	0.63	x	0.7	=	8.18	(74)
North	0.9x	0.77	X	2.55	х	8.86	X	0.63	X	0.7	=	6.91	(74)
North	0.9x	0.77	X	2.04	Х	8.86	X	0.63	X	0.7	=	5.53	(74)
South	0.9x	0.77	X	2.55	X	46.75	X	0.63	X	0.7	=	36.43	(78)
South	0.9x	0.77	X	5.07	x	46.75	X	0.63	X	0.7	=	72.44	(78)
South	0.9x	0.77	X	2.04	x	46.75	X	0.63	X	0.7	=	58.3	(78)
South	0.9x	0.77	X	2.55	x	76.57	X	0.63	X	0.7	=	59.67	(78)
South	0.9x	0.77	X	5.07	X	76.57	X	0.63	X	0.7	=	118.64	(78)
South	0.9x	0.77	X	2.04	X	76.57	X	0.63	X	0.7	=	95.47	(78)
South	0.9x	0.77	X	2.55	X	97.53	X	0.63	X	0.7	=	76.01	(78)
South	0.9x	0.77	X	5.07	x	97.53	x	0.63	X	0.7	=	151.12	(78)
South	0.9x	0.77	X	2.04	X	97.53	X	0.63	X	0.7	=	121.62	(78)
South	0.9x	0.77	X	2.55	x	110.23	X	0.63	X	0.7	=	85.91	(78)
South	0.9x	0.77	X	5.07	x	110.23	x	0.63	X	0.7	=	170.8	(78)
South	0.9x	0.77	X	2.04	x	110.23	x	0.63	X	0.7	=	137.45	(78)
South	0.9x	0.77	X	2.55	x	114.87	x	0.63	X	0.7	=	89.52	(78)
South	0.9x	0.77	X	5.07	x	114.87	x	0.63	X	0.7	=	177.99	(78)
South	0.9x	0.77	X	2.04	x	114.87	X	0.63	X	0.7	=	143.23	(78)
South	0.9x	0.77	x	2.55	x	110.55	X	0.63	x	0.7	=	86.15	(78)
South	0.9x	0.77	X	5.07	X	110.55	X	0.63	X	0.7	=	171.29	(78)



South	_							_						
	0.9x	0.77	X	2.0	)4	X	110.55	X	0.63	X	0.7	=	137.84	(78)
South	0.9x	0.77	X	2.5	55	x	108.01	X	0.63	X	0.7	=	84.18	(78)
South	0.9x	0.77	X	5.0	)7	x	108.01	X	0.63	X	0.7	=	167.36	(78)
South	0.9x	0.77	X	2.0	)4	x	108.01	X	0.63	x	0.7	=	134.68	(78)
South	0.9x	0.77	X	2.5	55	x	104.89	X	0.63	X	0.7	=	81.75	(78)
South	0.9x	0.77	X	5.0	)7	x	104.89	X	0.63	×	0.7	_	162.53	(78)
South	0.9x	0.77	X	2.0	)4	x	104.89	X	0.63	x	0.7	=	130.79	(78)
South	0.9x	0.77	X	2.5	55	x	101.89	X	0.63	x	0.7	=	79.4	(78)
South	0.9x	0.77	X	5.0	)7	x	101.89	X	0.63	x	0.7	=	157.87	(78)
South	0.9x	0.77	X	2.0	)4	x	101.89	X	0.63	x	0.7	=	127.04	(78)
South	0.9x	0.77	X	2.5	55	x	82.59	X	0.63	x	0.7	=	64.36	(78)
South	0.9x	0.77	X	5.0	)7	x	82.59	X	0.63	x	0.7	=	127.96	(78)
South	0.9x	0.77	X	2.0	)4	x	82.59	X	0.63	×	0.7	_	102.98	(78)
South	0.9x	0.77	X	2.5	55	x	55.42	X	0.63	x	0.7	=	43.19	(78)
South	0.9x	0.77	X	5.0	)7	x	55.42	X	0.63	x	0.7	=	85.87	(78)
South	0.9x	0.77	X	2.0	)4	x	55.42	X	0.63	×	0.7	_	69.1	(78)
South	0.9x	0.77	X	2.5	55	x	40.4	X	0.63	×	0.7	=	31.48	(78)
South	0.9x	0.77	X	5.0	)7	X	40.4	X	0.63	Х	0.7	=	62.6	(78)
South	0.9x	0.77	x	2.0	)4	х	40.4	x	0.63	X	0.7	=	50.37	(78)
Solar g (83)m=	ains in v 182.09	vatts, calcu	lated 7.19	for eacl 471.97	h month 515.55	$\overline{}$	07.48 490.97	(83)m	n = Sum(74)m . .18 422.55	( <mark>82</mark> )m		156.89		(83)
Total ga														
Ŭ,	ains – in	iternal and	solar	(84)m =	= (73)m	3) +	33)m , watts							
(84)m=	579.42		solar 9.94	(84)m = 834.4	= (73)m 857.41		33)m , watts 29.44 799.93	772	.84 747.6	674.8	585.72	543.69		(84)
(84)m=	579.42		9.94	834.4	857.41	82	· .	772	.84 747.6	674.8	585.72	543.69		(84)
(84)m= 7. Mea	579.42 an intern	697.65 77	9.94 ture (	834.4 (heating	857.41 season	82	· .			674.8	585.72	543.69	21	(84)
(84)m= [ 7. Mea Tempe	579.42 an interr	697.65 77 nal tempera during heat	9.94 ture (	834.4 (heating eriods ir	857.41 season	82 ng	29.44 799.93			674.8	585.72	543.69	21	
(84)m= [ 7. Mea Tempe	579.42 an interr	697.65 77  nal tempera  during heat  or for gains	9.94 ture (	834.4 (heating eriods ir	857.41 season	82 ng (se	29.44 799.93 area from Ta	ıble 9		674.8 Oct		543.69 Dec	21	
(84)m= [ 7. Mea Tempe	579.42 an interrection fact	697.65 77 nal tempera during heat or for gains Feb M	9.94 ture ( ing po	834.4 (heating eriods ir iving are	season the livi	1) ng :	29.44 799.93 area from Ta	ıble 9	, Th1 (°C)		Nov		21	
(84)m= [ 7. Mea Tempe Utilisa (86)m=	an interrection fact  Jan  0.99	during heat or for gains Feb N 0.98 0	9.94 ing positions for li	834.4 (heating eriods ir iving are Apr 0.9	season the livi ea, h1,m May	82 ng (so	29.44 799.93  area from Ta ee Table 9a)  Jun Jul	A 0.4	, Th1 (°C) ug Sep	Oct	Nov	Dec	21	(85)
(84)m= [ 7. Mea Tempe Utilisa (86)m=	an interrection fact  Jan  0.99	cor for gains Feb N 0.98 0 temperature	9.94 ing positions for li	834.4 (heating eriods ir iving are Apr 0.9	season the livi ea, h1,m May	ng (so	29.44 799.93  area from Ta ee Table 9a)  Jun Jul  0.61 0.45	A 0.4	, Th1 (°C)  ug Sep  18 0.71  Table 9c)	Oct	. Nov 0.98	Dec	21	(85)
7. Mea Tempo Utilisa (86)m= Mean (87)m=	an internerature of tion fact  Jan 0.99  internal 19.92	during heat for for gains Feb N 0.98 0 temperature 20.13 20	9.94 sture (ing positions for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for	keriods ir iving are Apr 0.9 iving are 20.67	season the livi ea, h1,m May 0.79 ea T1 (fo	82 n (se	29.44 799.93  area from Ta ee Table 9a) Jun Jul 0.61 0.45  w steps 3 to 0.97 21	A 0.4 7 in 1 20.	sep  Sep  Sep  Sep  Sep  Sep  Sep  Sep	Oct 0.92	. Nov 0.98	Dec 0.99	21	(85)
7. Mea Tempo Utilisa (86)m= Mean (87)m=	an internerature of tion fact  Jan 0.99  internal 19.92	during heat or for gains Feb N 0.98 0 temperature 20.13 20 during heat	9.94 sture (ing positions for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for limited for	keriods ir iving are Apr 0.9 iving are 20.67	season the livi ea, h1,m May 0.79 ea T1 (fo	82 (Second Second  29.44 799.93  area from Ta ee Table 9a)  Jun Jul  0.61 0.45  w steps 3 to	A 0.4 7 in 1 20.	s, Th1 (°C)  ug Sep  18 0.71  Table 9c)  99 20.95  9, Th2 (°C)	Oct 0.92	Nov 0.98 20.25	Dec 0.99	21	(85)	
(84)m= [ 7. Mea Tempo Utilisa (86)m= [ Mean (87)m= [ Tempo (88)m= [	an interrection fact Jan 0.99 internal 19.92 erature of 19.95	during heat or for gains Feb N 0.98 0 temperature 20.13 20 during heat 19.95 19	9.94 ture (ing post for ling line line line line line line line	keriods ir iving are Apr 0.9 iving are 20.67 eriods ir 19.96	season the livi ea, h1,m May 0.79 ea T1 (for 20.88 or rest of 19.97	ng (se collo ollo dw	29.44 799.93  area from Ta ee Table 9a)  Jun Jul  0.61 0.45  w steps 3 to 0.97 21  relling from T 9.98 19.98	A 0.2 7 in T 20. 2able 9	s, Th1 (°C)  ug Sep  18 0.71  Table 9c)  99 20.95  9, Th2 (°C)	Oct 0.92	Nov 0.98 20.25	Dec 0.99	21	(85)
(84)m= [ 7. Mea Tempo Utilisa (86)m= [ Mean (87)m= [ Tempo (88)m= [	an interrection fact Jan 0.99 internal 19.92 erature of 19.95	cor for gains temperature 20.13 20 during heat 19.95 19	9.94 ture (ing post for ling line line line line line line line	keriods ir iving are Apr 0.9 iving are 20.67 eriods ir 19.96	season the livi ea, h1,m May 0.79 ea T1 (for 20.88 or rest of 19.97	82 ng (so ollo ollo dw h2,	29.44 799.93  area from Ta ee Table 9a)  Jun Jul  0.61 0.45  w steps 3 to 0.97 21  relling from T	A 0.2 7 in T 20. 2able 9	sep  Sep  Sep  Sep  Solution (°C)  Sep  Solution (°C)   Oct 0.92	Nov 0.98 20.25	Dec 0.99	21	(85)	
(84)m= [ 7. Mea Tempo Utilisa (86)m= [ Mean (87)m= [ Tempo (88)m= [ Utilisa (89)m= [	an interrection fact Jan 0.99 internal 19.92 erature of 19.95 tion fact 0.99	during heat or for gains temperature 20.13 20 during heat 19.95 19 tor for gains 0.98 0	en logo of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the s	heating eriods ir iving are Apr 0.9 iving are 20.67 eriods ir 19.96 est of do 0.87	season the livi ea, h1,m May 0.79 ea T1 (for 20.88 or rest of 19.97 welling, 0.73	82 ng (so ollo ollo dw h2,	area from Ta ee Table 9a) Jun Jul 0.61 0.45 w steps 3 to 0.97 21 relling from T 9.98 19.98 m (see Table 0.52 0.35	A 0.4 7 in 1 20. able 9 19. 9a) 0.3	s, Th1 (°C)  ug Sep  18 0.71  Table 9c)  99 20.95  9, Th2 (°C)  98 19.97	Oct 0.92 20.68 19.97 0.89	Nov 0.98 3 20.25	Dec 0.99 19.88	21	(85) (86) (87) (88)
(84)m= [ 7. Mea Tempo Utilisa (86)m= [ Mean (87)m= [ Tempo (88)m= [ Utilisa (89)m= [ Mean	an internerature of tion fact Jan 0.99 internal 19.95 tion fact 0.99 internal 19.95 internal 19.95 internal 19.95 internal 19.95 internal	during heat temperature 20.13 20 during heat 19.95 19 cor for gains 0.98 0 temperature 20.13 20 during heat 19.95 19 cor for gains 0.98 0 temperature 20.19 0 temperature 20.19 19 0 te	enture (ing positions) for ling positions positions positions for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for resp	keriods ir heating are Apr 0.9 heriods ir 19.96 est of do 0.87 the rest	season the livi ea, h1,m May 0.79 ea T1 (for 20.88 n rest of 19.97 welling, 0.73 of dwell	83 ng (so (so (so (so (so (so (so (so (so (so	29.44 799.93  area from Ta ee Table 9a)  Jun Jul  0.61 0.45  w steps 3 to 0.97 21  relling from T 9.98 19.98  m (see Table 0.52 0.35  T2 (follow st	A 0.2 7 in T 20. (able 9 19. e 9a) 0.3 eps 3	y, Th1 (°C)  ug Sep  18 0.71  Table 9c)  99 20.95  9, Th2 (°C)  98 19.97  10 10 10 10 10 10 10 10 10 10 10 10 10 1	Oct 0.92 20.68 19.97 0.89 e 9c)	Nov 0.98 20.25 19.96	Dec 0.99 19.88 19.96	21	(85) (86) (87) (88) (89)
(84)m= [ 7. Mea Tempo Utilisa (86)m= [ Mean (87)m= [ Tempo (88)m= [ Utilisa (89)m= [	an interrection fact Jan 0.99 internal 19.92 erature of 19.95 tion fact 0.99	during heat temperature 20.13 20 during heat 19.95 19 cor for gains 0.98 0 temperature 20.13 20 during heat 19.95 19 cor for gains 0.98 0 temperature 20.19 0 temperature 20.19 19 0 te	en logo of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the s	heating eriods ir iving are Apr 0.9 iving are 20.67 eriods ir 19.96 est of do 0.87	season the livi ea, h1,m May 0.79 ea T1 (for 20.88 or rest of 19.97 welling, 0.73	83 ng (so (so (so (so (so (so (so (so (so (so	area from Ta ee Table 9a) Jun Jul 0.61 0.45 w steps 3 to 0.97 21 relling from T 9.98 19.98 m (see Table 0.52 0.35	A 0.4 7 in 1 20. able 9 19. 9a) 0.3	g Sep 18 0.71  Table 9c) 99 20.95 9, Th2 (°C) 98 19.97  38 0.62  10 7 in Table 98 19.93	Oct 0.92 20.68 19.97 0.89 e 9c)	Nov 0.98 20.25 19.96	Dec 0.99 19.88 19.96 0.99		(85) (86) (87) (88) (89)
(84)m= [ 7. Mea Tempe Utilisa (86)m= [ Mean (87)m= [ Tempe (88)m= [ Utilisa (89)m= [ Mean (90)m= [	an interrection fact  Jan 0.99 internal 19.92 erature of 19.95 tion fact 0.99 internal 18.53	during heat temperature 20.13 20 during heat 19.95 19 temperature 0.98 0 temperature 19.95 19 temperature 18.83 11	eg.94 sture (ing positions) for ling positions positions positions positions for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for response for re	keriods ir iving are 20.67 eriods ir 19.96 est of do 0.87 che rest 19.6	season the livi ea, h1,m May 0.79 ea T1 (for 20.88 n rest of 19.97 welling, 0.73 of dwell 19.85	82 (sollo 2 dw 1 h2, (sing 1 1	29.44 799.93  area from Ta ee Table 9a) Jun Jul 0.61 0.45  w steps 3 to 0.97 21  relling from T 9.98 19.98  m (see Table 0.52 0.35  T2 (follow st 9.96 19.98	A 0.4 7 in 1 20. able 9 19. e 9a) 0.3 eps 3	y, Th1 (°C)  ug Sep  18 0.71  Table 9c)  99 20.95  9, Th2 (°C)  98 19.97  38 0.62  4 to 7 in Table  19.93	Oct 0.92 20.68 19.97 0.89 e 9c)	Nov 0.98 3 20.25 7 19.96 0.98	Dec 0.99 19.88 19.96 0.99	0.5	(85) (86) (87) (88) (89)
(84)m= [ 7. Mea Tempo Utilisa (86)m= [ Mean (87)m= [ Tempo (88)m= [ Utilisa (89)m= [ Mean (90)m= [	an internerature of tion fact Jan 0.99 internal 19.95 tion fact 0.99 internal 18.53 internal	during heat or for gains Feb	9.94 sture (ing positions) for line (form) for	keriods ir iving are 20.67 eriods ir 19.96 est of do 0.87 the rest 19.6 er the wh	season the livi ea, h1,m May 0.79 ea T1 (for 20.88 n rest of 19.97 welling, 0.73 of dwell 19.85	mg (second of the second of th	area from Ta ee Table 9a) Jun Jul 0.61 0.45 w steps 3 to 0.97 21 relling from T 9.98 19.98 m (see Table 0.52 0.35 T2 (follow st 9.96 19.98	A 0.4 7 in T 20. 6 able 9 19. eps 3 19. + (1	g Sep  18 0.71  Table 9c)  99 20.95  9, Th2 (°C)  98 19.97  10 10 10 10 10 10 10 10 10 10 10 10 10 1	Oct 0.92 20.68 19.97 0.89 e 9c) 19.63	Nov 0.98 20.25 19.96 0.98	Dec 0.99 19.88 19.96 0.99 18.48		(85) (86) (87) (88) (89) (90) (91)
(84)m= [ 7. Mea Tempo Utilisa (86)m= [ Mean (87)m= [ Tempo (88)m= [ Utilisa (89)m= [ Mean (90)m= [ Mean (92)m= [	an internerature of tion fact Jan 19.92 erature of 19.95 tion fact 0.99 internal 18.53 internal 19.22	during heat or for gains on some series of the series of t	en ture (ing positions of positions) ing positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of positions of pos	eriods ir iving are Apr 0.9 iving are 20.67 eriods ir 19.96 est of do 0.87 che rest 19.6 r the wh	season the livi ea, h1,m May 0.79 ea T1 (for 20.88 n rest of 19.97 welling, 0.73 of dwell 19.85	mg (sollo ollo dw h2, (sing 1	29.44 799.93  area from Ta ee Table 9a) Jun Jul 0.61 0.45  w steps 3 to 0.97 21  relling from T 9.98 19.98  m (see Table 0.52 0.35  T2 (follow st 9.96 19.98	A 0.4 7 in 1 20. able 9 19. eps 3 19. + (1 20.	g Sep 18 0.71  Table 9c) 99 20.95 9, Th2 (°C) 98 19.97  88 0.62 10 7 in Tabl 98 19.93 1  - fLA) × T2 49 20.44	Oct 0.92 20.68 19.97 0.89 e 9c) 19.63 LA = Li	Nov 0.98 20.25 7 19.96 0.98 0.98 19.01 ving area ÷ (-	Dec 0.99 19.88 19.96 0.99		(85) (86) (87) (88) (89)



(93)m= 19.22	19.48	19.8	20.14	20.37	20.47	20.49	20.49	20.44	20.16	19.63	19.18		(93)
8. Space he	ating requ	uirement											
Set Ti to the			•		ed at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
the utilisatio								I -					
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fa	<del></del>	· ·	1								1		(0.4)
(94)m= 0.99	0.97	0.94	0.88	0.75	0.57	0.4	0.43	0.66	0.89	0.98	0.99		(94)
Useful gains	1	· `	r `		T	T	I	I	T	T	l 1		(05)
(95)m= 572.89		736.23	732.92	646.7	468.75	317.39	332.16	494.16	603.68	571.36	539.04		(95)
Monthly ave	<del> </del>	r	<del>i                                      </del>		r								(00)
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss ra			<del></del>		1	- ,	<u> </u>	<u> </u>					(07)
` '	1233.77	1121.87	935.66	719.78	481.89	319.17	334.82	523.03	793.92	1046.14	1257.12		(97)
Space heati	T i	1							<del></del>	r -			
(98)m= 515.82	372.61	286.91	145.97	54.37	0	0	0	0	141.54	341.84	534.26		<b>¬</b> ,,,,
							Tota	ll per year	(kWh/yeaı	r) = Sum(9	8) <sub>15,912</sub> =	2393.32	(98)
Space heati	ng require	ement in	kWh/m²	?/year								32.92	(99)
9a. Energy re	guiremer	nts – Indi	ividual h	eating s	vstems i	ncluding	micro-C	CHP)					
Space heat								,					
Fraction of s		t from s	econdar	y/supple	mentary	system						0	(201)
Fraction of s	pace hea	t from n	nain svst	em(s)			(202) = 1 -	(201) =			i	1	(202)
Fraction of t							(204) = (2	02) <b>x</b> [1 –	(203)1 =			1	(204)
			•						(/1				╡` ′
Efficiency of											ļ	93.5	(206)
Efficiency of	seconda	ry/suppl	ementar	y heating	g system	1, %						0	(208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Space heati	ng require	ement (c	alculate	d above)	)								
515.82	372.61	286.91	145.97	54.37	0	0	0	0	141.54	341.84	534.26		
(211)m = {[(9	B)m x (20	4)] } x 1	00 ÷ (20	06)									(211)
551.68	398.51	306.86	156.12	58.15	0	0	0	0	151.38	365.6	571.4		
	•	•	•		•		Tota	l (kWh/yea	ar) =Sum(2	211),5,1012	=	2559.71	(211)
Space heati	na fuel (s	econdar	v). kWh/	month									
= {[(98)m x (2	•		• , .										
(215)m= 0	0	0	0	0	0	0	0	0	0	0	0		
					!		Tota	l (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>	=	0	(215)
Water heatin	a										ı		
Output from v	_	ter (calc	ulated a	bove)									
191.87		177.71	159.4	156.28	139.74	134.3	147.24	146.94	165.29	174.65	187.29		
Efficiency of v	vater hea	ter	•		•		•	•				79.8	(216)
(217)m= 87.33	86.86	86.09	84.58	82.31	79.8	79.8	79.8	79.8	84.4	86.57	87.46		(217)
Fuel for wate	heating	kWh/ma	onth		!			I .	Į	Į			
(219)m = $(64)$	•												
(219)m= 219.72	1	206.44	188.46	189.86	175.11	168.3	184.51	184.13	195.83	201.74	214.15		
							Tota	I = Sum(2	19a) <sub>112</sub> =			2322.98	(219)
Annual total	S								k'	Wh/year	,	kWh/yea	<u></u> <u>r</u>
Space heatin	g fuel use	ed, main	system	1								2559.71	
											ı		



Water heating fuel used				2322.98	
Electricity for pumps, fans and electric keep-hot					
central heating pump:			30		(230c)
boiler with a fan-assisted flue			45		(230e)
Total electricity for the above, kWh/year	sum of (230a	)(230g) =		75	(231)
Electricity for lighting				320.39	(232)
12a. CO2 emissions – Individual heating systems	including micro-CHP				
	<b>Energy</b> kWh/year	Emission fac kg CO2/kWh	ctor	Emissions kg CO2/yea	r
Space heating (main system 1)	(211) x	0.216	=	552.9	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	501.76	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1054.66	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	166.28	(268)
Total CO2, kg/year	sum	of (265)(271) =		1259.87	(272)
TER =		r		17.33	(273)



User Details: **Assessor Name:** Stroma Number: **Software Version: Software Name:** Stroma FSAP 2012 Version: 1.0.5.12 Property Address: W1-03 , 156 West End Lane, Camden, London Address: 1. Overall dwelling dimensions Av. Height(m) Volume(m³) Area(m<sup>2</sup>) Ground floor 86.4 (1a) x 2.7 (2a) = (3a) 233.28 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)(4)86.4 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =233.28 (5) total m³ per hour main secondary other heating heating x 40 =Number of chimneys (6a) 0 0 x 20 =Number of open flues 0 0 0 (6b) Number of intermittent fans x 10 =(7a)3 30 x 10 =Number of passive vents (7b) 0 0 x 40 =Number of flueless gas fires 0 (7c)Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =(8)0.13 If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9)0 Additional infiltration [(9)-1]x0.1 =0 (10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)0 if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12)If no draught lobby, enter 0.05, else enter 0 (13)O Percentage of windows and doors draught stripped (14)0 Window infiltration  $0.25 - [0.2 \times (14) \div 100] =$ 0 (15)Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =O (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)5 If based on air permeability value, then  $(18) = [(17) \div 20] + (8)$ , otherwise (18) = (16)0.38 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)2  $(20) = 1 - [0.075 \times (19)] =$ Shelter factor (20)0.85  $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.32 Infiltration rate modified for monthly wind speed Jan Feb Sep Mar Apr May Jun Jul Aug Oct Nov Dec Monthly average wind speed from Table 7 (22)m =5.1 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor  $(22a)m = (22)m \div 4$ (22a)m 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18



Adjusted infiltr	ation rate (all	owing for sl	helter an	nd wind s	speed) =	(21a) x	(22a)m					
0.41	0.4 0.3	9 0.35	0.35	0.31	0.31	0.3	0.32	0.35	0.36	0.38		
Calculate effec		ge rate for	the appli	cable ca	ise	•	•	•	•	•	-	(cc. )
	al ventilation: eat pump using	Annendiy N (1	23h) - (23	a) × Emy (4	aguation (1	V5)) othe	nvica (23h	n) = (23a)			0	(23a)
	n heat recovery:							) = (23a)			0	(23b)
	-	-	_					Oh)m ı (	22h) v [	1 (226	0	(23c)
(24a)m= 0	ed mechanica		T o	0		0	$\frac{1}{1} = \frac{2}{0}$	0	23b) × [	0	) <del>-</del> 100] ]	(24a)
( 1)	l										_	(Σ ια)
(24b)m= 0				0	0	0 0	0	0	0	0	7	(24b)
	ouse extract		<u> </u>								_	(210)
,	n < 0.5 × (23l		•					.5 × (23b	o)			
(24c)m= 0	0 0	<del></del>	0	0	0	0	0	0	0	0		(24c)
	ventilation or	whole hous	se positi	ve input	ventilatio	on from	loft	<u> </u>	<u> </u>		_	
	n = 1, then (2							0.5]				
(24d)m= 0.58	0.58 0.5	8 0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.57	0.57		(24d)
Effective air	change rate	- enter (24a	a) or (24l	o) or (24	c) or (24	d) in bo	x (25)					
(25)m= 0.58	0.58 0.5	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.57	0.57		(25)
3. Heat losse	s and heat lo	ss paramet	er:							_	_	_
ELEMENT	Gross area (m²)	Openir		Net Ar A ,r		U-val W/m2		A X U (W/I	K)	k-valu kJ/m²·		A X k kJ/K
Doors				1.89	x	1	=	1.89				(26)
Windows Type	e 1			5.28	x1	/[1/( 1.4 )+	0.04] =	7	Ħ			(27)
Windows Type	2			2.64	x1.	/[1/( 1.4 )+	0.04] =	3.5	Ħ			(27)
Windows Type	3			5.28	x1,	/[1/( 1.4 )+	0.04] =	7	5			(27)
Windows Type	e 4			2.64	, x1,	/[1/( 1.4 )+	0.04] =	3.5	一			(27)
Windows Type				2.18		/[1/( 1.4 )+	0.04] =	2.89	$\exists$			(27)
Floor				86.4	=	0.13		11.232	<b>=</b>		$\neg$	(28)
Walls Type1	48.6	18.0	2	30.58	=	0.18	_	5.5	북 ¦			(29)
Walls Type2	14.31	1.89	=	12.42	=	0.18		2.24	륵 ¦		룩 늗	(29)
Total area of e		1.03	9		=	0.10		2.24				(31)
Party wall	nomonto, m			149.3	=		<u> </u>	0	— r			
Party ceiling				43.75	=	0	=	0				(32)
* for windows and	l roof windows	uso offoctivo w	indow II v	86.4		y formula 1	1/[/1/  L valu	10) 10 041 6	e given in	naragran		(32b)
** include the area					aleu usirig	j iorriula i	/[( 1/ <b>O-</b> vait	1 <del>0</del> /+0.04] a	is giveri iri	i paragrapi	11 3.2	
Fabric heat los	ss, W/K = S (	A x U)				(26)(30	) + (32) =				44.75	5 (33)
Heat capacity	Cm = S(A x k	()					((28).	(30) + (32	2) + (32a).	(32e) =	6480	(34)
Thermal mass	parameter (	ΓMP = Cm ·	÷ TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
For design assess can be used inste			e construct	tion are no	t known pr	recisely the	e indicative	e values of	TMP in T	able 1f		
Thermal bridge	es : S (L x Y)	calculated	using Ap	pendix l	K						11.44	4 (36)
J												

if details of thermal bridging are not known (36) = 0.05 x (31)



Total fabric heat loss			(33) +	(36) =			50.0	(37)
Ventilation heat loss calculated monthly			` '	$= 0.33 \times ($	25)m x (5)		56.2	(37)
Jan Feb Mar Apr May	Jun Jul	Aug	Sep	Oct	Nov	Dec		
<del>                                     </del>	42.09 42.09	41.9	42.48	43.1	43.54	43.99		(38)
Heat transfer coefficient, W/K	!		(39)m	= (37) + (3	38)m	ı.	ı	
	98.28 98.28	98.1	98.67	99.29	99.73	100.19		
	!			Average =		12 /12=	99.51	(39)
Heat loss parameter (HLP), W/m²K			` ′	= (39)m ÷	·		I	
(40)m= 1.17 1.17 1.15 1.15	1.14 1.14	1.14	1.14	1.15	1.15	1.16	1.15	(40)
Number of days in month (Table 1a)				Average =	Sum(40) <sub>1.</sub>	12 / 12=	1.15	(40)
Jan Feb Mar Apr May	Jun Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31 28 31 30 31	30 31	31	30	31	30	31		(41)
4. Water heating energy requirement:						kWh/ye	ear:	
Assumed occupancy, N					2	57		(42)
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349	9 x (TFA -13.9	9)2)] + 0.0	0013 x (	TFA -13.		<u> </u>		(/
if TFA £ 13.9, N = 1 Annual average hot water usage in litres per day	Vd average –	(25 v N)	<b>±</b> 36		0.5	204		(43)
Reduce the annual average hot water usage by 5% if the dwe	lling is designed			se target o		5.31		(43)
not more that 125 litres per person per day (all water use, hot	and cold)							
Jan Feb Mar Apr May	Jun Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in litres per day for each month Vd,m = facto		-						
(44)m= 104.84 101.03 97.22 93.41 89.59 8	85.78 85.78	89.59	93.41	97.22	101.03	104.84	44.40.75	7(44)
Energy content of hot water used - calculated monthly = 4.190	0 x Vd,m x nm x L	DTm / 3600		Total = Sui oth (see Ta	· /		1143.75	(44)
(45)m= 155.48 135.98 140.32 122.34 117.39	101.3 93.86	107.71	109	127.03	138.66	150.57		
				Total = Su	m(45) <sub>112</sub> =	-	1499.64	(45)
If instantaneous water heating at point of use (no hot water ste				1	ı	ı	1	(40)
(46)m= 23.32 20.4 21.05 18.35 17.61 Water storage loss:	15.19 14.08	16.16	16.35	19.05	20.8	22.59		(46)
Storage volume (litres) including any solar or WW	/HRS storage	within sa	ame ves	sel		150		(47)
If community heating and no tank in dwelling, enter	er 110 litres in	n (47)					l	
Otherwise if no stored hot water (this includes ins	tantaneous co	ombi boil	ers) ente	er '0' in (	47)			
Water storage loss:	. (Id\\/b/dayd)						1	(40)
a) If manufacturer's declared loss factor is known	i (kwii/day).					39		(48)
Temperature factor from Table 2b  Energy lost from water storage, kWh/year		(48) x (49)				54		(49)
b) If manufacturer's declared cylinder loss factor	is not known:	` ' ` '	-		0.	75		(50)
Hot water storage loss factor from Table 2 (kWh/l						0		(51)
If community heating see section 4.3							1	
Volume factor from Table 2a Temperature factor from Table 2b						0		(52) (53)
Energy lost from water storage, kWh/year						0		
Litergy iost from water storage, KWII/year		$(47) \vee (54)$	v (52) v /	53) -		^		/E /\
Enter (50) or (54) in (55)		(47) x (51)	x (52) x (	53) =	-	0 75		(54) (55)



Water storage loss calculated for each month $((56)m = (55) \times (41)m)$	
(56)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33	(56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H	
(57)m= 23.33 21.07 23.33 22.58 23.33 22.58 23.33 22.58 23.33 22.58 23.33	(57)
Primary circuit loss (annual) from Table 3	(58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m	
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26	(59)
Combi loss calculated for each month (61)m = (60) $\div$ 365 x (41)m	
(61)m= 0 0 0 0 0 0 0 0 0 0 0 0	(61)
Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m + (46)m + (57)m + (59)m + (61)m$	
(62)m= 202.08 178.07 186.92 167.43 163.98 146.39 140.46 154.31 154.09 173.62 183.75 197.17	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)	
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	
(63)m= 0 0 0 0 0 0 0 0 0 0 0	(63)
Output from water heater	
(64)m= 202.08 178.07 186.92 167.43 163.98 146.39 140.46 154.31 154.09 173.62 183.75 197.17	
Output from water heater (annual) 112 2048.26	(64)
Heat gains from water heating, kWh/month 0.25 [0.85 x (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]	
(65)m= 88.97 78.88 83.93 76.75 76.31 69.75 68.49 73.09 72.32 79.51 82.18 87.34	(65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating	
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating  5. Internal gains (see Table 5 and 5a):	
5. Internal gains (see Table 5 and 5a):	
5. Internal gains (see Table 5 and 5a):  Metabolic gains (Table 5), Watts	(66)
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)
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= 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66	(66) (67)
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= 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.6	. ,
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	. ,
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= 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.6	(67)
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= 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.6	(67)
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= 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.6	(67) (68)
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= 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.6	(67) (68)
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	(67) (68) (69)
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= 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.6	(67) (68) (69)
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= 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.	(67) (68) (69) (70)
Metabolic gains (Table 5), Watts    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	(67) (68) (69) (70)
Metabolic gains (Table 5), Watts    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	(67) (68) (69) (70) (71)
Metabolic gains (Table 5), Watts    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	(67) (68) (69) (70) (71)

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

6. Solar gains:



Orientation	on:	Access Factor Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	X	5.28	x	10.63	x	0.63	x	0.7	=	17.16	(74)
North	0.9x	0.77	X	2.64	x	10.63	X	0.63	x	0.7	=	8.58	(74)
North	0.9x	0.77	X	5.28	x	20.32	x	0.63	x	0.7	=	32.79	(74)
North	0.9x	0.77	X	2.64	x	20.32	x	0.63	X	0.7	=	16.4	(74)
North	0.9x	0.77	X	5.28	x	34.53	X	0.63	x	0.7	=	55.72	(74)
North	0.9x	0.77	X	2.64	x	34.53	x	0.63	x	0.7	=	27.86	(74)
North	0.9x	0.77	X	5.28	x	55.46	x	0.63	x	0.7	=	89.5	(74)
North	0.9x	0.77	X	2.64	x	55.46	x	0.63	x	0.7	=	44.75	(74)
North	0.9x	0.77	X	5.28	x	74.72	x	0.63	x	0.7	=	120.56	(74)
North	0.9x	0.77	X	2.64	X	74.72	X	0.63	x	0.7	=	60.28	(74)
North	0.9x	0.77	X	5.28	X	79.99	X	0.63	X	0.7	=	129.07	(74)
North	0.9x	0.77	X	2.64	X	79.99	x	0.63	x	0.7	=	64.53	(74)
North	0.9x	0.77	X	5.28	X	74.68	X	0.63	X	0.7	=	120.5	(74)
North	0.9x	0.77	X	2.64	x	74.68	X	0.63	X	0.7	=	60.25	(74)
North	0.9x	0.77	X	5.28	x	59.25	X	0.63	X	0.7	=	95.6	(74)
North	0.9x	0.77	X	2.64	X	59.25	X	0.63	X	0.7	=	47.8	(74)
North	0.9x	0.77	X	5.28	x	41.52	×	0.63	x	0.7	=	66.99	(74)
North	0.9x	0.77	X	2.64	х	41.52	×	0.63	x	0.7	=	33.5	(74)
North	0.9x	0.77	X	5.28	X	24.19	x	0.63	x	0.7	=	39.03	(74)
North	0.9x	0.77	X	2.64	x	24.19	Х	0.63	x	0.7	=	19.52	(74)
North	0.9x	0.77	X	5.28	x	13.12	X	0.63	x	0.7	=	21.17	(74)
North	0.9x	0.77	X	2.64	х	13.12	x	0.63	x	0.7	=	10.58	(74)
North	0.9x	0.77	X	5.28	X	8.86	X	0.63	X	0.7	=	14.3	(74)
North	0.9x	0.77	X	2.64	X	8.86	X	0.63	X	0.7	=	7.15	(74)
	0.9x	0.77	X	5.28	x	46.75	X	0.63	X	0.7	=	75.44	(78)
	0.9x	0.77	X	2.64	x	46.75	X	0.63	X	0.7	=	37.72	(78)
	0.9x	0.77	X	2.18	X	46.75	X	0.63	X	0.7	=	31.15	(78)
	0.9x	0.77	X	5.28	x	76.57	x	0.63	X	0.7	=	123.55	(78)
	0.9x	0.77	X	2.64	x	76.57	x	0.63	X	0.7	=	61.78	(78)
	0.9x	0.77	X	2.18	X	76.57	X	0.63	X	0.7	=	51.01	(78)
	0.9x	0.77	X	5.28	X	97.53	X	0.63	X	0.7	=	157.38	(78)
	0.9x	0.77	X	2.64	X	97.53	X	0.63	X	0.7	=	78.69	(78)
	0.9x	0.77	X	2.18	X	97.53	X	0.63	X	0.7	=	64.98	(78)
	0.9x	0.77	X	5.28	X	110.23	X	0.63	X	0.7	=	177.88	(78)
	0.9x	0.77	X	2.64	X	110.23	х	0.63	X	0.7	=	88.94	(78)
	0.9x	0.77	X	2.18	x	110.23	x	0.63	x	0.7	=	73.44	(78)
	0.9x	0.77	X	5.28	x	114.87	х	0.63	x	0.7	=	185.36	(78)
	0.9x		X	2.64	x	114.87	х	0.63	x	0.7	=	92.68	(78)
South	0.9x	0.77	X	2.18	X	114.87	X	0.63	X	0.7	=	76.53	(78)



South	0.9x	0.77	x	5.28	x	110.55	x	0.63	x	0.7	=	178.38	(78)
South	0.9x	0.77	х	2.64	x	110.55	x	0.63	x	0.7	=	89.19	(78)
South	0.9x	0.77	x	2.18	x	110.55	x	0.63	x	0.7	=	73.65	(78)
South	0.9x	0.77	x	5.28	x	108.01	x	0.63	x	0.7	=	174.29	(78)
South	0.9x	0.77	х	2.64	x	108.01	X	0.63	x	0.7	=	87.15	(78)
South	0.9x	0.77	х	2.18	x	108.01	x	0.63	x	0.7	=	71.96	(78)
South	0.9x	0.77	х	5.28	x	104.89	x	0.63	x	0.7	=	169.26	(78)
South	0.9x	0.77	x	2.64	x	104.89	x	0.63	x	0.7	<u> </u>	84.63	(78)
South	0.9x	0.77	x	2.18	x	104.89	x	0.63	x	0.7	=	69.88	(78)
South	0.9x	0.77	x	5.28	x	101.89	x	0.63	x	0.7	=	164.41	(78)
South	0.9x	0.77	x	2.64	x	101.89	x	0.63	x	0.7	=	82.2	(78)
South	0.9x	0.77	х	2.18	×	101.89	x	0.63	x	0.7	=	67.88	(78)
South	0.9x	0.77	x	5.28	x	82.59	x	0.63	x	0.7	=	133.26	(78)
South	0.9x	0.77	x	2.64	x	82.59	x	0.63	x	0.7	<u> </u>	66.63	(78)
South	0.9x	0.77	х	2.18	x	82.59	x	0.63	x	0.7	=	55.02	(78)
South	0.9x	0.77	x	5.28	x	55.42	x	0.63	x	0.7	=	89.42	(78)
South	0.9x	0.77	х	2.64	x	55.42	x	0.63	x	0.7	=	44.71	(78)
South	0.9x	0.77	x	2.18	X	55.42	Х	0.63	Х	0.7	=	36.92	(78)
South	0.9x	0.77	x	5.28	х	40.4	x	0.63	x	0.7		65.19	(78)
South	0.9x	0.77	x	2.64	х	40.4	×	0.63	x	0.7	=	32.59	(78)
South	0.9x	0.77	x	2.18	X	40.4	x	0.63	x	0.7	=	26.91	(78)
Solar g	ains in	watts, calcul	lated	for each mon	th		(83)m	n = Sum(74)m .	(82)m				
(83)m=	170.05		4.64	474.51 535.4		34.83 514.15	467	.18 414.98	313.47	202.81	146.15		(83)
Total g	ains – ii	nternal and	solar	(84)m = $(73)$ r	n + (	83)m , watts							
(84)m=	607.31	720.67 805	5.69	872.77 910.4	5 8	87.51 852.33	811	.46 770.98	692.48	608.28	571.55		(84)
7. Me	an inter	nal tempera	ture (	heating seas	on)								
Temp	erature	during heati	ng pe	eriods in the li	ving	area from Tab	ole 9	, Th1 (°C)				21	(85)
Utilisa	ition fac	tor for gains	for li	ving area, h1	,m (s	ee Table 9a)				_		1	
	Jan	Feb N	/lar	Apr Ma	у	Jun Jul	Α	ug Sep	Oct	Nov	Dec		
(86)m=	1	0.99 0.	98	0.94 0.84		0.67 0.5	0.5	0.78	0.95	0.99	1		(86)
Mean	interna	l temperatur	e in I	iving area T1	(follo	w steps 3 to 7	in T	able 9c)					
(87)m=	19.83	20.01 20	.27	20.58 20.83	3 2	20.96 20.99	20.	99 20.91	20.59	20.15	19.79		(87)
Temp	erature	during heati	ng pe	eriods in rest	of dw	elling from Ta	able 9	9, Th2 (°C)					
(88)m=	19.94		.95	19.96 19.96		19.97	19.	<del>`                                    </del>	19.96	19.96	19.95		(88)
l Itilies	ition fac	tor for gains	for r	est of dwelling	 1 h2	,m (see Table	 9a\						
(89)m=	0.99		97	0.91 0.79	_	0.58 0.39	0.4	13 0.7	0.93	0.99	1		(89)
		L		<u> </u>		T2 (follow ste			0.00/		Į		
(90)m=	18.39		.04	19.48 19.8	Ť	12 (10110W Ste	19.		9C) 19.51	18.87	18.35		(90)
(00)111-	10.00	1 10.00   10	· · ·	.0.10		10.07	L 'ö.			ring area ÷ (		0.23	(91)
					.,.			(1 A) ==		- (	•	0.20	

Mean internal temperature (for the whole dwelling) =  $fLA \times T1 + (1 - fLA) \times T2$ 



Apply adjustment to the mean internal temperature from Table 4e, where appropriate  (33)me 18/33 18/88 19/33 19/33 20/4 20/18 20/21 20/14 19/76 19/17 18/69 (33)  8. Space heating requirement  Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, hm:  Jan Peb Mar App May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm:  Jefficiency of mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, hm:  Jan Peb Mar App May Jun Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm:  Jefficiency of september With the Mar App May Sep Oct Nov Dec  Utilisation factor for gains, hm:  Jefficiency of september With the Mar App May Sep Sep Oct Nov Dec  Utilisation factor for gains, hm:  Jefficiency of september With the Mar App May Sep Sep Sep Sep Sep Sep Sep Sep Sep Sep														
Same   18.73   18.98   19.33   19.73   20.04   20.16   20.21   20.14   19.76   19.17   18.69   (33)	(92)m= 18.73	18.98	19.33	19.73	20.04	20.18	20.21	20.21	20.14	19.76	19.17	18.69		(92)
Same   18.73   18.98   19.33   19.73   20.04   20.16   20.21   20.14   19.76   19.17   18.69   (33)	Apply adjust	ment to the	ne mean	internal	tempera	ature fro	m Table	4e, whe	ere appro	priate				
Set Ti to the man internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Un Jul Aug Sep Oct Nov Dec  Utilisation factor for gains, hm:  194me 0.99 0.98 0.98 0.99 0.98 0.99 0.98 0.99 0.99	(93)m= 18.73	18.98	19.33	19.73	20.04	20.18	20.21	20.21	20.14	19.76	19.17	18.69		(93)
the utilisation factor for gains using Table 9a    Jan	8. Space hea	ating requ	uirement											
Utilisation factor for gains, hm:   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	Set Ti to the	mean int	ernal ten	nperatur	e obtain	ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
Utilisation factor for gains, hm:  9/m	the utilisation	factor fo	r gains u	using Ta	ble 9a									
194	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains, hmGm   W = (94)m x (84)m   Spins   60267   708.24   774.81   792.81   221.19   529.31   352.08   369.43   549.18   640.49   598.27   568.23   (95)	Utilisation fa	ctor for g	ains, hm	:										
Some   602.67   708.24   774.81   792.81   721.18   529.31   352.09   369.43   549.18   640.49   598.27   568.23   (95)	(94)m= 0.99	0.98	0.96	0.91	0.79	0.6	0.41	0.46	0.71	0.92	0.98	0.99		(94)
Monthly average external temperature from Table 8  186/me   4.3   4.9   6.5   8.9   11.7   14.6   16.6   16.4   14.1   10.6   7.1   4.2    186/me   4.3   4.9   6.5   8.9   11.7   14.6   16.6   16.4   14.1   10.6   7.1   4.2    186/me   4.3   4.9   14.02.8   129.08   1078.17   227.88   548.63   354.53   373.38   595.74   900.58   1203.84   451.38    187/me   1459.99   1420.88   129.08   1078.17   227.88   548.63   354.53   373.38   595.74   900.58   1203.84   451.38    188/me   637.47   478.9   384.1   205.46   79.39   0   0   0   0   200.21   436.01   657.06    189/mac   637.47   478.9   384.1   205.46   79.39   0   0   0   0   200.21   436.01   657.06    180/mac   70.00   70.00   70.00   70.00   70.00   70.00   70.00    180/mac   70.00   70.00   70.00   70.00   70.00   70.00    180/mac   70.00   70.00   70.00   70.00   70.00   70.00    180/mac   70.00   70.00   70.00   70.00   70	Useful gains	, hmGm ,	W = (94)	l)m x (84	4)m									
Selime	(95)m= 602.67	708.24	774.81	792.81	721.18	529.31	352.09	369.43	549.18	640.49	598.27	568.23		(95)
Heat loss rate for mean internal temperature, Lm., W = \((39)\text{m} \times \((39)\text{m} \) \((39)\text{m} \) \((39)\text{m} \) \((39)\text{m} \) \((39)\text{m} \) \((39)\text{m} \) \((37)\text{m} \) \((346.94\text{b} \) \((142.08\text{b} \) \((122.08\text{b} \) \((122.08b	Monthly ave	rage exte	rnal tem	perature	from Ta	able 8								
97/ms	(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Space heating requirement for each month, kWh/month = 0.024 x [(977m - (95)m] x (41)m - (95	Heat loss rat	e for mea	an intern	al tempe	erature, l	Lm , W =	=[(39)m :	x [(93)m	– (96)m	]				
88/me 637.47 478.9 384.1 205.46 79.38 0 0 0 0 200.21 436.01 657.06    Total per year (kWh/year) = Sum(98)s	( <mark>97)</mark> m= 1459.49	1420.88	1291.08	1078.17	827.88	548.63	354.53	373.38	595.74	909.58	1203.84	1451.38		(97)
Space heating requirement in kWh/m²/year   3078.6   (98)	Space heatir	ng require	ement fo	r each m	nonth, k\	Wh/mont	h = 0.02	24 x [(97)	)m – (95	)m] x (4 <sup>-</sup>	1)m			
Space heating requirement in kWh/m²/year   35.63   (39)	(98)m= 637.47	478.9	384.1	205.46	79.39	0	0	0	0	200.21	436.01	657.06		
Space heating:			-	-	-			Tota	l per year	(kWh/year	) = Sum(9	8) <sub>15,912</sub> =	3078.6	(98)
Space heating:	Space heating	na reauire	ement in	kWh/m²	/vear							i	35.63	(99)
Space heating: Fraction of space heat from secondary/supplementary system   0   (201)									VIID)	_				
Fraction of space heat from secondary/supplementary system  Fraction of space heat from main system(s)  Fraction of total heating from main system 1  Efficiency of main space heating system 1  Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Space heating requirement (calculated above)  637.47 478.9 384.1 205.46 79.39 0 0 0 0 200.21 436.01 657.06  211)m = {[(98)m x (204)] } x 100 ÷ (206)  681.79 512.19 410.8 219.74 84.91 0 0 0 0 214.12 466.32 702.74  Total (kWh/year) = Sum(211)s_s= 3292.62 (211)  Space heating fuel (secondary), kWh/month  a {[(98)m x (201)]} x 100 ÷ (208)  215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  Total (kWh/year) = Sum(215)s_s= 0 (215)  Vater heating  Dutput from water heater (calculated above)  202.08 178.07 186.92 167.43 163.98 146.39 140.46 154.31 154.09 173.62 183.75 197.17  Efficiency of water heater  217)m= 87.67 87.33 86.69 85.36 83 79.8 79.8 79.8 79.8 85.19 87.04 87.78  Fraction of space heat from main system 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (202) = 1 (20	a. Energy re	quiremer	ıts — Inai	viduai ne	eating sy	ystems II	nciuaing	micro-u	,HP)					
Fraction of space heat from main system (s)  Fraction of total heating from main system 1  Efficiency of main space heating system 1  Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec KWh/year Space heating requirement (calculated above)  637.47 478.9 384.1 205.46 79.39 0 0 0 0 200.21 436.01 657.06  211)m = {[(98)m x (204)] } x 100 ÷ (206)  Espace heating fuel (secondary), kWh/month = {[(98)m x (201)]} x 100 ÷ (208)  Space heating fuel (secondary), kWh/month = {[(98)m x (201)]} x 100 ÷ (208)  Vater heating  Unity trom water heater (calculated above)  202.08 178.07 186.92 167.43 163.98 146.39 140.46 154.31 154.09 173.62 183.75 197.17  Efficiency of water heater (calculated above)  202.08 778.07 186.92 167.43 163.98 146.39 140.46 154.31 154.09 173.62 183.75 197.17  Efficiency of water heater heating, kWh/month 219)m = (64)m x 100 ÷ (217)m  Fuel for water heating, kWh/month 219)m = (64)m x 100 ÷ (217)m  219)m = (30.49 203.91 215.61 196.14 197.56 183.44 176.01 193.37 193.09 203.79 211.11 224.61									\				_	
Fraction of total heating from main system 1  Efficiency of main space heating system 1  Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec KWh/year Space heating requirement (calculated above)  637.47 478.9 384.1 205.46 79.39 0 0 0 0 200.21 436.01 657.06  211)m = {[(98)m x (204)] } x 100 ÷ (206)  681.79 512.19 410.8 219.74 84.91 0 0 0 0 214.12 466.32 702.74  Total (kWh/year) = Sum(211) <sub>1.2.10.12</sub> 3292.62 (211 4(12 1))	•	_	t from se	acondarı	//cupple								0	7(201)
Efficiency of main space heating system 1  Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above)  [637.47   478.9   384.1   205.46   79.39   0   0   0   0   200.21   436.01   657.06    211)m = {[(98)m x (204)] } x 100 ÷ (206)  [681.79   512.19   410.8   219.74   84.91   0   0   0   0   0   214.12   466.32   702.74    Total (kWh/year) = Sum(211) <sub>1sum.v2</sub> = 3292.62   (211)  Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208)  215)m = 0   0   0   0   0   0   0   0   0   0	Fraction of s	pace h <mark>ea</mark>		·			system							(201)
Efficiency of secondary/supplementary heating system, %  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Space heating requirement (calculated above)  [637.47 478.9 384.1 205.46 79.39 0 0 0 0 200.21 436.01 657.06]  [211)m = {[(98)m x (204)] } x 100 ÷ (206)  [681.79 512.19 410.8 219.74 84.91 0 0 0 0 214.12 466.32 702.74]  Total (kWh/year) =Sum(211), 4.90, 17 = 3292.62 [211]  Space heating fuel (secondary), kWh/month  = {[(98)m x (201)] } x 100 ÷ (208)  215)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0  Total (kWh/year) =Sum(215), 4.90, 17 = 0 (215)  Vater heating  Dutput from water heater (calculated above)  202.08 178.07 186.92 167.43 163.98 146.39 140.46 154.31 154.09 173.62 183.75 197.17  Efficiency of water heater  217)m = 87.67 87.33 86.69 85.36 83 79.8 79.8 79.8 79.8 85.19 87.04 87.78  Fuel for water heating, kWh/month  219)m = (64)m x 100 ÷ (217)m  219)m = (230.49 203.91 215.61 196.14 197.56 183.44 176.01 193.37 193.09 203.79 211.11 224.61	Fraction of s	pace hea	it from m	ain syst	em(s)		system	(202) = 1 -	- (201) =					(201)
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	Fraction of s	pace hea	it from m	ain syst	em(s)		system	(202) = 1 -	- (201) =	(203)] =			1	⊣՝ ՝
Space heating requirement (calculated above)  637.47	Fraction of s Fraction of to	pace hea pace hea otal heatin	t from m	ain systomain sys	em(s) stem 1		system	(202) = 1 -	- (201) =	(203)] =			1	(202)
Space heating requirement (calculated above)  637.47	Fraction of s Fraction of s Fraction of to Efficiency of	pace hea pace hea otal heatin main spa	t from m	ain systomain sys	em(s) stem 1 em 1	mentary	system	(202) = 1 -	- (201) =	(203)] =			1 1 93.5	(202)
637.47	Fraction of s Fraction of s Fraction of to Efficiency of Efficiency of	pace hea pace hea otal heatii main spa seconda	t from m ng from r ace heati ry/supple	ain systemain systematry	em(s) stem 1 em 1 y heating	mentary	system	(202) = 1 · (204) = (2	- (201) = 02) × [1 -	0.1	Nov	Dec	1 1 93.5 0	(202) (204) (206) (208)
211)m = {[(98)m x (204)] } x 100 ÷ (206)	Fraction of s Fraction of s Fraction of to Efficiency of  Jan	pace hea pace hea otal heatin main spa seconda	nt from m ng from r ace heati ry/supple Mar	ain systemain systemain systementary	em(s) stem 1 em 1 y heating May	mentary g system Jun	system	(202) = 1 · (204) = (2	- (201) = 02) × [1 -	0.1	Nov	Dec	1 1 93.5 0	(202) (204) (206) (208)
Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (secondary), kWh/month   Space heating fuel (	Fraction of s Fraction of s Fraction of to Efficiency of Efficiency of Jan Space heatin	pace head pace head pace head patal heatin main spaceconda  Feb ng require	nt from many from reace heating ry/supplement (comment from the comment (comment from the comment (comment from the comment (comment from the comment from the	ain systemain systemain systementary Apr	em(s) stem 1 em 1 y heating May d above)	mentary g system Jun	system	(202) = 1 - (204) = (2) Aug	- (201) = 02) × [1 -	Oct			1 1 93.5 0	(202) (204) (206) (208)
Total (kWh/year) =Sum(211) <sub>151012</sub> = 3292.62 [211]  Space heating fuel (secondary), kWh/month  = {[(98)m x (201)]} x 100 ÷ (208)  215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0  Total (kWh/year) =Sum(215) <sub>151012</sub> = 0 [215]  Nater heating  Dutput from water heater (calculated above)  202.08 178.07 186.92 167.43 163.98 146.39 140.46 154.31 154.09 173.62 183.75 197.17  Efficiency of water heater  217)m= 87.67 87.33 86.69 85.36 83 79.8 79.8 79.8 79.8 85.19 87.04 87.78  Fuel for water heating, kWh/month  219)m = (64)m x 100 ÷ (217)m  219)m = 230.49 203.91 215.61 196.14 197.56 183.44 176.01 193.37 193.09 203.79 211.11 224.61	Fraction of s Fraction of s Fraction of to Efficiency of Efficiency of Jan Space heatir 637.47	pace head pace head pace head pace head pace head pace main special seconda Feb and require 478.9	nt from many from reace heating ry/supplement (co. 384.1	ain systemain systemain systementary Apr Alculated	em(s) stem 1 em 1 y heating May d above) 79.39	mentary g system Jun	system	(202) = 1 - (204) = (2) Aug	- (201) = 02) × [1 -	Oct			1 1 93.5 0	(202) (204) (206) (208) ear
Space heating fuel (secondary), kWh/month = {[(98)m x (201)]} x 100 ÷ (208)  215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0  Total (kWh/year) = Sum(215) <sub>1.5.9012</sub> = 0 (215)  Water heating  Output from water heater (calculated above)  202.08 178.07 186.92 167.43 163.98 146.39 140.46 154.31 154.09 173.62 183.75 197.17  Efficiency of water heater  217)m= 87.67 87.33 86.69 85.36 83 79.8 79.8 79.8 79.8 85.19 87.04 87.78  Fuel for water heating, kWh/month  219)m = (64)m x 100 ÷ (217)m  2219)m = 230.49 203.91 215.61 196.14 197.56 183.44 176.01 193.37 193.09 203.79 211.11 224.61	Fraction of s Fraction of s Fraction of to Efficiency of Efficiency of Jan Space heatir 637.47 (211)m = {[(98)	pace head pace head pace head pace head pace head main space seconda  Feb ng require 478.9  3)m x (20	ng from mace heating/supplement (carage)   x 1	ain systemain systemain systementary Apr Alculated 205.46 00 ÷ (20	em(s) stem 1 em 1 y heating May d above) 79.39	g system Jun 0	system  n, %  Jul  0	(202) = 1 - (204) = (204) = (204) = 0	- (201) = 02) × [1 - (	Oct 200.21	436.01	657.06	1 1 93.5 0	(202) (204) (206) (208) ear
E {[(98)m x (201)] } x 100 ÷ (208)  215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0  Total (kWh/year) = Sum(215) <sub>15,1012</sub> = 0  (215)  Water heating  Output from water heater (calculated above)  202.08   178.07   186.92   167.43   163.98   146.39   140.46   154.31   154.09   173.62   183.75   197.17  Efficiency of water heater  217)m=   87.67   87.33   86.69   85.36   83   79.8   79.8   79.8   79.8   85.19   87.04   87.78    Equation of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of t	Fraction of s Fraction of s Fraction of to Efficiency of Efficiency of Jan Space heatir 637.47 (211)m = {[(98)	pace head pace head pace head pace head pace head main space seconda  Feb ng require 478.9  3)m x (20	ng from mace heating/supplement (carage)   x 1	ain systemain systemain systementary Apr Alculated 205.46 00 ÷ (20	em(s) stem 1 em 1 y heating May d above) 79.39	g system Jun 0	system  n, %  Jul  0	(202) = 1 - (204) = (2 Aug	- (201) = 02) × [1 - 0] Sep 0	Oct 200.21 214.12	436.01 466.32	657.06	1 1 93.5 0 kWh/ye	(202) (204) (206) (208) ear
215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Fraction of s Fraction of s Fraction of to Efficiency of  Efficiency of  Jan  Space heatir  637.47  (211)m = {[(98) 681.79	pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace h	t from mag from race heating supplement (c. 384.1 4)] } x 1	ain systemain systemain systementary Apr alculated 205.46 00 ÷ (20 219.74	em(s) stem 1 em 1 y heating May d above) 79.39 6) 84.91	g system Jun 0	system  n, %  Jul  0	(202) = 1 - (204) = (2 Aug	- (201) = 02) × [1 - 0] Sep 0	Oct 200.21 214.12	436.01 466.32	657.06	1 1 93.5 0 kWh/ye	(202) (204) (206) (208) ear
Total (kWh/year) =Sum(215) <sub>15,1012</sub> 0 (215)  Water heating  Dutput from water heater (calculated above)  202.08 178.07 186.92 167.43 163.98 146.39 140.46 154.31 154.09 173.62 183.75 197.17  Efficiency of water heater  217)m= 87.67 87.33 86.69 85.36 83 79.8 79.8 79.8 79.8 85.19 87.04 87.78  Fuel for water heating, kWh/month 219)m = (64)m x 100 ÷ (217)m 219)m= 230.49 203.91 215.61 196.14 197.56 183.44 176.01 193.37 193.09 203.79 211.11 224.61	Fraction of s Fraction of s Fraction of to Efficiency of Efficiency of  Jan Space heatin  637.47  (211)m = {[(98 681.79)]	pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace h	t from many from race heating ry/supplement (carrows 384.1 410.8	ain systemain systemain systematary Apr alculated 205.46 00 ÷ (20 219.74	em(s) stem 1 em 1 y heating May d above) 79.39 6) 84.91	g system  Jun  0	system  n, %  Jul  0	(202) = 1 - (204) = (2 Aug	- (201) = 02) × [1 - 0] Sep 0	Oct 200.21 214.12	436.01 466.32	657.06	1 1 93.5 0 kWh/ye	(202) (204) (206) (208) ear
Vater heating         Dutput from water heater (calculated above)         202.08       178.07       186.92       167.43       163.98       146.39       140.46       154.31       154.09       173.62       183.75       197.17         Efficiency of water heater         217)m=       87.67       87.33       86.69       85.36       83       79.8       79.8       79.8       85.19       87.04       87.78         Fuel for water heating, kWh/month         219)m=       (64)m x 100 ÷ (217)m         219)m=       230.49       203.91       215.61       196.14       197.56       183.44       176.01       193.37       193.09       203.79       211.11       224.61	Fraction of s Fraction of s Fraction of s Fraction of to Efficiency of  Jan Space heatin 637.47 (211)m = {[(98) 681.79  Space heatin = {[(98)m x (2)	pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace h	mag from mag from rece heating supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the suppl	ain systemain systemain systemantary Apr alculated 205.46 00 ÷ (20 219.74 y), kWh/s	em(s) stem 1 em 1 y heating May d above) 79.39 16) 84.91	g system Jun 0	system  n, %  Jul  0	(202) = 1 - (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (2	- (201) = 02) × [1 - 0] Sep 0 1 (kWh/yea	Oct 200.21 214.12 ar) =Sum(2	436.01 466.32 211) <sub>15,1012</sub>	657.06 702.74	1 1 93.5 0 kWh/ye	(202) (204) (206) (208) (208) (211)
Dutput from water heater (calculated above)  202.08 178.07 186.92 167.43 163.98 146.39 140.46 154.31 154.09 173.62 183.75 197.17  Efficiency of water heater  217)m= 87.67 87.33 86.69 85.36 83 79.8 79.8 79.8 79.8 85.19 87.04 87.78  Fuel for water heating, kWh/month  219)m = (64)m x 100 ÷ (217)m  219)m= 230.49 203.91 215.61 196.14 197.56 183.44 176.01 193.37 193.09 203.79 211.11 224.61	Fraction of s Fraction of s Fraction of s Fraction of to Efficiency of  Jan Space heatin 637.47 (211)m = {[(98) 681.79  Space heatin = {[(98)m x (2	pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace h	mag from mag from rece heating supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the suppl	ain systemain systemain systemantary Apr alculated 205.46 00 ÷ (20 219.74 y), kWh/s	em(s) stem 1 em 1 y heating May d above) 79.39 16) 84.91	g system Jun 0	system  n, %  Jul  0	(202) = 1 - (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (2	- (201) = 02) × [1 - 6	Oct 200.21 214.12 ar) =Sum(2	436.01 466.32 211) <sub>15,1012</sub>	657.06 702.74	1 93.5 0 kWh/ye	(202) (204) (206) (208) (208) (211)
202.08 178.07 186.92 167.43 163.98 146.39 140.46 154.31 154.09 173.62 183.75 197.17  Efficiency of water heater  217)m= 87.67 87.33 86.69 85.36 83 79.8 79.8 79.8 79.8 85.19 87.04 87.78  Fuel for water heating, kWh/month 219)m = (64)m x 100 ÷ (217)m 219)m= 230.49 203.91 215.61 196.14 197.56 183.44 176.01 193.37 193.09 203.79 211.11 224.61	Fraction of s Fraction of s Fraction of s Fraction of to Efficiency of  Jan Space heatin 637.47 (211)m = {[(98) 681.79  Space heatin = {[(98)m x (2)	pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace h	mag from mag from rece heating supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the suppl	ain systemain systemain systemantary Apr alculated 205.46 00 ÷ (20 219.74 y), kWh/s	em(s) stem 1 em 1 y heating May d above) 79.39 16) 84.91	g system Jun 0	system  n, %  Jul  0	(202) = 1 - (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (2	- (201) = 02) × [1 - 6	Oct 200.21 214.12 ar) =Sum(2	436.01 466.32 211) <sub>15,1012</sub>	657.06 702.74	1 93.5 0 kWh/ye	(202) (204) (206) (208) (208) (211)
Efficiency of water heater 79.8 (216) 217)m= 87.67 87.33 86.69 85.36 83 79.8 79.8 79.8 79.8 85.19 87.04 87.78  Fuel for water heating, kWh/month 219)m = (64)m x 100 ÷ (217)m 219)m= 230.49 203.91 215.61 196.14 197.56 183.44 176.01 193.37 193.09 203.79 211.11 224.61	Fraction of s Fraction of s Fraction of s Fraction of to Efficiency of  Jan Space heatir 637.47 (211)m = {[(98) m x (2215)m= 0]	pace head pace head pace head pace head pace head pace head pace head pace head pace head secondal Feb agrequire 478.9  3) m x (20 512.19  ag fuel (second) ] } x 1 0	mag from mag from rece heating supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the supplement (constant) and the suppl	ain systemain systemain systemantary Apr alculated 205.46 00 ÷ (20 219.74 y), kWh/s	em(s) stem 1 em 1 y heating May d above) 79.39 16) 84.91	g system Jun 0	system  n, %  Jul  0	(202) = 1 - (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (2	- (201) = 02) × [1 - 6	Oct 200.21 214.12 ar) =Sum(2	436.01 466.32 211) <sub>15,1012</sub>	657.06 702.74	1 93.5 0 kWh/ye	(202) (204) (206) (208) (208) (211)
217)m= 87.67 87.33 86.69 85.36 83 79.8 79.8 79.8 79.8 85.19 87.04 87.78  Fuel for water heating, kWh/month 219)m = (64)m x 100 ÷ (217)m 219)m= 230.49 203.91 215.61 196.14 197.56 183.44 176.01 193.37 193.09 203.79 211.11 224.61	Fraction of s Fraction of s Fraction of s Fraction of to Efficiency of  Jan Space heatin 637.47  (211)m = {[(98) 681.79  Space heatin of to (215)m= 0  Water heatin Output from v	pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace h	t from many from race heating ry/supplement (can see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see the see t	ain systemain systemain systematary  Apr alculated 205.46  00 ÷ (20 219.74  y), kWh/68)  0	em(s) stem 1 em 1 y heating May d above) 79.39 66) 84.91 month 0	g system Jun 0	system  n, %  Jul  0  0	(202) = 1 - (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (2	- (201) = 02) × [1 - 6 02) × [1 - 6 0 0 I (kWh/yea	Oct  200.21  214.12  ar) =Sum(2	436.01 466.32 211) <sub>15,1012</sub>	657.06 702.74 = 0	1 93.5 0 kWh/ye	(202) (204) (206) (208) (208) (211)
Fuel for water heating, kWh/month 219)m = (64)m x 100 ÷ (217)m 219)m= 230.49   203.91   215.61   196.14   197.56   183.44   176.01   193.37   193.09   203.79   211.11   224.61	Fraction of s Fraction of s Fraction of s Fraction of to Efficiency of  Space heatin 637.47  (211)m = {[(98) m x (2(215)m=0)]}  Water heatin Output from v 202.08	pace head pace head pace head pace head pace head pace head pace head pace head seconda Feb and required 478.9  Solution 19	t from many from race heating ry/supplement (can see the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of t	ain systemain systemain systematary  Apr alculated 205.46  00 ÷ (20 219.74  y), kWh/68)  0	em(s) stem 1 em 1 y heating May d above) 79.39 66) 84.91 month 0	g system Jun 0	system  n, %  Jul  0  0	(202) = 1 - (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (2	- (201) = 02) × [1 - 6 02) × [1 - 6 0 0 I (kWh/yea	Oct  200.21  214.12  ar) =Sum(2	436.01 466.32 211) <sub>15,1012</sub>	657.06 702.74 = 0	1 93.5 0 kWh/ye	(202) (204) (206) (208) (211) (211)
219)m = (64)m x 100 ÷ (217)m 219)m= 230.49 203.91 215.61 196.14 197.56 183.44 176.01 193.37 193.09 203.79 211.11 224.61	Fraction of s Fraction of s Fraction of s Fraction of to Efficiency of  Space heatin 637.47  (211)m = {[(98) m x (2(215)m=0)]}  Water heatin Output from v 202.08	pace head pace head pace head pace head pace head pace head pace head pace head seconda Feb and required 478.9  Solution 19	t from many from race heating ry/supplement (can see the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of the seed of t	ain systemain systemain systematary  Apr alculated 205.46  00 ÷ (20 219.74  y), kWh/68)  0	em(s) stem 1 em 1 y heating May d above) 79.39 66) 84.91 month 0	g system Jun 0	system  n, %  Jul  0  0	(202) = 1 - (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (2	- (201) = 02) × [1 - 6 02) × [1 - 6 0 0 I (kWh/yea	Oct  200.21  214.12  ar) =Sum(2	436.01 466.32 211) <sub>15,1012</sub>	657.06 702.74 = 0	1 93.5 0 kWh/ye	(202) (204) (206) (208) (208) (211)
219)m= 230.49 203.91 215.61 196.14 197.56 183.44 176.01 193.37 193.09 203.79 211.11 224.61	Fraction of s Fraction of s Fraction of s Fraction of to Efficiency of  Zan Space heatin 637.47 (211)m = {[(98) m x (2215)m=0]}  Water heatin Output from w 202.08 Efficiency of v	pace head pace head pace head pace head pace head pace head pace head pace head secondal Feb agreequire 478.9  3) m x (20   512.19    ng fuel (second) } x 1   0    g  vater head   178.07     vater head   178.07     vater head   178.07     vater head   178.07     vater head   178.07     vater head   178.07     vater head   178.07     vater head   178.07     vater head   178.07     vater head   178.07     vater head   178.07     vater head   178.07     vater head   178.07	t from many from race heating ry/supplement (constant) of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the cond	ain systemain systemain systemain systematary Apr alculated 205.46   00 ÷ (20   219.74   y), kWh/88)   0   ulated at 167.43	em(s) stem 1 em 1 y heating May d above) 79.39 16) 84.91  month 0	g system Jun 0 0	system  1, %  Jul  0  0  140.46	(202) = 1 - (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (2	- (201) = 02) × [1 - 6 02) × [1 - 6 0 0 0 1 (kWh/yea 154.09	Oct  200.21  214.12  ar) =Sum(2  173.62	436.01 466.32 211) <sub>15,1012</sub> 0 215) <sub>15,1012</sub>	657.06  702.74  0  197.17	1 93.5 0 kWh/ye	(202) (204) (206) (208) (211) (211)
	Fraction of s Fraction of s Fraction of s Fraction of to Efficiency of  Zan Space heatin 637.47  (211)m = {[(98) 681.79  Space heatin = {[(98)m x (2(215)m= 0)]  Water heatin Output from w 202.08 Efficiency of w (217)m= 87.67	pace head pace head pace head pace head pace head pace head pace head pace head seconda  Feb mg require 478.9  3) m x (20  512.19  ng fuel (so on on on on on on on on on on on on on	t from many from race heating ry/supplement (call and and and and and and and and and and	ain systemain systemain systemain systematary Apr alculated 205.46   00 ÷ (20 219.74    y), kWh/s8)   0   ulated at 167.43   85.36	em(s) stem 1 em 1 y heating May d above) 79.39 16) 84.91  month 0	g system Jun 0 0	system  1, %  Jul  0  0  140.46	(202) = 1 - (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (2	- (201) = 02) × [1 - 6 02) × [1 - 6 0 0 0 1 (kWh/yea 154.09	Oct  200.21  214.12  ar) =Sum(2  173.62	436.01 466.32 211) <sub>15,1012</sub> 0 215) <sub>15,1012</sub>	657.06  702.74  0  197.17	1 93.5 0 kWh/ye	(202) (204) (206) (208) ear (211) (211)
Total = Sum(219a) <sub>112</sub> = 2429.15 (219)	Fraction of s Fraction of s Fraction of s Fraction of s Fraction of s Fraction of s Fraction of s Fraction of s Fraction of s Fraction of s Fraction of s Fraction of s Fraction of s Fraction of s  In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the second of s In the	pace head pace head pace head pace head pace head pace head pace head pace head pace head secondal Feb pag require 478.9  Solution and the pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace head pace he	t from many from race heating ry/supplement (constant) of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the cond	ain systemain systemain systemain systematary Apr alculated 205.46   00 ÷ (20   219.74   y), kWh/88)   0   ulated at 167.43   85.36   onth m	em(s) stem 1 em 1 y heating May d above) 79.39 16) 84.91  month 0  coove) 163.98	g system Jun 0 0 146.39	system  1, %  Jul  0  0  140.46  79.8	(202) = 1 - (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (2	- (201) = 02) × [1 - 6 02) × [1 - 6 0 0 0 1 (kWh/yea 154.09 79.8	Oct  200.21  214.12  ar) =Sum(2  173.62  85.19	436.01 466.32 211) <sub>15,1012</sub> 0 215) <sub>15,1012</sub> 183.75	657.06  702.74  0  197.17  87.78	1 93.5 0 kWh/ye	(202) (204) (206) (208) ear (211) (211)
	Fraction of s Fraction of s Fraction of s Fraction of to Efficiency of  Efficiency of  Jan Space heatin 637.47  (211)m = {[(98) 681.79  Space heatin = {[(98)m x (2) (215)m= 0  Water heatin Output from v 202.08  Efficiency of v (217)m= 87.67  Fuel for water	pace head pace head pace head pace head pace head pace head pace head pace head pace head seconda  Feb ag require 478.9  Signature 178.07  Feb ag require 478.9  Signature 178.07  Feb ag require 478.9  Feb ag require 478.9  Signature 178.07  Feb ag require 478.9  F	t from many from race heating ry/supplement (constant) of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the condary of the cond	ain systemain systemain systemain systematary Apr alculated 205.46   00 ÷ (20   219.74   y), kWh/88)   0   ulated at 167.43   85.36   onth m	em(s) stem 1 em 1 y heating May d above) 79.39 16) 84.91  month 0  coove) 163.98	g system Jun 0 0 146.39	system  1, %  Jul  0  0  140.46  79.8	(202) = 1 - (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (204) = (2	- (201) = 02) × [1 - 6 02) × [1 - 6 0 0 0 I (kWh/yea 154.09 79.8	Oct  200.21  214.12  ar) = Sum(2  173.62  85.19	436.01 466.32 211) <sub>15,1012</sub> 0 215) <sub>15,1012</sub> 183.75	657.06  702.74  0  197.17  87.78	1 93.5 0 kWh/ye	(202) (204) (206) (208) ear (211) (211) (215)



Annual totals		kWh/year	kWh/year
Space heating fuel used, main system 1		<b>,</b> .	3292.62
Water heating fuel used			2429.15
Electricity for pumps, fans and electric keep-hot			
central heating pump:		30	(230c)
boiler with a fan-assisted flue		45	(230e)
Total electricity for the above, kWh/year	sum of (230a)	u)(230g) =	75 (231)
Electricity for lighting			366.92 (232)
12a. CO2 emissions – Individual heating systems	including micro-CHP		
	<b>Energy</b> kWh/year	Emission factor	Emissions
	Kvvii/yeai	kg CO2/kWh	kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	711.21 (261)
Space heating (main system 1) Space heating (secondary)	•		
	(211) x	0.216	711.21 (261)
Space heating (secondary)	(211) x (215) x	0.216 =	711.21 (261) 0 (263)
Space heating (secondary) Water heating	(211) x (215) x (219) x	0.216 =	711.21 (261) 0 (263) 524.7 (264)
Space heating (secondary) Water heating Space and water heating	(211) x (215) x (219) x (261) + (262) + (263) + (264) =	0.216 = 0.519 = 0.216 =	711.21 (261) 0 (263) 524.7 (264) 1235.9 (265)
Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot	(211) x (215) x (219) x (261) + (262) + (263) + (264) = (231) x (232) x	0.216 = 0.519 = 0.519 = 0.519	711.21 (261)  0 (263)  524.7 (264)  1235.9 (265)  38.93 (267)



User Details: **Assessor Name:** Stroma Number: **Software Version: Software Name:** Stroma FSAP 2012 Version: 1.0.5.12 Property Address: W2-01 , 156 West End Lane, Camden, London Address: 1. Overall dwelling dimensions Av. Height(m) Volume(m³) Area(m<sup>2</sup>) Ground floor 94.3 (1a) x 2.7 (2a) = (3a) 254.61 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)(4)94.3 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =254.61 (5) total m³ per hour main secondary other heating heating x 40 =Number of chimneys (6a) 0 0 x 20 =Number of open flues 0 0 0 (6b) Number of intermittent fans x 10 =(7a)3 30 x 10 =Number of passive vents (7b) 0 0 x 40 =Number of flueless gas fires 0 (7c)Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =0.12 (8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9)0 Additional infiltration [(9)-1]x0.1 =0 (10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)0 if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12)If no draught lobby, enter 0.05, else enter 0 (13)O Percentage of windows and doors draught stripped (14)0 Window infiltration  $0.25 - [0.2 \times (14) \div 100] =$ 0 (15)Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =O (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)5 If based on air permeability value, then  $(18) = [(17) \div 20] + (8)$ , otherwise (18) = (16)0.37 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)2  $(20) = 1 - [0.075 \times (19)] =$ Shelter factor (20)0.85  $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.31 Infiltration rate modified for monthly wind speed Jan Feb Sep Mar Apr May Jun Jul Aug Oct Nov Dec Monthly average wind speed from Table 7 (22)m =5.1 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor  $(22a)m = (22)m \div 4$ (22a)m 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18



0.4	0.39	0.38	0.34	0.34	0.3	0.3	0.29	0.31	0.34	0.35	0.37		
Calculate effe		-	rate for t	he appli	cable ca	se					Į		
If mechanica												0	(2
If exhaust air h		0		, ,	,	. ,	,, .	,	) = (23a)			0	(2
If balanced with		•	-	_								0	(2
a) If balance	i	i	i	i	1	<del>-                                    </del>	<del>,                                    </del>	<del>í `</del>	<del> </del>	<del>,                                      </del>	<del>```</del>	÷ 100] I	15
24a)m= 0	0		0	0	0	0	0	0	0	0	0		(2
b) If balance	ı —	anicai ve	entilation 0	ı —	neat red	<del>-                                    </del>	<del>-                                    </del>	ŕ	<del>- ` `</del>	<del></del>	1 0	I	(2
	0			0		0	0	0	0	0	0	İ	(.
c) If whole h				•	/e input ' o); other				5 x (23h	n)			
4c)m = 0	0.07	0	0	0	0	0	0) = (22.	0	0 7 (20)	0	0		(
d) If natural	ventilatio	n or wh	ole hous	Lse nositiv	<u> </u>	ventilatio	n from l	<u> </u>				l	
,				•	erwise (2				0.5]				
4d)m= 0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57		(
Effective air	change	rate - er	nter (24a	) or (24k	o) or (24	c) or (24	d) in box	(25)				_	
5)m= 0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57		(
B. Heat losse	s and he	eat loss i	naramet	ar.					_	_	_		
LEMENT	Gros		Openin		Net Ar	rea	U-val	IE	AXU		k-value	۵	ΑΧk
LEMEN	area		r		A ,r		W/m2		(W/I	K)	kJ/m²·l		kJ/K
oors					1.89	x	1	= [	1.89				(
in <mark>dows</mark> Type	1				6.48	x1	/[1/( 1.4 )+	0.04] =	8.59	Ħ			(
indows Type	2				2.64	x1.	/[1/( 1.4 )+	0.04] =	3.5	Ħ			(
oor					94.3	X	0.13	=	12.259	, i		7 -	
alls Type1	66.4	2	19.6	8	46.74	1 X	0.18	<u> </u>	8.41	F i		<b>i</b> iii	
alls Type2	5.6	7	1.89		3.78	x	0.18	╡┇	0.68	<b>=</b>		<b>i</b>	<u> </u>
otal area of e					166.3	=							
arty wall		,			42.75	=	0		0			<b>–</b>	(
arty ceiling					94.3	=						╡╞	<u> </u>
or windows and	roof wind	ows. use e	effective wi	ndow U-va			ı formula 1	/[(1/U-valu	ie)+0.041 a	L as aiven in	paragraph		
include the area								2(	, ,	3	7-1-0-1		
abric heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				49.33	(
eat capacity	Cm = S(	(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	7072.5	(
nermal mass	parame	ter (TMF	P = Cm -	: TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(
or design assess				construct	ion are no	t known pr	ecisely the	indicative	values of	TMP in T	able 1f		
<i>n be used inste</i> nermal bridge				ueina Ar	nondiy l	<b>/</b>						44.0	
details of therma	•	,		• .	•	N.						11.8	(
otal fabric he		aro not kn	- (00)	- J.JJ X (J	•••			(33) +	(36) =			61.13	
entilation hea	at loss ca	alculated	l monthly	y				(38)m	= 0.33 × (	[25)m x (5]	)		`
	i	i	· ·	<u> </u>	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Jan	Feb	Mar	Apr	May	l oan		,				1 500	1	
	48.43	48.17	46.98	46.76	45.72	45.72	45.52	46.12	46.76	47.21	47.68		(
	48.43	48.17	<u> </u>		<del> </del>		<del>-</del>	46.12		47.21	+		(

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com

Average =  $Sum(39)_{1...12}/12=$ 

108.151<sub>age 2 o</sub> (39)



0)m= 1.16	meter (F	HLP), W/	m²K					(40)m	$= (39)m \div$	(4)			
	1.16	1.16	1.15	1.14	1.13	1.13	1.13	1.14	1.14	1.15	1.15		
ımber of day	s in mor	nth (Tahl	գ 1a)					,	Average =	Sum(40) <sub>1</sub> .	12 /12=	1.15	(4
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
)m= 31	28	31	30	31	30	31	31	30	31	30	31		(4
		!					<u> </u>	<u> </u>	<u> </u>	<u> </u>			
. Water heat	ting ener	gy requi	rement:								kWh/yea	ar:	
sumed occu			F.4		40 (TE	- 40.0	)	0040 /	10		68		(4
if TFA > 13.9 if TFA £ 13.9		+ 1./6 X	[1 - exp	(-0.0003	49 x (TF	·A -13.9	)2)] + 0.0	0013 x (	IFA -13.	.9)			
nual averag											.85		(4
duce the annua more that 125	_				_	-	to achieve	a water us	se target o	f	_		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
t water usage ii							_	Гоер	Oct	1400	Dec		
)m= 107.64	103.72	99.81	95.9	91.98	88.07	88.07	91.98	95.9	99.81	103.72	107.64		
									L Tota <u>l = Su</u>	m(44) <sub>112</sub> =		1174.24	(4
ergy content of	hot water	used - cald	culated mo	onthly $= 4$ .	190 x Vd,n	n x nm x C	Tm / 3600	) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		_
)m= 159.62	139.61	144.06	125.6	120.51	103.99	96.37	110.58	111.9	130.41	142.35	154.59		
			-5	la la sala					Total = Su	m(45) <sub>112</sub> =		1539.61	(4
st <mark>antane</mark> ous w													,
m= 23.94 ater storage	20.94	21.61	18.84	18.08	15.6	14.45	16.59	16.79	19.56	21.35	23.19		(4
orage volum		includin	g anv so	olar or W	WHRS:	storage	within sa	ame ves	sel		150		(4
community h	,												`
herwise if no	_			_			' '	ers) ente	er '0' in (	47)			
ater storage													
If manufact				or is kno	wn (kWh	n/day):				1.	39		(4
mperature fa										0.	54		(4
		_	-				(48) x (49)	) =		0.	75		/ -
ergy lost fro					ar ic not	known:							(5
If manufact			-								0		
If manufact t water stora	age loss	factor fro	om Tabl								0		
If manufact t water stora community h lume factor	age loss leating s from Tal	factor fro ee section ble 2a	om Tabl on 4.3								0		(5
If manufact it water store community had been stored lume factor mperature for	age loss leating s from Tal actor fro	factor from ee section ble 2a m Table	om Tabl on 4.3 2b	e 2 (kWl		y)							(5
If manufact t water store community h lume factor mperature for ergy lost fro	age loss leating s from Tal actor fro lm water	factor from the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the section of the secti	om Tabl on 4.3 2b	e 2 (kWl		y)		) x (52) x (	53) =		0 0		(£ (£ (£
If manufact of water store community had been store to the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store that the store t	age loss leating s from Tal actor fro om water (54) in (5	factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from th	om Tabl on 4.3 2b , kWh/ye	e 2 (kWl		y)	(47) x (51)				0		(E (E (E
If manufact t water stora community h lume factor mperature face ergy lost fronter (50) or ( ater storage	age loss leating s from Tal actor fro m water (54) in (5	factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from th	om Tabl on 4.3 2b , kWh/ye or each	e 2 (kWl	n/litre/da	у)	(47) x (51)	(55) × (41)	m	0.	0 0 0 0 0 75		(E (E (E (E
If manufact t water stora tommunity had been storage from the factor (50) or (after storage)	age loss leating s from Tal actor fro m water (54) in (5 loss cal	factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from th	om Tablon 4.3  2b , kWh/ye or each	e 2 (kWlear ear month	n/litre/da 22.58	23.33	(47) × (51) ((56)m = ( 23.33	(55) × (41)	m 23.33	0.	000000000000000000000000000000000000000	· Li	(£ (£ (£
If manufact t water stora community had been storage lost from ter (50) or (ater storage lost) and lost lost lost lost lost lost lost lost	age loss reating s from Tal actor from water (54) in (5 loss calc 21.07 s dedicated	factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from th	om Tablon 4.3  2b , kWh/ye or each  22.58  rage, (57)r	e 2 (kWl ear month 23.33 n = (56)m	22.58 x [(50) – (1	23.33 H11)] ÷ (5	(47) x (51) ((56)m = ( 23.33 0), else (5	22.58 7)m = (56)	23.33 m where (	0. 22.58 H11) is fro	0 0 0 75 23.33 m Appendix	н	(E) (E) (E) (E)
If manufact at water stora community halume factor imperature factor ergy lost fronter (50) or (ater storage	age loss leating s from Tal actor fro m water (54) in (5 loss cal	factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from th	om Tablon 4.3  2b , kWh/ye or each	e 2 (kWlear ear month	n/litre/da 22.58	23.33	(47) × (51) ((56)m = ( 23.33	(55) × (41)	m 23.33	0.	000000000000000000000000000000000000000	· H	(8) (8) (8) (8) (8) (8) (8) (8) (8) (8)
If manufact t water stora community had been storage with the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the storage of the stor	age loss reating s from Tal actor from water (54) in (54) loss calc 21.07 s dedicated 21.07	factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from th	om Tablon 4.3  2b  , kWh/ye  or each  22.58  rage, (57)r  22.58	ear month 23.33 m = (56)m 23.33	22.58 × [(50) – (1 22.58	23.33 H11)] ÷ (50 23.33	(47) x (51) ((56)m = ( 23.33 0), else (5) 23.33	22.58 7)m = (56) 22.58	23.33 m where (	22.58 H11) is fro	0 0 0 75 23.33 m Appendix	· H	(E) (E) (E) (E)
If manufact t water storact community had been been been been been been been bee	age loss reating s from Tal actor from water (54) in (5 loss calc 21.07 s dedicated 21.07 loss (an loss calc loss calc loss calc loss calc loss calc loss calc loss calc loss calc loss calc loss calc loss calc loss calc	factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from the factor from th	om Tablon 4.3  2b , kWh/ye or each 22.58 rage, (57)r 22.58 om Table or each	ear month 23.33 m = (56)m 23.33 e 3 month (s	22.58 x [(50) – (( 22.58	23.33 H11)] ÷ (50 23.33 58) ÷ 36	(47) x (51) ((56)m = ( 23.33 0), else (5) 23.33 65 x (41)	22.58 7)m = (56) 22.58	23.33 m where ( 23.33	22.58 H11) is fro	0 0 0 75 23.33 m Appendix 23.33	н	(±) (±) (±) (±) (±)

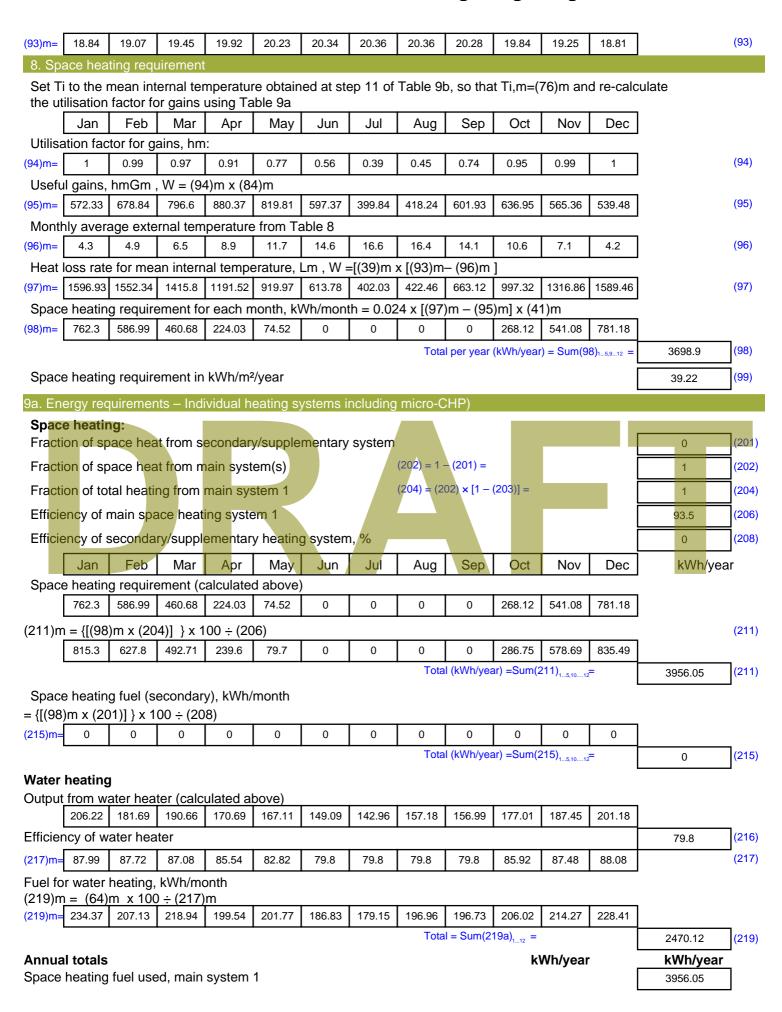


0 111				(0.4)	(22)	o= (44)							
Combi loss o	1			,		· ` `		1 .	Ι .	Ι ,		1	(64)
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0		(61)
	<del>-</del>						<del>`</del>		<del>ì ´</del>	<del>ì ´</del>	<del>r` ´                                     </del>	(59)m + (61)m	(00)
(62)m= 206.2		190.66	170.69	167.11	149.09	142.96	157.18		177.01	187.45	201.18		(62)
Solar DHW inpu									r contribut	ion to wate	er heating)		
(add addition						<del> </del>	<del></del>	<del> </del>				1	(00)
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from						1	1	_	1		ı	1	
(64)m= 206.2	2 181.69	190.66	170.69	167.11	149.09	142.96	157.18	_l	177.01	187.45	201.18		٦٫٫۰
								tput from w		,		2088.23	(64)
Heat gains fr		heating,	kWh/m			× (45)m	+ (61)	m] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	]	
(65)m= 90.35	80.09	85.18	77.83	77.35	70.65	69.32	74.04	73.28	80.64	83.41	88.68		(65)
include (57	7)m in cald	culation o	of (65)m	only if c	ylinder i	s in the	dwelling	g or hot w	ater is f	rom com	munity h	neating	
5. Internal	gains (see	Table 5	and 5a	):									
Metabolic ga	ins (Table	5), Wat	ts										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 134.0	1 134.01	134.01	134.01	134.01	134.01	134.01	134.01	134.01	134.01	134.01	134.01		(66)
Lighting gain	s (calcula	ted in Ap	pendix	L, equat	on L9 o	r L9a), a	lso see	Table 5					
(67)m= 22.07	19.6	15.94	12.07	9.02	7.62	8.23	10.7	14.36	18.23	21.28	22.68		(67)
Appliances g	ains (calc	ulated in	Append	dix L, eq	uation L	.13 or L1	3a), als	o see Ta	ble 5			•	
(68)m= 246.7	<u> </u>	242.88	229.14	211.8	195.5	184.61	182.05		202.24	219.58	235.88	]	(68)
Cooking gair	ns (calcula	ted in A	pendix	L, equat	ion L15	or L15a	), also s	see Table	5				
(69)m= $36.4$	36.4	36.4	36.4	36.4	36.4	36.4	36.4	36.4	36.4	36.4	36.4	]	(69)
Pumps and f	ans gains	(Table 5	ia)				l .				<u> </u>		
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3	]	(70)
Losses e.g. e	 evanoratio	n (negat	ive valu	es) (Tah	le 5)	<u> </u>	!		<u>!</u>		<u>!</u>	J	
(71)m= -107.2	<del></del>	-107.21	-107.21	-107.21	-107.21	-107.21	-107.21	-107.21	-107.21	-107.21	-107.21	1	(71)
Water heatin		ļ!				1		1	1 .0	1	1	J	` ,
(72)m= 121.4	<del>`</del>	114.49	108.1	103.96	98.13	93.17	99.52	101.78	108.38	115.84	119.19	1	(72)
` '			100.1	100.00		1	<u> </u>	+ (69)m +	l	<u> </u>	l	J	()
(73)m= 456.4	<del>_</del>	439.51	415.52	390.98	367.45	352.21	358.47	<del>-                                    </del>	395.06	422.91	443.96	1	(73)
6. Solar gai		439.51	410.02	390.96	307.43	352.21	330.47	370.64	393.00	422.91	443.90		(10)
Solar gains are		using solar	r flux from	Table 6a	and assoc	ciated equa	itions to d	convert to th	ne applicat	ole orientat	tion.		
Orientation:		•	Area		Flu	•		g_	о арриса.	FF		Gains	
Onomation.	Table 6d		m <sup>2</sup>			ble 6a		Table 6b	Т	able 6c		(W)	
West 0.9x	0.77	x	6.4	I.B.	x -	19.64	1 <sub>x</sub> [	0.63	ТхГ	0.7		38.9	(80)
West 0.9x		x	2.6		-	19.64	」^ <u>∟</u> ] <sub>×</sub>	0.63	^	0.7		79.23	](80)
West 0.9x		^ ^					」^ <u> </u>		^     x		_ =		](80)
West 0.9x		_	6.4		-	38.42	╎ ⊨	0.63	<b>≓</b>	0.7	=	76.09	-
		X	2.6		-	38.42	X	0.63	_	0.7	=	154.99	[(80)]
West 0.9x	0.77	X	6.4	8	X	63.27	X	0.63	X	0.7	=	125.3	(80)



\//aa+																
West	0.9x 0.7	7 ×	2.6	34	(	63.27	X	0.63	X	0.7	=	255.25	(80)			
West	0.9x 0.7	7 ×	6.4	18	<b>(</b> !	92.28	X	0.63	X	0.7	=	182.75	(80)			
West	0.9x 0.7	7 ×	2.6	64 )	( !	92.28	X	0.63	X	0.7	=	372.27	(80)			
West	0.9x 0.7	7 ×	6.4	18	<b>(</b> 1	13.09	X	0.63	X	0.7	=	223.97	(80)			
West	0.9x 0.7	7 ×	2.6	64 )	<b>(</b> 1	13.09	x	0.63	X	0.7	=	456.23	(80)			
West	0.9x 0.7	7 ×	6.4	18	<b>(</b> 1	15.77	X	0.63	X	0.7	=	229.27	(80)			
West	0.9x 0.7	7 ×	2.6	64 ×	( 1	15.77	X	0.63	X	0.7	=	467.03	(80)			
West	0.9x 0.7	7 ×	6.4	18	<b>(</b> 1	10.22	X	0.63	X	0.7	=	218.27	(80)			
West	0.9x 0.7	7 ×	2.6	64 )	<b>(</b> 1	10.22	X	0.63	X	0.7	=	444.63	(80)			
West	0.9x 0.7	7 ×	6.4	18	( !	94.68	X	0.63	X	0.7	=	187.49	(80)			
West	0.9x 0.7	7 ×	2.6	64 ×	<b>(</b> !	94.68	X	0.63	X	0.7	=	381.93	(80)			
West	0.9x 0.7	7 ×	6.4	18	(	73.59	X	0.63	X	0.7	=	145.73	(80)			
West	0.9x 0.7	7 ×	2.6	64 )	(	73.59	x	0.63	X	0.7	=	296.87	(80)			
West	0.9x 0.7	7 ×	6.4	18	<b>(</b> ,	45.59	X	0.63	X	0.7	=	90.28	(80)			
West	0.9x 0.7	7 ×	2.6	64 ×	<b>(</b> .	45.59	X	0.63	X	0.7	=	183.91	(80)			
West	0.9x 0.7	7 ×	6.4	18	(	24.49	x	0.63	X	0.7	=	48.5	(80)			
West	0.9x 0.7	7 ×	2.6	64 ×	(	24.49	x	0.63	X	0.7	=	98.79	(80)			
West	0.9x 0.7	7 ×	6.4	18		16.15	Х	0.63	X	0.7	=	31.99	(80)			
West	0.9x 0.7	7 ×	2.6	54	<b>(</b>	16.15	x	0.63	x	0.7	=	65.16	(80)			
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m																
(83)m=	118.13 231.08		555.02	680.19	696.3	662.9	569.	42 442.6	274.19	147.29	97.14		(83)			
	gains – internal			_	, ,	_						1				
(84)m=	574.61 685.39	820.06	970.53	1071.18	1063.74	1015.12	(84)m= 574.61 685.39 820.06 970.53 1071.18 1063.74 1015.12 927.9 813.44 669.25 570.19 541.1									
7. Me	ean internal tem	7. Mean internal temperature (heating season)														
													(84)			
remp	perature during	•	`	<i>'</i>	g area	from Tab	ole 9,					21	(85)			
•	perature during	heating p	eriods ir	n the livin	_		ole 9,					21				
•	-	heating p	eriods ir	n the livin	_		ole 9,	Th1 (°C)	Oct	Nov	Dec	21				
•	ation factor for	heating p	eriods in	n the livin	(see Ta	able 9a)		Th1 (°C)	Oct	Nov 1	Dec 1	21				
Utilisa (86)m=	ation factor for Jan Feb	heating p gains for Mar 0.98	eriods in living are Apr 0.93	n the livin ea, h1,m May	(see Ta Jun 0.62	Jul 0.46	At 0.5	Th1 (°C)  ug Sep 2 0.79		+		21	(85)			
Utilisa (86)m=	Jan Feb	heating p gains for Mar 0.98	eriods in living are Apr 0.93	n the livin ea, h1,m May	(see Ta Jun 0.62	Jul 0.46	At 0.5	Th1 (°C)  ug Sep 2 0.79  able 9c)		1		21	(85)			
Utilisa (86)m= Mean (87)m=	Jan Feb 1 0.99 internal temper	heating p gains for Mar 0.98 erature in 20.22	living are 0.93 living are 20.6	n the livin ea, h1,m May 0.81 ea T1 (fol	Jun 0.62 Ilow ste	Jul 0.46 eps 3 to 7 20.99	0.5 ' in T	Th1 (°C)  ug Sep 2 0.79  able 9c) 99 20.91	0.97	1	1	21	(85)			
Utilisa (86)m= Mean (87)m=	Jan Feb 1 0.99 n internal temper 19.75 19.92	heating p gains for Mar 0.98 erature in 20.22	living are 0.93 living are 20.6	n the livin ea, h1,m May 0.81 ea T1 (fol	Jun 0.62 Ilow ste	Jul 0.46 eps 3 to 7 20.99	0.5 ' in T	Th1 (°C)  ug Sep 2 0.79  able 9c) 99 20.91  0, Th2 (°C)	0.97	20.07	1	21	(85)			
Utilisa (86)m=  Mean (87)m=  Temp (88)m=	Jan Feb 1 0.99 n internal temper 19.75 19.92 perature during 19.95 19.95	heating p gains for Mar 0.98 erature in 20.22 heating p 19.95	Apr 0.93 living are 20.6 periods in	n the livin ea, h1,m May 0.81 ea T1 (fol 20.86 n rest of c	Jun 0.62  Illow ste 20.97  dwelling	Jul 0.46 eps 3 to 7 20.99 g from Ta	0.5 in T 20.9 ble 9	Th1 (°C)  ug Sep 2 0.79  able 9c) 99 20.91  0, Th2 (°C)	0.97 20.53	20.07	19.72	21	(85) (86) (87)			
Utilisa (86)m=  Mean (87)m=  Temp (88)m=	Jan Feb 1 0.99 n internal temper 19.75 19.92 perature during	heating p gains for Mar 0.98 erature in 20.22 heating p 19.95	Apr 0.93 living are 20.6 periods in	n the livin ea, h1,m May 0.81 ea T1 (fol 20.86 n rest of c	Jun 0.62  Illow ste 20.97  dwelling	Jul 0.46 eps 3 to 7 20.99 g from Ta	0.5 in T 20.9 ble 9	Th1 (°C)  ug Sep 2 0.79  able 9c) 99 20.91 9, Th2 (°C) 98 19.97	0.97 20.53	20.07	19.72	21	(85) (86) (87)			
Utilisa (86)m=  Mean (87)m=  Temp (88)m=  Utilisa (89)m=	Jan Feb 1 0.99 n internal temper 19.75 19.92 perature during 19.95 19.95 ation factor for 1 0.99	heating p gains for Mar 0.98 erature in 20.22 heating p 19.95 gains for 0.98	living are  Apr  0.93  living are  20.6  periods in  19.96  rest of d  0.91	n the livingea, h1,m  May  0.81  ea T1 (folicities 20.86)  n rest of control 19.96  welling, h  0.75	(see Ta Jun 0.62 Illow ste 20.97 dwelling 19.97 12,m (se 0.53	Jul 0.46  pps 3 to 7 20.99  g from Ta 19.97  ee Table 0.35	Au 0.5 7 in T 20.9 19.9 9a)	Th1 (°C)  ug Sep 2 0.79  able 9c) 99 20.91 0, Th2 (°C) 98 19.97	0.97 20.53 19.96	20.07	19.72	21	(85) (86) (87) (88)			
Utilisa (86)m=  Mean (87)m=  Temp (88)m=  Utilisa (89)m=  Mean	Jan Feb 1 0.99 n internal temper 19.75 19.92 perature during 19.95 19.95 ation factor for 1 0.99 n internal temper	heating programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the prog	living are Apr 0.93 living are 20.6 periods in 19.96 rest of d 0.91 the rest	the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living	(see Ta Jun 0.62 Illow ste 20.97 dwelling 19.97 12,m (so 0.53	Jul 0.46 eps 3 to 7 20.99 g from Ta 19.97 ee Table 0.35 follow ste	Au 0.57 in T 20.9 lble 9 19.9 0.4	Th1 (°C)  ug Sep 2 0.79  able 9c) 99 20.91  9, Th2 (°C) 98 19.97  1 0.71  to 7 in Tabl	0.97 20.53 19.96 0.95 e 9c)	1 20.07 19.96 0.99	1 19.72 19.96	21	(85) (86) (87) (88) (89)			
Utilisa (86)m=  Mean (87)m=  Temp (88)m=  Utilisa (89)m=	Jan Feb 1 0.99 n internal temper 19.75 19.92 perature during 19.95 19.95 ation factor for 1 0.99	heating p gains for Mar 0.98 erature in 20.22 heating p 19.95 gains for 0.98	living are  Apr  0.93  living are  20.6  periods in  19.96  rest of d  0.91	n the livingea, h1,m  May  0.81  ea T1 (folicities 20.86)  n rest of control 19.96  welling, h  0.75	(see Ta Jun 0.62 Illow ste 20.97 dwelling 19.97 12,m (se 0.53	Jul 0.46  pps 3 to 7 20.99  g from Ta 19.97  ee Table 0.35	Au 0.5 7 in T 20.9 19.9 9a)	Th1 (°C)  ug Sep 2 0.79  able 9c) 99 20.91 0, Th2 (°C) 98 19.97  1 0.71 to 7 in Table 97 19.9	0.97  20.53  19.96  0.95  e 9c)  19.42	1 20.07 19.96 0.99 18.75	1 19.72 19.96 1		(85) (86) (87) (88) (89) (90)			
Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m=	ation factor for  Jan Feb  1 0.99  n internal temper  19.75 19.92  Decrature during  19.95 19.95  ation factor for  1 0.99  n internal temper  18.28 18.54	heating programs for Mar 0.98 erature in 20.22 heating programs for 0.98 erature in 18.98	living are Apr 0.93 living are 20.6 periods in 19.96 rest of d 0.91 the rest 19.5	the livingea, h1,m May 0.81 ea T1 (for 20.86 19.96 welling, h 0.75 of dwelling 19.84	(see Ta Jun 0.62 Illow ste 20.97 dwelling 19.97 12,m (se 0.53 ng T2 (fe 19.96	Jul 0.46  eps 3 to 7 20.99 g from Ta 19.97  ee Table 0.35 follow ste	Au 0.5 ' in T 20.9 19.9 9a) 0.4 pps 3	Th1 (°C)  ug Sep 2 0.79  able 9c) 99 20.91 0, Th2 (°C) 98 19.97  1 0.71 to 7 in Table 97 19.9	0.97  20.53  19.96  0.95  e 9c)  19.42	1 20.07 19.96 0.99	1 19.72 19.96 1	0.38	(85) (86) (87) (88) (89)			
Utilisa (86)m=  Mean (87)m=  Temp (88)m=  Utilisa (89)m=  Mean (90)m=	Jan Feb 1 0.99 internal temper 19.75 19.92 perature during 19.95 19.95 ation factor for 1 0.99 internal temper 18.28 18.54	heating programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the programmer of the prog	living are  Apr  0.93  living are  20.6  periods in  19.96  rest of d  0.91  the rest  19.5	the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living the living	(see Ta Jun 0.62 Illow ste 20.97 dwelling 19.97 12,m (se 0.53 ng T2 (th 19.96 ing) = f	Jul 0.46 eps 3 to 7 20.99 g from Ta 19.97 ee Table 0.35 follow ste 19.97	Au 0.5 ' in T 20.9  19.9  0.4  pps 3 19.9  + (1-4)	Th1 (°C)  ug Sep 2 0.79  able 9c) 99 20.91  0, Th2 (°C) 98 19.97  1 0.71  to 7 in Tabl 97 19.9  f  - fLA) × T2	0.97  20.53  19.96  0.95  e 9c)  19.42  LA = Liv	1 20.07 19.96 0.99 18.75	1 19.72 19.96 1 18.24		(85) (86) (87) (88) (89) (90) (91)			
Utilisa  (86)m=  Mean  (87)m=  Temp  (88)m=  Utilisa  (89)m=  Mean  (90)m=	ation factor for  Jan Feb  1 0.99  n internal temper  19.75 19.92  Decrature during  19.95 19.95  ation factor for  1 0.99  n internal temper  18.28 18.54	heating programs for 0.98  Prature in 20.22  heating programs for 0.98  Prature in 18.98  Prature in 18.98	living are 20.6 living are 20.6 living are 20.6 living are 20.6 living are 20.6 living are 19.96 living are 19.96 living are 19.96 living are 19.96 living are 19.96 living are 19.96 living are 19.96 living are 19.96 living are 19.96 living are 19.96 living are 19.96 living are 19.96 living are 19.96 living are 19.96 living are 19.96 living are 19.96 living are 19.96 living are 19.96 living are 19.96 living are 19.96 living are 19.96 living are 19.96 living are 19.96 living are 19.96 living are 19.96 living are 19.96 living are 19.96 living are 19.96 living are 19.96 living are 19.96 living are 19.96 living are 19.96 living are 19.96 living are 19.96 living are 19.96 living are 19.96 living are 19.96 living are 19.96 living are 19.96 living are 19.96 living are 19.96 living are 19.96 living are 19.96 living are 19.96 living are 19.97 living are 19.99 living are 19.99 living are 19.99	the livingea, h1,m  May  0.81  ea T1 (for 20.86)  rest of correst of correst of correst of correst of correst of dwelling, has a correst of dwelling and the correst of dwelling and the correst of dwelling and the correst of dwelling and the correst of dwelling and the correst of dwelling and the correst of dwelling and the correst of dwelling and the correst of dwelling and the corresponding a	(see Ta Jun 0.62 Illow ste 20.97 dwelling 19.97 12,m (se 0.53 ng T2 (fe 19.96 ing) = fe	Jul 0.46  eps 3 to 7 20.99 g from Ta 19.97 ee Table 0.35 follow ste 19.97	Au 0.5 7 in T 20.9 19.9 0.4 pps 3 19.9 + (1.1 20.0	Th1 (°C)  ug Sep 2 0.79  able 9c) 99 20.91  0, Th2 (°C) 1 0.71  to 7 in Tabl 1 19.9  f  -fLA) × T2 36 20.28	0.97  20.53  19.96  0.95  e 9c)  19.42  LA = Liv	1 20.07 19.96 0.99 18.75 ring area ÷ (4	1 19.72 19.96 1		(85) (86) (87) (88) (89) (90)			







Water heating fuel was d			г		Ī
Water heating fuel used			L	2470.12	
Electricity for pumps, fans and electric keep-hot					
central heating pump:			30		(230c)
boiler with a fan-assisted flue			45		(230e)
Total electricity for the above, kWh/year	sum o	of (230a)(230g) =	[	75	(231)
Electricity for lighting			[	389.76	(232)
12a. CO2 emissions – Individual heating systems	including micro-CHP				
	<b>Energy</b> kWh/year	Emission fact kg CO2/kWh	or	Emissions kg CO2/year	r
Space heating (main system 1)	(211) x	0.216	=	854.51	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	= [	533.55	(264)
Space and water heating	(261) + (262) + (263) + (2	64) =	[	1388.05	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	= [	38.93	(267)
Electricity for lighting	(232) x	0.519	= [	202.29	(268)
Total CO2, kg/year  TER =		sum of (265)(271) =		1629.27	(272)



User Details: **Assessor Name:** Stroma Number: **Software Version: Software Name:** Stroma FSAP 2012 Version: 1.0.5.12 Property Address: W3-12 , 156 West End Lane, Camden, London Address: 1. Overall dwelling dimensions Av. Height(m) Volume(m³) Area(m<sup>2</sup>) Ground floor 51.8 (1a) x 2.7 (2a) = (3a) 139.86 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)(4)51.8 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =139.86 (5) total m³ per hour main secondary other heating heating x 40 =Number of chimneys (6a) 0 0 x 20 =Number of open flues 0 0 0 (6b) Number of intermittent fans x 10 =(7a)2 20 x 10 =Number of passive vents (7b) 0 0 x 40 =Number of flueless gas fires 0 (7c)Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =(8)0.14 If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9)0 Additional infiltration [(9)-1]x0.1 =0 (10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)0 if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12)If no draught lobby, enter 0.05, else enter 0 (13)O Percentage of windows and doors draught stripped (14)0 Window infiltration  $0.25 - [0.2 \times (14) \div 100] =$ 0 (15)Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =O (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)5 If based on air permeability value, then  $(18) = [(17) \div 20] + (8)$ , otherwise (18) = (16)0.39 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)3  $(20) = 1 - [0.075 \times (19)] =$ Shelter factor (20)0.78  $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.3 Infiltration rate modified for monthly wind speed Jan Feb Sep Mar Apr May Jun Jul Aug Oct Nov Dec Monthly average wind speed from Table 7 (22)m =5.1 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor  $(22a)m = (22)m \div 4$ (22a)m 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18



0.39	0.38	e (allowi	0.34	0.33	0.29	0.29	0.28	0.3	0.33	0.34	0.36		
Calculate effe		_	rate for t	he appli	cable ca	se							
If mechanica												0	(23
If exhaust air h		0		, ,	, ,	. `	,, .	`	) = (23a)			0	(23
If balanced with		•	•	_								0	(23
a) If balance	i	·	i		·	<del>-                                    </del>	<del>-                                    </del>	<del>```</del>	<u> </u>	<del></del>	<del>' ' '</del>	÷ 100] I	(0.
24a)m= 0		0	0	0	0	0	0	0	0	0	0		(24
b) If balance	ı —		ı —		ı —	<del>-                                    </del>	r ``	<del>``</del>	<u> </u>	<del>-                                    </del>	Ι ,	1	(24
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2-
c) If whole h if (22b)n				•	•				5 x (23h	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural	L ventilatio	n or wh	ole hous	L nositiv	/e input	ventilatio	n from I	oft		<u>!</u>	<u>!</u>	l	
if (22b)n				•					0.5]				
24d)m= 0.58	0.57	0.57	0.56	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.56		(24
Effective air	change	rate - er	nter (24a	) or (24k	o) or (24	c) or (24	d) in box	(25)				_	
25)m= 0.58	0.57	0.57	0.56	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.56		(2
3. Heat losse	s and he	eat loss r	naramet	or.							_	_	
LEMENT	Gros		Openin		Net Ar	rea	U-val	ue	AXU		k-value	9	ΑΧk
	area	(m²)	· m		A ,r	m²	W/m2	K	(W/	K)	kJ/m²-l	K	kJ/K
Doors					1.89	Х	1	= [	1.89				(2
Vin <mark>dows</mark> Type	1				5.28	x1.	/[1/( 1.4 )+	0.04] =	7				(2
Vindows Type	2				2.64	x1.	/[1/( 1.4 )+	0.04] =	3.5				(2
Valls Type1	18.3	36	7.92	!	10.44	1 x	0.18	=	1.88				(2
Valls Type2	18.3	36	1.89		16.47	7 X	0.18	=	2.96				(2
otal area of e	lements	, m²			36.72	2							(3
Party wall					37.5	X	0	= [	0				(3
Party floor					51.8					[			(3
Party ceiling					51.8					[			(3.
for windows and						lated using	formula 1	/[(1/U-valu	e)+0.04] a	as given in	paragraph	3.2	
* include the area				ls and par	titions		(26)(30)	1 + (32) -					—— <sub>(6</sub>
abric heat los		,	U)				(20)(30)	, ,	(30) + (3)	2) + (225)	(320) -	17.23	(3:
leat capacity Thermal mass			2 – Cm	TEA) ir	k I/m²k⁄				tive Value	2) + (32a). : Madium	(326) =	0	(3
For design assess	•	,		,			acisaly the				ahla 1f	250	(3
an be used inste				CONSTRUCT	on are no	t Kilowii pi	coisely the	riidicative	values of	TIVII III I	able II		
hermal bridge	es : S (L	x Y) cal	culated	using Ap	pendix I	K						2.82	(3
details of therma		are not kn	own (36) =	= 0.05 x (3	1)								
otal fabric he									(36) =			20.06	(3
entilation hea	i	i e	·							(25)m x (5)	1	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(0
38)m= 26.56	26.42	26.29	25.67	25.55	25.01	25.01	24.91	25.22	25.55	25.79	26.03		(3
leat transfer of	coefficie	nt, W/K	ı		ı	ı		(39)m	= (37) + (	38)m		1	
89)m= 46.61	46.48	46.35	45.72	45.61	45.06	45.06	44.96	45.27	45.61	45.84	46.09		

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com

Average =  $Sum(39)_{1...12}/12=$ 

45.78 age 2 (39)



at loss para	meter (H	HLP), W	m²K					(40)m	= (39)m ÷	(4)			
)m= 0.9	0.9	0.89	0.88	0.88	0.87	0.87	0.87	0.87	0.88	0.88	0.89		
mber of day	e in moi	oth (Tab	lo 1a)					,	Average =	Sum(40) <sub>1</sub>	12 /12=	0.88	(4
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
)m= 31	28	31	30	31	30	31	31	30	31	30	31		(4
									<u> </u>				
Water heat	ing enei	rgy requi	rement:								kWh/ye	ar:	
sumed occu f TFA > 13.9 f TFA £ 13.9	N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x ( <sup>-</sup>	TFA -13.		74		(4
nual averag duce the annua more that 125	l average	hot water	usage by	5% if the $a$	lwelling is	designed t			se target o		5.6		(-
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
water usage ir	iltres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)	•		•			
m= 83.16	80.14	77.11	74.09	71.06	68.04	68.04	71.06	74.09	77.11	80.14	83.16		
arcus content of	hat water	used sel	aulated m	anthly 1	*100 v Vd *	n nm F	Tm / 2600			m(44) <sub>112</sub> =		907.2	(4
ergy content of										_			
m= 123.32	107.86	111.3	97.04	93.11	80.35	74.45	85.43	86.45	100.75	109.98	119.43	4400.40	<b>—</b> ,
stantaneous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		lotal = Su	m(45) <sub>112</sub> =		1189.49	(
m= 18.5	16.18	16.7	14.56	13.97	12.05	11.17	12.82	12.97	15.11	16.5	17.91		(
ter storage		7											
rage volum	,							ame ves	sel		150		(
ommunity h	_			_				a wa \ a wa ta	a # (O) in /	47)			
nerwise if no Iter storage		not wate	er (unis ir	iciudes i	nstantar	ieous co	ווטט וטוווי	ers) ente	er o in (	47)			
If manufact		eclared l	oss facto	or is kno	wn (kWł	n/day):				1.	39		(
mperature fa	actor fro	m Table	2b							0.	54		(-
ergy lost fro	m water	storage	, kWh/ye	ear			(48) x (49)	) =		0.	75		(
If manufact			•										
t water stora ommunity h	•			e 2 (KVV	n/litre/da	ıy)					0		(
lume factor	•		JII 4.3								0		(
mperature fa	actor fro	m Table	2b							<b>—</b>	0		(
ergy lost fro	m water	storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(
nter (50) or (	54) in (5	55)	·							0.	75		(
iter storage	loss cal	culated f	or each	month			((56)m = (	(55) × (41)	m				
m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(
linder contains	dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Appendi	хH	
m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(
ســــــــ mary circuit	loss (ar	nual) fro	m Table	·	•	•	•		•		0		(!
mary on our	iooo (ai	aaij iic	, iii i abic	, 0									`
mary circuit	loss cal	culated t	for each	month (	59)m = 0	(58) ÷ 36	65 × (41)	m					
mary circuit modified by				,	•	. ,	, ,		r thermo	stat)			

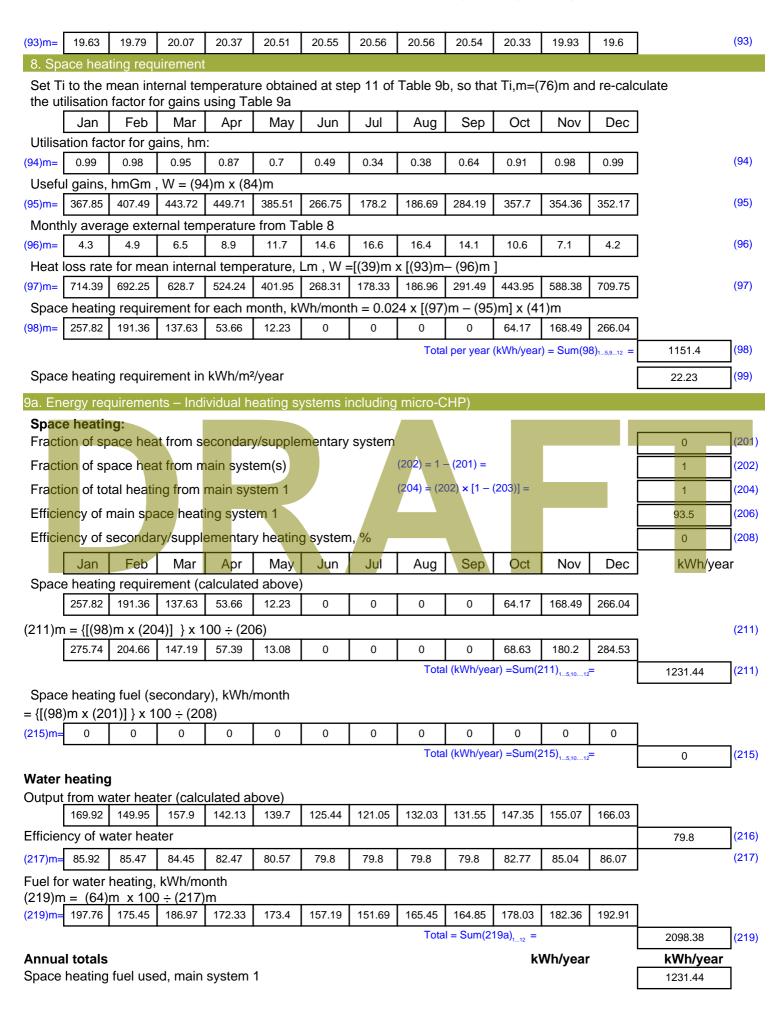


Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$													
	alculated	for each	montn (	(61)m =	(60) ÷ 3	05 × (41)		0	Ι ο	0	Ι ,	]	(61)
(* )	_!			<u> </u>			(00)		(45)	ļ	(57)	(50) (04)	(01)
	<del>-i</del>						<del>`</del>		(45)m + 147.35	(46)m + 1 <sub>55.07</sub>	<del>r` ´                                     </del>	(59)m + (61)m 1	(62)
(62)m= 169.9		157.9	142.13	139.7	125.44	121.05	132.0				166.03	l	(62)
Solar DHW inpu									ir contribu	ion to wate	er neating)		
(add addition $(63)$ m= 0	0	0	0	0	applies 0	o, see Ap	pendi.		0	0	0	1	(63)
Output from water heater												(00)	
(64)m= 169.9		157.9	142.13	139.7	125.44	121.05	132.0	3 131.55	147.35	155.07	166.03	1	
(0.)			1			1 .200	<u> </u>	output from w	<u> </u>	<u> </u>	l	1738.1	(64)
Heat gains fr	om water	heating	k\Mh/m	onth () 2	5 ′ [0 85	× (45)m							J` ′
(65)m= 78.28	1	74.28	68.34	68.23	62.79	62.03	65.68		70.78	72.64	76.99	]	(65)
include (57			ļ	l		<u> </u>			<u> </u>	<u> </u>	<u> </u>	] neating	` ,
5. Internal			, ,		yiii laci i	3 111 1110 (	avveiiii	ig or riot w	rater is in	OIII COIII	indinity i	icating	
Metabolic ga	,			)•									
Jan		Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec		
(66)m= 87.16		87.16	87.16	87.16	87.16	87.16	87.10	<del></del>	87.16	87.16	87.16		(66)
Lighting gain	s (calcula	ted in A	pendix	L, equat	ion L9 o	r L9a), a	lso se	e Table 5					
(67)m= 14.26		10.3	7.8	5.83	4.92	5.32	6.91		11.78	13.75	14.66		(67)
Appliances g	ains (calc	ulated ir	n Append	dix L, eq	uation L	13 or L1	3a), a	lso see Ta	ble 5				
(68)m= 151.9	1 153.48	149.51	141.05	130.38	120.35	113.64	112.0	7 116.04	124.5	135.17	145.2		(68)
Cooking gair	ns (calcula	ted in A	ppendix	L, equat	ion L15	or L15a	), also	see Table	5		!		
(69)m= 31.72	31.72	31.72	31.72	31.72	31.72	31.72	31.72	2 31.72	31.72	31.72	31.72		(69)
Pumps and f	ans gains	(Table	 5a)				•			•	•		
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)	•		•			•	-	
(71)m= -69.73	3 -69.73	-69.73	-69.73	-69.73	-69.73	-69.73	-69.7	3 -69.73	-69.73	-69.73	-69.73		(71)
Water heating	g gains (T	able 5)	•			•		•			•		
(72)m= 105.2	2 103.47	99.84	94.91	91.71	87.21	83.38	88.2	3 90.03	95.13	100.89	103.48		(72)
Total interna	al gains =				(66)	)m + (67)m	1 + (68)	m + (69)m +	(70)m + (7	(1)m + (72)	)m	•	
(73)m= 323.5	3 321.77	311.8	295.91	280.07	264.62	254.48	259.4	1 267.49	283.55	301.96	315.49		(73)
6. Solar gai	ns:												
Solar gains are	e calculated	using sola	r flux from	Table 6a		•	itions to	convert to the	ne applical		tion.		
Orientation:			Area m²		Flu	ıx ble 6a		g_ Table 6b	-	FF		Gains	
_	Table 6d		1112		Ta	Die ba	. –	Table 6b	_ '	able 6c		(W)	,
East 0.9>		X	5.2	28	X 1	19.64	X	0.63	X	0.7	=	31.69	(76)
East 0.9		X	2.6	64	X 1	19.64	X	0.63	x	0.7	=	15.85	(76)
East 0.9		X	5.2	28	x 3	38.42	x	0.63	x	0.7	_ =	62	(76)
East 0.9		X			x 3	38.42	x	0.63	x	0.7	=	31	(76)
East 0.9	0.77	X	5.2	28	x (	63.27	x	0.63	x	0.7	=	102.1	(76)



East	0.9x	0.77	x	2.6	4	X	6	3.27	X	0.63	x	0.7	=	51.05	(76)
East	0.9x	0.77	×	5.2	8	X	9	2.28	x	0.63	x	0.7	=	148.91	(76)
East	0.9x	0.77	X	2.6	4	X	9	2.28	X	0.63	x	0.7	=	74.45	(76)
East	0.9x	0.77	X	5.2	8	X	1	13.09	x	0.63	x	0.7	=	182.49	(76)
East	0.9x	0.77	X	2.6	4	X	1	13.09	X	0.63	x	0.7	=	91.25	(76)
East	0.9x	0.77	X	5.2	8	X	1	15.77	X	0.63	x	0.7	=	186.81	(76)
East	0.9x	0.77	X	2.6	4	X	1	15.77	x	0.63	x	0.7	=	93.41	(76)
East	0.9x	0.77	X	5.2	8	X	1	10.22	x	0.63	x	0.7	=	177.85	(76)
East	0.9x	0.77	X	2.6	4	X	1	10.22	X	0.63	X	0.7	=	88.93	(76)
East	0.9x	0.77	X	5.2	8	X	9	4.68	X	0.63	x	0.7	=	152.77	(76)
East	0.9x	0.77	X	2.6	4	X	9	4.68	X	0.63	x	0.7	=	76.39	(76)
East	0.9x	0.77	X	5.2	8	X	7	3.59	X	0.63	x	0.7	=	118.75	(76)
East	0.9x	0.77	X	2.6	4	X	7	3.59	x	0.63	x	0.7	=	59.37	(76)
East	0.9x	0.77	X	5.2	8	X	4	5.59	X	0.63	x	0.7	=	73.56	(76)
East	0.9x	0.77	X	2.6	4	X	4	5.59	X	0.63	x	0.7	=	36.78	(76)
East	0.9x	0.77	X	5.2	8	X	2	4.49	x	0.63	x	0.7	=	39.52	(76)
East	0.9x	0.77	X	2.6	4	X	2	4.49	X	0.63	x	0.7	=	19.76	(76)
East	0.9x	0.77	X	5.2	8	X	1	6.15	Х	0.63	X	0.7	=	26.06	(76)
East	0.9x	0.77	x	2.6	4	Х	1	6.15	x	0.63	x	0.7	=	13.03	(76)
Solar (	gains in	watts, <mark>calcu</mark>	lated	for eacl	n month	<u> </u>			(83)m	= Sum(74)m .	(82)m			,	
(83)m=			3.15	223.36	273.74	<u> </u>	80.22	266.78	229.	16 178.12	110.3	5 59.27	39.09		(83)
		nternal and	-	` '	•							_	·	,	
(84)m=	371.07	414.76 46	4.95	519.27	553.8	5	44.84	521.26	488.	445.61	393.9	361.23	354.58		(84)
7. Me	ean inter	nal tempera	iture (	(heating	seasor	า)									
Temp	perature	during heat	ing pe	eriods ir	the liv	ing	area f	rom Tab	ole 9,	Th1 (°C)				21	(85)
Utilis	ation fac	tor for gains	s for li	iving are	ea, h1,n	n (s	ee Ta	ble 9a)						-	
	Jan	Feb 1	Mar	Apr	May		Jun	Jul	Αι	ug Sep	Oct	Nov	Dec		
(86)m=	0.99	0.99 0	.97	0.89	0.73		0.52	0.38	0.4	2 0.68	0.93	0.99	1	]	(86)
Mear	n interna	temperatu	re in I	iving are	ea T1 (f	ollo	w ste	ps 3 to 7	in T	able 9c)					
(87)m=	20.22	20.36 20	0.58	20.82	20.96		21	21	21	20.98	20.79	20.47	20.2		(87)
Temp	perature	during heat	ing pe	eriods ir	rest of	f dw	elling	from Ta	ıble 9	), Th2 (°C)					
(88)m=	20.17	20.17 20	0.17	20.18	20.18	2	0.19	20.19	20.	19 20.19	20.18	20.18	20.18	]	(88)
Utilis	ation fac	tor for gains	s for r	est of d	vellina.	h2.	m (se	e Table	9a)	•		•	!	<b>-</b>	
(89)m=	0.99		.96	0.86	0.67	_	0.46	0.31	0.3	5 0.61	0.9	0.98	0.99	]	(89)
Moor	intorna	temperatu	ro in t	ho roct	of dwal	lina	T2 (f	ollow sto	ne 3	to 7 in Tabl	0.00		<u> </u>	1	
(90)m=	19.13	· · ·	9.65	19.99	20.15	Ť	0.19	20.19	20.	T I	19.96	19.5	19.11	1	(90)
V = V		1 1					-					/ing area ÷ (₄		0.45	(91)
			/5:	. 41 '	-11	. 111 -	\ "	Λ Τ.4	. /4			·			` ′
(92)m=		temperatui			ole dwe	HIII		_A × I1	+ (1	– TLA) × 12				7	
	1 10 60	10 70 I 00	ו קחר	20 27	20 51	1 -	0 55	20.56	20.4	56 20 54 1	າດາາ	10.00	10.6		(02)
	19.63		0.07 mean	20.37	20.51		0.55	20.56 m Table	20.	56 20.54 where appro	20.33		19.6	]	(92)







			_		_
Water heating fuel used				2098.38	
Electricity for pumps, fans and electric keep-hot					
central heating pump:		[	30		(230c)
boiler with a fan-assisted flue			45		(230e)
Total electricity for the above, kWh/year	sum of (23	0a)(230g) =		75	(231)
Electricity for lighting			Ī	251.82	(232)
12a. CO2 emissions – Individual heating systems	including micro-CHP				
	<b>Energy</b> kWh/year	Emission fact kg CO2/kWh	or	Emissions kg CO2/yea	r
Space heating (main system 1)	(211) x	0.216	=	265.99	(261)
Space heating (secondary)	(215) x	0.519	= [	0	(263)
Water heating	(219) x	0.216	= [	453.25	(264)
Space and water heating	(261) + (262) + (263) + (264) =		[	719.24	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	= [	38.93	(267)
Electricity for lighting	(232) x	0.519	= [	130.69	(268)
Total CO2, kg/year  TER =	su	m of (265)(271) =	] [	17.16	(272)



User Details: **Assessor Name:** Stroma Number: **Software Version: Software Name:** Stroma FSAP 2012 Version: 1.0.5.12 Property Address: W4-09 , 156 West End Lane, Camden, London Address: 1. Overall dwelling dimensions Av. Height(m) Volume(m³) Area(m<sup>2</sup>) Ground floor 86.4 (1a) x 2.7 (2a) = (3a) 233.28 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)(4)86.4 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =233.28 (5) total m³ per hour main secondary other heating heating x 40 =Number of chimneys (6a) 0 0 x 20 =Number of open flues 0 0 0 (6b) Number of intermittent fans x 10 =(7a)3 30 x 10 =Number of passive vents (7b) 0 0 x 40 =Number of flueless gas fires 0 (7c)Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =(8)0.13 If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9)0 Additional infiltration [(9)-1]x0.1 =0 (10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)0 if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12)If no draught lobby, enter 0.05, else enter 0 (13)0 Percentage of windows and doors draught stripped (14)0 Window infiltration  $0.25 - [0.2 \times (14) \div 100] =$ 0 (15)Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =O (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)5 If based on air permeability value, then  $(18) = [(17) \div 20] + (8)$ , otherwise (18) = (16)0.38 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)2  $(20) = 1 - [0.075 \times (19)] =$ Shelter factor (20)0.85  $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.32 Infiltration rate modified for monthly wind speed Jan Feb Sep Mar Apr May Jun Jul Aug Oct Nov Dec Monthly average wind speed from Table 7 (22)m =5.1 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor  $(22a)m = (22)m \div 4$ (22a)m 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18



Adjusted infiltr	ation rate	e (allowi	ng for sh	nelter an	nd wind s	speed) =	: (21a) x	(22a)m					
0.41	0.4	0.39	0.35	0.35	0.31	0.31	0.3	0.32	0.35	0.36	0.38	]	
Calculate effec		_	rate for t	he appli	cable ca	ise	•	•	•	•	•		
If mechanica			andiv N (2	3h) - (23s	a) <b>v</b> Emy (	equation (	N5N othe	rwisa (23h	n) = (23a)			0	(23a)
If balanced with		•		, ,	,			•	) = (20u)			0	(23b)
a) If balance		-	-	_					2h\m + (	23P) ^ L	1 <sub>—</sub> (23c	0 - 1001	(23c)
(24a)m= 0		0	0	0	0		0	0	0	0	0	]	(24a)
b) If balance	ed mecha	nical ve	L entilation	without	heat red	coverv (ľ	I MV) (24t	$\frac{1}{2}$	2b)m + (	L 23b)	ļ.	_	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	7	(24b)
c) If whole h if (22b)n	nouse extin < 0.5 ×			-	-				.5 × (23b	))		_1	
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24c)
d) If natural if (22b)n	ventilatio n = 1, the			•	•				0.5]			_	
(24d)m= 0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.57	0.57		(24d)
Effective air	change r	ate - er	nter (24a	) or (24b	o) or (24	c) or (24	ld) in bo	x (25)				_	
(25)m= 0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.57	0.57		(25)
3. Heat losse	s and hea	at loss	paramete	er:							_	_	
ELEMENT	Gross area (	s	Openin m	gs	Net Ar A ,ı		U-val W/m2		A X U (W/I	<)	k-valu kJ/m²·		A X k kJ/K
Doo <mark>rs</mark>					1.89	X	1	=	1.89				(26)
Windows Type	∌ 1				5.28	x1	/[1/( 1.4 )+	0.04] =	7				(27)
Windows Type	€2				2.64	x1	/[1/( 1.4 )+	0.04] =	3.5				(27)
Windows Type	e 3				5.28	x1	/[1/( 1.4 )+	0.04] =	7				(27)
Windows Type	e 4				2.64	. x1	/[1/( 1.4 )+	0.04] =	3.5				(27)
Walls Type1	48.6		18.4	В	30.12	2 <b>x</b>	0.18	=	5.42				(29)
Walls Type2	14.31	1	1.89		12.42	2 <b>x</b>	0.18	=	2.24				(29)
Roof	18.7		0		18.7	×	0.13	=	2.43				(30)
Total area of e	elements,	m²			81.6	1							(31)
Party wall					43.7	5 X	0	=	0				(32)
Party floor					86.4					[			(32a)
Party ceiling					67.7					[			(32b)
* for windows and ** include the area						lated using	g formula 1	I/[(1/U-valu	ue)+0.04] a	ns given in	paragrap	h 3.2	
		<b>~</b> / •					(26)(30	) + (32) =				36.4	8 (33)
Fabric heat los	ss, W/K =	S (A x	U)										00)
Fabric heat los Heat capacity		•	U)					((28).	(30) + (32	2) + (32a).	(32e) =	0	(34)
Heat capacity Thermal mass	Cm = S(A paramet	Axk) er (TMF	P = Cm +	,				Indica	ative Value:	Medium	, ,		(34)
Heat capacity	Cm = S(A paramet sments whe ead of a deta	A x k ) er (TMF ere the de ailed calcu	P = Cm ÷ tails of the	construct	ion are no	t known pi	recisely the	Indica	ative Value:	Medium	, ,	0	(34)

if details of thermal bridging are not known (36) = 0.05 x (31)



Total fabria haat laga	(22) + (26)	(07)
Total fabric heat loss  Ventilation heat loss calculated monthly	(33) + (36) = $(38)m = 0.33 \times (25)m \times (5)$	48.94 (37)
Jan Feb Mar Apr May Jun Jul	Aug Sep Oct Nov Dec	
(38)m= 44.97 44.72 44.47 43.31 43.1 42.09 42.09	41.9 42.48 43.1 43.54 43.99	(38)
Heat transfer coefficient, W/K	(39)m = (37) + (38)m	` ,
(39)m= 93.91 93.66 93.41 92.25 92.04 91.03 91.03	90.84 91.42 92.04 92.47 92.93	
(65)	Average = Sum(39) <sub>112</sub> /12=	92.25 (39)
Heat loss parameter (HLP), W/m²K	(40)m = $(39)$ m ÷ $(4)$	<u>'</u>
(40)m= 1.09 1.08 1.08 1.07 1.07 1.05 1.05	1.05 1.06 1.07 1.07 1.08	
Number of days in month (Table 1a)	Average = Sum(40) <sub>112</sub> /12=	1.07 (40)
Jan Feb Mar Apr May Jun Jul	Aug Sep Oct Nov Dec	
(41)m= 31 28 31 30 31 30 31	31 30 31 30 31	(41)
4. Water heating energy requirement:	kWh/ye	ear:
Assumed occupancy, N	2.57	(42)
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9		(42)
if TFA £ 13.9, N = 1	(0.5-1))	
Annual average hot water usage in litres per day Vd,average = Reduce the annual average hot water usage by 5% if the dwelling is designed		(43)
not more that 125 litres per person per day (all water use, hot and cold)		
Jan Feb Mar Apr May Jun Jul	Aug Sep Oct Nov Dec	
Hot water usage in litres per day for each month Vd,m = factor from Table 1c x	(43)	
(44)m= 104.84 101.03 97.22 93.41 89.59 85.78 85.78	89.59 93.41 97.22 101.03 104.84	
Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x l	Total = Sum(44) <sub>112</sub> = DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)	1143.75 (44)
(45)m= 155.48 135.98 140.32 122.34 117.39 101.3 93.86	107.71 109 127.03 138.66 150.57	
	Total = Sum(45) <sub>112</sub> =	1499.64 (45)
If instantaneous water heating at point of use (no hot water storage), enter 0 in	boxes (46) to (61)	
(46)m= 23.32 20.4 21.05 18.35 17.61 15.19 14.08 Water storage loss:	16.16 16.35 19.05 20.8 22.59	(46)
Storage volume (litres) including any solar or WWHRS storage	within same vessel 150	(47)
If community heating and no tank in dwelling, enter 110 litres in		( )
Otherwise if no stored hot water (this includes instantaneous co	•	
Water storage loss:		
a) If manufacturer's declared loss factor is known (kWh/day):	1.39	(48)
Temperature factor from Table 2b	0.54	(49)
Energy lost from water storage, kWh/year	(48) x (49) = 0.75	(50)
<ul> <li>b) If manufacturer's declared cylinder loss factor is not known:</li> <li>Hot water storage loss factor from Table 2 (kWh/litre/day)</li> </ul>	0	(51)
If community heating see section 4.3		(5.1)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) = 0	(54)
Enter (50) or (54) in (55)	0.75	(55)



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



Orientati	on:	Access Factor Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	X	5.28	x	10.63	x	0.63	x	0.7	=	17.16	(74)
North	0.9x	0.77	X	2.64	x	10.63	х	0.63	x	0.7	=	8.58	(74)
North	0.9x	0.77	X	5.28	x	20.32	х	0.63	x	0.7	=	32.79	(74)
North	0.9x	0.77	X	2.64	x	20.32	х	0.63	x	0.7	=	16.4	(74)
North	0.9x	0.77	X	5.28	x	34.53	х	0.63	x	0.7	=	55.72	(74)
North	0.9x	0.77	X	2.64	x	34.53	x	0.63	x	0.7	=	27.86	(74)
North	0.9x	0.77	X	5.28	x	55.46	x	0.63	x	0.7	=	89.5	(74)
North	0.9x	0.77	X	2.64	X	55.46	x	0.63	x	0.7	=	44.75	(74)
North	0.9x	0.77	X	5.28	x	74.72	x	0.63	x	0.7	=	120.56	(74)
North	0.9x	0.77	X	2.64	X	74.72	X	0.63	x	0.7	=	60.28	(74)
North	0.9x	0.77	X	5.28	x	79.99	x	0.63	X	0.7	=	129.07	(74)
North	0.9x	0.77	X	2.64	X	79.99	x	0.63	x	0.7	=	64.53	(74)
North	0.9x	0.77	X	5.28	X	74.68	x	0.63	X	0.7	=	120.5	(74)
North	0.9x	0.77	X	2.64	X	74.68	x	0.63	X	0.7	=	60.25	(74)
North	0.9x	0.77	X	5.28	x	59.25	x	0.63	x	0.7	=	95.6	(74)
North	0.9x	0.77	X	2.64	X	59.25	X	0.63	X	0.7	=	47.8	(74)
North	0.9x	0.77	X	5.28	х	41.52	×	0.63	x	0.7	=	66.99	(74)
North	0.9x	0.77	X	2.64	х	41.52	×	0.63	x	0.7	=	33.5	(74)
North	0.9x	0.77	X	5.28	X	24.19	x	0.63	x	0.7	=	39.03	(74)
North	0.9x	0.77	X	2.64	x	24.19	Х	0.63	x	0.7	=	19.52	(74)
North	0.9x	0.77	X	5.28	x	13.12	X	0.63	x	0.7	=	21.17	(74)
North	0.9x	0.77	X	2.64	Х	13.12	X	0.63	X	0.7	=	10.58	(74)
North	0.9x	0.77	X	5.28	X	8.86	х	0.63	X	0.7	=	14.3	(74)
North	0.9x	0.77	X	2.64	X	8.86	Х	0.63	X	0.7	=	7.15	(74)
South	0.9x	0.77	X	5.28	X	46.75	х	0.63	X	0.7	=	75.44	(78)
South	0.9x	0.77	X	2.64	x	46.75	X	0.63	X	0.7	=	75.44	(78)
South	0.9x	0.77	X	5.28	x	76.57	x	0.63	X	0.7	=	123.55	(78)
South	0.9x	0.77	X	2.64	x	76.57	x	0.63	X	0.7	=	123.55	(78)
South	0.9x	0.77	X	5.28	X	97.53	х	0.63	X	0.7	=	157.38	(78)
South	0.9x	0.77	X	2.64	X	97.53	X	0.63	X	0.7	=	157.38	(78)
South	0.9x	0.77	X	5.28	X	110.23	X	0.63	X	0.7	=	177.88	(78)
South	0.9x	0.77	X	2.64	X	110.23	Х	0.63	X	0.7	=	177.88	(78)
South	0.9x	0.77	X	5.28	X	114.87	X	0.63	X	0.7	=	185.36	(78)
South	0.9x	0.77	X	2.64	X	114.87	х	0.63	X	0.7	=	185.36	(78)
South	0.9x	0.77	X	5.28	X	110.55	х	0.63	X	0.7	=	178.38	(78)
South	0.9x	0.77	X	2.64	x	110.55	x	0.63	x	0.7	=	178.38	(78)
South	0.9x	0.77	X	5.28	x	108.01	х	0.63	x	0.7	=	174.29	(78)
South	0.9x		X	2.64	x	108.01	х	0.63	x	0.7	=	174.29	(78)
South	0.9x	0.77	X	5.28	X	104.89	X	0.63	X	0.7	=	169.26	(78)



South	0.9x	0.77	X	2.0	64	X	10	04.89	x [		0.63	x	0.7	=	169.26	(78)
South	0.9x	0.77	X	5.2	28	X	10	01.89	х		0.63	x	0.7	=	164.41	(78)
South	0.9x	0.77	х	2.0	64	X	10	01.89	x		0.63	x	0.7	=	164.41	(78)
South	0.9x	0.77	Х	5.2	28	X	8	2.59	x [		0.63	x	0.7	=	133.26	(78)
South	0.9x	0.77	Х	2.0	64	X	8	2.59	x [		0.63	x	0.7	=	133.26	(78)
South	0.9x	0.77	х	5.2	28	X	5	5.42	x		0.63	x	0.7	=	89.42	(78)
South	0.9x	0.77	Х	2.0	64	X	5	5.42	x [		0.63	x	0.7	=	89.42	(78)
South	0.9x	0.77	х	5.2	28	X	4	10.4	x [		0.63	x	0.7	=	65.19	(78)
South	0.9x	0.77	Х	2.0	64	X	4	10.4	x [		0.63	x	0.7	=	65.19	(78)
Solar g	ains in	watts, ca	alculated	for eac	h month	1			(83)m	= St	um(74)m .	(82)m	,		•	
(83)m=	176.62	296.29	398.35	490.01	551.57		50.37	529.34	481.	93	429.3	325.08	210.6	151.83		(83)
Total g	ains – i	nternal a	and sola	r (84)m :	= (73)m	+ (8	83)m	, watts						1	1	
(84)m=	613.84	731.41	819.37	888.25	926.58	9	03.04	867.5	826.	19	785.28	704.06	616.03	577.19		(84)
7. Mea	an inter	nal temp	erature	(heating	seasor	1)										
Temp	erature	during h	neating p	periods i	n the livi	ing	area f	rom Tab	ole 9,	Th	1 (°C)				21	(85)
Utilisa	ition fac	tor for g	ains for	living ar	ea, h1,m	า (ร	ee Ta	ble 9a)								
	Jan	Feb	Mar	Apr	May		Jun	Jul	Αι	ıg	Sep	Oct	Nov	Dec		
(86)m=	1	0.99	0.97	0.92	0.81		0.62	0.46	0.5	5	0.74	0.94	0.99	1		(86)
Mean	interna	l temper	ature in	living ar	ea T1 (f	ollo	w ste	ps 3 to 7	7 in T	able	9c)					
(87)m=	19.95	20.14	20.38	20.67	20.88		20.98	21	20.9		20.94	20.67	20.25	19.91		(87)
Tomp	oraturo	during h	neating r	eriods i	roct of	dv	ollina	from Ta	hlo 0	Th	2 (%C)					
(88)m=	20.01	20.01	20.02	20.03	20.03	-	20.04	20.04	20.0	_	20.04	20.03	20.03	20.02		(88)
									0-1							, ,
Utilisa (89)m=	0.99	0.98	0.96	rest of d	welling, 0.75	$\overline{}$	m (se 0.54	0.36	9a) 0.4	, 1	0.66	0.92	0.99	1		(89)
` ′ [			<u> </u>	<u> </u>	<u> </u>				<u> </u>				0.99	_ '		(00)
г		<u> </u>		the rest		┰Ŭ	<del></del>		<del>'</del>	_				1	1	(0.0)
(90)m=	18.62	18.89	19.25	19.65	19.92	2	20.02	20.04	20.0	04	19.99	19.67	19.08	18.58		(90)
											I	LA = LIVII	ng area ÷ (4	4) =	0.23	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	ellin	g) = fl	_A × T1	+ (1 -	– fL	A) × T2				•	
(92)m=	18.93	19.18	19.52	19.89	20.14	2	20.25	20.26	20.2	26	20.22	19.9	19.35	18.89		(92)
· · · · r			T T	n interna		$\overline{}$				$\overline{}$					1	
(93)m=	18.93	19.18	19.52	19.89	20.14	2	20.25	20.26	20.2	26	20.22	19.9	19.35	18.89		(93)
		ting requ														
				mperatu using Ta		ned	at ste	ep 11 of	lable	e 9b	, so tha	t Ti,m=(	76)m an	d re-cald	culate	
	Jan	Feb	Mar	Apr	May	Π	Jun	Jul	Αι	ıa	Sep	Oct	Nov	Dec		
เ Utilisa		tor for g		<u> </u>	Ια,	<u> </u>	<u> </u>			<u> </u>	ООР		1 1101			
(94)m=	0.99	0.98	0.96	0.89	0.76		0.56	0.38	0.4	2	0.67	0.91	0.98	0.99		(94)
ւ Usefu	I gains,	hmGm	, W = (9	4)m x (8	4)m	-									1	
(95)m=	608.9	717.34	783.11	792.56	704.32	5	03.15	332.14	348.	83	529.82	642.26	604.84	573.71		(95)
Month	ly aver	age exte	rnal ten	peratur	e from T	abl	e 8								•	
(96)m=	4.3	4.9	6.5	8.9	11.7		14.6	16.6	16.	4	14.1	10.6	7.1	4.2		(96)
Heat I	oss rate	for mea	an interr	nal temp	erature,	Lm	, W =	=[(39)m :	x [(93	3)m-	- (96)m	]			•	
(97)m=	1373.79	1337.83	1215.86	1014.08	777.09	5	14.05	333.32	350.	81	559.11	856.3	1132.89	1365.03		(97)



Space heating requirer	ment fo	r each n	nonth, k\	Wh/mont	:h = 0.02	24 x [(97)	)m – (95	)m] x (4 <sup>-</sup>	1)m			
(98)m= 569.08 416.97	321.96	159.5	54.14	0	0	0	0	159.24	380.2	588.74		_
						Tota	l per year	(kWh/year	) = Sum(9	8) <sub>15,912</sub> =	2649.83	(98)
Space heating requirer	ment in	kWh/m²	/year							[	30.67	(99)
9a. Energy requirements	s – Indi	vidual h	eating sy	/stems i	ncluding	micro-C	HP)					
Space heating:	f=====================================		ما مصروار		a a.t. a					г		7(204)
Fraction of space heat				mentary	-	(202) = 1 -	_ (201) _			Ĺ	0	(201)
Fraction of space heat Fraction of total heating		•	, ,			(204) = (204)	,	(203)] =		L T	1	(204)
Efficiency of main space	_	•				(20.)	o=, <sub>[</sub> .	(200)]			93.5	(206)
Efficiency of secondary				n system	ı %					L T	0	(208)
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	<b>」</b> ` ′
Space heating requirer					Jui	Nug	ОСР	<u> </u>	1404	Dec	KVVII/yC	ai
569.08 416.97	321.96	159.5	54.14	0	0	0	0	159.24	380.2	588.74		
$(211)$ m = {[(98)m x (204)	)] } x 1	00 ÷ (20	6)									(211)
608.64 445.96	344.35	170.59	57.9	0	0	0	0	170.31	406.63	629.67		
						Tota	I (kWh/yea	ar) =Sum(2	211) <sub>15,1012</sub>	į= L	2834.04	(211)
Space heating fuel (see $= \{[(98)m \times (201)]\} \times 100$			month									
$ = \{[(90)   11 \times (201)] \} \times 100 $ $ (215) m = 0 \qquad 0 $	0 + (20	0	0	0	0	0	0	0	0	0		
						Tota	I (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>	<b>,</b>	0	(215)
Water heating										_		
Output from water heate	er (calcu 186.92	ulated al	oove) 163.98	146.39	140.46	154.31	154.09	173.62	183.75	197.17		
Efficiency of water heate		107.43	103.90	140.59	140.40	134.31	134.09	175.02	103.73	197.17	79.8	(216)
(217)m= 87.43 87.01	86.25	84.68	82.21	79.8	79.8	79.8	79.8	84.58	86.71	87.55	70.0	(217)
Fuel for water heating, k	ـــــــــد دWh/mc	onth				ļ		<u> </u>				
$(219)m = (64)m \times 100 - (219)m = 231.13 = 204.66$	÷ (217)। 216.71	m 197.71	199.46	183.44	176.01	193.37	193.09	205.26	211.91	225.2		
(219)111= 231.13   204.00	210.71	197.71	199.46	103.44	176.01		I = Sum(2		211.91	225.2	2437.96	(219)
Annual totals							`		Wh/year		kWh/yeaı	
Space heating fuel used	l, main	system	1						, ,		2834.04	
Water heating fuel used	Í									Ī	2437.96	1
Electricity for pumps, far	ns and	electric	keep-hot	t								
central heating pump:										30		(230c
boiler with a fan-assiste	ed flue									45		(230e
		Mh/yoo	r			sum	of (230a).	(230g) =		 	75	_
TOTAL ELECTRICITY FOR THE A	(D)(DVE K										/5	(231)
Total electricity for the a Electricity for lighting	ibove, k	wii/yea					, ,	ν ο,		L T	75 366.31	(231)

EnergyEmission factorEmissionskWh/yearkg CO2/kWhkg CO2/year



Space heating (main system 1)	(211) x	0.216	=	612.15	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	526.6	(264)
Space and water heating	(261) + (262) + (263) + (264) =			1138.75	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	190.12	(268)
Total CO2, kg/year	sum of	f (265)(271) =		1367.79	(272)

TER = 15.83 (273)



User Details: **Assessor Name:** Stroma Number: **Software Version: Software Name:** Stroma FSAP 2012 Version: 1.0.5.12 Property Address: W5-12 , 156 West End Lane, Camden, London Address: 1. Overall dwelling dimensions Av. Height(m) Volume(m³) Area(m<sup>2</sup>) Ground floor 51.8 (1a) x 2.7 (2a) = (3a) 139.86 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)(4)51.8 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =139.86 (5) total m³ per hour main secondary other heating heating x 40 =Number of chimneys (6a) 0 0 x 20 =Number of open flues 0 0 0 (6b) Number of intermittent fans x 10 =(7a)2 20 x 10 =Number of passive vents (7b) 0 0 x 40 =Number of flueless gas fires 0 (7c)Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =(8)0.14 If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9)0 Additional infiltration [(9)-1]x0.1 =0 (10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)0 if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12)If no draught lobby, enter 0.05, else enter 0 (13)0 Percentage of windows and doors draught stripped (14)0 Window infiltration  $0.25 - [0.2 \times (14) \div 100] =$ 0 (15)Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =O (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)5 If based on air permeability value, then  $(18) = [(17) \div 20] + (8)$ , otherwise (18) = (16)0.39 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)3  $(20) = 1 - [0.075 \times (19)] =$ Shelter factor (20)0.78  $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.3 Infiltration rate modified for monthly wind speed Jan Feb Sep Mar Apr May Jun Jul Aug Oct Nov Dec Monthly average wind speed from Table 7 (22)m =5.1 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor  $(22a)m = (22)m \div 4$ (22a)m 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18



57.9page 2 (39)

Average =  $Sum(39)_{1...12}/12=$ 

# TER WorkSheet: New dwelling design stage

Adjusted infilt		<u> </u>				speea) =	: (21a) x	(22a)m	T	T	1	1	
0.39 Calculate effe	0.38	0.37	0.34 rate for t	0.33 he appli	0.29 <b>cable ca</b>	0.29	0.28	0.3	0.33	0.34	0.36		
If mechanic		•	ato for t	по арри	00010 00							0	(23a)
If exhaust air h	neat pump	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)) , othe	rwise (23b	) = (23a)			0	(23b)
If balanced with	th heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h	) =				0	(23c)
a) If balanc	ed mech	anical ve	ntilation	with he	at recov	ery (MVI	HR) (24a	a)m = (22)	2b)m + (	23b) × [	1 – (23c)	÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balanc		1				<del>-                                    </del>	<del>- ^ `                                  </del>	<del>``</del>	<del> </del>	23b)		1	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole I	nouse ex m < 0.5 >			-	-				5 × (23h	o)			
(24c)m = 0	0	0	0	0	0	0	0	0	0	0	0	]	(24c)
d) If natural	ventilati	on or wh	ole hous	e positiv	ve input	ventilatio	on from I	oft		<u> </u>		ı	
	m = 1, th								0.5]			,	
(24d)m= 0.58	0.57	0.57	0.56	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.56		(24d)
Effective air	<del></del>		iter (24a	) or (24k	<del></del>	c) or (24	<del> </del>	(25)				1	
(25)m= 0.58	0.57	0.57	0.56	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.56		(25)
3. Heat losse	es and he	eat loss	paramet	er:							_	_	
ELEMENT	Gros		Openin		Net Ar		U-val		AXU		k-value		AXk
	area	(m²)	m	12	A ,r	m²	W/m2	2K	(W/	K)	kJ/m²-l	K	kJ/K
Doors					1.89	<del>-</del>	1	= [	1.89				(26)
Windows Typ					5.28		/[1/( 1.4 )+		7	H			(27)
Windows Typ				\	2.64	x1	/[1/( 1.4 )+	0.04] =	3.5	닡 ,			(27)
Walls Type1	18.3	36	7.92		10.44	1 ×	0.18	=	1.88	<u> </u>		┥	(29)
Walls Type2	18.3	36	1.89		16.47	7 X	0.18	=	2.96	<u> </u>		┥	(29)
Roof	51.		0		51.8	X	0.13	= [	6.73	[			(30)
Total area of	elements	s, m²			88.52	2							(31)
Party wall					37.5	X	0	=	0			<u> </u>	(32)
Party floor					51.8					[			(32a)
* for windows and ** include the are						lated using	g formula 1	/[(1/U-valu	ie)+0.04] a	as given in	paragraph	1 3.2	
Fabric heat lo	ss, W/K	= S (A x	U)	·			(26)(30)	) + (32) =				23.97	(33)
Heat capacity	Cm = S	(A x k )						((28)	.(30) + (32	2) + (32a).	(32e) =	0	(34)
Thermal mass	s parame	eter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
For design asses				construct	ion are no	t known pr	recisely the	e indicative	values of	TMP in T	able 1f		
can be used inste				ioina An	n an div l	/							(00)
Thermal bridg	•	,		• .	-	^						8.34	(36)
Total fabric he		are not kin	OWII (30) -	- 0.00 x (3	'')			(33) +	(36) =			32.3	(37)
Ventilation he	at loss c	alculated	l monthly	y				(38)m	= 0.33 × (	(25)m x (5)	)		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 26.56	26.42	26.29	25.67	25.55	25.01	25.01	24.91	25.22	25.55	25.79	26.03		(38)
Heat transfer	coefficie	nt, W/K						(39)m	= (37) + (	38)m			
(39)m= 58.86	58.73	58.59	57.97	57.86	57.31	57.31	57.21	57.52	57.86	58.09	58.34	]	

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com



at loss para	meter (F	HLP), W/	m²K		г	Г		(40)m	= (39)m ÷	- (4)			
)m= 1.14	1.13	1.13	1.12	1.12	1.11	1.11	1.1	1.11	1.12	1.12	1.13		
mber of day	e in moi	oth (Tab	lo 1a)						Average =	Sum(40) <sub>1</sub> .	12 /12=	1.12	(4
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
)m= 31	28	31	30	31	30	31	31	30	31	30	31		(4
					ļ	ļ	<u>l</u>	<u> </u>	<u>l</u>		<u> </u>		
. Water heat	ing enei	gy requi	rement:								kWh/ye	ar:	
sumed occu				,							74		(4
f TFA > 13.9 f TFA £ 13.9		+ 1./6 x	[1 - exp	(-0.0003	849 x (11	-A -13.9	)2)] + 0.0	J013 х (	IFA -13.	.9)			
nual averag	e hot wa										5.6		(4
duce the annua more that 125	_				_	_	to achieve	a water us	se target o	f			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
water usage ir								Sep	Oct	INOV	Dec		
m= 83.16	80.14	77.11	74.09	71.06	68.04	68.04	71.06	74.09	77.11	80.14	83.16		
, [ 333										m(44) <sub>112</sub> =	L	907.2	(4
ergy content of	hot water	used - cal	culated me	onthly $= 4$ .	190 x Vd,r	n x nm x E	7 Tm / 3600						
m= 123.32	107.86	111.3	97.04	93.11	80.35	74.45	85.43	86.45	100.75	109.98	119.43		
							7		Total = Su	m(45) <sub>112</sub> =		1189.49	(4
st <mark>antane</mark> ous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46	) to (61)					
m= 18.5	16.18	16.7	14.56	13.97	12.05	11.17	12.82	12.97	15.11	16.5	17.91		(4
ater storage orage volum		íncludin	na any sa	olar or W	/WHRS	storage	within s	ame ves	ല		150		(4
community h									001		150		(-
nerwise if no	•			•			` '	ers) ente	er '0' in (	(47)			
ater storage	loss:		`					,	·	,			
If manufact	urer's de	eclared l	oss facto	or is kno	wn (kWh	n/day):				1.	39		(4
mperature fa	actor fro	m Table	2b							0.	54		(4
ergy lost fro		-	-				(48) x (49)	) =		0.	75		(5
If manufact t water stora			-										/5
community h	-			C Z (KVV	11/11116/06	iy <i>)</i>					0		(5
lume factor	•										0		(5
mperature fa	actor fro	m Table	2b								0		(5
ergy lost fro	m water	storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(5
nter (50) or (	54) in (5	55)								0.	75		(5
ater storage	loss cal	culated f	or each	month			((56)m = (	55) × (41)	m				
)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(5
/linder contains	dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Appendi	хН	
)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(5
mary circuit	loss (an	nual) fro	m Tabla	. 3			•	•	•		0		(5
mary circuit	•	•			59)m = (	(58) ÷ 36	65 × (41)	m			-		,
,			53511	(	•		, ,						
modified by	factor fi	om Tabl	le H5 if t	here is s	solar wat	er heatii	ng and a	ı cylinde	r thermo	stat)			

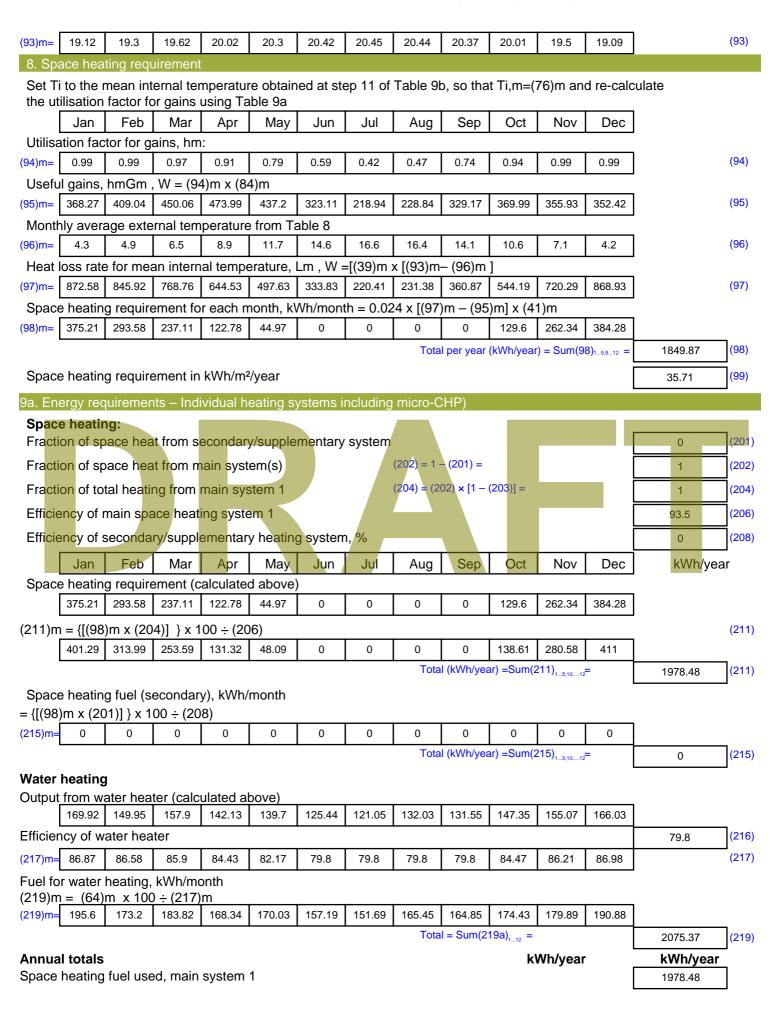


Osmahi Isaa		£		(04)	(00) - 0	05 (44	١						
Combi loss o	calculated 0	or each	montn (	(61)m =	$\frac{(60) \div 3}{0}$	05 × (41	<u> </u>	T 0	Ι ο	0	Ι ,	]	(61)
	!			<u> </u>			(22)		(45)	ļ	(57)	(50) (04)	(01)
	<del></del>						<del>`</del>		(45)m + 147.35	(46)m + 1 <sub>55.07</sub>	<del>r` ´                                     </del>	(59)m + (61)m 1	(62)
(62)m= 169.9		157.9	142.13	139.7	125.44	121.05	132.0				166.03		(62)
Solar DHW inpu									ir contribu	ion to wate	er heating)		
(add addition $(63)$ m= $0$	0	0	0	0	o applies	, see Ap	pendi)		0	0	0	1	(63)
	<u> </u>	<u> </u>										J	(00)
Output from (64)m= 169.9		157.9	142.13	139.7	125.44	121.05	132.0	3 131.55	147.35	155.07	166.03	1	
(6.)	_	100	1				<u> </u>	utput from w	<u> </u>	<u> </u>	l	1738.1	(64)
Heat gains f	rom water	heating	k\Mh/m	onth () 2	5 ′ [0 85	v (45)m							J` ′
(65)m= 78.28	1	74.28	68.34	68.23	62.79	62.03	65.68	1	70.78	72.64	76.99	]	(65)
include (5			ļ	l					<u> </u>	<u> </u>	<u> </u>	] neating	,
5. Internal	•		. ,		yiii iddi i		awciiii	g of flot w	rater is in	OIII COIII	indinity i	icating	
Metabolic ga				).									
Jar		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 87.16		87.16	87.16	87.16	87.16	87.16	87.16	<del></del>	87.16	87.16	87.16		(66)
Lighting gair	ns (calcula	ted in A	opendix	L, equat	ion L9 o	r L9a), a	lso se	Table 5	_				
(67)m= 14.26	<u> </u>	10.3	7.8	5.83	4.92	5.32	6.91	9.28	11.78	13.75	14.66		(67)
Appliances of	gains (calc	ulated ir	n Append	dix L, eq	uation L	13 or L1	3a), al	so see Ta	ble 5			•	
(68)m= 151.9	· `	149.51	141.05	130.38	120.35	113.64	112.0		124.5	135.17	145.2		(68)
Cooking gair	ns (calcula	ted in A	ppendix	L, equat	ion L15	or L15a	), also	see Table	5				
(69)m= $31.72$	<u> </u>	31.72	31.72	31.72	31.72	31.72	31.72		31.72	31.72	31.72		(69)
Pumps and	fans gains	(Table	5a)										
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)		•	•	!				
(71)m= -69.7	3 -69.73	-69.73	-69.73	-69.73	-69.73	-69.73	-69.7	3 -69.73	-69.73	-69.73	-69.73	]	(71)
Water heating	ng gains (T	able 5)	!					•			!	•	
(72)m= 105.2	2 103.47	99.84	94.91	91.71	87.21	83.38	88.28	90.03	95.13	100.89	103.48	]	(72)
Total intern	al gains =		•		(66	)m + (67)m	n + (68)r	n + (69)m +	(70)m + (7	'1)m + (72)	)m		
(73)m= 323.5	3 321.77	311.8	295.91	280.07	264.62	254.48	259.4	1 267.49	283.55	301.96	315.49	]	(73)
6. Solar gai	ns:												
Solar gains ar	e calculated	using sola	r flux from	Table 6a	and assoc	iated equa	ations to	convert to th	ne applical	ole orienta	tion.		
Orientation:			Area		Flu			g_ T 11 01	-	FF		Gains	
	Table 6d		m²		1a	ble 6a	_	Table 6b	_ '	able 6c		(W)	_
East 0.9	0.77	X	5.2	28	χ	19.64	x	0.63	x	0.7	=	31.69	(76)
East 0.9	0.77	X	2.6	64	X ·	19.64	×	0.63	X	0.7	=	15.85	(76)
East 0.9	0.77	X	5.2	28	x (	38.42	_ x	0.63	x [	0.7	=	62	(76)
East 0.9	0.77	x	2.6	64	x (	38.42	×	0.63	x	0.7	=	31	(76)
East 0.9	0.77	X	5.2	28	x (	63.27	x	0.63	х	0.7		102.1	(76)



East	0.9x	0.77	x	2.6	54	X	6	3.27	X	0.63	X	0.7	=	51.05	(76)
East	0.9x	0.77	x	5.2	28	X	9	2.28	X	0.63	×	0.7	=	148.91	(76)
East	0.9x	0.77	x	2.6	34	X	9	2.28	X	0.63	x	0.7	=	74.45	(76)
East	0.9x	0.77	X	5.2	28	X	1	13.09	X	0.63	x	0.7	=	182.49	(76)
East	0.9x	0.77	X	2.6	64	X	1	13.09	X	0.63	x	0.7	=	91.25	(76)
East	0.9x	0.77	X	5.2	!8	X	1	15.77	X	0.63	x	0.7	=	186.81	(76)
East	0.9x	0.77	x	2.6	64	X	1	15.77	X	0.63	x	0.7	=	93.41	(76)
East	0.9x	0.77	X	5.2	28	X	1	10.22	X	0.63	x	0.7	=	177.85	(76)
East	0.9x	0.77	X	2.6	54	X	1	10.22	X	0.63	x	0.7	=	88.93	(76)
East	0.9x	0.77	x	5.2	28	X	9	4.68	X	0.63	X	0.7	=	152.77	(76)
East	0.9x	0.77	X	2.6	54	X	9	4.68	X	0.63	x	0.7	=	76.39	(76)
East	0.9x	0.77	X	5.2	28	X	7	3.59	X	0.63	x	0.7	=	118.75	(76)
East	0.9x	0.77	X	2.6	54	X	7	3.59	x	0.63	x	0.7	=	59.37	(76)
East	0.9x	0.77	X	5.2	28	X	4	5.59	X	0.63	X	0.7	=	73.56	(76)
East	0.9x	0.77	X	2.6	54	X	4	5.59	X	0.63	x	0.7	=	36.78	(76)
East	0.9x	0.77	X	5.2	28	X	2	4.49	x	0.63	x	0.7	=	39.52	(76)
East	0.9x	0.77	X	2.6	64	X	2	4.49	X	0.63	X	0.7	=	19.76	(76)
East	0.9x	0.77	X	5.2	.8	X	1	6.15	X	0.63	X	0.7	=	26.06	(76)
East	0.9x	0.77	x	2.6	64	Х	1	6.15	x	0.63	x	0.7	_	13.03	(76)
Solar	gains in	watts, <mark>calcı</mark>	ulated	for eacl	n month	<u> </u>			(83)m	= Sum(74)m .	(82)m			,	
(83)m=	47.54		53.15	223.36	273.74	<u> </u>	80.22	266.78	229	.16 178.12	110.3	5 59.27	39.09		(83)
		nternal and	-	` '	` \		,					_	·	- I	
(84)m=	371.07	414.76	64.95	519.27	553.8	5	44.84	521.26	488	.57 445.61	393.9	361.23	354.58		(84)
7. Me	ean inter	nal temper	ature	(heating	seasor	n)									
Temp	perature	during hea	ting p	eriods ir	the liv	ing	area f	from Tab	ole 9,	Th1 (°C)				21	(85)
Utilis	ation fac	tor for gain	s for I	iving are	ea, h1,n	n (s	ee Ta	ble 9a)					1	7	
	Jan	Feb	Mar	Apr	May	$\downarrow$	Jun	Jul	Αι	ug Sep	Oct	Nov	Dec	_	
(86)m=	1	0.99	0.98	0.93	0.82		0.64	0.48	0.5	3 0.79	0.96	0.99	1		(86)
Mear	interna	temperatu	ıre in I	iving are	ea T1 (f	follo	w ste	ps 3 to 7	in T	able 9c)			_	_	
(87)m=	19.88	20.03 2	0.28	20.61	20.85	2	20.97	20.99	20.9	99 20.91	20.59	20.18	19.86		(87)
Temp	erature	during hea	ting p	eriods ir	rest of	f dw	elling	from Ta	ble 9	), Th2 (°C)					
(88)m=	19.97	19.97 1	9.98	19.99	19.99		20	20	20	19.99	19.99	19.98	19.98	]	(88)
Utilis	ation fac	tor for gain	s for r	est of d	wellina.	h2.	.m (se	e Table	9a)				•	_	
(89)m=	0.99		0.97	0.91	0.77	_	0.55	0.37	0.4	2 0.71	0.94	0.99	1	]	(89)
Moor	intorna	temperati	ıra in t	the rest	of dwal	lina	T2 (f	ollow etc	ne 3	to 7 in Tabl	0.00)		<u>!</u>	_	
(90)m=	18.5		9.07	19.53	19.85	Ť	9.98	19.99	19.9		19.52	18.94	18.47	1	(90)
(/												/ing area ÷ (₄		0.45	(91)
			//	41 '	ادماء	. 111	\ "	A T4	. /4			•			` ′
		remnerati	ICO ITO	r tha Wh		JIIIN	(11 — fl	/ V I I	<b>エ</b> (1)	$- fLA) \times T2$					
						_					20.04	10.5	10.00	٦	(92)
(92)m=	19.12	19.3 1	9.62	20.02	20.3	2	20.42	20.45	20.4		20.01		19.09		(92)







			_		_
Water heating fuel used				2075.37	
Electricity for pumps, fans and electric keep-hot					
central heating pump:			30		(230c)
boiler with a fan-assisted flue			45		(230e)
Total electricity for the above, kWh/year	sum of (230	Da)(230g) =		75	(231)
Electricity for lighting			Ī	251.82	(232)
12a. CO2 emissions – Individual heating systems	including micro-CHP				
	<b>Energy</b> kWh/year	Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the Emission factoring the	tor	Emissions kg CO2/yea	r
Space heating (main system 1)	(211) x	0.216	=	427.35	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	= [	448.28	(264)
Space and water heating	(261) + (262) + (263) + (264) =		[	875.63	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	= [	38.93	(267)
Electricity for lighting	(232) x	0.519	- [	130.69	(268)
Total CO2, kg/year  TER =	Sui	m of (265)(271) =	] [	20.18	(272)

Energy Strategy



**Be Lean DER** 



User Details: **Assessor Name:** Stroma Number: Stroma FSAP 2012 **Software Version: Software Name:** Version: 1.0.5.12 Property Address: E0-01 Address: 1. Overall dwelling dimensions Av. Height(m) Area(m²) Volume(m³) Ground floor 71 (1a) x 2.7 (2a) =191.7 (3a) Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)(4)71 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =191.7 (5) total m³ per hour main secondary other heating heating x 40 =Number of chimneys (6a) 0 0 x 20 =Number of open flues 0 0 0 (6b) Number of intermittent fans x 10 =(7a)0 0 x 10 =Number of passive vents (7b) 0 0 x 40 =Number of flueless gas fires 0 (7c)Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =÷ (5) (8) If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9)0 Additional infiltration [(9)-1]x0.1 =0 (10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)0 if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12)If no draught lobby, enter 0.05, else enter 0 (13)0 Percentage of windows and doors draught stripped (14)0 Window infiltration  $0.25 - [0.2 \times (14) \div 100] =$ 0 (15)Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =O (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)3 If based on air permeability value, then  $(18) = [(17) \div 20] + (8)$ , otherwise (18) = (16)0.15 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)1  $(20) = 1 - [0.075 \times (19)] =$ Shelter factor (20)0.92  $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.14 Infiltration rate modified for monthly wind speed Jan Feb Jul Sep Mar Apr May Jun Aug Oct Nov Dec Monthly average wind speed from Table 7 (22)m =5.1 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor  $(22a)m = (22)m \div 4$ (22a)m 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18



Adjusted infiltration rate (allowing for shelter and wind	speed) = (21a)	x (22a)m					
0.18 0.17 0.17 0.15 0.15 0.13	0.13 0.13	<del>`</del>	0.15	0.16	0.16	]	
Calculate effective air change rate for the applicable c	ase		<u> </u>		<u> </u>	J	
If mechanical ventilation:	(		\ (00 \			0.5	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv			) = (23a)			0.5	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use						76.5	(23c)
a) If balanced mechanical ventilation with heat recovery	<del>, , , , , , , , , , , , , , , , , , , </del>	<del></del>	<del> </del>		<u> </u>	) ÷ 100] 1	(0.1.)
(24a)m= 0.29 0.29 0.29 0.27 0.27 0.25	0.25 0.25		0.27	0.27	0.28		(24a)
b) If balanced mechanical ventilation without heat re	<del>                                     </del>	<del>i `</del>	<del>r i</del>	•	1	1	(0.41.)
(24b)m= 0 0 0 0 0 0	0 0	0	0	0	0		(24b)
c) If whole house extract ventilation or positive input			F (22h	`			
if $(22b)m < 0.5 \times (23b)$ , then $(24c) = (23b)$ ; othe	$\frac{\text{TWISE } (240) = (240)}{100}$	26) III + 0.	5 <b>x</b> (230	0	0	]	(24c)
` '			0	0		J	(240)
<ul> <li>d) If natural ventilation or whole house positive input if (22b)m = 1, then (24d)m = (22b)m otherwise (</li> </ul>			0.5]				
(24d)m= 0 0 0 0 0 0	0 0	0	0	0	0		(24d)
Effective air change rate - enter (24a) or (24b) or (24	4c) or (24d) in b	ox (25)					
(25)m= 0.29 0.29 0.29 0.27 0.27 0.25	0.25	0.26	0.27	0.27	0.28		(25)
3. Heat losses and heat loss parameter:							_
ELEMENT Gross Openings Net A	rea U-v	alue	AXU		k-value	е А	Χk
		n2K	(W/ł	<)	kJ/m <sup>2</sup> ·l		J/K
Doo <mark>rs</mark>	9 x 1.	4 =	2.646				(26)
Windows Type 4	_						
Windows Type 1 7.5	8 x1/[1/( 1.2	)+ 0.04] =	8.68				(27)
Windows Type 1  Windows Type 2  2.7	1,171,1/10	)+0.04] = [ $)+0.04] = [$	3.11				(27) (27)
	2 x1/[1/( 1.2						` ,
Windows Type 2	2 x1/[1/( 1.2 2 x1/[1/( 1.2	)+ 0.04] =	3.11				(27)
Windows Type 2  Windows Type 3  2.7	2 x1/[1/( 1.2 2 x1/[1/( 1.2 2 x1/[1/( 1.2	)+ 0.04] = [ )+ 0.04] = [ )+ 0.04] = [	3.11				(27) (27)
Windows Type 2  Windows Type 3  Windows Type 4  Floor  Type 4  Floor  Wells Type 4	2 x1/[1/( 1.2 2 x1/[1/( 1.2 2 x1/[1/( 1.2 2 x 0.2	)+ 0.04] = [ )+ 0.04] = [ )+ 0.04] = [ 2 = [	3.11 3.11 3.11 8.52				(27) (27) (27) (27)
Windows Type 2       2.7         Windows Type 3       2.7         Windows Type 4       2.7         Floor       71         Walls Type 1       65.34       21.18       44.7	2 x1/[1/( 1.2 2 x1/[1/( 1.2 2 x1/[1/( 1.2 2 x 0.4 6 x 0.4	)+ 0.04] = [ )+ 0.04] = [ )+ 0.04] = [ 2 = [ 6 = [	3.11 3.11 3.11 8.52 7.07				(27) (27) (27) (28) (29)
Windows Type 2       2.7         Windows Type 3       2.7         Windows Type 4       2.7         Floor       71         Walls Type1       65.34       21.18       44.1         Walls Type2       4.32       1.89       2.4	2 x1/[1/( 1.2 2 x1/[1/( 1.2 2 x1/[1/( 1.2 2 x 0.2 16 x 0.2 3 x 0.2	)+ 0.04] = [ )+ 0.04] = [ )+ 0.04] = [ 2 = [ 6 = [	3.11 3.11 3.11 8.52 7.07 0.37				(27) (27) (27) (28) (29) (29)
Windows Type 2       2.7         Windows Type 3       2.7         Windows Type 4       2.7         Floor       71         Walls Type1       65.34       21.18       44.1         Walls Type2       4.32       1.89       2.4         Walls Type3       7.29       0       7.2	x1/[1/(1.2 x1/[1/(1.2 x1/[1/(1.2 x 0.3 x 0.3 x 0.3 y x 0.3	)+ 0.04] = [ )+ 0.04] = [ )+ 0.04] = [ 2	3.11 3.11 3.11 8.52 7.07 0.37 1.17				(27) (27) (27) (28) (29) (29) (29)
Windows Type 2       2.7         Windows Type 3       2.7         Windows Type 4       2.7         Floor       71         Walls Type1       65.34       21.18       44.3         Walls Type2       4.32       1.89       2.4         Walls Type3       7.29       0       7.2         Roof       6       0       6	2 x1/[1/( 1.2 2 x1/[1/( 1.2 2 x1/[1/( 1.2 2 x 0.4 3 x 0.4 3 x 0.4 9 x 0.4 9 x 0.4	)+ 0.04] = [ )+ 0.04] = [ )+ 0.04] = [ 2	3.11 3.11 3.11 8.52 7.07 0.37				(27) (27) (27) (28) (29) (29) (29) (30)
Windows Type 2       2.7         Windows Type 3       2.7         Windows Type 4       2.7         Floor       71         Walls Type1       65.34       21.18       44.1         Walls Type2       4.32       1.89       2.4         Walls Type3       7.29       0       7.2         Roof       6       0       6         Total area of elements, m²       153.	x1/[1/(1.2 x1/[1/(1.2 x1/[1/(1.2 x 0.4 x 0.4 x 0.4 x 0.4 x 0.4 x 0.4 x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x	)+ 0.04] = [ )+ 0.04] = [ )+ 0.04] = [ 2	3.11 3.11 3.11 8.52 7.07 0.37 1.17				(27) (27) (27) (28) (29) (29) (29) (30) (31)
Windows Type 2       2.7         Windows Type 3       2.7         Windows Type 4       2.7         Floor       71         Walls Type1       65.34       21.18       44.1         Walls Type2       4.32       1.89       2.4         Walls Type3       7.29       0       7.2         Roof       6       0       6         Total area of elements, m²       153.         Party wall       19.1	x1/[1/(1.2 x1/[1/(1.2 x1/[1/(1.2 x 0.2 x 0.2	)+ 0.04] = [ )+ 0.04] = [ )+ 0.04] = [ 2	3.11 3.11 3.11 8.52 7.07 0.37 1.17				(27) (27) (27) (28) (29) (29) (29) (30) (31)
Windows Type 2       2.7         Windows Type 3       2.7         Windows Type 4       2.7         Floor       71         Walls Type 1       65.34       21.18       44.1         Walls Type 2       4.32       1.89       2.4         Walls Type 3       7.29       0       7.2         Roof       6       0       6         Total area of elements, m²       153.         Party wall       19.1         Party ceiling       65         * for windows and roof windows, use effective window U-value calculations	x1/[1/(1.2 x1/[1/(1.2 x1/[1/(1.2 x 0.3 x 0.3 x 0.3 x 0.3 y x 0.3 y x 0.3 x 0.3	)+ 0.04] = [ )+ 0.04] = [ )+ 0.04] = [ 2	3.11 3.11 3.11 8.52 7.07 0.37 1.17 0.72	s given in	paragraph		(27) (27) (27) (28) (29) (29) (29) (30) (31)
Windows Type 2       2.7         Windows Type 3       2.7         Windows Type 4       2.7         Floor       71         Walls Type1       65.34       21.18       44.1         Walls Type2       4.32       1.89       2.4         Walls Type3       7.29       0       7.2         Roof       6       0       6         Total area of elements, m²       153.         Party wall       19.1         Party ceiling       65	x1/[1/(1.2 x1/[1/(1.2 x1/[1/(1.2 x 0.2 x	)+ 0.04] = [ )+ 0.04] = [ )+ 0.04] = [ 2	3.11 3.11 3.11 8.52 7.07 0.37 1.17 0.72	s given in	paragraph	13.2	(27) (27) (27) (28) (29) (29) (29) (30) (31)
Windows Type 2  Windows Type 3  Windows Type 4  Floor  Walls Type1  65.34  Walls Type2  4.32  Name of 6  Total area of elements, m²  Party wall  Party ceiling  * for windows and roof windows, use effective window U-value calculations  * include the areas on both sides of internal walls and partitions	x1/[1/(1.2 x1/[1/(1.2 x1/[1/(1.2 x 0.2 x	$\begin{array}{c} (1) + 0.04 \\ (2) + 0.04 \\ (3) + 0.04 \\ (4) = [ \\ (4) + 0.04 ] \\ (5) = [ \\ (6) = [ \\ (6) = [ \\ (6) = [ \\ (12) = [ \\ (12) = [ \\ (13) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (1$	3.11 3.11 3.11 8.52 7.07 0.37 1.17 0.72				(27) (27) (27) (28) (29) (29) (30) (31) (32) (32b)
Windows Type 2       2.7         Windows Type 3       2.7         Windows Type 4       2.7         Floor       71         Walls Type1       65.34       21.18       44.1         Walls Type2       4.32       1.89       2.4         Walls Type3       7.29       0       7.2         Roof       6       0       6         Total area of elements, m²       153.         Party wall       19.1         Party ceiling       65         ** for windows and roof windows, use effective window U-value calculations         *** include the areas on both sides of internal walls and partitions         Fabric heat loss, W/K = S (A x U)	2 x1/[1/( 1.2 2 x1/[1/( 1.2 2 x1/[1/( 1.2 2 x1/[1/( 1.2 2 x 0.4 3 x 0.4 9 x 0.4 9 x 0.4 95 x 0.4 95 y 0.4 95 y 0.4 95 y 0.4 95 y 0.4 95 y 0.4 95 y 0.4 96 y 0.4 97 y 0.4 98 y 0.4 99 y 0.4 99 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y	$\begin{array}{c} )+0.04] = [\\ )+0.04] = [\\ )+0.04] = [\\ \hline 2                                 $	3.11 3.11 3.11 8.52 7.07 0.37 1.17 0.72 0	?) + (32a).		44.74	(27) (27) (27) (28) (29) (29) (30) (31) (32) (32b)
Windows Type 2       2.7         Windows Type 3       2.7         Windows Type 4       2.7         Floor       71         Walls Type1       65.34       21.18       44.1         Walls Type2       4.32       1.89       2.4         Walls Type3       7.29       0       7.2         Roof       6       0       6         Total area of elements, m²       153.         Party wall       19.1         Party ceiling       65         * for windows and roof windows, use effective window U-value calculations         ** include the areas on both sides of internal walls and partitions         Fabric heat loss, W/K = S (A x U)         Heat capacity Cm = S(A x k)	2 x1/[1/( 1.2 2 x1/[1/( 1.2 2 x1/[1/( 1.2 2 x 1/[1/( 1.2 2 x 0.7 3 x 0.7 9 x 0.7 9 x 0.7 95 x 0.7 17 x 0	$\begin{array}{c} )+0.04] = \\ \\ )+0.04] = \\ \\ \\ )+0.04] = \\ \\ \hline \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	3.11 3.11 3.11 8.52 7.07 0.37 1.17 0.72  0  1e)+0.04] a  1.(30) + (32)  tive Value:	?) + (32a). Medium	(32e) =	44.74	(27) (27) (27) (28) (29) (29) (29) (30) (31) (32) (32b)
Windows Type 3  Windows Type 4  Floor  Walls Type1  65.34  Walls Type2  4.32  Walls Type3  Roof  6  Total area of elements, m²  Party wall  Party ceiling  * for windows and roof windows, use effective window U-value calculations  Fabric heat loss, W/K = S (A x U)  Heat capacity Cm = S(A x k)  Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²l	2 x1/[1/( 1.2 2 x1/[1/( 1.2 2 x1/[1/( 1.2 2 x1/[1/( 1.2 2 x 1/[1/( 1.2 3 x 0.² 3 x 0.² 9 x 0.² 9 x 0.² 17 x 0.²  17 x 0.²  18 y 0.²  19 y 0.²  10 y 0.²  11 y 0.²  12 y 0.²  13 y 0.²  14 y 0.²  15 y 0.²  16 y 0.²  17 y 0.²  17 y 0.²  18 y 0.²  19 y 0.²  10 y 0.²  11 y 0.²  12 y 0.²  13 y 0.²  14 y 0.²  15 y 0.²  16 y 0.²  17 y 0.²  18 y 0.²  19 y 0.²  10 y 0.²  11 y 0.²  12 y 0.²  13 y 0.²  14 y 0.²  15 y 0.²  16 y 0.²  17 y 0.²  18 y 0.²  19 y 0.²  10 y 0.²  11 y 0.²  12 y 0.²  13 y 0.²  14 y 0.²  15 y 0.²  16 y 0.²  17 y 0.²  18 y 0.²  19 y 0.²  10 y 0.²  11 y 0.²  12 y 0.²  13 y 0.²  14 y 0.²  15 y 0.²  16 y 0.²  17 y 0.²  18 y 0.²  19 y 0.²  10 y 0.²  10 y 0.²  11 y 0.²  12 y 0.²  13 y 0.²  14 y 0.²  15 y 0.²  16 y 0.²  17 y 0.²  18 y 0.²  19 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10 y 0.²  10	$\begin{array}{c} )+0.04] = \\ \\ )+0.04] = \\ \\ \\ )+0.04] = \\ \\ \hline \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	3.11 3.11 3.11 8.52 7.07 0.37 1.17 0.72  0  1e)+0.04] a  1.(30) + (32)  tive Value:	?) + (32a). Medium	(32e) =	44.74	(27) (27) (27) (28) (29) (29) (30) (31) (32) (32b)



Total fabric heat loss	if details of the	rmal bridging	are not kn	own (36) =	= 0.05 x (3	1)								_
Same									,	,			64.58	(37)
(38)   18.62   18.4   18.19   17.09   16.87   15.77   15.55   16.21   16.87   17.31   17.75   13.55   16.21   16.87   17.31   17.75   13.55   16.21   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35   17.35					<u> </u>		·	<u> </u>	·	·	<u> </u>			
Heat transfer coefficient, W/K  (39)m= 83.2 82.98 82.77 81.67 81.45 80.35 80.35 80.13 80.79 81.45 81.89 82.33  ***Noverage = Sum(39)+1/2= 81.61 (39) (40)m= (91)m= (11.7 1.17 1.17 1.17 1.17 1.15 1.15 1.15		_		<del></del>	<del></del>	<del>                                     </del>	+	<del> </del>	<del></del>		<u> </u>			(20)
133   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139   139	(38)m= 18.6	18.4	18.19	17.09	16.87	15.77	15.77	15.55	16.21	16.87	17.31	17.75		(38)
Average   Sum(39), v/12   B1.61   (39)   (41)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (40)   (			nt, W/K						· ` ′	= (37) + (	38)m		l	
Heat loss parameter (HLP), W/m²K  (40)m= 1.17 1.17 1.17 1.17 1.15 1.15 1.15 1.13 1.13 1.13 1.13 1.14 1.15 1.15 1.16 1.16  Number of days in month (Table 1a)    May	(39)m= 83.2	2 82.98	82.77	81.67	81.45	80.35	80.35	80.13				l		<b>_</b>
Average   Sum(40),/12=   1.15   (40)	Heat loss pa	arameter (H	HLP), W/	/m²K								12 /12=	81.61	(39)
Number of days in month (Table 1a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  4. Water heating energy requirement:  ***  **Wiff TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)  if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)  if TFA £ 13.9, N = 1  Annual average hot water usage in litres per day Vd, average = (25 x N) + 36  **Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target or not more that 125 litres per person per day all water usa, but and cold)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Hot water usage in litres per day for each month Vam = factor from Table 1c x (43)  (44)m= 66.93 99.4 69.88 86.35 82.83 79.3 79.3 79.3 82.83 86.35 89.88 93.4 96.93  **Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWhimonth (see Tables 1b. 1c., 1d)  ### Listed Table 13.1 108.52 93.65 86.78 99.58 100.77 117.44 128.19 139.21  ### Total = Sum(44) = 1057.39 143.1 108.52 93.65 86.78 99.58 100.77 117.44 128.19 139.21  ### Total = Sum(45) = 1386.41 (45)  ### Instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)  ### Community heating and no tank in dwelling, enter 110 litres in (47)  Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)  Water storage loss:  a) If manufacturer's declared loss factor is known (kWh/day):	(40)m= 1.17	7 1.17	1.17	1.15	1.15	1.13	1.13	1.13	1.14	1.15	1.15	1.16		
4. Water heating energy requirement:  ***XWh/year:**  Assumed occupancy, N  if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)  if TFA £ 13.9, N = 1  Annual average hot water usage in litres per day Vd, average = (25 x N) + 36  **Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target or not more that 125 tires per person per day (all water usa, hot and cod)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Hot water usage in litres per day for each month Vd, m = factor from Table 1c x (43)  (44)m= 96.93 93.4 89.88 86.35 82.83 79.3 79.3 82.83 86.35 89.89 93.4 96.93  Total = Sum(44) = 1057.39 (44)  Energy content of hot water used - calculated monthly = 4.190 x Vd, m x nm x DTm / 3600 kW/mnoth (see Tables 1b, fc; 1d)  (45)m= 143.74 125.72 129.73 113.1 108.52 93.65 86.78 99.58 100.77 117.44 128.19 139.21  Total = Sum(45) = 1386.41 (45)  if instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)  (46)m= 21.56 18.86 19.46 16.97 16.28 14.05 13.02 14.94 15.12 17.62 19.23 20.88  (47)  If community heating and no tank in dwelling, enter 110 litres in (47)  Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)  Water storage loss:  a) If manufacturer's declared loss factor is known (kWh/day):  © (48)  Temperature factor from Table 2b  Energy lost from water storage, kWh/year (48) x (49) = 110 (50)  b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day)  © (50)  Total = Sum(45) = 1057.39 (44)  Energy lost from water storage, kWh/year (48) x (49) = 110 (50)  Energy lost from water storage, kWh/year (48) x (49) = 10.0 (60)  Energy lost from water storage, kWh/year (48) x (49) = 10.0 (60)  Energy lost from water storage, kWh/year (48) x (49) = 10.0 (60)  Energy lost from water storage, kWh/year (48) x (47) x (51) x (52) x (53) = 1.03	Number of o	days in moi	nth (Tab	le 1a)					,	Average =	Sum(40) <sub>1</sub>	12 /12=	1.15	(40)
4. Water heating energy requirement:  Assumed occupancy, N  if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)  if TFA £ 13.9, N = 1  Annual average hot water usage in litres per day Vd, average = (25 x N) + 36  Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target or not more that 125 litres per person per day [all water use, hot and cold]  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Hot water usage in litres per day for each month Vd, me factor from Table 1c x (43)  (44)m = 96.93	Jai	n Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Assumed occupancy, N  if TFA > 13.9, N = 1 + 1.76 × [1 - exp(-0.000349 × (TFA -13.9)2)] + 0.0013 × (TFA -13.9)  if TFA E 13.9, N = 1  Annual average hot water usage in litres per day Vd, average = (25 x N) + 36  Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target or not more that 125 litres per person per day (all water use, hot and cold)  Lan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Hot water usage in litres per day for each month Vd, m = factor from Table 1c x (43)  (44)m = 96.93 93.4 89.88 86.35 82.83 79.3 79.3 82.83 86.36 89.88 93.4 96.93  Energy content of hot water used - calculated monthly = 4.190 x Vd, m x nm x DTm / 3600 kWh/month (see Tables th, 1c, 1d)  (45)m	(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
Assumed occupancy, N  if TFA > 13.9, N = 1 + 1.76 × [1 - exp(-0.000349 × (TFA -13.9)2)] + 0.0013 × (TFA -13.9)  if TFA E 13.9, N = 1  Annual average hot water usage in litres per day Vd, average = (25 x N) + 36  Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target or not more that 125 litres per person per day (all water use, hot and cold)  Lan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Hot water usage in litres per day for each month Vd, m = factor from Table 1c x (43)  (44)m = 96.93 93.4 89.88 86.35 82.83 79.3 79.3 82.83 86.36 89.88 93.4 96.93  Energy content of hot water used - calculated monthly = 4.190 x Vd, m x nm x DTm / 3600 kWh/month (see Tables th, 1c, 1d)  (45)m		•	•				1	1				•		
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA ≥ 13.9, N = 1  Annual average hot water usage in litres per day Vd, average = (25 x N) + 36  Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target or not more that 125 litres per person per day (all water use, hot and cold)  Jan Feb Mar Apr May Jun Juli Aug Sep Oct Nov Dec  Hot water usage in litres per day for each month Vd, m = factor from Table 1c x (43)  (44)m= 96.93 93.4 89.88 86.35 82.83 79.3 79.3 79.3 82.83 86.35 89.88 93.4 96.93  Total = Sum(44)	4. Water h	eating ene	rgy requi	irement:								kWh/ye	ear:	
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA ≥ 13.9, N = 1  Annual average hot water usage in litres per day Vd, average = (25 x N) + 36  Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target or not more that 125 litres per person per day (all water use, hot and cold)  Jan Feb Mar Apr May Jun Juli Aug Sep Oct Nov Dec  Hot water usage in litres per day for each month Vd, m = factor from Table 1c x (43)  (44)m= 96.93 93.4 89.88 86.35 82.83 79.3 79.3 79.3 82.83 86.35 89.88 93.4 96.93  Total = Sum(44)	A course and co		N I										ı	(15)
if TFA £ 13.9, N = 1  Annual average but water usage in litres per day Vd, average = (25 x N) + 36  Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Hot water usage in litres per day for each month Val, m = factor from Table 1c x (43)  (44)m= 96.93 93.4 89.88 86.35 82.83 79.3 79.3 79.3 82.83 86.35 89.88 93.4 96.93  Energy content of hot water used - calculated monthly = 4.190 x Vd, m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)  (45)m= 143.74 125.72 129.73 113.1 108.52 93.65 86.78 99.58 100.77 117.44 128.19 139.21  If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)  (46)m= 21.56 18.86 19.46 16.97 16.28 14.05 13.02 14.94 15.12 17.62 19.23 20.88  Water storage loss:  Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)  If community heating and no tank in dwelling, enter 110 litres in (47)  Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)  Water storage loss:  a) If manufacturer's declared loss factor is known (kWh/day): 0 (48)  Temperature factor from Table 2b 0 (49)  Energy lost from water storage, kWh/year (48) x (49) = 110 (50)  If community heating see section 4.3  Volume factor from Table 2a 1.03 (52)  Temperature factor from Table 2b 0.66 (53)  Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)				[1 - exp	(-0.0003	349 x (TI	FA -13.9	)2)] + 0.0	0013 x ( <sup>-</sup>	ΓFA -13.		.27		(42)
Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  Hot water usage in litres per day for each month Vd.m = factor from Table 1c x (43)  (44)m = \$6.93 \$ 93.4 \$ 89.88 \$ 66.35 \$ 82.83 \$ 79.3 \$ 79.3 \$ 82.83 \$ 86.35 \$ 83.88 \$ 93.4 \$ 96.93  Energy content of hot water used - calculated monthly = 4.190 x Vd.m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)  (45)m = \$143.74\$ \$ 125.72 \$ 129.73 \$ 113.1 \$ 108.52 \$ 93.65 \$ 86.78 \$ 99.58 \$ 100.77 \$ 117.44 \$ 128.19 \$ 139.21  It instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)  Vater storage loss:  Storage volume (litres) including any solar or WWHRS storage within same vessel \$ 0 \$ (47) \$ (47) \$ (47) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (48) \$ (4				i. cyb	( 0.000		71 1010	/_/_	(					
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec												3.12		(43)
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec		_				_	-	to achieve	a water us	se target o	Ť			
Hot water usage in litres per day for each month Vd.m = factor from Table 1c x (43)  (44)m = 96.93								Aug	Con	Oot	Nov	Doo		
(44)m= 96.93 93.4 89.88 86.35 82.83 79.3 79.3 82.83 86.36 89.88 93.4 96.93    Total = Sum(44)_19 = 10,57.39 (44)									Sep	Oct	INOV	Dec		
Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)  (45)m=	(44)m= 96.9	3 93.4	89.88	86.35	82.83	79.3	79.3	82.83	86.35	89.88	93.4	96.93		
(45)me       143.74       125.72       129.73       113.1       108.52       93.65       86.78       99.58       100.77       117.44       128.19       139.21         Total = Sum(45) <sub>112</sub> = 1386.41       Total = Sum(45) <sub>112</sub> = 1386.41       (45)         If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)         Total = Sum(45) <sub>112</sub> = 1386.41       (45)         If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)         Water storage loss:         Storage rolume (litres) including any solar or WWHRS storage within same vessel       0       (47)         If colspan="8">In storage loss:       0       (47)         Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)         Water storage loss:       0       (48)         If manufacturer's declared loss factor is known (kWh/day):       0       (48)         Colspan="8">In manufacturer's declared cylinder loss factor is not known:         Hot water storage loss factor from Table 2 (kWh/litre/day)       0.02       (51)         If in manufacturer's declared cylinder loss factor is not known:         Hot water storage loss factor from Table 2a<	,								<u> </u>				1057.39	(44)
Total = Sum(45) =   1386.41   (45)	Energy conten	t of hot water	used - cal	culated m	onthly $= 4$ .	190 x Vd,i	m x nm x E	OTm / 3600	) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)  (46)m= 21.56	(45)m= 143.	74 125.72	129.73	113.1	108.52	93.65	86.78	99.58	100.77	117.44	128.19	139.21		
(46)me       21.56       18.86       19.46       16.97       16.28       14.05       13.02       14.94       15.12       17.62       19.23       20.88         Water storage loss:         Storage volume (litres) including any solar or WWHRS storage within same vessel       0       (47)         If community heating and no tank in dwelling, enter 110 litres in (47)         Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)         Water storage loss:         a) If manufacturer's declared loss factor is known (kWh/day):       0       (48)         Temperature factor from Table 2b       0       (49)         Energy lost from water storage, kWh/year       (48) x (49) =       110       (50)         b) If manufacturer's declared cylinder loss factor is not known:         Hot water storage loss factor from Table 2 (kWh/litre/day)       0.02       (51)         If community heating see section 4.3         Volume factor from Table 2a       1.03       (52)         Temperature factor from Table 2b       0.6       (53)         Energy lost from water storage, kWh/year       (47) x (51) x (52) x (53) =       1.03       (54)	16 '							h (40		Total = Su	m(45) <sub>112</sub> =	=	1386.41	(45)
Water storage loss:  Storage volume (litres) including any solar or WWHRS storage within same vessel  O  (47)  If community heating and no tank in dwelling, enter 110 litres in (47)  Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)  Water storage loss:  a) If manufacturer's declared loss factor is known (kWh/day):  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  (48) x (49) =  110  (50)  b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day)  If community heating see section 4.3  Volume factor from Table 2a  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  (47) x (51) x (52) x (53) =  1.03  (54)					ı				1	ı	Г	I	ı	(15)
Storage volume (litres) including any solar or WWHRS storage within same vessel 0 (47)  If community heating and no tank in dwelling, enter 110 litres in (47)  Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)  Water storage loss:  a) If manufacturer's declared loss factor is known (kWh/day):  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  (48) × (49) = 110  (50)  b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day)  If community heating see section 4.3  Volume factor from Table 2a  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  (47) × (51) × (52) × (53) = 1.03  (54)	* *		19.46	16.97	16.28	14.05	13.02	14.94	15.12	17.62	19.23	20.88		(46)
If community heating and no tank in dwelling, enter 110 litres in (47)  Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)  Water storage loss:  a) If manufacturer's declared loss factor is known (kWh/day):  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  (48) × (49) = 110  (50)  b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day)  If community heating see section 4.3  Volume factor from Table 2a  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  (47) × (51) × (52) × (53) = 1.03  (54)		-	) includin	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)  Water storage loss:  a) If manufacturer's declared loss factor is known (kWh/day):  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day)  If community heating see section 4.3  Volume factor from Table 2a  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  (47) × (51) × (52) × (53) =  1.03  (54)	If communit	y heating a	and no ta	ınk in dw	elling, e	nter 110	) litres in	(47)						
a) If manufacturer's declared loss factor is known (kWh/day):  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day)  If community heating see section 4.3  Volume factor from Table 2a  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  (47) × (51) × (52) × (53) =  1.03  (54)		,			•			` '	ers) ente	er '0' in (	47)			
Temperature factor from Table 2b  Energy lost from water storage, kWh/year  b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day)  If community heating see section 4.3  Volume factor from Table 2a  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  (47) × (51) × (52) × (53) =  0 (49)  0 (49)  110  110  110  110  110  110  110  1		-												
Energy lost from water storage, kWh/year (48) x (49) = 110 (50) b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day) 0.02 (51) If community heating see section 4.3  Volume factor from Table 2a 1.03 (52) Temperature factor from Table 2b 0.6 (53) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 1.03 (54)	a) If manufa	acturer's de	eclared l	oss facto	or is kno	wn (kWl	h/day):					0		(48)
b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day)  If community heating see section 4.3  Volume factor from Table 2a  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  (47) × (51) × (52) × (53) =  1.03  (54)	Temperatur	e factor fro	m Table	2b								0		(49)
Hot water storage loss factor from Table 2 (kWh/litre/day)  If community heating see section 4.3  Volume factor from Table 2a  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  (47) × (51) × (52) × (53) =  1.03  (51)  1.03  (52)  1.03  (54)	• • • • • • • • • • • • • • • • • • • •		•	-				(48) x (49	) =		1	10		(50)
If community heating see section 4.3  Volume factor from Table 2a  Temperature factor from Table 2b  Energy lost from water storage, kWh/year $ \begin{array}{c cccc}  & 1.03 & (52) \\  & 0.6 & (53) \end{array} $ $ \begin{array}{c ccccc}  & (47) \times (51) \times (52) \times (53) = \\  & 1.03 & (54) \end{array} $	•			-								00		(51)
Volume factor from Table 2a1.03(52)Temperature factor from Table 2b0.6(53)Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) =$ 1.03(54)		-			- (IVVI	, o, uc	~ <i>}  </i>				<u>0.</u>	.02		(31)
Energy lost from water storage, kWh/year $ (47) \times (51) \times (52) \times (53) = 1.03 $ (54)				-							1.	.03		(52)
	Temperatur	e factor fro	m Table	2b							0	0.6		(53)
Enter (50) or (54) in (55)	Energy lost	from water	storage	, kWh/ye	ear			(47) x (51	) x (52) x (	53) =	1.	.03		(54)
	Enter (50)	or (54) in (5	55)								1.	.03		(55)



Water storage loss calculated for each month $((56)m = (55) \times (41)m)$	
(56)m= 32.01 28.92 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01	(56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H	
(57)m= 32.01 28.92 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01	(57)
Primary circuit loss (annual) from Table 3	(58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m	
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26	(59)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m	
(61)m= 0 0 0 0 0 0 0 0 0 0 0 0 0	(61)
Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m + (46)m + (57)m + (59)m + (61)m$	
(62)m= 199.02 175.64 185.01 166.59 163.8 147.14 142.05 154.86 154.26 172.71 181.68 194.48	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)	
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	
(63)m= 0 0 0 0 0 0 0 0 0 0 0	(63)
Output from water heater	
(64)m= 199.02 175.64 185.01 166.59 163.8 147.14 142.05 154.86 154.26 172.71 181.68 194.48	
Output from water heater (annual) <sub>112</sub> 2037.25	(64)
Heat gains from water heating, kWh/month 0.25 [0.85 x (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]	
(65)m= 92.02 81.74 87.36 80.4 80.31 73.93 73.07 77.33 76.3 83.27 85.42 90.51	(65)
in <mark>clude</mark> (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating	
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating  5. Internal gains (see Table 5 and 5a):	
5. Internal gains (see Table 5 and 5a):	
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)
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)
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) (67)
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	, ,
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	, ,
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	(67)
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= 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.5	(67)
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= 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.5	(67) (68)
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	(67) (68)
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	(67) (68) (69)
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= 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.5	(67) (68) (69)
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	(67) (68) (69) (70)
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= 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.5	(67) (68) (69) (70)
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= 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.5	(67) (68) (69) (70) (71)
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	(67) (68) (69) (70) (71)

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

6. Solar gains:



Orientati	ion:	Access Factor Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	X	2.72	x	10.63	x	0.4	x	0.7	=	11.22	(74)
North	0.9x	0.77	x	2.72	x	20.32	х	0.4	x	0.7	=	21.45	(74)
North	0.9x	0.77	x	2.72	x	34.53	х	0.4	x	0.7	=	36.45	(74)
North	0.9x	0.77	x	2.72	x	55.46	x	0.4	x	0.7	=	58.55	(74)
North	0.9x	0.77	x	2.72	x	74.72	x	0.4	x	0.7	=	78.87	(74)
North	0.9x	0.77	x	2.72	x	79.99	х	0.4	x	0.7	=	84.43	(74)
North	0.9x	0.77	x	2.72	x	74.68	х	0.4	x	0.7	=	78.83	(74)
North	0.9x	0.77	x	2.72	x	59.25	x	0.4	x	0.7	=	62.54	(74)
North	0.9x	0.77	x	2.72	x	41.52	x	0.4	x	0.7	=	43.82	(74)
North	0.9x	0.77	x	2.72	x	24.19	x	0.4	x	0.7	=	25.53	(74)
North	0.9x	0.77	X	2.72	X	13.12	X	0.4	X	0.7	=	13.85	(74)
North	0.9x	0.77	X	2.72	x	8.86	x	0.4	x	0.7	=	9.36	(74)
South	0.9x	0.77	x	7.58	x	46.75	X	0.4	x	0.7	=	68.76	(78)
South	0.9x	0.77	x	2.72	x	46.75	x	0.4	x	0.7	=	49.35	(78)
South	0.9x	0.77	X	7.58	x	76.57	x	0.4	x	0.7	=	112.62	(78)
South	0.9x	0.77	X	2.72	X	76.57	X	0.4	X	0.7		80.82	(78)
Sout <mark>h</mark>	0.9x	0.77	X	7.58	х	97.53	x	0.4	x	0.7		143.46	(78)
Sout <mark>h</mark>	0.9x	0.77	x	2.72	х	97.53	×	0.4	x	0.7	=	102.95	(78)
Sout <mark>h</mark>	0.9x	0.77	X	7.58	X	110.23	x	0.4	x	0.7	=	162.14	(78)
Sout <mark>h</mark>	0.9x	0.77	X	2.72	x	110.23	Х	0.4	x	0.7	=	116.36	(78)
Sout <mark>h</mark>	0.9x	0.77	x	7.58	x	114.87	x	0.4	x	0.7	=	168.96	(78)
Sout <mark>h</mark>	0.9x	0.77	X	2.72	х	114.87	X	0.4	x	0.7	=	121.26	(78)
South	0.9x	0.77	X	7.58	X	110.55	X	0.4	X	0.7	=	162.6	(78)
South	0.9x	0.77	X	2.72	X	110.55	X	0.4	X	0.7	=	116.69	(78)
South	0.9x	0.77	X	7.58	x	108.01	x	0.4	X	0.7	=	158.87	(78)
South	0.9x	0.77	X	2.72	x	108.01	x	0.4	x	0.7	=	114.01	(78)
South	0.9x	0.77	X	7.58	x	104.89	x	0.4	X	0.7	=	154.28	(78)
South	0.9x	0.77	X	2.72	x	104.89	x	0.4	x	0.7	=	110.72	(78)
South	0.9x	0.77	X	7.58	X	101.89	X	0.4	X	0.7	=	149.86	(78)
South	0.9x	0.77	X	2.72	X	101.89	X	0.4	X	0.7	=	107.55	(78)
South	0.9x	0.77	X	7.58	X	82.59	X	0.4	X	0.7	=	121.47	(78)
South	0.9x	0.77	X	2.72	X	82.59	X	0.4	X	0.7	=	87.18	(78)
South	0.9x	0.77	X	7.58	X	55.42	X	0.4	X	0.7	=	81.51	(78)
South	0.9x	0.77	X	2.72	X	55.42	X	0.4	X	0.7	=	58.5	(78)
South	0.9x	0.77	X	7.58	x	40.4	x	0.4	x	0.7	] =	59.42	(78)
South	0.9x	0.77	X	2.72	X	40.4	x	0.4	X	0.7	=	42.64	(78)
West	0.9x	0.77	X	2.72	x	19.64	x	0.4	x	0.7	=	10.37	(80)
West	0.9x	0.77	X	2.72	X	38.42	x	0.4	X	0.7	=	20.28	(80)
West	0.9x	0.77	X	2.72	X	63.27	X	0.4	X	0.7	] =	33.39	(80)



West	0.9x	0.77	X	2.7	72	x	9	2.28	x [	(	0.4	x	0.7	=	48.7	(80)
West	0.9x	0.77	X	2.7	72	x	1	13.09	] x [	(	0.4	x	0.7	=	59.69	(80)
West	0.9x	0.77	Х	2.7	72	x	1	15.77	x [	(	0.4	x [	0.7	=	61.1	(80)
West	0.9x	0.77	X	2.7	72	x	1	10.22	_ x [	(	0.4	x	0.7	=	58.17	(80)
West	0.9x	0.77	Х	2.7	72	x	9	4.68	x [	(	0.4	x	0.7	=	49.97	(80)
West	0.9x	0.77	Х	2.7	72	x	7	3.59	x [	(	0.4	x	0.7	=	38.84	(80)
West	0.9x	0.77	X	2.7	72	x	4	5.59	x [		0.4	x	0.7	=	24.06	(80)
West	0.9x	0.77	Х	2.7	72	x	2	4.49	] x [	(	0.4	x	0.7	=	12.93	(80)
West	0.9x	0.77	X	2.7	72	x	1	6.15	_ x [	(	0.4	x	0.7	=	8.52	(80)
ĭ	ains in	watts, ca	alculated	for eac	h month				(83)m	= Sum	n(74)m .	(82)m	1		1	
(83)m=	139.7	235.17	316.25	385.75	428.77		24.82	409.88	377.	51 3	340.07	258.24	166.78	119.94		(83)
ŗ				r (84)m =	<u> </u>	·				ı			1		1	(0.1)
(84)m=	537.85	631.36	700.05	749.56	772.36	74	48.85	721.13	694.	4 6	67.16	605.51	537.25	507.75		(84)
7. Mea	an inter	nal temp	perature	(heating	seasor	1)										
Temp	erature	during h	neating p	eriods i	n the livi	ng	area f	rom Tab	ole 9,	Th1	(°C)				21	(85)
Utilisa	ition fac	tor for g	ains for	living are	ea, h1,m	า (s	ee Ta	ble 9a)			-				1	
	Jan	Feb	Mar	Apr	May		Jun	Jul	Au	ıg	Sep	Oct	Nov	Dec		
(86)m=	0.99	0.99	0.97	0.93	0.83		0.65	0.48	0.52	2	0.75	0.94	0.99	1		(86)
Me <mark>an</mark>	interna	l temp <mark>e</mark> r	ature in	living ar	ea T1 (f	ollo	w ste	ps 3 t <mark>o 7</mark>	in Ta	able 9	9c)					
(87)m=	19.87	20.06	20.31	20.61	20.84	2	0.96	20.99	20.9	9 :	20.93	20.63	20.2	19.84		(87)
Temp	erature	during h	neating p	periods in	n rest of	dw	elling	from Ta	able 9	, Th2	(°C)					
(88)m=	19.94	19.95	19.95	19.96	19.96	1	9.98	19.98	19.9	8	19.97	19.96	19.96	19.95		(88)
Utilisa	ition fac	tor for q	ains for	rest of d	welling.	h2,	m (se	e Table	9a)							
(89)m=	0.99	0.98	0.96	0.9	0.77	$\overline{}$	0.56	0.37	0.41	1	0.67	0.91	0.98	0.99		(89)
Mean	interna	l temper	ature in	the rest	of dwell	ina	T2 (fd	ollow ste	ens 3	to 7 i	n Tabl	e 9c)	•	•		
(90)m=	18.46	18.73	19.1	19.52	19.81	┰	9.95	19.97	19.9		19.92	19.56	18.94	18.42		(90)
L		<u> </u>	<u>l</u>		<u> </u>						f	LA = Livir	ig area ÷ (4	4) =	0.37	(91)
Mean	intorna	l tompor	aturo (fo	or the wh	olo dwa	llin	a) – fl	Λ <b>ν</b> Τ1	<b></b> (1 _	_ fΙ Λ'	\ <b>v</b> T2					
(92)m=	18.98	19.22	19.54	19.92	20.19	т —	20.32	20.35	20.3		20.29	19.95	19.4	18.94		(92)
				n interna					<u> </u>				10.1	10.01		(3 )
(93)m=	18.98	19.22	19.54	19.92	20.19	_	0.32	20.35	20.3	$\overline{}$	20.29	19.95	19.4	18.94		(93)
8. Spa	ace hea	ting requ	uiremen	t												
Set Ti	to the i	mean int	ernal te	mperatu	re obtaiı	ned	at ste	ep 11 of	Table	9b,	so that	t Ti,m=(	76)m an	d re-cald	culate	
the uti	ilisation	factor fo	or gains	using Ta	able 9a	_									Ī	
	Jan	Feb	Mar	Apr	May		Jun	Jul	Au	ıg	Sep	Oct	Nov	Dec		
Г		tor for g		1		Ι.				_					1	(0.4)
(94)m=	0.99	0.98	0.96	0.9	0.79		0.59	0.41	0.45		0.7	0.91	0.98	0.99		(94)
Г	1 gains, 532.62	618.21	, VV = (9- 669.14	4)m x (8 674.69	4)m 606.34	1 4	44.25	298.98	313.0	ng /	164.69	553.35	526.28	503.92	]	(95)
(95)m=   Month		l		perature		1		230.30	J 313.0	00   4	104.09	JJJ.JJ	320.20	303.82		(90)
(96)m=	4.3	4.9	6.5	8.9	11.7	$\overline{}$	14.6	16.6	16.4	<sub>4</sub> T	14.1	10.6	7.1	4.2		(96)
L		<u> </u>	<u> </u>	nal temp	Į								I	L	I	<b>\ -</b> /
(97)m=		1188.24		899.88	691.53		59.88	301.04	316.2		199.77	761.61	1007.31	1213.57		(97)
٠ ، ا		I	L	1	L	_			Ц				I	L	ı	



Space heating requirement for each	month k\	Nh/mon	th = 0.0	24 x [(97	)m – (95	5)ml x (4	1)m			
(98)m= 512.39 383.06 305.25 162.1		0	0	0	0	154.95	r	7.98		
	•		•	Tota	al per year	(kWh/year	r) = Sum(98) <sub>15,</sub>	912 =	2455.5	(98)
Space heating requirement in kWh/i	n²/year								34.58	(99)
9b. Energy requirements – Communi	ty heating	scheme	)							
This part is used for space heating, s Fraction of space heat from seconda							unity schem	e	0	(301)
Fraction of space heat from commun		•	•	(10001	1, 0 11 1	10110				(302)
The community scheme may obtain heat from		,	,	allows for	CHP and	up to four	other heat soul	ces; the		
includes boilers, heat pumps, geothermal and Fraction of heat from Community hea	waste heat f					,		Γ	1	(303a)
Fraction of total space heat from Con	nmunity he	eat pum	р			(3	02) x (303a) =		1	(304a)
Factor for control and charging method	od (Table	4c(3)) fc	r comm	unity hea	ating sys	tem			1	(305)
Distribution loss factor (Table 12c) fo	r commun	ity heati	ng syste	em					1.05	(306)
Space heating								_	kWh/year	_
Annual space heating requirement									2455.5	
Space heat from Community heat pu	mp				(98) x (3	04a) x (30	5) x (306) =		2578.27	(307a)
Efficiency of secondary/supplementa	ry heating	system	in % (fr	om Table	4a or A	Appendix	E)		0	(308
Space heating requirement from second	ondary/sup	plemen	itary sys	tem	(98) x (3	01) x 100 ·	÷ (308) =		0	(309)
Water heating								_		-
Annual water heating requirement									2037.25	
If DHW from community scheme: Water heat from Community heat pur	mp				(64) x (3	03a) x (30	5) x (306) =		2139.11	(310a)
Electricity used for heat distribution				0.01	× [(307a)	(307e) +	· (310a)(310e	e)] =	47.17	(313)
Cooling System Energy Efficiency Ra	itio								0	(314)
Space cooling (if there is a fixed cool	ng system	n, if not	enter 0)		= (107) -	÷ (314) =			0	(315)
Electricity for pumps and fans within mechanical ventilation - balanced, ex	• ,			n outside				Г	154.94	(330a)
warm air heating system fans								F	0	(330b)
pump for solar water heating									0	(330g)
Total electricity for the above, kWh/ye	ear				=(330a)	+ (330b) +	(330g) =		154.94	(331)
Energy for lighting (calculated in App	endix L)							F	314.29	(332)
12b. CO2 Emissions – Community he	eating sch	eme						_		
					ergy		mission fac			
CO2 from other sources of space and	d water he				h/year		g CO2/kWh  5) for the secon		g CO2/year	7,,,,,
Efficiency of heat source 1 (%)		n ulete IS							95.6	(367a)
CO2 associated with heat source 1			[(307b)-	+(310b)] x	100 ÷ (367	′b) x	0.22	] = 1	1065.85	(367)
Electrical energy for heat distribution				[(313) x		L	0.52	] =	24.48	(372)



Total CO2 associated with community systems	(363)(366) + (368)(372)		=	1090.34	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or insta	antaneous heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			1090.34	(376)
CO2 associated with electricity for pumps and fans within	dwelling (331)) x	0.52	=	80.41	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	163.12	(379)
Total CO2, kg/year sum of (376)(382):	=			1333.87	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =				18.79	(384)
El rating (section 14)				84.59	(385)





User Details: **Assessor Name:** Stroma Number: Stroma FSAP 2012 **Software Version: Software Name:** Version: 1.0.5.12 Property Address: E1-18 Address: 1. Overall dwelling dimensions Av. Height(m) Area(m²) Volume(m³) Ground floor (1a) x 2.7 (2a) =135 (3a) 50 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)(4)50 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =135 (5) total m³ per hour main secondary other heating heating x 40 =Number of chimneys (6a) 0 0 x 20 =Number of open flues 0 0 0 (6b) Number of intermittent fans x 10 =(7a)0 0 x 10 =Number of passive vents (7b) 0 0 x 40 =Number of flueless gas fires 0 (7c)Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =÷ (5) (8) If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9)0 Additional infiltration [(9)-1]x0.1 =0 (10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)0 if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12)If no draught lobby, enter 0.05, else enter 0 (13)0 Percentage of windows and doors draught stripped (14)0 Window infiltration  $0.25 - [0.2 \times (14) \div 100] =$ 0 (15)Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =O (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)3 If based on air permeability value, then  $(18) = [(17) \div 20] + (8)$ , otherwise (18) = (16)0.15 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)3  $(20) = 1 - [0.075 \times (19)] =$ Shelter factor (20)0.78  $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.12 Infiltration rate modified for monthly wind speed Jan Feb Jul Sep Mar Apr May Jun Aug Oct Nov Dec Monthly average wind speed from Table 7 (22)m =5.1 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor  $(22a)m = (22)m \div 4$ (22a)m 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18



Adjusted infiltr	ation rate	(allowii	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14	]	
Calculate effec		-	ate for t	he appli	cable ca	se		<u> </u>	<u> </u>	<u>I</u>	!	J	
If mechanica							.=					0.5	(23a)
If exhaust air h									) = (23a)			0.5	(23b)
If balanced with		•	-	_								76.5	(23c)
a) If balance						<u> </u>	<u> </u>	ŕ	<del> </del>	<del></del>	<u>` `                                  </u>	÷ 100]	
(24a)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.23	0.23	0.24	0.25	0.25		(24a)
b) If balance	ed mechar	nical ve	ntilation	without	heat rec	overy (N	/IV) (24b	p)m = (22)	2b)m + (2	23b)		1	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b
c) If whole h				•	•				_	,			
	n < 0.5 × (	<u>`</u>	,	, ,	<u> </u>	· · ·	<u> </u>	ŕ	· ` ·	<del></del>		1	(240
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	J	(24c
d) If natural if (22b)n	ventilation n = 1, ther			•	•				0.5]			_	
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d
Effective air	change ra	ate - en	ter (24a	) or (24b	o) or (24	c) or (24	d) in box	(25)				_	
(25)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.23	0.23	0.24	0.25	0.25		(25)
3. Heat losse	s and hea	t loss p	aramete	er:								_	_
ELEMENT	Gross		Openin		Net Ar	ea	U-val	ue	AXU		k-value	9	AXk
	are <mark>a (</mark> r	m²)	· m		A ,r	n²	W/m2	!K	(W/I	<)	kJ/m²-	K	kJ/K
Doors					1.89	Х	1.4	= [	2.646				(26)
Windows Type	e 1				5.42	x1,	/[1/( 1.2 )+	0.04] =	6.21				(27)
Windows Type	2				2.72	x1,	/[1/( 1.2 )+	0.04] =	3.11				(27)
Windows Type	e 3				2.72	x1,	/[1/( 1.2 )+	0.04] =	3.11	٦			(27)
Walls Type1	22.95		10.86	3	12.09	x	0.16		1.93				(29)
Walls Type2	20.79		1.89		18.9	x	0.15	<u> </u>	2.84	T i		7 F	(29)
Total area of e		m²			43.74								(31)
Party wall					35.37	, x	0		0	<b>–</b> [			(32)
Party floor					50							╡	(32a
Party ceiling					50							╡ ⊨	(32b
* for windows and	roof window	vs. use e	ffective wi	ndow U-va		 ated usino	formula 1	/[(1/U-valu	ıe)+0.041 a	L ns aiven in	paragraph		(320
** include the area								. (	,	J	r 3 p.		
Fabric heat los	ss, W/K =	S (A x	U)				(26)(30)	+ (32) =				19.86	(33)
Heat capacity	Cm = S(A)	xk)						((28)	(30) + (32	2) + (32a).	(32e) =	0	(34)
Thermal mass	paramete	er (TMP	? = Cm ÷	- TFA) ir	ı kJ/m²K			Indica	tive Value	Medium		250	(35)
For design assess can be used inste				construct	ion are no	t known pr	ecisely the	e indicative	values of	TMP in Ta	able 1f		_
Thermal bridge	es : S (L x	Y) cald	culated u	using Ap	pendix l	<						6.55	(36)
if details of therma		re not kno	own (36) =	= 0.05 x (3	1)			(33) +	(36) =			26.41	(37)
Ventilation hea		culated	monthly	/					$= 0.33 \times ($	25)m x (5)	)	20.41	(07)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
Jail	1 60	ivial	Λþi	iviay	Juli	Jui	Aug	l geb	1 001	INOV	l Dec	J	



(38)m= 11.	84 11.71	11.58	10.93	10.8	10.15	10.15	10.03	10.41	10.8	11.06	11.32		(38)
Heat transf	fer coefficie	nt, W/K	-					(39)m	= (37) + (37)	38)m			
(39)m= 38.	25 38.12	37.99	37.34	37.21	36.57	36.57	36.44	36.82	37.21	37.47	37.73		
Heat loss r	oarameter (H	-II D) \\\/	/m²K						Average = = (39)m ÷	Sum(39) <sub>1.</sub>	12 /12=	37.31	(39)
(40)m= $0.7$	<del></del>	0.76	0.75	0.74	0.73	0.73	0.73	0.74	0.74	0.75	0.75		
` /	<u> </u>		<u> </u>				<u> </u>	,	L Average =	Sum(40) <sub>1</sub> .	12 /12=	0.75	(40)
Number of	days in mo	nth (Tab	le 1a)										
	an Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 3	1 28	31	30	31	30	31	31	30	31	30	31	I	(41)
4. Water l	neating ene	rgy requi	irement:								kWh/ye	ear:	
	occupancy,						<b>.</b>				69		(42)
	13.9, N = 1 13.9, N = 1	+ 1.76 x	[1 - exp	(-0.0003	849 x (TF	-A -13.9)	)2)] + 0.0	0013 x (	ΓFA -13.	.9)			
Annual ave	erage hot wa										.34		(43)
	nnual average 125 litres per				_	_	to achieve	a water us	se target o	f			
		,	<u> </u>				A.1.0	Con	Oct	Nov	Doo		
	n Feb	Mar r day for ea	Apr ach month	May $Vd,m = fa$	Jun ctor from 7	Jul Fable 1c x	Aug (43)	Sep	Oct	Nov	Dec		
(44)m= 81.	77 78.8	75.83	72.85	69.88	66.91	66.91	69.88	72.85	75.83	78.8	81.77		
( ) [ ]										m(44) <sub>112</sub> =		892.08	(44)
Energy conte	nt of hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x C	)Tm / 3600	kWh/mor	nth (see Ta	bles 1b, 1	c, 1d)		
(45)m= 121	.27 106.06	109.45	95.42	91.56	79.01	73.21	84.01	85.01	99.08	108.15	117.44		
If instantaneo	us water heati	na at point	of use (no	hot water	r storage).	enter 0 in	boxes (46		Total = Su	m(45) <sub>112</sub> =	•	1169.66	(45)
(46)m= 18.		16.42	14.31	13.73	11.85	10.98	12.6	12.75	14.86	16.22	17.62		(46)
Water stora		10.42	14.01	10.70	11.00	10.50	12.0	12.70	14.00	10.22	17.02		(10)
Storage vo	lume (litres)	) includin	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
	ity heating a			•			` '						
Otherwise Water stora	if no stored	hot wate	er (this in	icludes i	nstantar	eous co	mbi boil	ers) ente	er '0' in (	47)			
	age loss. facturer's d	eclared l	oss facto	or is kno	wn (kWh	n/day):					0		(48)
•	re factor fro				`	• /					0		(49)
Energy los	t from water	r storage	, kWh/ye	ear			(48) x (49)	=		1	10		(50)
•	facturer's d		-									1	
	storage loss ity heating s			e 2 (KVV	n/litre/da	ıy)				0.	02	I	(51)
	ctor from Ta		011 1.0							1.	03		(52)
Temperatu	re factor fro	m Table	2b							0	.6		(53)
•	t from water	_	, kWh/ye	ear			(47) x (51)	x (52) x (	53) =	1.	03		(54)
, ,	or (54) in (5	•	_	_						1.	03	I	(55)
	age loss cal	culated f	for each	month	·		((56)m = (	55) × (41)ı	m	1		1	
(56)m= 32.		32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	 	(56)
	ntains dedicate											ıx H	
(57)m= 32.	01 28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	I	(57)



Primary circuit loss (annual) from Table 3	(58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 x (41)m	
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26	(59)
Combi loss calculated for each month (61)m = (60) $\div$ 365 x (41)m	
(61)m= 0 0 0 0 0 0 0 0 0 0 0	(61)
Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m +	(61)m
(62)m= 176.55 155.99 164.72 148.91 146.83 132.5 128.49 139.29 138.51 154.35 161.64 172.72	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)	
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	
(63)m= 0 0 0 0 0 0 0 0 0 0 0 0	(63)
Output from water heater	
(64)m= 176.55 155.99 164.72 148.91 146.83 132.5 128.49 139.29 138.51 154.35 161.64 172.72	
Output from water heater (annual) <sub>112</sub> 1820	).5 (64)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m ]	
(65)m= 84.54 75.21 80.61 74.52 74.66 69.06 68.56 72.15 71.06 77.16 78.75 83.27	(65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating	
5. Internal gains (see Table 5 and 5a):	
Metabolic gains (Table 5), Watts	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
(66)m= 84.51 84.51 84.51 84.51 84.51 84.51 84.51 84.51 84.51 84.51 84.51 84.51	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
(67)m= 13.14 11.67 9.49 7.18 5.37 4.53 4.9 6.37 8.55 10.85 12.67 13.5	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	
(68)m= 147.23 148.76 144.91 136.72 126.37 116.64 110.15 108.62 112.47 120.67 131.01 140.74	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	
(69)m= 31.45 31.45 31.45 31.45 31.45 31.45 31.45 31.45 31.45 31.45 31.45 31.45	(69)
Pumps and fans gains (Table 5a)	
(70)m= 0 0 0 0 0 0 0 0 0 0 0	(70)
Losses e.g. evaporation (negative values) (Table 5)	
(71)m= -67.6 -67.6 -67.6 -67.6 -67.6 -67.6 -67.6 -67.6 -67.6 -67.6 -67.6 -67.6	(71)
Water heating gains (Table 5)	
(72)m= 113.63 111.92 108.35 103.5 100.35 95.92 92.16 96.98 98.7 103.71 109.38 111.92	(72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m$	
(73)m= 322.36 320.7 311.1 295.75 280.44 265.45 255.55 260.32 268.07 283.59 301.41 314.51	(73)
6. Solar gains:	
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.	
Orientation: Access Factor Area Flux g_ FF Gains	
Table 6d m <sup>2</sup> Table 6a Table 6b Table 6c (W)	
South 0.9x 0.77 x 2.72 x 46.75 x 0.4 x 0.7 = 24.6	(78)
South $0.9x$ 0.77 × 2.72 × 76.57 × 0.4 × 0.7 = 40.4	(78)



South	0.9x	0.77	X	- 2	2.72	X	9	7.53	x		0.4	x	0.7	=		51.48	(78)
South	0.9x	0.77	X		2.72	X	1	10.23	x		0.4	x	0.7	=		58.18	(78)
South	0.9x	0.77	X		2.72	X	1	14.87	x		0.4	x	0.7	=		60.63	(78)
South	0.9x	0.77	X	2	2.72	x	1	10.55	x		0.4	x	0.7	=		58.35	(78)
South	0.9x	0.77	X	2	2.72	X	1	08.01	x		0.4	x	0.7	=		57.01	(78)
South	0.9x	0.77	X	- 2	2.72	X	1	04.89	x		0.4	x	0.7	=		55.36	(78)
South	0.9x	0.77	X	2	2.72	x	1	01.89	x		0.4	x	0.7	=		53.77	(78)
South	0.9x	0.77	X	2	2.72	X	8	2.59	x		0.4	x	0.7	=		43.59	(78)
South	0.9x	0.77	X	2	2.72	x	5	5.42	X		0.4	X	0.7	=		29.25	(78)
South	0.9x	0.77	X	2	2.72	x		40.4	X		0.4	x	0.7	=		21.32	(78)
West	0.9x	0.77	X		5.42	x	1	9.64	x		0.4	x	0.7	=		20.66	(80)
West	0.9x	0.77	X	2	2.72	x	1	9.64	X		0.4	X	0.7	=		10.37	(80)
West	0.9x	0.77	X	;	5.42	x	3	8.42	x		0.4	x	0.7	=		40.41	(80)
West	0.9x	0.77	X	2	2.72	X	3	8.42	X		0.4	X	0.7	=		20.28	(80)
West	0.9x	0.77	X	;	5.42	X	6	3.27	X		0.4	X	0.7	=		66.54	(80)
West	0.9x	0.77	X	2	2.72	x	6	3.27	X		0.4	X	0.7	=		33.39	(80)
West	0.9x	0.77	X	;	5.42	X	9	2.28	X		0.4	X	0.7	=		97.05	(80)
West	0.9x	0.77	X		2.72	X	9	2.28	Х		0.4	X	0.7	=		48.7	(80)
West	0.9x	0.77	X		5.42	х	1	13.09	] x		0.4	x	0.7	=	1	118.94	(80)
West	0.9x	0.77	×	2	2.72	X	1	13.09	] x		0.4	x	0.7	=		59.69	(80)
West	0.9x	0.77	X	į	5.42	X	1	15.77	] x		0.4	x	0.7	=	1	121.76	(80)
West	0.9x	0.77	×	2	2.72	x	1	15.77	Х		0.4	x	0.7	=		61.1	(80)
West	0.9x	0.77	X	,	5.42	x	1	10.22	X		0.4	x	0.7	=	1	115.92	(80)
West	0.9x	0.77	X	2	2.72	x	1	10.22	X		0.4	x	0.7	=		58.17	(80)
West	0.9x	0.77	×	;	5.42	X	9	4.68	X		0.4	x	0.7	=		99.57	(80)
West	0.9x	0.77	X		2.72	X	9	4.68	X		0.4	X	0.7	=		49.97	(80)
West	0.9x	0.77	×		5.42	X	7	3.59	X		0.4	X	0.7	=		77.39	(80)
West	0.9x	0.77	×		2.72	X	7	3.59	X		0.4	x	0.7	=		38.84	(80)
West	0.9x	0.77	X		5.42	X	4	5.59	X		0.4	X	0.7	=		47.95	(80)
West	0.9x	0.77	×		2.72	X	4	5.59	X		0.4	X	0.7	=		24.06	(80)
West	0.9x	0.77	X		5.42	X	2	4.49	X		0.4	х	0.7	=		25.76	(80)
West	0.9x	0.77	X	2	2.72	X	2	4.49	X		0.4	x	0.7	=		12.93	(80)
West	0.9x	0.77	×		5.42	X	1	6.15	X		0.4	X	0.7	=		16.99	(80)
West	0.9x	0.77	X	2	2.72	X	1	6.15	X		0.4	X	0.7	=		8.52	(80)
٦		watts, ca			1				<del></del>	_	ım(74)m .		1		7		(00)
(83)m=	55.7	101.1	151.42				241.2	231.1	204	1.9	170.01	115.6	67.93	46.83	_		(83)
Ĭ	378.05	nternal a 421.79		<u>, , , , , , , , , , , , , , , , , , , </u>	<del></del>	_	506.66	486.65	465	22	120.07	399.18	369.34	361.35	٦		(84)
(84)m=			462.52	<u> </u>			00.00	400.00	405	.22	438.07	399.18	309.34	301.35			(04)
		nal temp			Ĭ					_,	. (0.0)						7,
_		during h				_			oie 9,	, Ih1	ı (°C)					21	(85)
Utilisa		tor for ga		$\overline{}$		Ť			Ι Δ		Ca:: 1	0-1	NI=	D	٦		
	Jan	Feb	Mar	Apr	Ma	У	Jun	Jul	L A	ug	Sep	Oct	Nov	Dec	╛		



(86)m= 0.99 0.98 0.94 0.83 0.65 0.46 0.33 0.36 0.58 0.86 0.97 0.99		(86)
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)		
(87)m= 20.47 20.59 20.76 20.92 20.99 21 21 21 21 20.91 20.67 20.44		(87)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)	_	
(88)m= 20.28 20.29 20.29 20.3 20.3 20.31 20.31 20.32 20.31 20.3 20.3 20.29		(88)
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)	_	
(89)m= 0.99 0.97 0.92 0.8 0.61 0.41 0.28 0.31 0.52 0.83 0.97 0.99		(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)		
(90)m= 19.58 19.76 20 20.22 20.29 20.31 20.31 20.32 20.31 20.21 19.89 19.55		(90)
fLA = Living area ÷ (4) =	0.47	(91)
Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 – fLA) × T2	,	
(92)m= 20 20.16 20.36 20.55 20.62 20.64 20.64 20.64 20.63 20.55 20.26 19.97	]	(92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate	1	(03)
(93)m= 20 20.16 20.36 20.55 20.62 20.64 20.64 20.64 20.63 20.55 20.26 19.97 8. Space heating requirement		(93)
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calc	culate	
the utilisation factor for gains using Table 9a	raidio	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec		
Utilisation factor for gains, hm:	1	(0.4)
(94)m= 0.99 0.97 0.93 0.81 0.63 0.44 0.3 0.33 0.55 0.84 0.97 0.99 Useful gains, hmGm , W = (94)m x (84)m		(94)
(95)m= 372.56 408.87 428.05 404.53 327.13 220.5 147.66 154.45 239.18 336.38 356.49 357.24	1	(95)
Monthly average external temperature from Table 8	ı	
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2		(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m ]	1	
(97)m= 600.47 581.52 526.66 435.16 331.97 220.78 147.68 154.48 240.57 370.12 493.14 595.19		(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m  (98)m= 169.56 116.02 73.37 22.05 3.6 0 0 0 0 25.1 98.39 177.03	1	
Total per year (kWh/year) = Sum(98) <sub>15,912</sub> =	685.12	(98)
		](99)
Space heating requirement in kWh/m²/year	13.7	](99)
9b. Energy requirements – Community heating scheme  This part is used for space heating, space cooling or water heating provided by a community scheme.		
Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none	0	(301)
Fraction of space heat from community system 1 – (301) =	1	(302)
The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; to	he latter	1
includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.		1
Fraction of heat from Community heat pump	1	(303a)
Fraction of total space heat from Community heat pump (302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system	1	(305)
Distribution loss factor (Table 12c) for community heating system	1.05	(306)
Space heating	kWh/year	_
Annual space heating requirement	685.12	



Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	719.38	307a)
Efficiency of secondary/supplementary heating system in	n % (from Table 4a or Appendix E)	0 (3	308
Space heating requirement from secondary/supplementa	ary system (98) x (301) x 100 ÷ (308) =	0 (3	309)
Water heating			
Annual water heating requirement		1820.5	
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	1911.52	310a)
Electricity used for heat distribution	0.01 × [(307a)(307e) + (310a)(310e)]	= 26.31	313)
Cooling System Energy Efficiency Ratio		0 (3	314)
Space cooling (if there is a fixed cooling system, if not er	nter 0) = (107) ÷ (314) =	0 (3	315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input	ut from outside	109.11 (	330a)
warm air heating system fans		0 (3	330b)
pump for solar water heating		0 (3	330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	109.11	331)
Energy for lighting (calculated in Appendix L)		232 (3	332)
12b. CO2 Emissions – Community heating scheme	Energy Emission factor kWh/year kg CO2/kWh	or Emissions kg CO2/year	
CO2 from other sources of space and water heating (not Efficiency of heat source 1 (%)	CHP using two fuels repeat (363) to (366) for the second	fuel 95.6 (3	367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x 0.22	= 594.43 (3	367)
Electrical energy for heat distribution	[(313) x 0.52	= 13.65 (3	372)
Total CO2 associated with community systems	(363)(366) + (368)(372)	= 608.08 (3	373)
CO2 associated with space heating (secondary)	(309) x	= 0 (3	374)
CO2 associated with water from immersion heater or ins	tantaneous heater (242) y	= 0 (3	375)
	tantaneous heater (312) x 0.22	(	
Total CO2 associated with space and water heating	(373) + (374) + (375) =		376)
Total CO2 associated with space and water heating CO2 associated with electricity for pumps and fans withir	(373) + (374) + (375) =	608.08	376) 378)
,	(373) + (374) + (375) =	608.08 (3 = 56.63 (3	
CO2 associated with electricity for pumps and fans within	(373) + (374) + (375) = in dwelling (331)) x	608.08 (3 = 56.63 (3 = 120.41 (3	378)
CO2 associated with electricity for pumps and fans within CO2 associated with electricity for lighting	(373) + (374) + (375) = in dwelling (331)) x	608.08 (3 = 56.63 (3 = 120.41 (3 785.12 (3	378) 379)

El rating (section 14)

(385)

88.93



User Details: **Assessor Name:** Stroma Number: Stroma FSAP 2012 **Software Version: Software Name:** Version: 1.0.5.12 Property Address: E2-07 Address: 1. Overall dwelling dimensions Av. Height(m) Area(m²) Volume(m³) Ground floor 50.3 (1a) x 2.7 (2a) =135.81 (3a) Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)(4)50.3 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =135.81 (5) total m³ per hour main secondary other heating heating x 40 =Number of chimneys (6a) 0 0 x 20 =Number of open flues 0 0 0 (6b) Number of intermittent fans x 10 =(7a)0 0 x 10 =Number of passive vents (7b) 0 0 x 40 =Number of flueless gas fires 0 (7c)Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = $\div (5)$ (8) If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9)0 Additional infiltration [(9)-1]x0.1 =0 (10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)0 if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12)If no draught lobby, enter 0.05, else enter 0 (13)0 Percentage of windows and doors draught stripped (14)0 Window infiltration  $0.25 - [0.2 \times (14) \div 100] =$ 0 (15)Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =O (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)3 If based on air permeability value, then  $(18) = [(17) \div 20] + (8)$ , otherwise (18) = (16)0.15 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)3  $(20) = 1 - [0.075 \times (19)] =$ Shelter factor (20)0.78  $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.12 Infiltration rate modified for monthly wind speed Jan Feb Jul Sep Mar Apr May Jun Aug Oct Nov Dec Monthly average wind speed from Table 7 (22)m =5.1 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor  $(22a)m = (22)m \div 4$ (22a)m 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18



Adjusted infiltra	ation rate (allov	ving for sl	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.15	0.15 0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14	]	
Calculate effect	_	e rate for t	he appli	cable ca	se	ļ	!	!	!	!	J	
If mechanical ventilation:											0.5	(23a
If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a)  If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =											0.5	(23b
	-	-	_								76.5	(23c)
· ·	d mechanical v				<del>- ` ` </del>	<del>-                                    </del>	<del>i `</del>	<del>,                                    </del>	<del></del>	<del>- ` ` `</del>	) ÷ 100] 1	(0.4
(24a)m= 0.27	0.26 0.26	0.25	0.24	0.23	0.23	0.23	0.23	0.24	0.25	0.25	]	(24a
· —	d mechanical v		1		<del></del>	<del>- ^ `                                  </del>	ŕ	<del>r Ó - Ò</del>	<del> </del>		1	(0.4)
(24b)m= 0	0 0	0	0	0	0	0	0	0	0	0	]	(24b
,	ouse extract ve		•	•				E (22h	. \			
(24c)m = 0	$\frac{1 < 0.5 \times (23b)}{0}$	1 0	0 = (230)		wise (24	C) = (22)	0 m + 0	.5 × (23L	0	0	1	(240
` '											]	(240
,	ventilation or w n = 1, then (24			•				0.5]			-	
(24d)m= 0	0 0	0	0	0	0	0	0	0	0	0		(24d
Effective air	change rate -	enter (24a	) or (24b	o) or (24	c) or (24	d) in box	x (25)				_	
(25)m = 0.27	0.26 0.26	0.25	0.24	0.23	0.23	0.23	0.23	0.24	0.25	0.25		(25)
3. Heat losses	s and heat loss	paramet	er:								_	_
ELEMENT	Gross	Openir		Net Ar	ea	U-val	ue	AXU		k-valu	e	ΑΧk
	area (m²)	'n		A ,r	m²	W/m2	2K	(W/I	K)	kJ/m².	K	kJ/K
Doo <mark>rs</mark>				1.89	X	1.4	=	2.646				(26)
Windows Type	1			8.16	x1	/[1/( 1.2 )+	0.04] =	9.34				(27)
Windows Type	2			2.72	x1	/[1/( 1.2 )+	0.04] =	3.11				(27)
Walls Type1	15.93	10.8	8	5.05	X	0.16		0.81				(29)
Walls Type2	25.11	1.89	)	23.22	<u>x</u>	0.15	=	3.49				(29)
Walls Type3	13.77	0		13.77	7 X	0.14	=	1.93				(29)
Total area of e	lements, m <sup>2</sup>			54.81								(31)
Party wall				23.49	) x	0	=	0			$\neg$	(32)
Party floor				50.3	一						7 F	(32a
Party ceiling				50.3					Ī		7 F	(32b
* for windows and  ** include the area					ated using	ı formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragrapi	h 3.2	
			.s and pan			(26)(30)	) + (32) =				21.33	3 (33)
Fabric heat loss, W/K = S (A x U) Heat capacity $Cm = S(A \times k)$						. ,		(30) + (32	2) + (32a).	(32e) =	0	(34)
Thermal mass parameter (TMP = $Cm \div TFA$ ) in $kJ/m^2K$							., ,	tive Value	, , ,	()	250	(35)
For design assess	ments where the o	details of the	,			ecisely the				able 1f	230	(00)
can be used instead Thermal bridge			usina Ar	nendix I	<						7.00	(36)
if details of therma	, ,		• .	-	•						7.88	(30)
Total fabric hea		(00)	2.30 % (0	,			(33) +	(36) =			29.2	1 (37)
Ventilation hea	t loss calculate	ed monthl	y				(38)m	= 0.33 × (	(25)m x (5)	)	-	
		<del>-</del>				•		<del> </del>	<del></del>		-	



(38)m= 11.91	11.78	11.65	11	10.87	10.22	10.22	10.09	10.48	10.87	11.13	11.39		(38)
Heat transfer	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m= 41.12	40.99	40.86	40.2	40.07	39.42	39.42	39.29	39.68	40.07	40.33	40.59		
Heat loss pa	rameter (l	HIP) W	/m²K						Average = = (39)m ÷	Sum(39) <sub>1</sub>	12 /12=	40.17	(39)
(40)m= 0.82	<del></del>	0.81	0.8	0.8	0.78	0.78	0.78	0.79	0.8	0.8	0.81		
` /		!	<u> </u>		ļ	ļ	!		L Average =	Sum(40) <sub>1</sub>	12 /12=	0.8	(40)
Number of d	ays in mo	nth (Tab	le 1a)										_
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water he	ating ene	rgy requi	irement:								kWh/ye	ear:	
Assumed oc	cupancy.	N								1	.7		(42)
if TFA > 13	3.9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (	ΓFA -13.		.1	I	(12)
if TFA £ 13	•						(O.E. N.I)	00				1	
Annual avera Reduce the ann									se target o		.55		(43)
not more that 12	_				_	_							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage	e in litres pe	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m= 82	79.02	76.04	73.06	70.08	67.09	67.09	70.08	73.06	76.04	79.02	82		
										m(44) <sub>112</sub> =		894.6	(44)
Energy content	of hot water	used - cal	culated m	onthly $= 4$ .	190 x Vd,r	n x nm x E	OTm / 3600	kWh/mor	th (see Ta	bles 1b, 1	c, 1d)		
(45)m= 121.6	1 106.36	109.76	95.69	91.81	79.23	73.42	84.25	85.25	99.35	108.45	117.77		_
If instantaneous	water heati	ina at point	of use (no	hot wate	r storage).	enter 0 in	boxes (46		Total = Su	m(45) <sub>112</sub> =	=	1172.96	(45)
(46)m= 18.24	-	16.46	14.35	13.77	11.88	11.01	12.64	12.79	14.9	16.27	17.67		(46)
Water storage		10.40	14.33	13.77	11.00	11.01	12.04	12.79	14.5	10.27	17.07	I	(40)
Storage volu	me (litres	) includir	ng any so	olar or W	WHRS	storage	within sa	ame ves	sel		0		(47)
If community	heating a	and no ta	ınk in dw	elling, e	enter 110	litres in	(47)						
Otherwise if		hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	47)			
Water storag			(	!	(1.) (1.)	- /-1 \						l	(10)
a) If manufa				JI IS KIIO	WII (KVVI	i/uay).					0	] 	(48)
Temperature							(40) (40)				0	 	(49)
Energy lost f b) If manufa		-	-		or is not		(48) x (49)	) =		1	10		(50)
Hot water sto			-							0.	02		(51)
If community	_		on 4.3										
Volume factor			O.L							1.	.03		(52)
Temperature										0	.6		(53)
Energy lost f		_	, kWh/ye	ear			(47) x (51)	x (52) x (	53) =	-	.03		(54)
Enter (50) o	, , ,	•	for oach	month			((56) <del>~</del> = (	55) × (44):	<b>m</b>	1.	.03	J	(55)
Water storag		i		i	00.55		((56)m = (			00.5-	00.5	l	(50)
(56)m= 32.01 If cylinder conta		32.01	30.98	32.01 m = (56)m	30.98 x [(50) = (	32.01 H11)1 ÷ (5	32.01 0) else (5	30.98 7)m = (56)	32.01 m where (	30.98 H11) is fro	32.01	 ix H	(56)
				· ·								N   1	( <del></del> )
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)



Primary circuit loss (annual) from Table 3	0 (58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 x (41)m	
(modified by factor from Table H5 if there is solar water heating and a cylinder thermost	at)
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 23.26 23.26 23.26	22.51 23.26 (59)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m	
(61)m= 0 0 0 0 0 0 0 0 0 0	0 0 (61)
Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m + (45)m + (45)m + (45)m + (45)m + (45)m + (45)m + (45)m + (45)m + (45)m + (45)m + (45)m + (45)m $	6)m + (57)m + (59)m + (61)m
(62)m= 176.89 156.29 165.03 149.18 147.09 132.72 128.69 139.52 138.75 154.63	161.95 173.05 (62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution	n to water heating)
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	
(63)m= 0 0 0 0 0 0 0 0 0 0	0 0 (63)
Output from water heater	
(64)m= 176.89 156.29 165.03 149.18 147.09 132.72 128.69 139.52 138.75 154.63	161.95 173.05
Output from water heater (a	annual) <sub>112</sub> 1823.8 (64)
Heat gains from water heating, kWh/month 0.25 $^{\prime}$ [0.85 $\times$ (45)m + (61)m] + 0.8 $\times$ [(46)m +	(57)m + (59)m ]
(65)m= 84.66 75.31 80.72 74.61 74.75 69.14 68.63 72.23 71.14 77.26	78.86 83.38 (65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from	n community heating
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= 84.95 84.95 84.95 84.95 84.95 84.95 84.95 84.95 84.95 84.95	84.95 84.95 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
(67)m= 13.21 11.73 9.54 7.22 5.4 4.56 4.93 6.4 8.59 10.91	12.73 13.58 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	
(68)m= 148.01 149.55 145.68 137.44 127.04 117.26 110.73 109.2 113.07 121.31	131.71 141.48 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	
(69)m= 31.49 31.49 31.49 31.49 31.49 31.49 31.49 31.49 31.49 31.49	31.49 31.49 (69)
Pumps and fans gains (Table 5a)	· · · · · · · · · · · · · · · · · · ·
(70)m= 0 0 0 0 0 0 0 0 0 0	0 0 (70)
Losses e.g. evaporation (negative values) (Table 5)	<del></del>
(71)m= -67.96 -67.96 -67.96 -67.96 -67.96 -67.96 -67.96 -67.96 -67.96 -67.96 -67.96	-67.96 -67.96 (71)
Water heating gains (Table 5)	<u> </u>
(72)m= 113.79 112.06 108.49 103.63 100.47 96.03 92.25 97.09 98.81 103.84	109.52 112.07 (72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (71)m$	m + (72)m
(73)m= 323.49 321.83 312.19 296.77 281.39 266.33 256.39 261.17 268.95 284.54 3	302.45 315.61 (73)
6. Solar gains:	
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable	orientation.
Orientation: Access Factor Area Flux g_	FF Gains
	ole 6c (W)
East 0.9x 0.77 x 8.16 x 19.64 x 0.4 x	0.7 = 31.1 (76)
East 0.9x 0.77 x 2.72 x 19.64 x 0.4 x	0.7 = 10.37 (76)



East	0.9x	0.77		X	8.1	6	X	3	8.42	X		0.4	x	0.7	-	= [	60.83	(76)
East	0.9x	0.77		X	2.7	2	X	3	8.42	x		0.4	x	0.7		<u> </u>	20.28	(76)
East	0.9x	0.77		X	8.1	6	X	6	3.27	X		0.4	x	0.7		- [	100.18	(76)
East	0.9x	0.77		X	2.7	2	X	6	3.27	X		0.4	x	0.7		- [	33.39	(76)
East	0.9x	0.77		X	8.1	6	X	9	2.28	X		0.4	x	0.7	-	- [	146.11	(76)
East	0.9x	0.77		X	2.7	2	X	9	2.28	X		0.4	x	0.7		= [	48.7	(76)
East	0.9x	0.77		X	8.1	6	X	11	13.09	X		0.4	x	0.7		= [	179.07	(76)
East	0.9x	0.77		X	2.7	2	X	11	13.09	x		0.4	x	0.7		= [	59.69	(76)
East	0.9x	0.77		X	8.1	6	X	11	15.77	X		0.4	x	0.7		= [	183.31	(76)
East	0.9x	0.77		X	2.7	2	X	11	15.77	X		0.4	x	0.7		- [	61.1	(76)
East	0.9x	0.77		X	8.1	6	X	11	10.22	X		0.4	x	0.7	-	= [	174.52	(76)
East	0.9x	0.77		X	2.7	2	X	11	10.22	X		0.4	x	0.7		= [	58.17	(76)
East	0.9x	0.77		X	8.1	6	X	9	4.68	X		0.4	x	0.7		- [	149.91	(76)
East	0.9x	0.77		X	2.7	2	X	9	4.68	X		0.4	x	0.7	-	- [	49.97	(76)
East	0.9x	0.77		X	8.1	6	X	7	3.59	X		0.4	x	0.7		= [	116.52	(76)
East	0.9x	0.77		X	2.7	2	X	7	3.59	X		0.4	x	0.7		= [	38.84	(76)
East	0.9x	0.77		X	8.1	6	X	4	5.59	X		0.4	x	0.7		= [	72.18	(76)
East	0.9x	0.77		X	2.7	2	X	4	5.59	Х		0.4	X	0.7	-	= [	24.06	(76)
East	0.9x	0.77		X	8.1	6	х	2	4.49	x		0.4	x	0.7		- [	38.78	(76)
East	0.9x	0.77		X	2.7	2	X	2	4.49	x		0.4	x	0.7	=	= [	12.93	(76)
East	0.9x	0.77		X	8.1	6	X	1	6.15	x		0.4	x	0.7	-	- [	25.57	(76)
East	0.9x	0.77		X	2.7	2	X	1	6.15	Х		0.4	x	0.7		= [	8.52	(76)
Solar	gains in	watts, ca	alcula	ted	for eacl	n month	1			(83)m	= Sun	n(74)m .	(82)m		1	_		
(83)m=	41.46	81.11	133.		194.82	238.76		44.41	232.69	199.	.88	155.36	96.25	51.7	34.1			(83)
	_	nternal a		_	<del>`                                    </del>		<del>`</del>							1				(0.4)
(84)m=	364.96	402.94	445.	//	491.59	520.15	5	10.74	489.08	461.	.05   4	424.31	380.79	354.15	349.7	1		(84)
		nal temp																_
Temp	perature	during h	eatin	g pe	eriods ir	the liv	ing	area f	rom Tab	ole 9,	Th1	(°C)					21	(85)
Utilis		tor for ga		$\neg$			Ť							_	1	_		
	Jan	Feb	Ma	$\rightarrow$	Apr	May	+	Jun	Jul	_	ug	Sep	Oct	_	Ded	$\dashv$		(2.5)
(86)m=	0.99	0.99	0.9	6	0.87	0.69	(	0.49	0.35	0.3	39	0.63	0.91	0.98	0.99			(86)
Mear		l temper	ature	in I	iving are	ea T1 (f	ollo	w ste	os 3 to 7	in T	able	9c)		_		_		
(87)m=	20.36	20.48	20.6	37	20.88	20.98		21	21	21	1	20.99	20.86	20.58	20.33	3		(87)
Temp	erature	during h	eatin	g pe	eriods ir	rest of	dw	elling	from Ta	able 9	9, Th2	2 (°C)						
(88)m=	20.24	20.24	20.2	24	20.25	20.26	2	20.27	20.27	20.2	27	20.26	20.26	20.25	20.25	5		(88)
Utilis	ation fac	tor for ga	ains f	or r	est of d	welling,	h2,	,m (se	e Table	9a)						_		
(89)m=	0.99	0.98	0.9		0.84	0.65	_	0.44	0.3	0.3	33	0.57	0.88	0.98	0.99			(89)
Mear	interna	l tempera	ature	in t	he rest	of dwel	lina	T2 (fc	ollow ste	eps 3	to 7	in Table	e 9c)	-				
(90)m=	19.38	19.56	19.8	$\overline{}$	20.12	20.24	Ť	20.27	20.27	20.2		20.26	20.1	19.71	19.36	3		(90)
			<u> </u>	!		<u> </u>			<u> </u>			fl	LA = Liv	ing area ÷ (	4) =	寸	0.59	(91)
																L		_



Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$		
	1	(92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate	J	(- )
(93)m= 19.95 20.1 20.33 20.57 20.67 20.7 20.7 20.7 20.69 20.55 20.22 19.93	1	(93)
8. Space heating requirement		
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calc the utilisation factor for gains using Table 9a	culate	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	1	
Utilisation factor for gains, hm:	J	
(94)m= 0.99 0.98 0.95 0.85 0.67 0.47 0.33 0.37 0.61 0.89 0.98 0.99	1	(94)
Useful gains, hmGm , W = (94)m x (84)m	J	
(95)m= 361.3 394.91 422.83 418.01 349.97 239.6 161.46 168.77 257.69 339.27 346.08 346.95	]	(95)
Monthly average external temperature from Table 8	_	
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2	]	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m ]	-	
(97)m= 643.61 622.91 564.88 469.05 359.46 240.3 161.51 168.87 261.37 398.58 529.17 638.62	]	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m	1	
(98)m= 210.04 153.21 105.68 36.75 7.06 0 0 0 44.12 131.83 217		7
Total per year (kWh/year) = Sum(98) <sub>15,912</sub> =	905.7	(98)
Space heating requirement in kWh/m²/year	18.01	(99)
9b. Energy requirements – Community heating scheme		
This part is used for space heating, space cooling or water heating provided by a community scheme.  Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none	0	(301)
Fraction of space heat from community system 1 – (301) =	1	」 (302)
The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources;		](***)
includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.  Fraction of heat from Community heat pump	1	(303a)
Fraction of total space heat from Community heat pump (302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system	1	(305)
Distribution loss factor (Table 12c) for community heating system	1.05	(306)
Space heating	kWh/year	_
Annual space heating requirement	905.7	
Space heat from Community heat pump (98) x (304a) x (305) x (306) =	950.99	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0	(308
Space heating requirement from secondary/supplementary system (98) x (301) x 100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement	1823.8	7
If DHW from community scheme:  Water heat from Community heat pump  (64) x (303a) x (305) x (306) =	1914.99	☐ (310a)
Electricity used for heat distribution 0.01 × [(307a)(307e) + (310a)(310e)] =	28.66	](313)
Cooling System Energy Efficiency Ratio	0	](314)
Space cooling (if there is a fixed cooling system, if not enter 0) = $(107) \div (314) =$	0	(315)



Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from or	outside			109.77	(330a)
warm air heating system fans				0	(330b)
pump for solar water heating			Ī	0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	b) + (330g) =	Ē	109.77	(331)
Energy for lighting (calculated in Appendix L)			Ī	233.27	(332)
12b. CO2 Emissions – Community heating scheme			_		
	Energy kWh/year	Emission fact kg CO2/kWh		missions g CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%)  If there is CHP using	two fuels repeat (363) to	(366) for the second	l fuel	95.6	(367a)
CO2 associated with heat source 1 [(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(307b)+(3	310b)] x 100 ÷ (367b) x	0.22	=	647.54	(367)
Electrical energy for heat distribution	(313) x	0.52	=	14.87	(372)
Total CO2 associated with community systems	363)(366) + (368)(372	2)	=	662.42	(373)
CO2 associated with space heating (secondary)	309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantaneous	ous heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and water heating	373) + (374) + (375) =			662.42	(376)
CO2 associated with electricity for pumps and fans within dwelling	ng (331)) x	0.52	=	56.97	(378)
CO2 associated with electricity for lighting	332))) x	0.52	=	121.07	(379)
Total CO2, kg/year sum of (376)(382) =				840.45	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =				16.71	(384)

El rating (section 14)

(385)



User Details: **Assessor Name:** Stroma Number: Stroma FSAP 2012 **Software Version: Software Name:** Version: 1.0.5.12 Property Address: E5-03 Address: 1. Overall dwelling dimensions Av. Height(m) Area(m²) Volume(m³) Ground floor 74.5 (1a) x 2.7 (2a) =201.15 (3a) Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)(4)74.5 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =201.15 (5) total m<sup>3</sup> per hour main secondary other heating heating x 40 =Number of chimneys (6a) 0 0 x 20 =Number of open flues 0 0 0 (6b) Number of intermittent fans x 10 =(7a)0 0 x 10 =Number of passive vents (7b) 0 0 x 40 =Number of flueless gas fires 0 (7c)Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = $\div (5)$ (8) If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9)0 Additional infiltration [(9)-1]x0.1 =0 (10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)0 if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12)If no draught lobby, enter 0.05, else enter 0 (13)0 Percentage of windows and doors draught stripped (14)0 Window infiltration  $0.25 - [0.2 \times (14) \div 100] =$ 0 (15)Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =O (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)3 If based on air permeability value, then  $(18) = [(17) \div 20] + (8)$ , otherwise (18) = (16)0.15 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)2  $(20) = 1 - [0.075 \times (19)] =$ Shelter factor (20)0.85  $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.13 Infiltration rate modified for monthly wind speed Jan Feb Jul Sep Mar Apr May Jun Aug Oct Nov Dec Monthly average wind speed from Table 7 (22)m =5.1 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor  $(22a)m = (22)m \div 4$ (22a)m 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18



Adjusted infiltration rate (allow	ving for shelter ar	nd wind sn	need) =	(21a) x	(22a)m					
0.16 0.16 0.16	0.14 0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15	]	
Calculate effective air change	rate for the appl	icable cas	se		ļ			<u> </u>	]	
If mechanical ventilation:									0.5	(23a)
If exhaust air heat pump using App						) = (23a)			0.5	(23b)
If balanced with heat recovery: effi									76.5	(23c)
a) If balanced mechanical v	1		<del>-                                    </del>		<del>í `</del>	<del> </del>	<del>-                                    </del>	<del>``</del>	÷ 100]	4
(24a)m= 0.28 0.28 0.27	0.26 0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27		(24a)
b) If balanced mechanical v	1 1			, ` <u> </u>	<del>i `</del>	<del> </del>		ı	1	4- 44
(24b)m= 0 0 0	0 0	0	0	0	0	0	0	0		(24b)
c) If whole house extract ve	•	•				F (00k				
if $(22b)m < 0.5 \times (23b)$ ,	then $(24c) = (23c)$	o); otnerw	1se (240	(22)	o) m + 0.	$5 \times (230)$	0		1	(24c)
( 1)		با ــــــــــــــــــــــــــــــــــــ				U	0	0	J	(240)
d) If natural ventilation or wif (22b)m = 1, then (24d	•	•				0.5]			_	
(24d)m = 0 0 0	0 0	0	0	0	0	0	0	0		(24d)
Effective air change rate - e	enter (24a) or (24	b) or (24c)	or (24	d) in box	x (25)				_	
(25)m= 0.28 0.28 0.27	0.26 0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27		(25)
3. Heat losses and heat loss	parameter:								_	
ELEMENT Gross	Openings	Net Are	a	U-val	ue	AXU		k-value	9	ΑΧk
area (m²)	m <sup>2</sup>	A ,m	2	W/m2	2K	(VV/I	<)	kJ/m².	K	kJ/K
Doo <mark>rs</mark>		1.89	х	1.4	= [	2.646				(26)
Windows Type 1		5.42	x1/	[1/( 1.2 )+	0.04] =	6.21				(27)
Windows Type 2		2.72	x1/	[1/( 1.2 )+	0.04] =	3.11				(27)
Windows Type 3		5.42	x1/	[1/( 1.2 )+	0.04] =	6.21				(27)
Walls Type1 46.17	24.4	21.77	х	0.16		3.48				(29)
Walls Type2 11.07	1.89	9.18	x	0.15		1.38				(29)
Roof 74.5	0	74.5	x	0.12	<b>=</b> i	8.94	Ħ i		7 <b>7</b>	(30)
Total area of elements, m <sup>2</sup>		131.74	= '							(31)
Party wall		35.64	x	0		0				(32)
Party floor		74.5	╡ '						<b>=</b>	(32a)
* for windows and roof windows, use		alue calcula	ted using	formula 1	/[(1/U-valu	ıe)+0.04] a	L ns given in	paragrapl	1 3.2	\` ′
** include the areas on both sides of	•	rtitions		(26)(30)	)					
Fabric heat loss, $W/K = S(A)$	( 0)			(20)(30)		(00) - (00	2) - (00-)	(00-)	44.39	(33)
Heat capacity $Cm = S(A \times k)$	ID O TEA):	. l. 1/2226			., ,	.(30) + (32	, , ,	(32e) =	0	(34)
Thermal mass parameter (TM	,		l	:		tive Value:		-61- 45	250	(35)
For design assessments where the d can be used instead of a detailed call		uon are not r	Kriowri pre	ecisely trie	e indicative	values of	IIVIP III T	арте п		
Thermal bridges : S (L x Y) ca	lculated using A	opendix K							20.56	(36)
if details of thermal bridging are not k Total fabric heat loss	$(36) = 0.05 \times (36)$	31)			(33) +	(36) =			64.05	(37)
Ventilation heat loss calculate	d monthly					$= 0.33 \times ($	25)m x (5)	1	64.95	(37)
Jan Feb Mar	Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
L Gail   1 GD   Wal	I THI I Way	Juli	Jui	Aug	Годр	1 001	1 1100	l Dec	J	



(38)m=	18.59	18.38	18.17	17.11	16.9	15.84	15.84	15.63	16.26	16.9	17.32	17.74		(38)
Heat trai	nsfer c	oefficier	nt, W/K						(39)m	= (37) + (	38)m			
(39)m=	83.54	83.32	83.11	82.05	81.84	80.78	80.78	80.57	81.21	81.84	82.27	82.69		_
Heat los	s para	meter (H	HP) W/	/m²K						Average = = (39)m ÷	Sum(39) <sub>1.</sub>	12 /12=	82	(39)
	1.12	1.12	1.12	1.1	1.1	1.08	1.08	1.08	1.09	1.1	1.1	1.11		
<u> </u>				!			Į.		,	Average =	Sum(40) <sub>1</sub> .	12 /12=	1.1	(40)
Number	<del>.                                    </del>		<del>`</del>	<del></del>			<del></del>				·		I	
(41)m-	Jan 31	Feb 28	Mar 31	Apr 30	May 31	Jun 30	Jul 31	Aug 31	Sep 30	Oct 31	Nov 30	Dec 31		(41)
(41)m=	31	20	31	30	31	30	31	31	30	31	30	31		(41)
4 Wate	er heat	ing ener	rgy requi	irement:								kWh/ye	ar.	
				nomont.								1 ( V V I I / Y V	par.	
Assumed if TFA				:[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x ( <sup>-</sup>	ΓFA -13.		35		(42)
if TFA	£ 13.9	9, N = 1				·	•	, ,-	,				•	
Annual a										se target o		0.02		(43)
not more ti		_				_	_			J				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water	usage ir	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m=	99.02	95.42	91.82	88.22	84.62	81.02	81.02	84.62	88.22	91.82	95.42	99.02		_
Energy co	ntent of	hot water	used - cal	culated mo	onthly = $4$ .	190 x Vd.r	n x nm x E	OTm / 3600			m(44) <sub>112</sub> =		1080.22	(44)
	146.84	128.43	132.53	115.54	110.87	95.67	88.65	101.73	102.94	119.97	130.96	142.21		
` '   L								l	-	Γotal = Su	m(45) <sub>112</sub> =	  -	1416.34	(45)
If instantar	neous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)	) to (61)				•	
` '	22.03	19.26	19.88	17.33	16.63	14.35	13.3	15.26	15.44	18	19.64	21.33		(46)
Water st Storage			includin	na anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If commi		` ,		•			•					0	I	(,
Otherwis	-	•			_			. ,	ers) ente	er '0' in (	47)			
Water st	-		ا لم معمام م	foot	ممادة	/1.\^/b	- /d · \ .						I	(40)
a) If ma					or is kno	wn (Kvvr	i/day):					0	<u> </u>	(48)
Tempera Energy l					aar			(48) x (49)	١ –			0	] <b>[</b>	(49)
b) If ma			•	-		or is not		(40) X (40)	, –		1	10		(50)
Hot water		_			e 2 (kW	h/litre/da	ıy)				0.	02		(51)
If common	-	•		on 4.3									l	(50)
Tempera				2b								.6		(52) (53)
Energy I					ear			(47) x (51)	) x (52) x (	53) =		.03		(54)
Enter (5			-	,				, , , ,		,		.03		(55)
Water st	orage	loss cal	culated f	for each	month			((56)m = (	55) × (41)ı	m				
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder	contains	dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	ix H	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)



Primary circuit loss (annual) from Table 3	0	(58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 x (41)m		'
(modified by factor from Table H5 if there is solar water heating and a cylinder thermo	ostat)	
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 23.26 22.51 23.26	22.51 23.26	(59)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m		
(61)m= 0 0 0 0 0 0 0 0 0	0 0	(61)
Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m +$	(46)m + (57)m +	(59)m + (61)m
(62)m= 202.12 178.36 187.81 169.04 166.14 149.16 143.93 157 156.44 175.25	184.45 197.49	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribu	tion to water heating)	J
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)		
(63)m= 0 0 0 0 0 0 0 0 0 0	0 0	(63)
Output from water heater		1
(64)m= 202.12 178.36 187.81 169.04 166.14 149.16 143.93 157 156.44 175.25	184.45 197.49	
Output from water heate	er (annual) <sub>112</sub>	2067.18 (64)
Heat gains from water heating, kWh/month 0.25 $^{\prime}$ [0.85 $\times$ (45)m + (61)m] + 0.8 $\times$ [(46)m	ı + (57)m + (59)m	]
(65)m= 93.05 82.65 88.29 81.21 81.08 74.6 73.7 78.05 77.02 84.11	86.34 91.51	(65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is f	rom community h	leating
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	i
(66)m= 117.51 117.51 117.51 117.51 117.51 117.51 117.51 117.51 117.51 117.51 117.51	117.51 117.51	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5		
(67)m= 18.5 16.44 13.37 10.12 7.56 6.39 6.9 8.97 12.04 15.29	17.84 19.02	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5		
(68)m= 207.56 209.72 204.29 192.74 178.15 164.44 155.28 153.13 158.56 170.11	184.7 198.41	(68)
	104.7	(55)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5  (69)m= 34.75 34.75 34.75 34.75 34.75 34.75 34.75 34.75 34.75	34.75 34.75	(69)
	34.73	(00)
Pumps and fans gains (Table 5a)  (70)m=	0 0	(70)
		(70)
Losses e.g. evaporation (negative values) (Table 5)		(71)
(71)m=	-94.01 -94.01	(71)
Water heating gains (Table 5)	<del> </del>	l (70)
(72)m= 125.06 122.98 118.67 112.8 108.98 103.62 99.06 104.9 106.98 113.05	ļ ļ	(72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m	<del>, , , , , , , , , , , , , , , , , , , </del>	l
(73)m= 409.39 407.39 394.58 373.9 352.95 332.7 319.49 325.25 335.83 356.7	380.71 398.67	(73)
6. Solar gains:		
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applica		Octob
Orientation: Access Factor Area Flux g_ Table 6d m <sup>2</sup> Table 6a Table 6b T	FF Table 6c	Gains (W)
South     0.9x     0.77     x     2.72     x     46.75     x     0.4     x       South     0.9x     0.77     x     5.42     x     46.75     x     0.4     x	0.7 =	24.68 (78)
South 0.9x 0.77 x 5.42 x 46.75 x 0.4 x	0.7	98.34 (78)



South	0.9x	0.77	x	2.72	X	76.57	X	0.4	x	0.7	=	40.41	(78)
South	0.9x	0.77	×	5.42	x	76.57	X	0.4	x	0.7	=	161.05	(78)
South	0.9x	0.77	×	2.72	X	97.53	X	0.4	x	0.7	=	51.48	(78)
South	0.9x	0.77	x	5.42	X	97.53	X	0.4	x	0.7	=	205.15	(78)
South	0.9x	0.77	×	2.72	X	110.23	X	0.4	x	0.7	=	58.18	(78)
South	0.9x	0.77	x	5.42	X	110.23	X	0.4	x	0.7	=	231.87	(78)
South	0.9x	0.77	x	2.72	X	114.87	X	0.4	x	0.7	=	60.63	(78)
South	0.9x	0.77	x	5.42	X	114.87	X	0.4	x	0.7	=	241.62	(78)
South	0.9x	0.77	x	2.72	X	110.55	X	0.4	x	0.7	=	58.35	(78)
South	0.9x	0.77	×	5.42	X	110.55	X	0.4	x	0.7	=	232.53	(78)
South	0.9x	0.77	x	2.72	X	108.01	X	0.4	x	0.7	=	57.01	(78)
South	0.9x	0.77	x	5.42	X	108.01	X	0.4	x	0.7	=	227.19	(78)
South	0.9x	0.77	x	2.72	X	104.89	X	0.4	x	0.7	=	55.36	(78)
South	0.9x	0.77	x	5.42	X	104.89	X	0.4	x	0.7	=	220.63	(78)
South	0.9x	0.77	x	2.72	X	101.89	X	0.4	x	0.7	=	53.77	(78)
South	0.9x	0.77	x	5.42	X	101.89	X	0.4	x	0.7	=	214.31	(78)
South	0.9x	0.77	X	2.72	X	82.59	X	0.4	x	0.7	=	43.59	(78)
South	0.9x	0.77	x	5.42	X	82.59	X	0.4	X	0.7	=	173.71	(78)
South	0.9x	0.77	x	2.72	х	55.42	] x	0.4	x	0.7		29.25	(78)
South	0.9x	0.77	x	5.42	х	55.42	] x	0.4	x	0.7	=	116.56	(78)
South	0.9x	0.77	x	2.72	X	40.4	] x	0.4	x	0.7	=	21.32	(78)
South	0.9x	0.77	x	5.42	X	40.4	Х	0.4	х	0.7	=	84.97	(78)
West	0.9x	0.77	x	5.42	x	19.64	X	0.4	x	0.7	=	41.31	(80)
West	0.9x	0.77	x	5.42	x	38.42	X	0.4	x	0.7	=	80.81	(80)
West	0.9x	0.77	×	5.42	X	63.27	X	0.4	x	0.7	=	133.09	(80)
West	0.9x	0.77	X	5.42	X	92.28	X	0.4	x	0.7	=	194.1	(80)
West	0.9x	0.77	×	5.42	X	113.09	X	0.4	x	0.7	=	237.88	(80)
West	0.9x	0.77	×	5.42	X	115.77	X	0.4	x	0.7	=	243.51	(80)
West	0.9x	0.77	X	5.42	X	110.22	X	0.4	x	0.7	=	231.83	(80)
West	0.9x	0.77	×	5.42	X	94.68	X	0.4	x	0.7	=	199.14	(80)
West	0.9x	0.77	×	5.42	x	73.59	X	0.4	x [	0.7	=	154.79	(80)
West	0.9x	0.77	×	5.42	X	45.59	X	0.4	x	0.7	=	95.89	(80)
West	0.9x	0.77	x	5.42	x	24.49	X	0.4	x	0.7	=	51.51	(80)
West	0.9x	0.77	×	5.42	X	16.15	X	0.4	x	0.7	=	33.97	(80)
-				for each mor			(83)m	n = Sum(74)m	(82)m		,	1	
(83)m=	164.32		39.72	484.15 540.1		34.38 516.03	475	.14 422.87	313.19	197.32	140.27		(83)
_				(84)m = $(73)$ i	<del>`</del>	<del></del>	_	-				I	
(84)m=	573.71	689.67 78	34.29	858.05 893.0	8 8	67.08 835.52	800	.39 758.69	669.89	578.03	538.94		(84)
7. Me	an inter	nal tempera	ature (	(heating seas	on)								
Temp	erature	during hear	ting p	eriods in the I	iving	area from Tal	ble 9	, Th1 (°C)				21	(85)
Utilisa		<del></del>			Ť	ee Table 9a)				1		l	
	Jan	Feb	Mar	Apr Ma	у	Jun Jul	A	ug Sep	Oct	Nov	Dec		



(86)m= 0.99	0.98	0.96	0.89	0.77	0.58	0.42	0.46	0.69	0.92	0.99	1		(86)
Mean interna	l tempera	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	7 in Tabl	e 9c)					
(87)m= 19.95	20.16	20.43	20.71	20.9	20.98	21	21	20.96	20.7	20.27	19.92		(87)
Temperature	during h	eating p	eriods ir	rest of	dwelling	from Ta	able 9, T	h2 (°C)					
(88)m= 19.98	19.99	19.99	20	20	20.01	20.01	20.02	20.01	20	20	19.99		(88)
Utilisation fac	tor for ga	ains for i	est of d	welling,	h2,m (se	e Table	9a)						
(89)m= 0.99	0.98	0.95	0.86	0.71	0.5	0.33	0.36	0.61	0.89	0.98	0.99		(89)
Mean interna	l tempera	ature in	the rest	of dwell	ing T2 (f	ollow ste	eps 3 to	7 in Tabl	le 9c)	_			
(90)m= 18.61	18.91	19.28	19.68	19.91	20	20.01	20.01	19.98	19.68	19.08	18.56		(90)
								1	fLA = Livin	g area ÷ (	4) =	0.36	(91)
Mean interna	l tempera	ature (fo	r the wh	ole dwe	lling) = f	LA × T1	+ (1 – fL	A) × T2			,	•	
(92)m= 19.09	19.36	19.69	20.05	20.27	20.35	20.37	20.37	20.33	20.05	19.51	19.05		(92)
Apply adjustn	r				1			<del></del>	<del></del>	10.54	10.05	1	(03)
(93)m= 19.09 8. Space hea	19.36	19.69	20.05	20.27	20.35	20.37	20.37	20.33	20.05	19.51	19.05		(93)
Set Ti to the r			nperatur	e obtair	ned at sto	ep 11 of	Table 9	b. so tha	t Ti.m=(	76)m an	d re-calc	culate	
the utilisation						ор о.							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac		_											(0.4)
(94)m= 0.99 Useful gains,	0.97	0.94	0.86	0.72	0.53	0.36	0.4	0.64	0.89	0.98	0.99		(94)
(95)m= 567.65	672.32	738.75	741.82	646.35	456.66	303.35	318.15	484.03	598.08	564.54	534.63		(95)
Monthly avera					able 8						l		. ,
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate				erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m	]	1	_	•	
(97)m= 1235.69				701.26	464.9	304.3	319.66	505.86	773.25	1020.6	1227.8		(97)
Space heating (98)m= 497.02	g require 357.66	ment fo 266.27	r each m 124.77	10nth, k 40.86	Wh/mon	$\frac{1}{0} = 0.02$	24 x [(97   0	)m – (95 l 0	)m] x (4 130.33	1)m 328.37	515.71	1	
(90)111= 497.02	337.00	200.27	124.77	40.00				l per year			l	2260.99	(98)
Casas bootin	a roquira	mont in	Is\A/b/m2	hioor			1018	ii pei yeai	(KVVII/yeai	) = Sum(s	O)15,912 —		=
Space heating	• ,											30.35	(99)
9b. Energy red This part is use				Ĭ			ting prov	idad by	0.00mm	unity ool	nomo		
Fraction of spa					_		<b>.</b>	•		urilly Sci	ienie.	0	(301)
Fraction of spa	ace heat	from co	mmunity	system	1 – (30 <sup>-</sup>	1) =						1	(302)
The community so			•	•	,	•	allows for	CHP and i	up to four	other heat	sources; t	he latter	
includes boilers, h	eat pumps	, geothern	nal and wa	iste heat f							, -		
Fraction of hea				•								1	(303a)
Fraction of total	al space	heat froi	m Comn	nunity he	eat pump	0			(3	02) x (303	ia) =	1	(304a
Factor for cont	rol and c	harging	method	(Table	4c(3)) fo	r comm	unity hea	ating sys	tem			1	(305)
Distribution los	s factor	(Table 1	2c) for c	ommun	ity heati	ng syste	m					1.05	(306)
Space heating	g											kWh/ye	ar
Annual space	heating r	equirem	ent									2260.99	



Space heat from Community heat pump	(98) x (304a) x (305) x (306) =	2374.04	(307a)
Efficiency of secondary/supplementary heating system in	n % (from Table 4a or Appendix E)	0	(308
Space heating requirement from secondary/supplementa	ary system (98) x (301) x 100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement	Γ	2067.18	- 1
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x (305) x (306) =	2170.54	(310a)
Electricity used for heat distribution	0.01 × [(307a)(307e) + (310a)(310e)] =	45.45	(313)
Cooling System Energy Efficiency Ratio	Ī	0	(314)
Space cooling (if there is a fixed cooling system, if not er	nter 0) = (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input	ut from outside	162.58	(330a)
warm air heating system fans	Ī	0	(330b)
pump for solar water heating	Ī	0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	162.58	(331)
Energy for lighting (calculated in Appendix L)		326.8	(332)
12b. CO2 Emissions – Community heating scheme  CO2 from other sources of space and water heating (not	Energy Emission factor E kWh/year kg CO2/kWh k	Emiss <mark>ions</mark>	
	CHD)		
	CHP)  CHP using two fuels repeat (363) to (366) for the second fuel	95.6	(367a)
Efficiency of heat source 1 (%)			(367a)
Efficiency of heat source 1 (%)	CHP using two fuels repeat (363) to (366) for the second fuel	95.6	<b>」</b> ` `
Efficiency of heat source 1 (%)  CO2 associated with heat source 1	HP using two fuels repeat (363) to (366) for the second fuel [(307b)+(310b)] x 100 ÷ (367b) x 0.22 =	95.6	(367)
Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution	(367b) (366) for the second fuel [(307b)+(310b)] x 100 ÷ (367b) x	95.6 1026.81 23.59	(367)
Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community systems	(307b)+(310b)] x 100 ÷ (367b) x	95.6 1026.81 23.59 1050.4	(367) (372) (373)
Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community systems  CO2 associated with space heating (secondary)	(363)(366) + (368)(372) = (309) x	95.6 1026.81 23.59 1050.4	(367) (372) (373) (374)
Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community systems  CO2 associated with space heating (secondary)  CO2 associated with water from immersion heater or ins	[(307b)+(310b)] x 100 ÷ (367b) x	95.6 1026.81 23.59 1050.4 0	(367) (372) (373) (374) (375)
Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community systems  CO2 associated with space heating (secondary)  CO2 associated with water from immersion heater or ins  Total CO2 associated with space and water heating	(307b)+(310b)] x 100 ÷ (367b) x	95.6 1026.81 23.59 1050.4 0	(367) (372) (373) (374) (375) (376)
Efficiency of heat source 1 (%)  CO2 associated with heat source 1  Electrical energy for heat distribution  Total CO2 associated with community systems  CO2 associated with space heating (secondary)  CO2 associated with water from immersion heater or ins  Total CO2 associated with space and water heating  CO2 associated with electricity for pumps and fans within	(307b)+(310b)] x 100 ÷ (367b) x	95.6 1026.81 23.59 1050.4 0 0 1050.4 84.38	(367) (372) (373) (374) (375) (376) (378)

El rating (section 14)

(385)

85.37



User Details: **Assessor Name:** Stroma Number: Stroma FSAP 2012 **Software Version: Software Name:** Version: 1.0.5.12 Property Address: EB1-04 Address: 1. Overall dwelling dimensions Av. Height(m) Area(m²) Volume(m³) Ground floor 72.7 (1a) x 2.7 (2a) =196.29 (3a) Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)(4)72.7 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =196.29 (5) total m<sup>3</sup> per hour main secondary other heating heating x 40 =Number of chimneys (6a) 0 0 x 20 =Number of open flues 0 0 0 (6b) Number of intermittent fans x 10 =(7a)0 0 x 10 =Number of passive vents (7b) 0 0 x 40 =Number of flueless gas fires 0 (7c)Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = $\div (5)$ (8) If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9)0 Additional infiltration [(9)-1]x0.1 =0 (10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)0 if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12)If no draught lobby, enter 0.05, else enter 0 (13)0 Percentage of windows and doors draught stripped (14)0 Window infiltration  $0.25 - [0.2 \times (14) \div 100] =$ 0 (15)Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =O (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)3 If based on air permeability value, then  $(18) = [(17) \div 20] + (8)$ , otherwise (18) = (16)0.15 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)2  $(20) = 1 - [0.075 \times (19)] =$ Shelter factor (20)0.85  $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.13 Infiltration rate modified for monthly wind speed Jan Feb Jul Sep Mar Apr May Jun Aug Oct Nov Dec Monthly average wind speed from Table 7 (22)m =5.1 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor  $(22a)m = (22)m \div 4$ (22a)m 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18



Adjusted infiltration rate (allowing for shelter and wind speed) =	21a) x (22a)m
0.16	0.12 0.13 0.14 0.14 0.15
Calculate effective air change rate for the applicable case	
If mechanical ventilation:	0.5 (23 (23b) (23c)
If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N	- 11 · 11 ·
If balanced with heat recovery: efficiency in % allowing for in-use factor (from	10.0
a) If balanced mechanical ventilation with heat recovery (MVH	
(24a)m= 0.28 0.28 0.27 0.26 0.25 0.24 0.24	0.24   0.24   0.25   0.26   0.27   (24
b) If balanced mechanical ventilation without heat recovery (M	<del></del>
(24b)m= 0 0 0 0 0 0 0 0	0 0 0 0 0
c) If whole house extract ventilation or positive input ventilation if $(22b)m < 0.5 \times (23b)$ , then $(24c) = (23b)$ ; otherwise $(24c)$	
(24c)m =	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$
d) If natural ventilation or whole house positive input ventilatio	
if $(22b)m = 1$ , then $(24d)m = (22b)m$ otherwise $(24d)m = 0$	
(24d)m= 0 0 0 0 0 0 0	0 0 0 0 0 (24
Effective air change rate - enter (24a) or (24b) or (24c) or (24c)	) in box (25)
(25)m= 0.28 0.28 0.27 0.26 0.25 0.24 0.24	0.24 0.24 0.25 0.26 0.27 (25
3. Heat losses and heat loss parameter:	
ELEMENT Gross Openings Net Area	U-value A X U k-value A X k
area (m²) m² A ,m²	W/m2K
Death	
Doors 1.89 x	1.4 = 2.646 (26
1.00	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$
Windows Type 1	
Windows Type 1 2.72 x1/1 Windows Type 2 2.72 x1/1	$\frac{1}{(1.2) + 0.04} = 3.11 \tag{27}$
Windows Type 1  Windows Type 2  Windows Type 3  2.72  x1/[  2.72  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[	$\frac{1}{(1.2) + 0.04} = 3.11$ $\frac{1}{(1.2) + 0.04} = 3.11$ (27)
Windows Type 1       2.72       x1/1         Windows Type 2       2.72       x1/1         Windows Type 3       5.42       x1/1         Windows Type 4       2.18       x1/1	$\frac{1}{(1.2) + 0.04} = 3.11$ $\frac{1}{(1.2) + 0.04} = 3.11$ $\frac{1}{(1.2) + 0.04} = 6.21$ (27)
Windows Type 1       2.72       x1/I         Windows Type 2       2.72       x1/I         Windows Type 3       5.42       x1/I         Windows Type 4       2.18       x1/I	$\frac{1}{(1.2) + 0.04} = 3.11$ $\frac{1}{(1.2) + 0.04} = 3.11$ $\frac{1}{(1.2) + 0.04} = 6.21$ $\frac{1}{(1.2) + 0.04} = 2.5$ (27)
Windows Type 1       2.72       x1/1         Windows Type 2       2.72       x1/1         Windows Type 3       5.42       x1/1         Windows Type 4       2.18       x1/1         Windows Type 5       2.18       x1/1	$ \frac{1}{(1.2) + 0.04} = 3.11 \qquad (27) $ $ \frac{1}{(1.2) + 0.04} = 3.11 \qquad (27) $ $ \frac{1}{(1.2) + 0.04} = 6.21 \qquad (27) $ $ \frac{1}{(1.2) + 0.04} = 2.5 \qquad (27) $ $ \frac{1}{(1.2) + 0.04} = 2.5 \qquad (27) $
Windows Type 1       2.72       x1/I         Windows Type 2       2.72       x1/I         Windows Type 3       5.42       x1/I         Windows Type 4       2.18       x1/I         Windows Type 5       2.18       x1/I         Floor       72.7       x	$ \frac{1}{(1.2) + 0.04} = 3.11 \qquad (27) $ $ \frac{1}{(1.2) + 0.04} = 3.11 \qquad (27) $ $ \frac{1}{(1.2) + 0.04} = 6.21 \qquad (27) $ $ \frac{1}{(1.2) + 0.04} = 2.5 \qquad (27) $ $ \frac{1}{(1.2) + 0.04} = 2.5 \qquad (27) $ $ \frac{1}{(1.2) + 0.04} = 8.723999 \qquad (28) $
Windows Type 1       2.72       x1/I         Windows Type 2       2.72       x1/I         Windows Type 3       5.42       x1/I         Windows Type 4       2.18       x1/I         Windows Type 5       2.18       x1/I         Floor       72.7       x         Walls       43.2       19.29       23.91       x	$ \frac{1}{(1.2) + 0.04} = 3.11  \frac{1}{(1.2) + 0.04} = 3.11  \frac{1}{(1.2) + 0.04} = 6.21  \frac{1}{(1.2) + 0.04} = 2.5  \frac{1}{(1.2) + 0.04} = 2.5  \frac{1}{(1.2) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = $
Windows Type 1       2.72       x1/I         Windows Type 2       2.72       x1/I         Windows Type 3       5.42       x1/I         Windows Type 4       2.18       x1/I         Windows Type 5       2.18       x1/I         Floor       72.7       x         Walls       43.2       19.29       23.91       x         Total area of elements, m²       115.9       115.9	$ \frac{1}{(1.2) + 0.04} = 3.11  \frac{1}{(1.2) + 0.04} = 3.11  \frac{1}{(1.2) + 0.04} = 6.21  \frac{1}{(1.2) + 0.04} = 2.5  \frac{1}{(1.2) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(2$
Windows Type 1       2.72       x1/I         Windows Type 2       2.72       x1/I         Windows Type 3       5.42       x1/I         Windows Type 4       2.18       x1/I         Windows Type 5       2.18       x1/I         Floor       72.7       x [         Walls       43.2       19.29       23.91       x [         Total area of elements, m²       115.9       49.14       x [         Party wall       49.14       x [	$ \frac{1}{(1.2) + 0.04} = 3.11 $ $ \frac{1}{(1.2) + 0.04} = 3.11 $ $ \frac{1}{(1.2) + 0.04} = 6.21 $ $ \frac{1}{(1.2) + 0.04} = 2.5 $ $ \frac{1}{(1.2) + 0.04} = 2.5 $ $ \frac{1}{(1.2) + 0.04} = 3.83 $ $ \frac{1}{(29)} $ $ \frac{1}{(29)} $ $ \frac{1}{(29)} $ $ \frac{1}{(29)} $ $ \frac{1}{(29)} $ $ \frac{1}{(29)} $ $ \frac{1}{(32)} $ $ \frac{1}{(32)} $
Windows Type 1  Windows Type 2  Windows Type 3  Windows Type 4  Windows Type 5  Floor  Walls  43.2  Total area of elements, m²  Party wall  Party ceiling  * for windows and roof windows, use effective window U-value calculated using the include the areas on both sides of internal walls and partitions	$ \frac{1}{(1.2) + 0.04} = 3.11                                 $
Windows Type 1  Windows Type 2  Windows Type 3  Windows Type 4  Windows Type 5  Floor  Walls  43.2  Total area of elements, m²  Party wall  Party ceiling  * for windows and roof windows, use effective window U-value calculated using the include the areas on both sides of internal walls and partitions  Fabric heat loss, W/K = S (A x U)	1/(1.2) + 0.04] = 3.11 (27) 1/(1.2) + 0.04] = 6.21 (27) 1/(1.2) + 0.04] = 6.21 (27) 1/(1.2) + 0.04] = 2.5 (27) 1/(1.2) + 0.04] = 2.5 (27) 0.12 = 8.723999 (28) 0.16 = 3.83 (29) 0.16 = 0 (31) 0 = 0 (32) 0 = 0 (33)
Windows Type 1  Windows Type 2  Windows Type 3  Windows Type 4  Windows Type 5  Floor  Walls  43.2  Total area of elements, m²  Party wall  Party ceiling  * for windows and roof windows, use effective window U-value calculated using the include the areas on both sides of internal walls and partitions  Fabric heat loss, W/K = S (A x U)  Heat capacity Cm = S(A x k)	$ \frac{1}{(1.2) + 0.04} = 3.11                                 $
Windows Type 1  Windows Type 2  Windows Type 3  Windows Type 4  Windows Type 5  Floor  Walls  43.2  Total area of elements, m²  Party wall  Party ceiling  * for windows and roof windows, use effective window U-value calculated using ** include the areas on both sides of internal walls and partitions  Fabric heat loss, W/K = S (A x U)  Heat capacity Cm = S(A x k)  Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K	1/(1.2) + 0.04] = 3.11 (27 1/(1.2) + 0.04] = 3.11 (27 1/(1.2) + 0.04] = 6.21 (27 1/(1.2) + 0.04] = 2.5 (27 1/(1.2) + 0.04] = 2.5 (27 0.12 = 8.723999 (28 0.16 = 3.83 (29 0.16 = 3.83 (31 0 = 0 (32 0 = 0 (33 0 = 0 (34) 0 = 0 (35) 0 = 0 (35) 0 = 0 (36) 0 = 0 (37) 0 = 0 (38) 0 = 0 (39) 0 = 0 (30) 0 = 0 (31) 0 = 0 (32) 0 = 0 (33) 0 = 0 (34) 0 = 0 (35) 0 = 0 (35) 0 = 0 (35) 0 = 0 (36) 0 = 0 (37) 0 = 0 (37) 0 = 0 (38) 0 = 0 (39) 0 = 0 (39) 0 = 0 (30) 0 = 0 (31) 0 = 0 (32) 0 = 0 (33) 0 = 0 (34) 0 = 0 (35) 0 = 0 (35)
Windows Type 1  Windows Type 2  Windows Type 3  Windows Type 4  Windows Type 5  Floor  Walls  43.2  Total area of elements, m²  Party wall  Party ceiling  * for windows and roof windows, use effective window U-value calculated using the include the areas on both sides of internal walls and partitions  Fabric heat loss, W/K = S (A x U)  Heat capacity Cm = S(A x k)	1/(1.2) + 0.04] = 3.11 (27 1/(1.2) + 0.04] = 3.11 (27 1/(1.2) + 0.04] = 6.21 (27 1/(1.2) + 0.04] = 2.5 (27 1/(1.2) + 0.04] = 2.5 (27 0.12 = 8.723999 (28 0.16 = 3.83 (29 0.16 = 3.83 (31 0 = 0 (32 0 = 0 (33 0 = 0 (34) 0 = 0 (35) 0 = 0 (35) 0 = 0 (36) 0 = 0 (37) 0 = 0 (38) 0 = 0 (39) 0 = 0 (30) 0 = 0 (31) 0 = 0 (32) 0 = 0 (33) 0 = 0 (34) 0 = 0 (35) 0 = 0 (35) 0 = 0 (35) 0 = 0 (36) 0 = 0 (37) 0 = 0 (37) 0 = 0 (38) 0 = 0 (39) 0 = 0 (39) 0 = 0 (30) 0 = 0 (31) 0 = 0 (32) 0 = 0 (33) 0 = 0 (34) 0 = 0 (35) 0 = 0 (35)
Windows Type 2  Windows Type 3  Windows Type 4  Windows Type 5  Floor  Walls  43.2  Total area of elements, m²  Party wall  Party ceiling  * for windows and roof windows, use effective window U-value calculated using the include the areas on both sides of internal walls and partitions  Fabric heat loss, W/K = S (A x U)  Heat capacity Cm = S(A x k)  Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K  For design assessments where the details of the construction are not known presented.	1/(1.2) + 0.04] = 3.11 (27 1/(1.2) + 0.04] = 3.11 (27 1/(1.2) + 0.04] = 6.21 (27 1/(1.2) + 0.04] = 2.5 (27 1/(1.2) + 0.04] = 2.5 (27 0.12 = 8.723999 (28 0.16 = 3.83 (29 0.16 = 3.83 (31 0 = 0 (32 0 = 0 (33 0 = 0 (34) 0 = 0 (35) 0 = 0 (35) 0 = 0 (36) 0 = 0 (37) 0 = 0 (38) 0 = 0 (39) 0 = 0 (30) 0 = 0 (31) 0 = 0 (32) 0 = 0 (33) 0 = 0 (34) 0 = 0 (35) 0 = 0 (35) 0 = 0 (35) 0 = 0 (36) 0 = 0 (37) 0 = 0 (37) 0 = 0 (38) 0 = 0 (39) 0 = 0 (39) 0 = 0 (30) 0 = 0 (31) 0 = 0 (32) 0 = 0 (33) 0 = 0 (34) 0 = 0 (35) 0 = 0 (35)
Windows Type 1  Windows Type 2  Windows Type 3  Windows Type 4  Windows Type 5  Floor  Walls  43.2  Total area of elements, m²  Party wall  Party ceiling  * for windows and roof windows, use effective window U-value calculated using * include the areas on both sides of internal walls and partitions  Fabric heat loss, W/K = S (A x U)  Heat capacity Cm = S(A x k)  Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K  For design assessments where the details of the construction are not known precan be used instead of a detailed calculation.	1/(1.2) + 0.04] = 3.11 (27 1/(1.2) + 0.04] = 3.11 (27 1/(1.2) + 0.04] = 6.21 (27 1/(1.2) + 0.04] = 2.5 (27 1/(1.2) + 0.04] = 2.5 (27 0.12 = 8.723999 (28 0.16 = 3.83 (29 0.16 = 3.83 (31 0 = 0 (32 0 = 0 (33 0 = 0 (34 0 = 0 (35) (35) (35) (35) (35) (35) (35) (35)



Ventilation hea	at loss ca	alculated	l monthly	<b>/</b>				(38)m	= 0.33 × (	25)m x (5)	)		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 18.14	17.93	17.73	16.7	16.49	15.46	15.46	15.25	15.87	16.49	16.9	17.32		(38)
Heat transfer of	coefficie	nt, W/K						(39)m	= (37) + (	38)m			
(39)m= 68.34	68.13	67.93	66.89	66.69	65.66	65.66	65.45	66.07	66.69	67.1	67.51		
Heat loss para	meter (H	HLP), W/	m²K						Average = = (39)m ÷	Sum(39) <sub>1</sub> .	12 /12=	66.84	(39)
(40)m= 0.94	0.94	0.93	0.92	0.92	0.9	0.9	0.9	0.91	0.92	0.92	0.93		
Number of day	s in mo	nth (Tab	le 1a)					,	Average =	Sum(40) <sub>1</sub>	12 /12=	0.92	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heat	ting ene	rgy requi	rement:								kWh/ye	ar:	
Assumed occu			[1 - exp	(-0.0003	149 x (TF	-A -13 9	)2)] + 0 (	0013 x ( <sup>-</sup>	ΓFA -13		.31		(42)
if TFA £ 13.9		1 1.70 X	ι σχρ	( 0.0000	73 X (11	70.0	<i>)</i>	) X 010 X (	1177 10	.0)			
Annual averag									e target o		0.06		(43)
not more that 125						-	o acmeve	a water us	e targer o	'			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in								ООР					
(44)m= 97.96	94.4	90.84	87.28	83.72	80.15	80.15	83.72	87.28	90.84	94.4	97.96		
Energy content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	m x nm x E	)Tm / 3600			m(44) <sub>112</sub> = ables 1b, 1		1068.71	(44)
(45)m= 145.28	127.06	131.12	114.31	109.68	94.65	87.71	100.64	101.85	118.69	129.56	140.69		
							l.		Total = Su	m(45) <sub>112</sub> =	=	1401.24	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46	) to (61)		,			
(46)m= 21.79 Water storage	19.06	19.67	17.15	16.45	14.2	13.16	15.1	15.28	17.8	19.43	21.1		(46)
Storage volum		includin	ia anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	, ,					•					<u> </u>		(,
Otherwise if no Water storage	stored			•			` '	ers) ente	er '0' in (	47)			
a) If manufact		eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature fa	actor fro	m Table	2b								0		(49)
Energy lost fro							(48) x (49)	) =		1	10		(50)
<ul><li>b) If manufact</li><li>Hot water stora</li></ul>			-								02		(51)
If community h	_			C 2 (KVV)	11/11110/00	·y <i>)</i>				0.	.02		(31)
Volume factor	-									1.	.03		(52)
Temperature fa	actor fro	m Table	2b							0	.6		(53)
Energy lost fro		-	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	1.	.03		(54)
Enter (50) or (	. , .	,								1.	.03		(55)
Water storage							((56)m = (						
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)



If cylinder contains dedicated solar storage, $(57)$ m = $(56)$ m x $[(50) - (H11)] \div (50)$ , else $(57)$ m = $(56)$ m where $(H11)$ is from Appendix H	
(57)m= 32.01 28.92 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01	(57)
Primary circuit loss (annual) from Table 3	(58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m	
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26	(59)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m	
(61)m= 0 0 0 0 0 0 0 0 0 0 0 0	(61)
Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m + (46)m + (57)m + (59)m + (61)m$	
(62)m= 200.56 176.99 186.39 167.8 164.96 148.14 142.98 155.92 155.34 173.97 183.05 195.97	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)	
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	
(63)m= 0 0 0 0 0 0 0 0 0 0 0	(63)
Output from water heater	
(64)m= 200.56 176.99 186.39 167.8 164.96 148.14 142.98 155.92 155.34 173.97 183.05 195.97	,
Output from water heater (annual) <sub>112</sub> 2052.08	(64)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 x (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]	
(65)m= 92.53 82.19 87.82 80.8 80.69 74.27 73.38 77.69 76.66 83.69 85.87 91	(65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating	
5. Internal gains (see Table 5 and 5a):	
o. Internal gams (see Table 6 and 6a).	
Metabolic gains (Table 5), Watts	
Metabolic gains (Table 5), Watts	(66)
Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	(66)
Metabolic gains (Table 5), Watts         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         (66)m=       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49	(66) (67)
Metabolic gains (Table 5), Watts    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	, ,
Metabolic gains (Table 5), Watts         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         (66)m=       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49	, ,
Metabolic gains (Table 5), Watts    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	(67)
Metabolic gains (Table 5), Watts           Jan         Feb         Mar         Apr         May         Jun         Jul         Aug         Sep         Oct         Nov         Dec           (66)m=         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49	(67)
Metabolic gains (Table 5), Watts    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	(67) (68)
Metabolic gains (Table 5), Watts    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	(67) (68)
Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  (66)m= 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115	(67) (68) (69)
Metabolic gains (Table 5), Watts         Jan         Feb         Mar         Apr         May         Jun         Jul         Aug         Sep         Oct         Nov         Dec           (66)m=         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49 <t< td=""><td>(67) (68) (69)</td></t<>	(67) (68) (69)
Metabolic gains (Table 5), Watts         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         (66)m=       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49	(67) (68) (69) (70)
Metabolic gains (Table 5), Watts           Jan         Feb         Mar         Apr         May         Jun         Jul         Aug         Sep         Oct         Nov         Dec           (66)m=         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49	(67) (68) (69) (70)
Metabolic gains (Table 5), Watts           Jan         Feb         Mar         Apr         May         Jun         Jul         Aug         Sep         Oct         Nov         Dec           (66)m=         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49	(67) (68) (69) (70) (71)
Metabolic gains (Table 5), Watts           Jan         Feb         Mar         Apr         May         Jun         Jul         Aug         Sep         Oct         Nov         Dec           (66)m=         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49	(67) (68) (69) (70) (71)
Metabolic gains (Table 5), Watts    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	(67) (68) (69) (70) (71)

Flux

Orientation: Access Factor Area Flux g\_ FF
Table 6d m² Table 6a Table 6b Table 6c

Gains (W)



North	0.9x	0.77	X	2.72	x	10.63	X	0.4	x	0.7	=	5.61	(74)
North	0.9x	0.77	X	2.18	x	10.63	X	0.4	x	0.7	=	4.5	(74)
North	0.9x	0.77	X	2.72	x	20.32	x	0.4	x	0.7	=	10.73	(74)
North	0.9x	0.77	X	2.18	x	20.32	x	0.4	x	0.7	=	8.6	(74)
North	0.9x	0.77	X	2.72	x	34.53	X	0.4	x	0.7	=	18.22	(74)
North	0.9x	0.77	X	2.18	x	34.53	X	0.4	x	0.7	=	14.61	(74)
North	0.9x	0.77	X	2.72	X	55.46	X	0.4	x	0.7	=	29.27	(74)
North	0.9x	0.77	X	2.18	X	55.46	X	0.4	x	0.7	] =	23.46	(74)
North	0.9x	0.77	X	2.72	X	74.72	X	0.4	x	0.7	=	39.43	(74)
North	0.9x	0.77	X	2.18	x	74.72	X	0.4	x	0.7	=	31.61	(74)
North	0.9x	0.77	X	2.72	x	79.99	X	0.4	x	0.7	=	42.22	(74)
North	0.9x	0.77	X	2.18	x	79.99	X	0.4	x	0.7	=	33.83	(74)
North	0.9x	0.77	X	2.72	x	74.68	X	0.4	x	0.7	=	39.41	(74)
North	0.9x	0.77	X	2.18	x	74.68	X	0.4	x	0.7	=	31.59	(74)
North	0.9x	0.77	X	2.72	x	59.25	X	0.4	x	0.7	=	31.27	(74)
North	0.9x	0.77	X	2.18	x	59.25	X	0.4	x	0.7	=	25.06	(74)
North	0.9x	0.77	X	2.72	X	41.52	X	0.4	X	0.7	=	21.91	(74)
North	0.9x	0.77	X	2.18	X	41.52	Х	0.4	X	0.7	-	17.56	(74)
North	0.9x	0.77	X	2.72	х	24.19	x	0.4	x	0.7	=	12.77	(74)
North	0.9x	0.77	X	2.18	х	24.19	X	0.4	x	0.7	=	10.23	(74)
North	0.9x	0.77	X	2.72	X	13.12	X	0.4	x	0.7	=	6.92	(74)
North	0.9x	0.77	X	2.18	X	13.12	Х	0.4	x	0.7	=	5.55	(74)
North	0.9x	0.77	X	2.72	х	8.86	X	0.4	x	0.7	=	4.68	(74)
North	0.9x	0.77	X	2.18	Х	8.86	X	0.4	X	0.7	=	3.75	(74)
South	0.9x	0.77	X	2.72	X	46.75	X	0.4	X	0.7	=	24.68	(78)
South	0.9x	0.77	X	5.42	x	46.75	X	0.4	X	0.7	=	49.17	(78)
South	0.9x	0.77	X	2.18	x	46.75	X	0.4	X	0.7	=	39.55	(78)
South	0.9x	0.77	X	2.72	x	76.57	X	0.4	X	0.7	=	40.41	(78)
South	0.9x	0.77	X	5.42	x	76.57	x	0.4	X	0.7	=	80.53	(78)
South	0.9x	0.77	X	2.18	X	76.57	X	0.4	X	0.7	=	64.78	(78)
South	0.9x	0.77	X	2.72	x	97.53	X	0.4	X	0.7	=	51.48	(78)
South	0.9x	0.77	X	5.42	x	97.53	x	0.4	X	0.7	=	102.58	(78)
South	0.9x	0.77	X	2.18	X	97.53	X	0.4	X	0.7	=	82.52	(78)
South	0.9x	0.77	X	2.72	X	110.23	X	0.4	X	0.7	=	58.18	(78)
South	0.9x	0.77	X	5.42	X	110.23	X	0.4	X	0.7	=	115.93	(78)
South	0.9x	0.77	X	2.18	x	110.23	x	0.4	X	0.7	=	93.26	(78)
South	0.9x	0.77	X	2.72	x	114.87	x	0.4	X	0.7	=	60.63	(78)
South	0.9x	0.77	X	5.42	x	114.87	x	0.4	X	0.7	=	120.81	(78)
South	0.9x	0.77	X	2.18	x	114.87	X	0.4	X	0.7	=	97.18	(78)
South	0.9x	0.77	x	2.72	x	110.55	X	0.4	x	0.7	=	58.35	(78)
South	0.9x	0.77	X	5.42	X	110.55	X	0.4	X	0.7	=	116.26	(78)



South	0.9x	0.77	X	2.1	8	X	1	10.55	X	0.4	X	0.7	=	93.53	(78)
South	0.9x	0.77	X	2.7	′2	X	10	08.01	x	0.4	X	0.7	=	57.01	(78)
South	0.9x	0.77	X	5.4	12	X	10	08.01	X	0.4	X	0.7	=	113.6	(78)
South	0.9x	0.77	X	2.1	8	X	10	08.01	X	0.4	X	0.7	=	91.38	(78)
South	0.9x	0.77	X	2.7	'2	X	10	04.89	X	0.4	X	0.7	=	55.36	(78)
South	0.9x	0.77	X	5.4	12	X	10	04.89	X	0.4	X	0.7	=	110.32	(78)
South	0.9x	0.77	x	2.1	8	X	10	04.89	X	0.4	X	0.7	=	88.74	(78)
South	0.9x	0.77	X	2.7	'2	X	10	01.89	X	0.4	X	0.7	=	53.77	(78)
South	0.9x	0.77	X	5.4	12	X	10	01.89	X	0.4	X	0.7	=	107.15	(78)
South	0.9x	0.77	X	2.1	8	X	10	01.89	X	0.4	X	0.7	=	86.2	(78)
South	0.9x	0.77	X	2.7	<b>'</b> 2	X	8	2.59	X	0.4	X	0.7	=	43.59	(78)
South	0.9x	0.77	X	5.4	12	X	8	2.59	X	0.4	X	0.7	=	86.86	(78)
South	0.9x	0.77	X	2.1	8	X	8	2.59	x	0.4	X	0.7	=	69.87	(78)
South	0.9x	0.77	X	2.7	<b>'</b> 2	X	5	5.42	X	0.4	X	0.7	=	29.25	(78)
South	0.9x	0.77	X	5.4	12	X	5	5.42	X	0.4	X	0.7	=	58.28	(78)
South	0.9x	0.77	X	2.1	8	X	5	5.42	x	0.4	X	0.7	=	46.88	(78)
South	0.9x	0.77	X	2.7	'2	X	4	40.4	X	0.4	X	0.7	=	21.32	(78)
South	0.9x	0.77	X	5.4	2	X	4	40.4	X	0.4	X	0.7	=	42.49	(78)
South	0.9x	0.77	x	2.1	8	Х	4	40.4	x	0.4	X	0.7	=	34.18	(78)
Solar (	gains in	watts, calc	ulated	for eacl	h month	1/			(83)m	= Sum(74)m	(82)m			_	
(83)m=	123.51		269.4	320.11	349.66	<u> </u>	44.18	332.99	310.	.75 286.6	223.3	1 146.89	106.41		(83)
		nternal and		` '	· •	_								7	4
(84)m=	527.18	606.73	558.49	688.88	697.85	6	72.47	648.29	631	.75 617.98	575.2	2 522.39	499.56		(84)
7. Me	an inter	nal temper	rature (	(heating	seasor	า)									
Temp	erature	during hea	ating p	eriods ir	the liv	ing	area f	from Tab	ole 9,	Th1 (°C)				21	(85)
Utilisa	ation fac	tor for gair	ns for li	ving are	ea, h1,n	n (s	ee Ta	ble 9a)						_	
	Jan	Feb	Mar	Apr	May	<u> </u>	Jun	Jul	Αι	ug Sep	Oct	Nov	Dec	_	
(86)m=	0.99	0.99	0.97	0.92	0.8		0.61	0.44	0.4	7 0.7	0.92	0.99	1		(86)
Mean	interna	temperati	ure in I	iving are	ea T1 (f	ollo	w ste	ps 3 to 7	in T	able 9c)				_	
(87)m=	20.17	20.33	20.53	20.76	20.92	2	0.99	21	2'	1 20.97	20.78	3 20.44	20.14		(87)
Temp	erature	during hea	ating p	eriods ir	n rest of	dw	elling	from Ta	ble 9	), Th2 (°C)					
(88)m=	20.13	20.14	20.14	20.15	20.15	2	0.16	20.16	20.	17 20.16	20.15	20.15	20.14	]	(88)
Utilisa	ation fac	tor for gair	ns for r	est of d	wellina.	h2.	m (se	e Table	9a)	•	•	•	•	_	
(89)m=	0.99		0.96	0.89	0.75	_	0.54	0.36	0.3	9 0.63	0.9	0.98	0.99	]	(89)
Moan	interna	temperati	uro in t	ho roct	of dwal	lina	T2 (f	ollow etc	ne 3	to 7 in Tab	lo Oc)		<u>!</u>	_	
(90)m=	19.03		19.56	19.88	20.08	Ť	0.16	20.16	20.	T T	19.91	19.43	19	7	(90)
()							-					ving area ÷ (		0.5	(91)
	. laker : . !		/*:	ا - ما 4 س	ا- مام	. 11! -	~\	A <b>T</b> 4	. /4			`			<b></b> ` ′
				・ エロヘ いんり		aiiin.	(11 — fl	$\Delta \sim 11$	<b>+</b> (1)	ーTAVYI2					
		temperati				_						10.04	10.57	7	(92)
(92)m=	19.61	19.8	20.05	20.32	20.5	2	0.57	20.58	20.		20.35		19.57	]	(92)



	1	T	l		T						T	1	(00)
(93)m= 19.61	19.8	20.05	20.32	20.5	20.57	20.58	20.58	20.56	20.35	19.94	19.57		(93)
8. Space he Set Ti to the				e ohtair	ned at st	en 11 of	Tahle 9h	so tha	t Ti m=(	76)m an	d re-calc	rulate	
the utilisatio			•				Tuble of	), 50 tria	,–(			·	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fa	ctor for g	ains, hm	1:									•	
(94)m= 0.99	0.98	0.96	0.9	0.77	0.57	0.4	0.43	0.67	0.9	0.98	0.99		(94)
Useful gains	1	· `	ŕ					==				Ī	(05)
(95)m= 522.63		630.2	618.71	540.4	386.08	260.91	272.91	411.73	520.55	511.93	496.28		(95)
Monthly ave	rage exte	ernai tem 6.5	perature 8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss ra		ļ								7.1	4.2		(30)
(97)m= 1045.9	1	920.18	764.02	586.85	392.22	261.51	273.82	426.61	650.22	861.35	1037.96		(97)
Space heati		Į			l	ļ				1)m	<u> </u>		
(98)m= 389.35	<del></del>	215.74	104.63	34.55	0	0	0	0	96.47	251.59	403.01		
					!		Tota	l per year	(kWh/yea	r) = Sum(9	8)15,912 =	1777.77	(98)
Space heati	na requir	ement in	kWh/m²	/vear								24.45	(99)
9b. Energy re	• ,			•	schame								
This part is u	•		· ·	Ĭ			ing prov	ided by a	a comm	unity sch	neme		
Fraction of sp										unity 001		0	(301)
Fraction of sp	ace heat	from co	mmunity	system	1 - (30	1) =						1	(302)
The community					•		allows for	CHP and u	up to four	other heat	sources: ti	he latter	
inclu <mark>des boi</mark> lers,											,		_
Fraction of he	eat from (	Commun	ity heat <sub>l</sub>	oump								1	(303a)
Fraction of to	tal space	heat fro	m Comn	nunity he	eat pump				(3	02) x (303	sa) =	1	(304a)
Factor for cor	ntrol and	charging	method	(Table	4c(3)) fo	r commu	ınity hea	ting syst	tem			1	(305)
Distribution lo	ss factor	(Table 1	12c) for c	commun	ity heatii	ng systei	m					1.05	(306)
Space heatir		`	,		,	0 ,						kWh/yea	
Annual space	_	requiren	nent									1777.77	<u>.</u>
Space heat fr				р				(98) x (30	04a) x (30a	5) x (306)	=	1866.65	(307a)
Efficiency of	secondar	y/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)		0	(308
Space heatin	g require	ment fro	m secon	dary/su	oplemen	tary syst	em	(98) x (30	)1) x 100 ·	÷ (308) =		0	(309)
Water heatin					•								
Annual water	_	requirem	ent									2052.08	7
If DHW from		•											<b>-</b>
Water heat fr	om Comr	nunity he	eat pump	)				(64) x (30	03a) x (30	5) x (306)	=	2154.69	(310a)
Electricity use	ed for hea	at distrib	ution				0.01	× [(307a).	(307e) +	· (310a)	(310e)] =	40.21	(313)
Cooling Syste	em Energ	y Efficie	ncy Ratio	0								0	(314)
Space cooling	g (if there	is a fixe	d cooling	g systen	n, if not e	enter 0)		= (107) ÷	(314) =			0	(315)
Electricity for													_
mechanical v	entilation	- balanc	ced, extra	act or po	sitive in	put from	outside					158.65	(330a)

# FHP (C

warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330l	o) + (330g) =	158.65	(331)
Energy for lighting (calculated in Appendix L)			320.42	(332)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP)  Efficiency of heat source 1 (%)  If there is CHP using to	two fuels repeat (363) to	(366) for the second fu	el 95.6	(367a)
CO2 associated with heat source 1 [(307b)+(3	10b)] x 100 ÷ (367b) x	0.22	908.59	(367)
Electrical energy for heat distribution [(3	313) x	0.52	= 20.87	(372)
Total CO2 associated with community systems (3)	63)(366) + (368)(372	2)	929.46	(373)
CO2 associated with space heating (secondary) (3	09) x	0	= 0	(374)
CO2 associated with water from immersion heater or instantaneo	us heater (312) x	0.22	= 0	(375)
Total CO2 associated with space and water heating (3	73) + (374) + (375) =		929.46	(376)
CO2 associated with electricity for pumps and fans within dwelling	g (331)) x	0.52	82.34	(378)
CO2 associated with electricity for lighting (3:	32))) x	0.52	166.3	(379)
Total CO2, kg/year sum of (376)(382) =			1178.1	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			16.2	(384)
El rating (section 14)			86.59	(385)



User Details: **Assessor Name:** Stroma Number: **Software Version: Software Name:** Stroma FSAP 2012 Version: 1.0.5.12 Property Address: W1-03 , 156 West End Lane, Camden, London Address: 1. Overall dwelling dimensions Av. Height(m) Volume(m³) Area(m<sup>2</sup>) Ground floor 86.4 (1a) x 2.7 (2a) = (3a) 233.28 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)(4)86.4 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =233.28 (5) total m<sup>3</sup> per hour main secondary other heating heating x 40 =Number of chimneys (6a) 0 0 x 20 =Number of open flues 0 0 0 (6b) Number of intermittent fans x 10 =(7a)0 0 x 10 =Number of passive vents (7b) 0 0 x 40 =Number of flueless gas fires 0 (7c)Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =(8) If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9)0 Additional infiltration [(9)-1]x0.1 =0 (10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)0 if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12)If no draught lobby, enter 0.05, else enter 0 (13)0 Percentage of windows and doors draught stripped (14)0 Window infiltration  $0.25 - [0.2 \times (14) \div 100] =$ 0 (15)Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =O (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)3 If based on air permeability value, then  $(18) = [(17) \div 20] + (8)$ , otherwise (18) = (16)0.15 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)2  $(20) = 1 - [0.075 \times (19)] =$ Shelter factor (20)0.85  $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.13 Infiltration rate modified for monthly wind speed Jan Feb Sep Mar Apr May Jun Jul Aug Oct Nov Dec Monthly average wind speed from Table 7 (22)m =5.1 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor  $(22a)m = (22)m \div 4$ (22a)m 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18



/ lajaotea iriiliti	ation rate	(allowing	ng for sh	elter an	d wind s	peed) =	(21a) x	(22a)m					
0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15	]	
Calculate effec		-	rate for t	he appli	cable ca	se	•				•		((a.c. )
If mechanica			andiv N (2	3h) - (23a	a) v Emy (e	aguation (N	VSV) other	wice (23h	) <b>–</b> (23a)			0.5	(23a)
If balanced with									) = (25a)			0.5	(23b)
		-	-	_					2b\m , /	22h) v [	1 (226)	76.5	(23c)
a) If balance (24a)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24 0.24	0.24	0.25	0.26	0.27	) <del>-</del> 100] ]	(24a)
b) If balance	<u> </u>				<u> </u>	<u> </u>	<u> </u>		<b>!</b>		0.27	]	(214)
(24b)m= 0		o T	0	0	0	0	0	0	0	0	0	1	(24b)
c) If whole h	<u> </u>				<u> </u>					0		J	(2.15)
,	ouse exila ∩ < 0.5 × (			•	•				5 × (23b	)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24c)
d) If natural	ventilation	or who	ole hous	e positiv	re input	ventilatio	on from I	oft	<u> </u>		Į.	J	
	n = 1, then								0.5]			_	
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24d)
Effective air	change ra	ate - en	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)				_	
(25)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27		(25)
3. Heat losse	s and hea	t loss p	paramete	er:								_	_
ELEMENT	Gross area (r		Openin m	gs	Net Ar		U-valu		AXU		k-valu		A X k
		,		-	A ,r	n²	W/m2	K	(W/ł	<)	kJ/m²•	K	kJ/K
Doors			- "		A ,r	_	W/m2 1.4	K = [	(W/ł 2.646	<) 	kJ/m².	K	(26)
Doo <mark>rs</mark> Windows Type	e 1			1		х		<b>-</b> [	`	<)	kJ/m²•	K	
			"		1.89	x x1	1.4	0.04] = [	2.646	<) 	kJ/m²•	K	(26)
Windows Type	2				1.89	x x1, x1,	1.4	= [ 0.04] = [ 0.04] = [	2.646	() 	kJ/m²·	ĸ	(26) (27)
Windows Type	2 2				1.89 5.28 2.64	x x1, x1, x1,	1.4 /[1/( 1.2 )+ /[1/( 1.2 )+	= [ 0.04] = [ 0.04] = [ 0.04] =	2.646 6.05 3.02	() 	kJ/m².	K	(26) (27) (27)
Windows Type Windows Type Windows Type	e 2 e 3 e 4				1.89 5.28 2.64 5.28	x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	1.4 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	$= \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix}$	2.646 6.05 3.02 6.05		kJ/m².	K	(26) (27) (27) (27)
Windows Type Windows Type Windows Type Windows Type	e 2 e 3 e 4				1.89 5.28 2.64 5.28 2.64 2.18	x x1, x1, x1, x1, x1, x1, x1, x1, x1, x1	1.4 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	$= \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix}$	2.646 6.05 3.02 6.05 3.02 2.5		kJ/m².	к	(26) (27) (27) (27) (27) (27)
Windows Type Windows Type Windows Type Windows Type Windows Type Floor	2 2 2 3 4 4 4 5 5				1.89 5.28 2.64 5.28 2.64 2.18 86.4	x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	1.4 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [	2.646 6.05 3.02 6.05 3.02 2.5 8.64		kJ/m².	K	(26) (27) (27) (27) (27) (27) (28)
Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type1	2 2 2 3 2 4 4 2 5 48.6		18.02	2	1.89 5.28 2.64 5.28 2.64 2.18 86.4 30.58	x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	1.4 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.1	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [	2.646 6.05 3.02 6.05 3.02 2.5 8.64 4.89		kJ/m².	K	(26) (27) (27) (27) (27) (27) (28) (29)
Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2	48.6 48.6			2	1.89 5.28 2.64 5.28 2.64 2.18 86.4 30.58	x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	1.4 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [	2.646 6.05 3.02 6.05 3.02 2.5 8.64		kJ/m².	K	(26) (27) (27) (27) (27) (27) (28) (29)
Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2 Total area of e	48.6 48.6		18.02	2	1.89 5.28 2.64 5.28 2.64 2.18 86.4 30.58 12.42 149.3	x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	1.4 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.1 0.16	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [	2.646 6.05 3.02 6.05 3.02 2.5 8.64 4.89		kJ/m².	K E	(26) (27) (27) (27) (27) (28) (29) (29) (31)
Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2 Total area of e Party wall	48.6 48.6		18.02	2	1.89 5.28 2.64 5.28 2.64 2.18 86.4 30.58 12.42 149.3 43.75	x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	1.4 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.1	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [	2.646 6.05 3.02 6.05 3.02 2.5 8.64 4.89		kJ/m².	K E	(26) (27) (27) (27) (27) (28) (29) (29) (31) (32)
Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2 Total area of e Party wall Party ceiling	48.6 48.6 14.31	m²	18.02	2	1.89 5.28 2.64 5.28 2.64 2.18 86.4 30.58 12.42 149.3 43.75 86.4	x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	1.4 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+  0.1  0.16  0.15	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [	2.646 6.05 3.02 6.05 3.02 2.5 8.64 4.89 1.86				(26) (27) (27) (27) (27) (28) (29) (29) (31)
Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2 Total area of e Party wall	48.6 48.6 14.31 4 roof window	m²	18.02 1.89	2 ndow U-ve	1.89 5.28 2.64 5.28 2.64 2.18 86.4 30.58 12.42 149.3 43.75 86.4 alue calcul	x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	1.4 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+  0.1  0.16  0.15	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [	2.646 6.05 3.02 6.05 3.02 2.5 8.64 4.89 1.86				(26) (27) (27) (27) (27) (28) (29) (29) (31) (32)
Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2 Total area of e Party wall Party ceiling * for windows and	48.6 48.6 14.31 Lements, r	m² vs, use eades of index	18.02 1.89 ffective winternal wall	2 ndow U-ve	1.89 5.28 2.64 5.28 2.64 2.18 86.4 30.58 12.42 149.3 43.75 86.4 alue calcul	x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	1.4 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+  0.1  0.16  0.15		2.646 6.05 3.02 6.05 3.02 2.5 8.64 4.89 1.86				(26) (27) (27) (27) (27) (28) (29) (29) (31) (32) (32b)
Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2 Total area of e Party wall Party ceiling * for windows and ** include the area	48.6 48.6 14.31 Elements, r	m² vs, use eides of inits S (A x	18.02 1.89 ffective winternal wall	2 ndow U-ve	1.89 5.28 2.64 5.28 2.64 2.18 86.4 30.58 12.42 149.3 43.75 86.4 alue calcul	x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	1.4 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+  0.1  0.16  0.15		2.646 6.05 3.02 6.05 3.02 2.5 8.64 4.89 1.86	[]	n paragrapi	] [ ] [ ] [ ] 3.2	(26) (27) (27) (27) (27) (28) (29) (31) (32) (32b)
Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2 Total area of e Party wall Party ceiling * for windows and ** include the area Fabric heat los	48.6 48.6 14.31 Elements, respectively. The second windows as on both sides, which seeds as the second windows as on both sides, which is seed as the second windows as on both sides. The second windows as on both sides, which is seed as the second windows as on both sides. The second windows are second windows as on both sides. The second windows are second windows as on both sides. The second windows are second windows as on both sides. The second windows are second windows as on both sides.	m²  vs, use endes of into S (A x X X X X X X X X X X X X X X X X X X	18.02 1.89  ffective winternal wall U)	ndow U-va	1.89 5.28 2.64 5.28 2.64 2.18 86.4 30.58 12.42 149.3 43.75 86.4 alue calculatitions	x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	1.4 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+  0.1  0.16  0.15		2.646 6.05 3.02 6.05 3.02 2.5 8.64 4.89 1.86 0		n paragrapi	n 3.2	(26) (27) (27) (27) (27) (28) (29) (31) (32) (32b)
Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2 Total area of e Party wall Party ceiling * for windows and ** include the area Fabric heat los Heat capacity	48.6  48.6  14.31  Elements, respectively. The second both sides, W/K = S(A) parameters where	m²  s, use eldes of into S (A x x k )  er (TMP)  e the det	18.02 1.89  ffective winternal wall U)  P = Cm ÷ tails of the	ndow U-vals and part	1.89 5.28 2.64 5.28 2.64 2.18 86.4 30.58 12.42 149.3 43.75 86.4 alue calculatitions	x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	1.4 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+  0.1  0.16  0.15  0  formula 1. (26)(30)	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [	2.646 6.05 3.02 6.05 3.02 2.5 8.64 4.89 1.86 0 ue)+0.04] a		n paragraph (32e) =	38.67 6480	(26) (27) (27) (27) (27) (28) (29) (29) (31) (32) (32b)

if details of thermal bridging are not known (36) = 0.05 x (31)



Total fabric he	at locc							(22) 1	(36) =			50.40	(27)
Ventilation he		alculated	d monthly	/				` '	$= 0.33 \times ($	25)m x (5)		53.43	(37)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 21.56	21.31	21.07	19.84	19.6	18.37	18.37	18.12	18.86	19.6	20.09	20.58		(38)
Heat transfer	coefficie	nt, W/K				l		(39)m	= (37) + (3	38)m		l	
(39)m= 74.99	74.75	74.5	73.27	73.03	71.8	71.8	71.56	72.29	73.03	73.52	74.01		
									Average =		12 /12=	73.21	(39)
Heat loss para	r `	<del></del>	r	0.05	T				= (39)m ÷	` '	0.00	l	
(40)m= 0.87	0.87	0.86	0.85	0.85	0.83	0.83	0.83	0.84	0.85 Average =	0.85	0.86	0.85	(40)
Number of day	ys in mo	nth (Tab	le 1a)					,	Average =	Sum(40) <sub>1.</sub>	12 / 12=	0.65	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
Assumed occ	unancv	N								2	57		(42)
if TFA > 13.	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (	TFA -13.		31		(42)
if TFA £ 13.			na in litua		\/al a		(OF v. M)	. 20					(12)
Ann <mark>ual averaç</mark> Redu <mark>ce the</mark> annu									se target o		.31		(43)
not m <mark>ore th</mark> at 125	litres per	person pe	r day (all w	rater use, l	hot and co	ld)							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage	in litres pe	r day for ea		Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m= 104.84	101.03	97.22	93.41	89.59	85.78	85.78	89.59	93.41	97.22	101.03	104.84		_
Energy content o	f hot water	used - cal	lculated mo	onthly = $4$ .	190 x Vd,r	n x nm x L	OTm / 3600		Total = Sui oth (see Ta	( /		1143.75	(44)
(45)m= 155.48	135.98	140.32	122.34	117.39	101.3	93.86	107.71	109	127.03	138.66	150.57		
									Total = Su	m(45) <sub>112</sub> =		1499.64	(45)
If instantaneous v	vater heati	ng at point	t of use (no	hot water	r storage),	enter 0 in	boxes (46,	) to (61)				ı	
(46)m= 23.32 Water storage	20.4	21.05	18.35	17.61	15.19	14.08	16.16	16.35	19.05	20.8	22.59		(46)
Storage volum		) includir	ng any so	olar or W	WHRS	storage	within sa	ame ves	sel		0		(47)
If community I	` '					_							, ,
Otherwise if n	-			_			` '	ers) ente	er '0' in (	47)			
Water storage													
a) If manufac				or is kno	wn (kWh	n/day):					0		(48)
Temperature t											0		(49)
Energy lost from b) If manufact		_	-		or is not	known:	(48) x (49)	) =		1	10		(50)
Hot water stor			-							0.	02		(51)
If community h	neating s	see secti	on 4.3	·									. ,
Volume factor										1.	03		(52)
Temperature t										0	.6		(53)
Energy lost fro Enter (50) or		_	, kWh/ye	ear			(47) x (51)	x (52) x (	53) =		03		(54)
HDTOT (b()) Or	1541 In (1	าวไ								1 1	03		(55)



	ulated for eac	n month			((56)m = (	55) × (41)ı	m				
(56)m= 32.01 28.92	32.01 30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contains dedicated s	solar storage, (5	')m = (56)m	x [(50) – (	[H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	ix H	
(57)m= 32.01 28.92	32.01 30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit loss (annu	ual) from Tab	le 3			=		=		0		(58)
Primary circuit loss calcu	•		59)m = (	(58) ÷ 36	65 × (41)	m					
(modified by factor from	m Table H5 i	there is s	solar wat	ter heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 23.26 21.01	23.26 22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi loss calculated fo	or each month	(61)m =	(60) ÷ 30	65 × (41)	)m						
(61)m= 0 0	0 0	0	0	0	0	0	0	0	0		(61)
Total heat required for w	ater heating	calculated	for eac	h month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	1
(62)m= 210.76 185.91	195.6 175.83	172.66	154.79	149.14	162.99	162.49	182.3	192.15	205.85		(62)
Solar DHW input calculated us	sing Appendix G	or Appendix	H (negati	ve quantity	/) (enter '0	if no sola	r contribut	ion to wate	er heating)		
(add additional lines if Fo	GHRS and/or	WWHRS	applies	, see Ap	pendix (	∋)					
(63)m= 0 0	0 0	0	0	0	0	0	0	0	0		(63)
Output from water heate	r	-		-	-		-	-	-	•	
(64)m= 210.76 185.91	195.6 175.83	172.66	154.79	149.14	162.99	162.49	182.3	192.15	205.85		_
					Outp	out from wa	ater heate	r (annual) <sub>1</sub>	12	2150.48	(64)
Heat gains from water he	eating <mark>, kWh/</mark> r	nonth 0.2	5 [0.85	× (45)m	+ (61)n	n] + 0.8 x	( [(46)m	+ (57)m	+ (59)m	1	
(65)m= 95.92 85.16	90.88 83.47	83.25	76.48	75.43	80.04	79.04	86.46	88.9	94.29		(65)
include (57)m in calcu	lation of (65)	1									
include (37 Jill ill calcu	iation of (03)	n only it c	ylinder i	s in the o	dwelling	or hot w	ate <mark>r is f</mark> r	om com	<mark>mu</mark> nity h	eating	
5. Internal gains (see T	•		ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	mu <mark>nity h</mark>	eating	
` '	Table 5 and 5		ylinder i	s in the d	dwelling	or hot w	ater is fr	om com	mu <mark>nity h</mark>	eating	
5. Internal gains (see T	Table 5 and 5		Jun	s in the o	dwelling	or hot w	oct	Nov	munity h	eating	
5. Internal gains (see T Metabolic gains (Table 5 Jan Feb	Table 5 and 5	a):								eating	(66)
5. Internal gains (see T Metabolic gains (Table 5 Jan Feb	Table 5 and 5 5), Watts Mar Apr 128.66 128.66	May 128.66	Jun 128.66	Jul 128.66	Aug 128.66	Sep 128.66	Oct	Nov	Dec	eating	(66)
5. Internal gains (see Total gains (Table 5)  Jan Feb  (66)m= 128.66 128.66	Table 5 and 5  Natts  Mar Apr  128.66 128.66  d in Appendix	May 128.66 x L, equat	Jun 128.66 ion L9 o	Jul 128.66 r L9a), a	Aug 128.66 Iso see	Sep 128.66 Table 5	Oct	Nov	Dec	neating	(66)
5. Internal gains (see Total gains (Table 5)  Jan Feb  (66)m= 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128	Mar Apr 128.66 128.66 d in Appendix 15.01 11.36	May 128.66 a L, equat 8.49	Jun 128.66 ion L9 o	Jul 128.66 r L9a), a	Aug 128.66 Iso see	Sep 128.66 Table 5 13.52	Oct 128.66	Nov 128.66	Dec 128.66	neating	, ,
5. Internal gains (see Total gains (Table 5)  Jan Feb  (66)m= 128.66 128.66 128.66  Lighting gains (calculate (67)m= 20.78 18.45  Appliances gains (calculate gains (calculate gains (calculate gains (calculate gains (calculate gains (calculate gains (calculate gains (calculate gains (calculate gains (calculate gains gains (calculate gains gains (calculate gains gains (calculate gains gains (calculate gains gains gains gains (calculate gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains	Mar Apr 128.66 128.66 d in Appendix 15.01 11.36	May 128.66 a L, equat 8.49	Jun 128.66 ion L9 o	Jul 128.66 r L9a), a	Aug 128.66 Iso see	Sep 128.66 Table 5 13.52	Oct 128.66	Nov 128.66	Dec 128.66	neating	, ,
5. Internal gains (see Total gains (Table 5)  Jan Feb  (66)m= 128.66 128.66 128.66  Lighting gains (calculate (67)m= 20.78 18.45  Appliances gains (calculate gains (calculate gains (calculate gains (calculate gains (calculate gains (calculate gains (calculate gains (calculate gains (calculate gains (calculate gains gains (calculate gains gains (calculate gains gains (calculate gains gains gains (calculate gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains	Mar Apr 128.66 128.66 d in Appendix 15.01 11.36 ated in Appe	May 128.66 x L, equat 8.49 ndix L, eq 199.38	Jun 128.66 ion L9 o 7.17 uation L 184.03	Jul 128.66 r L9a), a 7.75 13 or L1 173.79	Aug 128.66 Iso see 10.07 3a), also	Sep 128.66 Table 5 13.52 see Tal 177.45	Oct 128.66 17.16 ble 5 190.38	Nov 128.66 20.03	Dec 128.66	neating	(67)
Metabolic gains (Table 5  Jan Feb  (66)m= 128.66 128.66 2  Lighting gains (calculate (67)m= 20.78 18.45  Appliances gains (calculate (68)m= 232.3 234.71 2  Cooking gains (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calcu	Mar Apr 128.66 128.66 d in Appendix 15.01 11.36 ated in Appe	May 128.66 x L, equat 8.49 ndix L, eq 199.38	Jun 128.66 ion L9 o 7.17 uation L 184.03	Jul 128.66 r L9a), a 7.75 13 or L1 173.79	Aug 128.66 Iso see 10.07 3a), also	Sep 128.66 Table 5 13.52 see Tal 177.45	Oct 128.66 17.16 ble 5 190.38	Nov 128.66 20.03	Dec 128.66	neating	(67)
Metabolic gains (Table 5  Jan Feb  (66)m= 128.66 128.66 7  Lighting gains (calculate (67)m= 20.78 18.45  Appliances gains (calculate (68)m= 232.3 234.71 2  Cooking gains (calculate (69)m= 35.87 35.87	Mar Apr 128.66 128.66 d in Appendix 15.01 11.36 ated in Appe 228.63 215.7 ed in Appendix 35.87 35.87	May 128.66 x L, equat 8.49 ndix L, eq 199.38 x L, equat	Jun 128.66 ion L9 o 7.17 uation L 184.03	Jul 128.66 r L9a), a 7.75 13 or L1 173.79 or L15a)	Aug 128.66 Iso see 10.07 3a), also 171.37	Sep 128.66 Table 5 13.52 see Tal 177.45 ee Table	Oct 128.66 17.16 ble 5 190.38	Nov 128.66 20.03	Dec 128.66 21.35	neating	(67) (68)
Metabolic gains (Table 5  Jan Feb  (66)m= 128.66 128.66 1  Lighting gains (calculate (67)m= 20.78 18.45  Appliances gains (calculate (68)m= 232.3 234.71 2  Cooking gains (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calcu	Mar Apr 128.66 128.66 d in Appendix 15.01 11.36 ated in Appe 228.63 215.7 ed in Appendix 35.87 35.87	May 128.66 x L, equat 8.49 ndix L, eq 199.38 x L, equat	Jun 128.66 ion L9 o 7.17 uation L 184.03	Jul 128.66 r L9a), a 7.75 13 or L1 173.79 or L15a)	Aug 128.66 Iso see 10.07 3a), also 171.37	Sep 128.66 Table 5 13.52 see Tal 177.45 ee Table	Oct 128.66 17.16 ble 5 190.38	Nov 128.66 20.03	Dec 128.66 21.35	neating	(67) (68)
Metabolic gains (Table 5  Jan Feb  (66)m= 128.66 128.66 1  Lighting gains (calculate (67)m= 20.78 18.45  Appliances gains (calculate (68)m= 232.3 234.71 2  Cooking gains (calculate (69)m= 35.87 35.87  Pumps and fans gains (70)m= 0 0	Mar Apr 128.66 128.66 d in Appendix 15.01 11.36 ated in Appe 228.63 215.7 ed in Appendix 35.87 35.87 Table 5a)	May 128.66 x L, equat 8.49 ndix L, eq 199.38 x L, equat 35.87	Jun 128.66 ion L9 o 7.17 uation L 184.03 tion L15 35.87	Jul 128.66 r L9a), a 7.75 13 or L1 173.79 or L15a) 35.87	Aug 128.66 Iso see 10.07 3a), also 171.37 ), also se 35.87	Sep 128.66 Table 5 13.52 see Tal 177.45 ee Table 35.87	Oct 128.66 17.16 ble 5 190.38 5 35.87	Nov 128.66 20.03 206.7	Dec 128.66 21.35 222.05	neating	(67) (68) (69)
Metabolic gains (Table 5  Jan Feb  (66)m= 128.66 128.66 2  Lighting gains (calculate (67)m= 20.78 18.45  Appliances gains (calculate (68)m= 232.3 234.71 2  Cooking gains (calculate (69)m= 35.87 35.87  Pumps and fans gains (70)m= 0 0  Losses e.g. evaporation	Mar Apr 128.66 128.66 d in Appendix 15.01 11.36 ated in Appe 228.63 215.7 ed in Appendix 35.87 35.87 Table 5a)	May 128.66 a L, equat 8.49 ndix L, eq 199.38 a L, equat 35.87	Jun 128.66 ion L9 o 7.17 uation L 184.03 tion L15 35.87	Jul 128.66 r L9a), a 7.75 13 or L1 173.79 or L15a) 35.87	Aug 128.66 Iso see 10.07 3a), also 171.37 ), also se 35.87	Sep 128.66 Table 5 13.52 see Tal 177.45 ee Table 35.87	Oct 128.66 17.16 ble 5 190.38 5 35.87	Nov 128.66 20.03 206.7	Dec 128.66 21.35 222.05	neating	(67) (68) (69)
Metabolic gains (Table 5  Jan Feb  (66)m= 128.66 128.66 2  Lighting gains (calculate (67)m= 20.78 18.45  Appliances gains (calculate (68)m= 232.3 234.71 2  Cooking gains (calculate (69)m= 35.87 35.87  Pumps and fans gains (70)m= 0 0  Losses e.g. evaporation	Mar Apr 128.66 128.66 d in Appendix 15.01 11.36 ated in Appe 228.63 215.7 ed in Appendix 35.87 35.87 Table 5a) 0 0 (negative value)	May 128.66 a L, equat 8.49 ndix L, eq 199.38 a L, equat 35.87	Jun 128.66 ion L9 o 7.17 uation L 184.03 tion L15 35.87	Jul 128.66 r L9a), a 7.75 13 or L1 173.79 or L15a) 35.87	Aug 128.66 Iso see 10.07 3a), also 171.37 , also se 35.87	Sep 128.66 Table 5 13.52 see Tal 177.45 ee Table 35.87	Oct 128.66 17.16 ble 5 190.38 5 35.87	Nov 128.66 20.03 206.7	Dec 128.66 21.35 222.05 35.87	neating	(67) (68) (69) (70)
Metabolic gains (Table 5  Jan Feb  (66)m= 128.66 128.66 7  Lighting gains (calculate (67)m= 20.78 18.45  Appliances gains (calculate (68)m= 232.3 234.71 2  Cooking gains (calculate (69)m= 35.87 35.87  Pumps and fans gains (70)m= 0 0  Losses e.g. evaporation (71)m= -102.93 -102.93 -102.93 -102.93	Mar Apr 128.66 128.66 d in Appendix 15.01 11.36 ated in Appe 228.63 215.7 ed in Appendix 35.87 35.87 Table 5a) 0 0 (negative value)	May 128.66 a L, equat 8.49 ndix L, eq 199.38 a L, equat 35.87 0 ues) (Tab	Jun 128.66 ion L9 o 7.17 uation L 184.03 tion L15 35.87	Jul 128.66 r L9a), a 7.75 13 or L1 173.79 or L15a) 35.87	Aug 128.66 Iso see 10.07 3a), also 171.37 , also se 35.87	Sep 128.66 Table 5 13.52 see Tal 177.45 ee Table 35.87	Oct 128.66 17.16 ble 5 190.38 5 35.87	Nov 128.66 20.03 206.7	Dec 128.66 21.35 222.05 35.87	neating	(67) (68) (69) (70)
Metabolic gains (Table 5  Jan Feb  (66)m= 128.66 128.66 7  Lighting gains (calculate (67)m= 20.78 18.45  Appliances gains (calculate (68)m= 232.3 234.71 2  Cooking gains (calculate (69)m= 35.87 35.87  Pumps and fans gains (70)m= 0 0  Losses e.g. evaporation (71)m= -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.	Mar Apr 128.66 128.66 d in Appendix 15.01 11.36 ated in Appe 228.63 215.7 ed in Appendix 35.87 35.87 Table 5a) 0 0 (negative value) 102.93 -102.93	May 128.66 a L, equat 8.49 ndix L, eq 199.38 a L, equat 35.87 0 ues) (Tab	Jun 128.66 ion L9 o 7.17 uation L 184.03 tion L15 35.87 0 ole 5) -102.93	Jul 128.66 r L9a), a 7.75 13 or L1 173.79 or L15a) 35.87	Aug 128.66 Iso see 10.07 3a), also 171.37 , also se 35.87 0	Sep 128.66 Table 5 13.52 see Tal 177.45 ee Table 35.87 0	Oct 128.66  17.16 ble 5 190.38 5 35.87 0 -102.93	Nov 128.66 20.03 206.7 35.87 0	Dec 128.66 21.35 222.05 35.87 0 -102.93	neating	(67) (68) (69) (70)
Metabolic gains (Table 5  Jan Feb  (66)m= 128.66 128.66 7  Lighting gains (calculate (67)m= 20.78 18.45 7  Appliances gains (calculate (68)m= 232.3 234.71 2  Cooking gains (calculate (69)m= 35.87 35.87 7  Pumps and fans gains (70)m= 0 0  Losses e.g. evaporation (71)m= -102.93 -102.93 -102.93 7  Water heating gains (Tal (72)m= 128.92 126.72 7  Total internal gains =	Mar Apr 128.66 128.66 d in Appendix 15.01 11.36 ated in Appe 228.63 215.7 ed in Appendix 35.87 35.87 Table 5a) 0 0 (negative value) 102.93 -102.93	May 128.66 x L, equat 8.49 ndix L, eq 199.38 x L, equat 35.87  0 ues) (Tab	Jun 128.66 ion L9 o 7.17 uation L 184.03 tion L15 35.87 0 ole 5) -102.93	Jul 128.66 r L9a), a 7.75 13 or L1 173.79 or L15a) 35.87 0	Aug 128.66 Iso see 10.07 3a), also 171.37 , also se 35.87 0	Sep 128.66 Table 5 13.52 see Tal 177.45 ee Table 35.87 0	Oct 128.66  17.16 ble 5 190.38 5 35.87 0 -102.93	Nov 128.66 20.03 206.7 35.87 0	Dec 128.66 21.35 222.05 35.87 0 -102.93	neating	(67) (68) (69) (70)
Metabolic gains (Table 5  Jan Feb  (66)m= 128.66   128.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28	Mar Apr 128.66 128.66 d in Appendix 15.01 11.36 ated in Appe 228.63 215.7 ed in Appendix 35.87 35.87 Table 5a) 0 0 (negative value) 102.93 -102.93 ble 5) 122.15 115.93	May 128.66 x L, equat 8.49 ndix L, eq 199.38 x L, equat 35.87  0 ues) (Tab	Jun 128.66 ion L9 o 7.17 uation L 184.03 tion L15 35.87 0 ole 5) -102.93	Jul 128.66 r L9a), a 7.75 13 or L1 173.79 or L15a) 35.87 0 -102.93	Aug 128.66 Iso see 10.07 3a), also 171.37 0, also se 35.87 0	Sep 128.66 Table 5 13.52 see Tal 177.45 ee Table 35.87 0 -102.93	Oct 128.66 17.16 ble 5 190.38 5 35.87 0 -102.93 116.21 (70)m + (7	Nov 128.66 20.03 206.7 35.87 0 -102.93 123.47 1)m + (72)	Dec 128.66 21.35 222.05 35.87 0 -102.93	neating	(67) (68) (69) (70) (71) (72)

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



Orientati	on:	Access Factor Table 6d	•	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	X	5.28	x	10.63	x	0.4	x	0.7	] =	10.89	(74)
North	0.9x	0.77	X	2.64	x	10.63	x	0.4	x	0.7	] <b>=</b>	5.45	(74)
North	0.9x	0.77	X	5.28	x	20.32	x	0.4	x	0.7	<u> </u>	20.82	(74)
North	0.9x	0.77	X	2.64	x	20.32	x	0.4	x	0.7	] =	10.41	(74)
North	0.9x	0.77	X	5.28	x	34.53	x	0.4	x	0.7	<b>=</b>	35.38	(74)
North	0.9x	0.77	X	2.64	x	34.53	x	0.4	x	0.7	=	17.69	(74)
North	0.9x	0.77	X	5.28	x	55.46	x	0.4	x	0.7	=	56.83	(74)
North	0.9x	0.77	X	2.64	X	55.46	X	0.4	X	0.7	=	28.41	(74)
North	0.9x	0.77	X	5.28	x	74.72	x	0.4	x	0.7	=	76.55	(74)
North	0.9x	0.77	X	2.64	x	74.72	X	0.4	X	0.7	=	38.27	(74)
North	0.9x	0.77	X	5.28	x	79.99	x	0.4	x	0.7	=	81.95	(74)
North	0.9x	0.77	X	2.64	x	79.99	x	0.4	x	0.7	=	40.97	(74)
North	0.9x	0.77	X	5.28	X	74.68	X	0.4	x	0.7	=	76.51	(74)
North	0.9x	0.77	X	2.64	x	74.68	x	0.4	x	0.7	=	38.25	(74)
North	0.9x	0.77	X	5.28	x	59.25	x	0.4	x	0.7	=	60.7	(74)
North	0.9x	0.77	X	2.64	X	59.25	X	0.4	X	0.7	=	30.35	(74)
North	0.9x	0.77	X	5.28	х	41.52	X	0.4	X	0.7	=	42.54	(74)
North	0.9x	0.77	X	2.64	х	41.52	×	0.4	x	0.7	=	21.27	(74)
North	0.9x	0.77	X	5.28	Х	24.19	X	0.4	X	0.7	=	24.78	(74)
North	0.9x	0.77	X	2.64	x	24.19	х	0.4	x	0.7	=	12.39	(74)
North	0.9x	0.77	X	5.28	x	13.12	Х	0.4	X	0.7	=	13.44	(74)
North	0.9x	0.77	X	2.64	Х	13.12	X	0.4	X	0.7	=	6.72	(74)
North	0.9x	0.77	X	5.28	x	8.86	X	0.4	X	0.7	=	9.08	(74)
North	0.9x	0.77	X	2.64	x	8.86	X	0.4	X	0.7	=	4.54	(74)
South	0.9x	0.77	X	5.28	x	46.75	x	0.4	X	0.7	=	47.9	(78)
South	0.9x	0.77	X	2.64	X	46.75	X	0.4	X	0.7	=	23.95	(78)
South	0.9x	0.77	X	2.18	X	46.75	X	0.4	X	0.7	=	19.78	(78)
South	0.9x		X	5.28	X	76.57	X	0.4	X	0.7	=	78.45	(78)
South	0.9x	0.77	X	2.64	X	76.57	X	0.4	X	0.7	=	39.22	(78)
South	0.9x	0.77	X	2.18	X	76.57	X	0.4	X	0.7	=	32.39	(78)
South	0.9x		X	5.28	x	97.53	X	0.4	X	0.7	=	99.93	(78)
South	0.9x	0.77	X	2.64	X	97.53	X	0.4	X	0.7	=	49.96	(78)
South	0.9x		X	2.18	x	97.53	X	0.4	X	0.7	=	41.26	(78)
South	0.9x		X	5.28	X	110.23	X	0.4	X	0.7	=	112.94	(78)
South	0.9x		X	2.64	X	110.23	X	0.4	X	0.7	=	56.47	(78)
South	0.9x		X	2.18	x	110.23	x	0.4	X	0.7	=	46.63	(78)
South	0.9x		X	5.28	x	114.87	X	0.4	X	0.7	=	117.69	(78)
South	0.9x		X	2.64	x	114.87	X	0.4	X	0.7	=	58.84	(78)
South	0.9x	0.77	X	2.18	X	114.87	X	0.4	X	0.7	] =	48.59	(78)



South	0.9x	0.77	x	5.28	X	110.55	x	0.4	x [	0.7	=	113.26	(78)
South	0.9x	0.77	х	2.64	X	110.55	x	0.4	x	0.7	=	56.63	(78)
South	0.9x	0.77	x	2.18	X	110.55	x	0.4	x [	0.7	=	46.76	(78)
South	0.9x	0.77	x	5.28	X	108.01	x	0.4	x [	0.7	=	110.66	(78)
South	0.9x	0.77	x	2.64	X	108.01	x	0.4	x [	0.7	=	55.33	(78)
South	0.9x	0.77	x	2.18	X	108.01	x	0.4	x [	0.7	=	45.69	(78)
South	0.9x	0.77	x	5.28	X	104.89	x	0.4	x	0.7	=	107.47	(78)
South	0.9x	0.77	x	2.64	X	104.89	x	0.4	x	0.7	=	53.73	(78)
South	0.9x	0.77	x	2.18	X	104.89	x	0.4	x	0.7	=	44.37	(78)
South	0.9x	0.77	x	5.28	X	101.89	x	0.4	x	0.7	=	104.39	(78)
South	0.9x	0.77	x	2.64	X	101.89	x	0.4	x [	0.7	=	52.19	(78)
South	0.9x	0.77	x	2.18	X	101.89	x	0.4	x	0.7	=	43.1	(78)
South	0.9x	0.77	x	5.28	X	82.59	x	0.4	x	0.7	=	84.61	(78)
South	0.9x	0.77	x	2.64	X	82.59	x	0.4	x	0.7	=	42.31	(78)
South	0.9x	0.77	x	2.18	X	82.59	x	0.4	x	0.7	=	34.93	(78)
South	0.9x	0.77	x	5.28	X	55.42	x	0.4	x	0.7	=	56.78	(78)
South	0.9x	0.77	X	2.64	X	55.42	x	0.4	x	0.7	=	28.39	(78)
South	0.9x	0.77	x	2.18	X	55.42	Х	0.4	X	0.7	=	23.44	(78)
South	0.9x	0.77	x	5.28	Х	40.4	x	0.4	х	0.7	=	41.39	(78)
South	0.9x	0.77	x	2.64	Х	40.4	x	0.4	х	0.7	=	20.69	(78)
South	0.9x	0.77	x	2.18	X	40.4	x	0.4	x	0.7	=	17.09	(78)
Solar g	ains in			for each mon			(83)m	n = Sum(74)m .	(82)m		1		
(83)m=	107.97		4.21	301.28 339.9		39.57 326.44	296	.62 263.48	199.03	128.77	92.8		(83)
Ī				(84)m = $(73)$ r	$\overline{}$	<u> </u>					l 1		(0.4)
(84)m=	551.56	622.77 67	1.6	705.87 721.3	1 6	98.59 670.96	647	.24 625.81	584.37	540.57	524.52		(84)
7. Me	an inter	nal tempera	ture (	heating seas	on)								_
Temp	erature	during heati	ng pe	eriods in the li	ving	area from Tab	ole 9	, Th1 (°C)				21	(85)
Utilisa	tion fac	tor for gains	for li	ving area, h1	,m (s	ee Table 9a)		<del>- 1</del>				1	
	Jan		/lar	Apr Ma	_	Jun Jul	<del></del>	ug Sep	Oct	Nov	Dec		
(86)m=	1	0.99 0.	98	0.94 0.84		0.64 0.47	0.5	0.75	0.95	0.99	1		(86)
Mean			e in I		<del>`</del>	w steps 3 to 7	7 in T	able 9c)					
(87)m=	20.2	20.33 20	.52	20.75 20.9	1 2	20.99 21	2	1 20.97	20.77	20.44	20.17		(87)
Temp	erature	during heati	ng pe	eriods in rest	of dw	elling from Ta	able 9	9, Th2 (°C)					
(88)m=	20.19	20.2 20	).2	20.21 20.2	2	20.23 20.23	20.	23 20.22	20.21	20.21	20.2		(88)
Utilisa	tion fac	tor for gains	for r	est of dwelling	g, h2	,m (see Table	9a)						
(89)m=	1		98	0.92 0.79		0.57 0.39	0.4	0.68	0.93	0.99	1		(89)
Mean	interna	l temperatur	e in t	he rest of dwe	elling	T2 (follow ste	eps 3	to 7 in Tabl	e 9c)			•	
(90)m=	19.12		.59	19.92 20.13	Ť	20.22 20.23	20.		19.95	19.49	19.09		(90)
L					•		•	f	LA = Liv	ing area ÷ (	4) =	0.23	(91)
			,,		,	\ a \ -:	,.						

Mean internal temperature (for the whole dwelling) =  $fLA \times T1 + (1 - fLA) \times T2$ 



(92)m= 19.37 19.55 19.8 20.11 20.31 20.4 20.41 20.41		19.34 (92)
Apply adjustment to the mean internal temperature from Table 4e, who		19.34 (93)
(93)m= 19.37 19.55 19.8 20.11 20.31 20.4 20.41 20.41 8. Space heating requirement	20.38 20.14 19.71	19.34 (93)
Set Ti to the mean internal temperature obtained at step 11 of Table 9	h so that Ti m-(76)m and	re-calculate
the utilisation factor for gains using Table 9a	b, 30 that 11,111=(10)111 and	Coalodiato
Jan Feb Mar Apr May Jun Jul Aug	Sep Oct Nov	Dec
Utilisation factor for gains, hm:		
(94)m= 0.99 0.99 0.97 0.92 0.8 0.59 0.41 0.44	0.7 0.93 0.99	1 (94)
Useful gains, hmGm , W = (94)m x (84)m		
(95)m= 548.54 615.2 652.35 650.78 577.34 410.61 272.87 286.05	437.02 543.11 533.46	(95)
Monthly average external temperature from Table 8		
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4	14.1 10.6 7.1	4.2 (96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m	<del>,                                    </del>	
(97)m= 1129.99 1095.05 991.07 821.34 629.12 416.33 273.32 286.79		120.84 (97)
Space heating requirement for each month, kWh/month = 0.024 x [(97		
(98)m= 432.6 322.46 252.01 122.8 38.53 0 0 0		45.27
Tota	al per year (kWh/year) = Sum(98)	5,912 = 2011.31 (98)
Space heating requirement in kWh/m²/year		23.28 (99)
9b. Energy requirements - Community heating scheme		
This part is used for space heating, space cooling or water heating provi		
Fraction of space heat from secondary/supplementary heating (Table 1	1) '0' if none	0 (301)
Fraction of space heat from community system 1 – (301) =		1 (302)
The community scheme may obtain heat from several sources. The procedure allows for	CHP and up to four other heat so	urces; the latter
includes boilers, heat pumps, geothermal and waste heat from power stations. See Appe	ndix C.	
Fraction of heat from Community boilers		(303a)
Fraction of total space heat from Community boilers	(302) x (303a)	= 1 (304a)
Factor for control and charging method (Table 4c(3)) for community hea	ating system	1 (305)
Distribution loss factor (Table 12c) for community heating system		1.05 (306)
Space heating		kWh/year
Annual space heating requirement		2011.31
Space heat from Community boilers	(98) x (304a) x (305) x (306) =	2111.88 (307a)
Efficiency of secondary/supplementary heating system in % (from Table		0 (308
	,	
Space heating requirement from secondary/supplementary system	$(98) \times (301) \times 100 \div (308) =$	0 (309)
Water heating		
Annual water heating requirement		2150.48
If DHW from community scheme:	(0.1) (0.0) (7.7)	
Water heat from Community boilers	$(64) \times (303a) \times (305) \times (306) =$	2258.01 (310a)
Electricity used for heat distribution 0.01	I × [(307a)(307e) + (310a)(31	0e)] = 43.7 (313)
Electricity used for heat distribution 0.01  Cooling System Energy Efficiency Ratio	I × [(307a)(307e) + (310a)(31	0e)] = 43.7 (313) 0 (314)
	<ul><li>1 x [(307a)(307e) + (310a)(31</li><li>= (107) ÷ (314) =</li></ul>	



Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from or		177.88	(330a)		
warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b	b) + (330g) =		177.88	(331)
Energy for lighting (calculated in Appendix L)				366.92	(332)
12b. CO2 Emissions – Community heating scheme					
	Energy kWh/year	Emission facto		issions CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%)  If there is CHP using	two fuels repeat (363) to	(366) for the second f	uel	95.7	(367a)
CO2 associated with heat source 1 [(307b)+(	310b)] x 100 ÷ (367b) x	0.22	= [	986.31	(367)
Electrical energy for heat distribution	(313) x	0.52	= [	22.68	(372)
Total CO2 associated with community systems	363)(366) + (368)(372	2)	= [	1008.99	(373)
CO2 associated with space heating (secondary)	309) x	0	= [	0	(374)
CO2 associated with water from immersion heater or instantane	ous heater (312) x	0.52	= [	0	(375)
Total CO2 associated with space and water heating	373) + (374) + (375) =			1008.99	(376)
CO2 associated with electricity for pumps and fans within dwelling	ng (331)) x	0.52	= [	92.32	(378)
CO2 associated with electricity for lighting	332))) x	0.52	= [	190.43	(379)
Total CO2, kg/year sum of (376)(382) =				1291.74	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =				14.95	(384)

El rating (section 14)

(385)



User Details: **Assessor Name:** Stroma Number: **Software Version: Software Name:** Stroma FSAP 2012 Version: 1.0.5.12 Property Address: W2-01 , 156 West End Lane, Camden, London Address: 1. Overall dwelling dimensions Av. Height(m) Volume(m³) Area(m<sup>2</sup>) Ground floor 94.3 (1a) x 2.7 (2a) = (3a) 254.61 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)(4)94.3 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =254.61 (5) total m<sup>3</sup> per hour main secondary other heating heating x 40 =Number of chimneys (6a) 0 0 x 20 =Number of open flues 0 0 0 (6b) Number of intermittent fans x 10 =(7a)0 0 x 10 =Number of passive vents (7b) 0 0 x 40 =Number of flueless gas fires 0 (7c)Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =(8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9)0 Additional infiltration [(9)-1]x0.1 =0 (10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)0 if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12)If no draught lobby, enter 0.05, else enter 0 (13)0 Percentage of windows and doors draught stripped (14)0 Window infiltration  $0.25 - [0.2 \times (14) \div 100] =$ 0 (15)Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =O (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)3 If based on air permeability value, then  $(18) = [(17) \div 20] + (8)$ , otherwise (18) = (16)0.15 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)2  $(20) = 1 - [0.075 \times (19)] =$ Shelter factor (20)0.85  $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.13 Infiltration rate modified for monthly wind speed Jan Feb Jul Sep Mar Apr May Jun Aug Oct Nov Dec Monthly average wind speed from Table 7 (22)m =5.1 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor  $(22a)m = (22)m \div 4$ (22a)m 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18



0.16	0.16	0.16	0.14	0.14	0.12	0.12	(21a) x	0.13	0.14	0.14	0.15		
Calculate effe		-	rate for t	he appli	cable ca	ise		ļ	<u> </u>				
If mechanica												0.5	(2
If exhaust air h		0		, ,	,	. ,	,, .	,	) = (23a)		ļ	0.5	(2
If balanced with		-	•	_								76.5	(2
a) If balance		1				<del>- ` `                                 </del>	<del>, ``</del>	<del>í `</del>	<del> </del>	<del></del>	<del>r ` ´</del>	÷ 100] I	(2)
24a)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27		(2
b) If balance						<del></del>	<del>-                                    </del>	<del>i `</del>	<del>r Ó T</del>	<del> </del>		1	(2
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h		tract ven < (23b), t		•					5 v (23h	<b>.</b> )			
$\frac{11(220)11}{24c)m} = 0$	0.5 7	0	0	0	0	0	0 = (221	0	0	0	0		(2
d) If natural													`
,		en (24d)		•	•				0.5]				
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
Effective air	change	rate - er	iter (24a	) or (24k	o) or (24	c) or (24	d) in bo	x (25)	•	•	•	•	
25)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27		(2
Last less	and be	et less	o romet	0.51				•					
3. Heat losse					Net Ar		U-val		AXU		م برمایید		λΧk
LEMENT	Gros area		Openin m		A ,r		W/m2		(W/I	<)	k-value kJ/m²-k		AXK (J/K
oors					1.89	x	1.4	= [	2.646				(
in <mark>dows</mark> Type	1				6.48	x1	/[1/( 1.2 )+	0.04] =	7.42	Ħ			(
indows Type	2				2.64	x1,	/[1/( 1.2 )+	0.04] =	3.02	Ħ			(
oor					94.3		0.06	=	5.658	5 ,			) (2
/alls Type1	66.4	12	19.68	8	46.74	=	0.16	<u>-</u>	7.48	륵 ;			<u> </u>
/alls Type2	5.67		1.89	_	3.78	=	0.15	<u> </u>	0.57	륵 ;			<u> </u>
otal area of e		<u>i</u>	1.00		166.3	=	0.10		0.07				\` (
arty wall	iomonio	,			42.75	=	0		0				(
arty wall						=							<u> </u>
or windows and	roof wind	OWS USE 6	effective wi	ndow I I-va	94.3		n formula 1	/[(1/Ll-valu	ıe)±0 041 a	L os aiven in	naragranh		(
include the area						atou domig	, romiala i	/[(	10/10.04/0	io givori iii	paragrapir	. 0.2	
abric heat los	s, W/K :	= S (A x	U)				(26)(30)	) + (32) =				38.88	(
eat capacity	Cm = S(	(A x k )						((28)	(30) + (32	2) + (32a).	(32e) =	7072.5	
nermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	Medium	Ĭ	250	
or design assess				construct	ion are no	t known pr	ecisely the	e indicative	values of	TMP in Ta	able 1f		
n be used inste						12							
nermal bridge	,	,		• .	-	K					l	14.75	(
J - ( - '   ( )		are not kn	own (36) =	= 0.05 X (3	11)			(33) +	(36) =		i	53.63	
	ลเ เบรร									25)m x (5)		55.05	\
otal fabric he		alculated	l monthly	/				انالمان	= 0.55 X 1	20/111 8 10	)		
details of thermand tall fabric he entilation head	at loss ca	1			Jun	Jul	Aun						
otal fabric he entilation hea		alculated Mar	Apr	May	Jun 20.05	Jul 20.05	Aug 19.78	Sep 20.59	Oct	Nov	Dec 22.46		(:
otal fabric he entilation hea	Feb	Mar 23	Apr		Jun 20.05	<del> </del>	<del>l                                     </del>	Sep 20.59		Nov 21.92	Dec		(

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com

Average =  $Sum(39)_{1...12}/12=$ 

75.28 age 2 (39)



Heat loss para	meter (l	HLP), W/	m²K					(40)m	= (39)m ÷	÷ (4)			
(40)m= 0.82	0.82	0.81	0.8	0.8	0.78	0.78	0.78	0.79	0.8	0.8	0.81		
Number of day	e in mo	nth (Tab	lo 1a)						Average =	Sum(40) <sub>1.</sub>	12 /12=	0.8	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heat	ing ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (	TFA -13		68		(42)
Annual averag Reduce the annua not more that 125	al average	hot water	usage by	5% if the c	lwelling is	designed			se target o		7.85		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage ii	n litres pei	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)		,				
(44)m= 107.64	103.72	99.81	95.9	91.98	88.07	88.07	91.98	95.9	99.81	103.72	107.64	4474.04	
Energy content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x E	Tm / 3600			ım(44) <sub>112</sub> = ables 1b, 1		1174.24	(44)
(45)m= 159.62	139.61	144.06	125.6	120.51	103.99	96.37	110.58	111.9	130.41	142.35	154.59		
			5 (		7 .				Total = Su	ım(45) <sub>112</sub> =		1539.61	(45)
If instantaneous w													(40)
(46)m= 23.94 Water storage	20.94 loss:	21.61	18.84	18.08	15.6	14.45	16.59	16.79	19.56	21.35	23.19		(46)
Storage volum		includin	ig any so	olar or W	WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	_			_									
Otherwise if no Water storage		hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	(47)			
a) If manufact		eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature fa	actor fro	m Table	2b								0		(49)
Energy lost fro		_	-				(48) x (49)	) =		1	10		(50)
b) If manufact Hot water stora			-								00		(E1)
If community h	-			6 Z (KVV	ii/iiti G/GC	iy <i>)</i>				0.	.02		(51)
Volume factor	_									1.	.03		(52)
Temperature fa	actor fro	m Table	2b							0	.6		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	1.	.03		(54)
Enter (50) or (	, ,	,								1.	.03		(55)
Water storage		culated t					((56)m = (	55) × (41)	m <del></del>				
(56)m= 32.01 If cylinder contains	28.92 s dedicate	32.01 d solar sto	30.98 rage, (57)	32.01 m = (56)m	30.98 x [(50) – (	32.01 H11)] ÷ (5	32.01 0), else (5	30.98 7)m = (56)	32.01 m where (	30.98 (H11) is fro	32.01 m Append	ix H	(56)
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit					<u> </u>	<u> </u>	<u> </u>	<u> </u>		ļ	0		(58)
Primary circuit	loss cal	culated f	or each	month (	•	. ,	, ,				~		(30)
(modified by							<del></del>	<u> </u>		ostat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)



Combi loss ca	lculated t	for each	month (	(61)m =	(60) ÷ 3	865 <b>x</b> (41	)m						
(61)m= 0	0	0	0	0	0	0	0	0	0	Το	0	1	(61)
	uired for	water he	eating ca	Lulated	L I for eac	h month	(62)m	 ı = 0.85 x i	(45)m ∍	 - (46)m +	(57)m +	ı (59)m + (61)m	
(62)m= 214.9	189.54	199.34	179.09	175.79	157.49	1	165.8		185.69	<del>``</del>	209.86	]	(62)
Solar DHW input of											l .	l	, ,
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)													
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(63)
Output from wa	ater heat	ter								_ <b>!</b>		ı	
(64)m= 214.9	189.54	199.34	179.09	175.79	157.49	151.64	165.8	6 165.4	185.69	195.85	209.86	1	
							C	utput from w	ater heat	er (annual)	112	2190.45	(64)
Heat gains from	m water	heating,	kWh/m	onth 0.2	5 ′ [0.85	5 × (45)m	ı + (61	)m] + 0.8 x	x [(46)n	n + (57)m	+ (59)m	 . ]	-
(65)m= 97.3	86.36	92.12	84.56	84.29	77.37	76.26	80.9	80	87.58	90.13	95.62	]	(65)
include (57)	m in calc	ulation o	of (65)m	only if c	ylinder	is in the	dwellir	ng or hot w	ater is	from com	munity h	neating	
5. Internal ga				•	-						•	,	
Metabolic gain	Ì												
Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec		
(66)m= 134.01	134.01	134.01	134.01	134.01	134.01	134.01	134.0	1 134.01	134.01	134.01	134.01		(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
(67)m= 22.07	19.6	15.94	12.07	9.02	7.62	8.23	10.7	14.36	18.23	21.28	22.68	]	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
(68)m= 246.77	249.33	242.88	229.14	211.8	195.5	184.61	182.0	5 188.51	202.24	219.58	235.88		(68)
Cooking gains	(calcula	ted in A	opendix	L, equat	ion L15	or L15a	), also	see Table	5		•		
(69)m= 36.4	36.4	36.4	36.4	36.4	36.4	36.4	36.4	36.4	36.4	36.4	36.4		(69)
Pumps and far	ns gains	(Table 5	5a)					•			•		
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses e.g. ev	aporatio	n (negat	ive valu	es) (Tab	le 5)			•	•	•		•	
(71)m= -107.21	-107.21	-107.21	-107.21	-107.21	-107.21	-107.21	-107.2	1 -107.21	-107.21	-107.21	-107.21		(71)
Water heating	gains (T	able 5)						•					
(72)m= 130.77	128.51	123.82	117.44	113.3	107.46	102.5	108.8	6 111.11	117.72	125.18	128.52		(72)
Total internal	gains =				(66	6)m + (67)m	n + (68)	m + (69)m +	(70)m + (	(71)m + (72)	)m		
(73)m= 462.82	460.65	445.84	421.85	397.32	373.78	358.55	364.8	1 377.18	401.4	429.24	450.29		(73)
6. Solar gains	S:									•			
Solar gains are o	calculated u	using sola	r flux from	Table 6a	and asso	ciated equa	tions to	convert to th	ne applica	able orienta	tion.		
Orientation: A		actor	Area			ux		g_ Table Ch	_	FF		Gains	
_	Table 6d		m²		T &	able 6a	. –	Table 6b		Table 6c		(W)	_
West 0.9x	0.77	X	6.4	18	x	19.64	x	0.4	X	0.7	=	24.7	(80)
West 0.9x	0.77	X	2.6	64	х	19.64	x	0.4	x	0.7	=	50.31	(80)
West 0.9x	0.77	X	6.4	18	х	38.42	x	0.4	x [	0.7	=	48.31	(80)
West 0.9x	0.77	x	2.6	64	х	38.42	x	0.4	x [	0.7	=	98.41	(80)
West 0.9x	0.77	X	6.4	18	X	63.27	X	0.4	X	0.7	=	79.56	(80)



West	0.9x	0.77	X	2.6	54	X	6	3.27	X	0.4		x	0.7		162.06	(80)
West	0.9x	0.77	X	6.4	-8	X	9	2.28	x	0.4		X	0.7	=	116.03	(80)
West	0.9x	0.77	X	2.6	54	X	9	2.28	X	0.4		X	0.7	=	236.36	(80)
West	0.9x	0.77	X	6.4	-8	X	1	13.09	X	0.4		x	0.7	=	142.2	(80)
West	0.9x	0.77	X	2.6	54	X	1	13.09	x	0.4		X	0.7	=	289.67	(80)
West	0.9x	0.77	X	6.4	-8	X	1	15.77	X	0.4		X	0.7	=	145.57	(80)
West	0.9x	0.77	X	2.6	54	X	1	15.77	x	0.4		x	0.7	=	296.53	(80)
West	0.9x	0.77	X	6.4	-8	X	1	10.22	X	0.4		x	0.7	=	138.59	(80)
West	0.9x	0.77	X	2.6	54	X	1	10.22	X	0.4		x	0.7	=	282.31	(80)
West	0.9x	0.77	X	6.4	-8	X	9	4.68	X	0.4		x	0.7		119.04	(80)
West	0.9x	0.77	X	2.6	54	X	9	4.68	X	0.4		x	0.7	=	242.5	(80)
West	0.9x	0.77	X	6.4	-8	X	7	3.59	X	0.4		x	0.7		92.53	(80)
West	0.9x	0.77	X	2.6	54	X	7	3.59	x	0.4		x	0.7	=	188.49	(80)
West	0.9x	0.77	X	6.4	-8	X	4	5.59	X	0.4		x	0.7	=	57.32	(80)
West	0.9x	0.77	X	2.6	54	X	4	5.59	X	0.4		x	0.7	=	116.77	(80)
West	0.9x	0.77	X	6.4	-8	X	2	4.49	x	0.4		x	0.7	=	30.79	(80)
West	0.9x	0.77	X	2.6	54	X	2	4.49	X	0.4		x	0.7	=	62.72	(80)
West	0.9x	0.77	X	6.4	-8	X	1	6.15	Х	0.4		X	0.7	=	20.31	(80)
West	0.9x	0.77	x	2.6	54	Х	1	6.15	x	0.4		x	0.7		41.37	(80)
Solar g	gains in	watts, <mark>cal</mark>	culated	for eac	n month	<u> </u>			(83)m	= Sum(74)	)m(	<mark>8</mark> 2)m			_	
(83)m=	75		241.62	352.39	431.87	<u> </u>	42.09	420.89	361.	.54 281.0	02 1	74.09	93.52	61.68		(83)
Total g		nternal an		` '	`	_									_	
(84)m=	537.82	607.37	687.46	774.24	829.19	8	15.88	779.44	726	.35 658.	2 5	75.49	522.76	511.97		(84)
7. Me	an inter	nal tempe	erature	(heating	seaso	n)										
Temp	erature	during he	eating p	eriods ir	the liv	ing	area f	from Tab	ole 9,	Th1 (°C)	)				21	(85)
Utilisa	ation fac	tor for gai	ins for I	iving are	ea, h1,n	n (s	ee Ta	ble 9a)					_		_	
	Jan	Feb	Mar	Apr	May	<u> </u>	Jun	Jul	Αι	ug Se	p	Oct	Nov	Dec	<u>:</u>	
(86)m=	1	1	0.98	0.93	0.79		0.57	0.42	0.4	6 0.74	4	0.96	1	1		(86)
Mean	interna	tempera	ture in I	iving are	ea T1 (1	follo	w ste	ps 3 to 7	in T	able 9c)						
(87)m=	20.2	20.33	20.54	20.8	20.95		21	21	2	1 20.9	8 2	20.76	20.44	20.19		(87)
Temp	erature	during he	eating p	eriods ir	rest of	f dw	elling	from Ta	ble 9	), Th2 (°C	C)					
(88)m=	20.24	20.24	20.24	20.25	20.26	2	20.27	20.27	20.2	27 20.2	6 2	20.26	20.25	20.25		(88)
Utilisa	ation fac	tor for gai	ins for r	est of d	wellina.	h2.	m (se	e Table	9a)	•			•			
(89)m=	1	0.99	0.98	0.91	0.74	_	0.51	0.35	0.3	9 0.68	3	0.95	0.99	1	7	(89)
Moan	intorna	tempera	turo in t	ho rost	of dwal	lina	T2 (f	ollow etc	ne 3	to 7 in T	ablo	0c)	1	<u> </u>		
(90)m=	19.16	19.35	19.65	20.02	20.21	Ť	20.27	20.27	20.			19.98	19.51	19.14	٦	(90)
(= j										1 -0.2			ing area ÷ (4		0.38	(91)
			4	41 '	-11	. 111 -	\ "	A T4	. /4	£1 A\ -						` ′
	INTOTO	remnera	TITO ITO	r tne wh	$\alpha = \alpha =$	חוווב	(1) = fl	$A \times I1$	+ (1)	— TI A I 🗙	レ					
Mean			T T			$\overline{}$					_	20.20	40.07	10.54		(02)
(92)m=	19.56	19.72	19.99	20.32	20.49	2	0.54	20.55	20.	55 20.5	2 :	20.28	19.87	19.54		(92)



	•												
(93)m= 19.56	19.72	19.99	20.32	20.49	20.54	20.55	20.55	20.52	20.28	19.87	19.54		(93)
8. Space hea	·												
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a													
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	l		<u> </u>	1		<u> </u>	7 14 9	004					
(94)m= 1													(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m= 536.23 603.09 671.8 706.53 625.65 435.25 290.7 304.18 461.26 546.26 518.96 510.85												(95)	
Monthly average external temperature from Table 8													
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate			<del></del>	i	i	<del>-`` '</del>	- , ,	<u> </u>					(07)
(97)m= 1177.41	l			659.7	438	290.89	304.61	476.77	725.95	964.52	1167.27		(97)
Space heatin (98)m= 477.04	g require	269.28	r each n	25.33	/Vh/moni		4 x [(97)	)m – (95 0	)m] x (4 133.69	1)m 320.81	488.38		
(98)m= 477.04	360.55	209.20	110.21	25.33		0					<u> </u>	0405.00	7(08)
							rota	i per year	(Kvvn/yeai	r) = Sum(9	8)15,912 =	2185.28	(98)
Space heatin	g require	ement in	kWh/m²	²/year								23.17	(99)
9b. Energy requirements – Community heating scheme													
This part is used for space heating, space cooling or water heating provided by a community scheme.  First ion of space heat from secondary/supplementary heating (Table 11) '0' if page 12.											7(204)		
Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none										0	(301)		
Fraction of space heat from community system 1 – (301) =										1	(302)		
The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter													
includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.  Fraction of heat from Community boilers										1	(303a)		
									_, [		╡`		
										02) x (303	a) =	1	(304a)
Factor for cont	rol and	charging	method	l (Table	4c(3)) fo	r commu	nity hea	ting sys	tem		L	1	(305)
Distribution los	ss factor	(Table 1	12c) for (	commun	ity heatii	ng syster	n					1.05	(306)
Space heating	g											kWh/yea	r
Annual space	heating	requiren	nent									2185.28	
Space heat fro	m Com	munity b	oilers					(98) x (30	04a) x (30	5) x (306) =	- <u> </u>	2294.54	(307a)
Efficiency of se	econdar	y/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)	Ī	0	(308
Space heating	require	ment fro	m secon	darv/su	oplemen	tarv svste	em	(98) x (30	)1) x 100 ·	÷ (308) =	Ĺ	0	(309)
<b>O</b> pass meaning					- p. o	, -, -, -, -	• • • • • • • • • • • • • • • • • • • •	, , ,	,	,	L		`
Water heating Annual water h		equirem	ent								Γ	2190.45	٦
If DHW from c	ommuni	ty schen	ne:								_		
Water heat fro	m Comr	nunity bo	oilers					(64) x (30	03a) x (30	5) x (306) =	= [	2299.97	(310a)
Electricity used	d for hea	at distrib	ution				0.01	× [(307a).	(307e) +	· (310a)(	[310e)] =	45.95	(313)
Cooling Syster	m Energ	y Efficie	ncy Rati	0							į	0	(314)
Space cooling	(if there	is a fixe	d coolin	g systen	n, if not e	enter 0)		= (107) ÷	(314) =		Ī	0	(315)
Electricity for p	oumps a	nd fans	within dv	velling (	Γable 4f)	:					-		_
mechanical ve							outside					205.79	(330a)

# FHP (C

warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b	o) + (330g) =	205.79	(331)
Energy for lighting (calculated in Appendix L)			389.76	(332)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP)  Efficiency of heat source 1 (%)  If there is CHP using to	wo fuels repeat (363) to	(366) for the second fu	el 95.7	(367a)
CO2 associated with heat source 1 [(307b)+(3	10b)] x 100 ÷ (367b) x	0.22	1037.01	(367)
Electrical energy for heat distribution [(3	313) x	0.52	23.85	(372)
Total CO2 associated with community systems (36)	63)(366) + (368)(372	2)	1060.85	(373)
CO2 associated with space heating (secondary) (30	09) x	0	= 0	(374)
CO2 associated with water from immersion heater or instantaneous	us heater (312) x	0.52	= 0	(375)
Total CO2 associated with space and water heating (37)	73) + (374) + (375) =		1060.85	(376)
CO2 associated with electricity for pumps and fans within dwelling	g (331)) x	0.52	106.8	(378)
CO2 associated with electricity for lighting (33	32))) x	0.52	202.29	(379)
Total CO2, kg/year sum of (376)(382) =			1369.94	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			14.53	(384)
El rating (section 14)			86.82	(385)



User Details: **Assessor Name:** Stroma Number: **Software Version: Software Name:** Stroma FSAP 2012 Version: 1.0.5.12 Property Address: W3-12 , 156 West End Lane, Camden, London Address: 1. Overall dwelling dimensions Av. Height(m) Volume(m³) Area(m<sup>2</sup>) Ground floor 51.8 (1a) x 2.7 (2a) = (3a) 139.86 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)(4)51.8 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =139.86 (5) total m<sup>3</sup> per hour main secondary other heating heating x 40 =Number of chimneys (6a) 0 0 x 20 =Number of open flues 0 0 0 (6b) Number of intermittent fans x 10 =(7a)0 0 x 10 =Number of passive vents (7b) 0 0 x 40 =Number of flueless gas fires 0 (7c)Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = $\div (5)$ (8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9)0 Additional infiltration [(9)-1]x0.1 =0 (10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)0 if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12)If no draught lobby, enter 0.05, else enter 0 (13)0 Percentage of windows and doors draught stripped (14)0 Window infiltration  $0.25 - [0.2 \times (14) \div 100] =$ 0 (15)Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =O (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)3 If based on air permeability value, then  $(18) = [(17) \div 20] + (8)$ , otherwise (18) = (16)0.15 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)3  $(20) = 1 - [0.075 \times (19)] =$ Shelter factor (20)0.78  $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.12 Infiltration rate modified for monthly wind speed Jan Feb Sep Mar Apr May Jun Jul Aug Oct Nov Dec Monthly average wind speed from Table 7 (22)m =5.1 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor  $(22a)m = (22)m \div 4$ (22a)m 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18



0.15	0.15	e (allowi 0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14	1	
Calculate effec		_	rate for t	he appli	cable ca	se	<u> </u>	ļ	ļ	<u> </u>	ļ	ı	
If mechanica			l' N. (6		/		.15\\	. (20)	\ (00 \			0.5	(2
If exhaust air h		0		, ,	,	. ,	,, .	,	) = (23a)			0.5	(2
If balanced with		-	-	_								76.5	(2
a) If balance				<b>.</b>		<del>- ` ` </del>	<del>,                                    </del>	<del>``</del>	<del> </del>	<del>-                                    </del>	<del>```</del>	· ÷ 100] I	(2
(4a)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.23	0.23	0.24	0.25	0.25	J	(2
b) If balance	ea mecna	anicai ve	ntilation	without	neat red	overy (r	0 (240	0) m = (22)	2b)m + (2   0	23D) 0	0	1	(2
·		<u> </u>		<u> </u>		<u> </u>				0		J	(-
c) If whole h if (22b)n				•					5 x (23h	<b>)</b>			
4c)m= 0	0.0 %	0	0	0	0	0	0) = (22.	0	0	0	0	1	(
d) If natural	ventilatio	n or wh	ole hous	Lse nositiv	ve input	ventilatio	n from l	oft.	<u> </u>			l	
if (22b)n				•	•				0.5]				
4d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(
Effective air	change	rate - er	iter (24a	) or (24k	o) or (24	c) or (24	d) in box	(25)				_	
5)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.23	0.23	0.24	0.25	0.25		(
. Heat losse	s and he	at loss	naramet	ar.					_		_		
LEMENT	Gros		Openin		Net Ar	ea	U-val	IE	AXU		k-value	a <i>E</i>	λΧk
	area		r		A ,r		W/m2		(W/I	<)	kJ/m²·l		J/K
oors					1.89	х	1.4	= [	2.646				
in <mark>dows</mark> Type	<del>)</del> 1				5.28	x1.	/[1/( 1.2 )+	0.04] =	6.05	П			(
indows Type	2				2.64	x1,	/[1/( 1.2 )+	0.04] =	3.02	Ħ			(
alls Type1	18.3	36	7.92	2	10.44	x	0.16	=	1.67	5 (		¬ <u> </u>	
alls Type2	18.3	36	1.89		16.47	7 X	0.15	<b>=</b>	2.47	T i		<b>i</b>	_
tal area of e	lements	, m²			36.72	2							
arty wall					37.5	x	0		0			$\neg \vdash$	
arty floor					51.8	=	<u> </u>					<b>i</b>	_
arty ceiling					51.8	=						╡ ├─	=
or windows and	roof wind	ows, use e	ffective wi	ndow U-va			formula 1	/[(1/U-valu	ıe)+0.04] a	L ns given in	paragraph		
include the area									, -	ŭ	, , ,		
bric heat los	ss, W/K =	= S (A x	U)				(26)(30)	+ (32) =				15.85	
eat capacity	Cm = S(	(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	0	
nermal mass	parame	ter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	Medium		250	(
r design assess				construct	ion are no	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
n be used inste nermal bridge				ueina Ar	nondiy l							1.00	
letails of therma	•	,		• .	-	`						4.23	
otal fabric he		are not kn	(00) -	0.00 x (0	••/			(33) +	(36) =			20.08	
entilation has	at loss ca	alculated	l monthl	y				(38)m	= 0.33 × (	25)m x (5)	)		
		1		1	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
Jan	Feb	Mar	Apr	May	Juli	լ յա	l Aug	l OCB	1 000	INOV	ן טפט		
Jan	Feb 12.13	Mar 12	11.32	11.19	10.52	10.52	10.39	10.79	11.19	11.46	11.73		(
Jan	12.13	12		<u> </u>	<del>                                     </del>	-	<del>-</del>	10.79	-	11.46			1

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com

Average =  $Sum(39)_{1...12}/12=$ 

31.37<sub>age 2 (39)</sub>



eat loss para	meter (H	HLP), W/	m²K					(40)m	= (39)m ÷	- (4)			
0.62	0.62	0.62	0.61	0.6	0.59	0.59	0.59	0.6	0.6	0.61	0.61		
umber of day	s in mor	nth (Tah	le 1a)						Average =	Sum(40) <sub>1</sub> .	12 /12=	0.61	(40
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
1)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41
4. Water heat	ing ener	gy requi	irement:								kWh/ye	ar:	
ssumed occu if TFA > 13.9 if TFA £ 13.9	, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (	TFA -13		74		(42
nnual averag educe the annua ot more that 125	e hot wa I average	hot water	usage by	5% if the c	lwelling is	designed t			se target c		5.6		(43
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
ot water usage ii	litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
4)m= 83.16	80.14	77.11	74.09	71.06	68.04	68.04	71.06	74.09	77.11	80.14	83.16		
nergy content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x E	Tm / 3600			m(44) <sub>112</sub> = ables 1b, 1		907.2	(44
5)m= 123.32	107.86	111.3	97.04	93.11	80.35	74.45	85.43	86.45	100.75	109.98	119.43		
									Total = Su	m(45) <sub>112</sub> =		1189.49	(4
instantaneous w							boxes (46						
6)m= 18.5 /ater storage	16.18	16.7	14.56	13.97	12.05	11.17	12.82	12.97	15.11	16.5	17.91		(4
torage volum		includin	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(4
community h	eating a	nd no ta	ınk in dw	elling, e	nter 110	litres in	(47)						
therwise if no		hot wate	er (this in	ıcludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	(47)			
/ater storage  i) If manufact		aclared l	nee facti	nr is kna	wn (k\//k	u/dav/).							(4
emperature fa				) 13 KHO	wii (ikwi	ı, day).					0		(4
nergy lost fro				ear			(48) x (49)	) =			10		(5
) If manufact		-	-		or is not	known:		•					(-
ot water stora	-			e 2 (kW	h/litre/da	ıy)				0.	02		(5
community holume factor	_		on 4.3								00		(E
emperature fa			2b								.6		(5. (5.
nergy lost fro				ear			(47) x (51)	) x (52) x (	53) =		03		(5
Inter (50) or (		_	,,	Jul			(11)11(01)	, (, (	,		03		(5
ater storage	loss cal	culated f	for each	month			((56)m = (	(55) × (41)	m				
6)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(5
cylinder contains												хН	V-
7)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(5
rimary circuit	loss (an	nual) fro	m Tahle	· 3	•		•	•	•		0		(5
rimary circuit	•	•			59)m = (	(58) ÷ 36	65 × (41)	ım					,
(modified by					•	. ,	, ,		r thermo	stat)			
(Inidamica by													



Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m														
(61)m= 0	0	0	0	0	0	0	)   0	)	0	0	0	0	1	(61)
	L auired for	water h	Leating ca	Lulated	L I for eac	h month	(62)	—— m =	0 85 x (	 ′45)m +	(46)m +	(57)m +	ı · (59)m + (61)m	
(62)m= 178.6	<del></del>	166.58	150.53	148.39	133.84	129.73	140	_	139.95	156.03	163.48	174.71	]	(62)
Solar DHW inpu	t calculated	using App	endix G o	· Appendix	H (negat	ive quantity	y) (ent	er '0'	if no sola	r contribu	tion to wate	r heating)	<b>_</b>	
(add addition												•		
(63)m= 0	0	0	0	0	0	0	0	)	0	0	0	0	]	(63)
Output from	water hea	ter	•			•	•				•	•	•	
(64)m= 178.6	157.79	166.58	150.53	148.39	133.84	129.73	140	.71	139.95	156.03	163.48	174.71	]	
	•	•	•	•		•		Outp	out from wa	ater heate	r (annual)	l12	1840.33	(64)
Heat gains fr	om water	heating	, kWh/m	onth 0.2	5 ´ [0.85	5 × (45)m	ı + (6	1)m	n] + 0.8 x	c [(46)m	+ (57)m	+ (59)m	n ]	
(65)m= 85.23	75.81	81.23	75.06	75.18	69.51	68.98	72.	63	71.54	77.72	79.36	83.93		(65)
include (57	7)m in cald	culation	of (65)m	only if c	ylinder	is in the	dwell	ing	or hot w	ater is f	rom com	munity h	neating	
5. Internal	gains (see	Table 5	and 5a	):										
Metabolic ga	ins (Table	5). Wat	ts											
Jan		Mar	Apr	May	Jun	Jul	A	ug	Sep	Oct	Nov	Dec		
(66)m= 87.16	87.16	87.16	87.16	87.16	87.16	87.16	87.	16	87.16	87.16	87.16	87.16		(66)
Ligh <mark>ting g</mark> ain	s (calcula	ted in A	opendix	L, equ <mark>a</mark> t	ion L9 c	r L9a), <mark>a</mark>	lso s	ee	Table 5					
(67)m= 14.26	12.66	10.3	7.8	5.83	4.92	5.32	6.9	1	9.28	11.78	13.75	14.66		(67)
Appliances g	ains (ca <mark>lc</mark>	<mark>ulat</mark> ed ir	Append	dix L, eq	uation L	.13 or L1	3a), a	also	see Tal	ble <mark>5</mark>				
(68)m= 151.9°	1 153.48	149.51	141.05	130.38	120.35	113.64	112	.07	116.04	124.5	135.17	145.2		(68)
Cooking gair	ns (calcula	ited in A	ppendix	L, equat	ion L15	or L15a	), als	o se	e Table	5		-		
(69)m= 31.72	31.72	31.72	31.72	31.72	31.72	31.72	31.	72	31.72	31.72	31.72	31.72		(69)
Pumps and f	ans gains	(Table	5a)										_	
(70)m= 0	0	0	0	0	0	0	0	)	0	0	0	0	]	(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)								_	
(71)m= -69.73	-69.73	-69.73	-69.73	-69.73	-69.73	-69.73	-69.	.73	-69.73	-69.73	-69.73	-69.73		(71)
Water heatin	g gains (T	able 5)											_	
(72)m= 114.5	5 112.81	109.18	104.25	101.05	96.54	92.71	97.	62	99.36	104.47	110.23	112.81		(72)
Total interna	al gains =	l			(66	5)m + (67)m	n + (68	3)m +	- (69)m + (	(70)m + (7	71)m + (72)	)m	_	
(73)m= 329.8°	7 328.1	318.14	302.25	286.4	270.96	260.82	265	.75	273.83	289.89	308.29	321.82		(73)
6. Solar gai	ns:													
Solar gains are		•				·	tions	to co	nvert to th	e applical		tion.		
Orientation:	Access F Table 6d		Area m²		Flu	ux ible 6a		т	g_ able 6b	т	FF able 6c		Gains (W)	
F							1							٦
East 0.9x		×			_	19.64	X		0.4	_  ×	0.7	=	20.12	(76)
East 0.9x		×				19.64	X		0.4	x	0.7	_ =	10.06	(76)
East 0.9x		×				38.42	X		0.4	X	0.7	=	39.36	(76)
East 0.9x		×				38.42	X		0.4	x	0.7	=	19.68	(76)
East 0.9x	0.77	X	5.2	28	x	63.27	X		0.4	X	0.7	=	64.83	(76)



East													_					
East	East	0.9x	0.77	X	2.6	4	X	6	3.27	X	0.4		x	0.7		=	32.41	(76)
East	East	0.9x	0.77	X	5.2	8	x	9	2.28	X	0.4		x	0.7		=	94.54	(76)
East	East	0.9x	0.77	X	2.6	4	x	9	2.28	x	0.4		x	0.7		=	47.27	(76)
East	East	0.9x	0.77	X	5.2	8	x	1	13.09	X	0.4		x	0.7		=	115.87	(76)
East	East	0.9x	0.77	x	2.6	4	x	1	13.09	x	0.4		x [	0.7		=	57.93	(76)
East	East	0.9x	0.77	x	5.2	8	x	1	15.77	x	0.4		x F	0.7		=	118.61	(76)
East	East	0.9x	0.77	x	2.6	4	x	1	15.77	x	0.4		x $\lceil$	0.7		=	59.31	(76)
East	East	0.9x	0.77	x	5.2	8	x	1	10.22	x	0.4		x $\lceil$	0.7		=	112.92	(76)
East	East	0.9x	0.77	x	2.6	4	x	1	10.22	x	0.4		x F	0.7		=	56.46	(76)
East	East	0.9x	0.77	x	5.2	8	x	9	4.68	x	0.4		x [	0.7		=	97	(76)
East	East	0.9x	0.77	x	2.6	4	x	9	4.68	X	0.4		x F	0.7		=	48.5	(76)
East	East	0.9x	0.77	x	5.2	8	x	7	3.59	x	0.4		x F	0.7		=	75.39	(76)
East	East	0.9x	0.77	x	2.6	4	x	7	3.59	x	0.4		x F	0.7		=	37.7	(76)
East 0.9x 0.77 x 5.28 x 24.49 x 0.4 x 0.7 = 25.09 (76)  East 0.9x 0.77 x 5.28 x 16.15 x 0.4 x 0.7 = 12.54 (76)  East 0.9x 0.77 x 5.28 x 16.15 x 0.4 x 0.7 = 12.54 (76)  East 0.9x 0.77 x 2.64 x 16.15 x 0.4 x 0.7 = 12.54 (76)  East 0.9x 0.77 x 2.64 x 16.15 x 0.4 x 0.7 = 12.54 (76)  East 0.9x 0.77 x 2.64 x 16.15 x 0.4 x 0.7 = 12.54 (76)  East 0.9x 0.77 x 2.64 x 16.15 x 0.4 x 0.7 = 12.54 (76)  East 0.9x 0.77 x 2.64 x 16.15 x 0.4 x 0.7 = 12.54 (76)  Solar gains in watts, calculated for each month (83)m s Sum(74)m(82)m (83)m 30.18 59.04 97.24 141.82 173.8 177.92 169.38 145.5 113.09 70.06 37.63 24.82 (83)  Total gains - internal and solar (84)m = (73)m + (83)m , watts (84)m 360.05 387.15 415.38 444.06 460.2 448.87 430.2 411.24 386.92 359.95 345.93 346.64 (84)  7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m 20.63 20.72 20.85 20.96 21 21 21 21 21 20.96 20.79 20.62 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m 20.41 20.41 20.41 20.42 20.43 20.44 20.44 20.44 20.43 20.43 20.42 20.42 (88)  Wean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (89)m 20.99 0.97 0.92 0.79 0.59 0.4 0.27 0.3 0.5 0.81 0.96 0.99 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m 19.92 20.05 20.23 20.39 20.42 20.44 20.44 20.44 20.43 20.38 20.16 19.91 (90)  ILA = Living area + (4) = 0.45 (91)  Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92)m 20.64 20.45 20.23 (92)	East	0.9x	0.77	x	5.2	8	x	4	5.59	x	0.4		x F	0.7		=	46.71	(76)
East	East	0.9x	0.77	х	2.6	4	x	4	5.59	x	0.4		x F	0.7		=	23.35	(76)
East 0.9x 0.77 x 2.64 x 16.15 x 0.4 x 0.7 = 8.27 (76)  Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83)m = 30.18 59.04 97.24 141.82 173.8 177.92 169.38 145.5 113.09 70.06 37.63 24.82 (83)  Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m = 360.05 387.15 415.38 444.06 460.2 448.87 430.2 411.24 386.92 359.95 345.93 346.64 (84)  7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9a, Th1 (°C) 21 (85)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m = 20.63 20.72 20.85 20.96 21 21 21 21 21 21 21 20.96 20.79 20.62 (87)  Temperature during heating periods in rest of dwelling, h2,m (see Table 9a) (88)m = 20.41 20.41 20.41 20.42 20.43 20.44 20.44 20.44 20.43 20.43 20.42 20.42 (88)  Mean internal temperature in the rest of dwelling, h2,m (see Table 9a) (89)m = 0.99 0.97 0.92 0.79 0.59 0.4 0.27 0.3 0.5 0.81 0.96 0.99 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (80)m = 19.92 20.05 20.23 20.39 20.42 20.44 20.44 20.44 20.43 20.38 20.16 19.91 (90) (90)m = 19.92 20.05 20.23 20.39 20.42 20.44 20.44 20.44 20.43 20.38 20.16 19.91 (90) (90)m = 19.92 20.05 20.23 20.39 20.42 20.44 20.44 20.44 20.43 20.38 20.16 19.91 (90) (90)m = 19.92 20.24 20.35 20.51 20.65 20.68 20.69 20.69 20.69 20.69 20.69 20.69 20.64 20.45 20.23 (92)	East	0.9x	0.77	x	5.2	8	x	2	4.49	x	0.4		x F	0.7		=	25.09	(76)
East 0.9x 0.77 x 2.64 x 16.15 x 0.4 x 0.7 = 8.27 (76)  Solar gains in watts, calculated for each month (83)m = Sum(74)m(62)m (83)m = 30.18 59.04 97.24 141.82 173.8 177.92 169.38 145.5 113.09 70.06 37.63 24.82 (83)  Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m = 360.05 387.15 415.38 444.06 460.2 448.87 430.2 411.24 386.92 359.95 345.93 346.64 (84)  7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m = 20.63 20.72 20.85 20.96 21 21 21 21 21 21 20.96 20.79 20.62 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m = 20.41 20.41 20.41 20.42 20.43 20.44 20.44 20.44 20.43 20.43 20.42 20.42 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m = 0.99 0.97 0.92 0.79 0.59 0.4 0.27 0.3 0.5 0.81 0.96 0.99 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m = 19.92 20.05 20.23 20.39 20.42 20.44 20.44 20.44 20.43 20.38 20.16 19.91 (90)  ### FLAT STOR STOR STOR STOR STOR STOR STOR STO	East	0.9x	0.77	x	2.6	4	x	2	4.49	x	0.4		x	0.7		=	12.54	(76)
Solar gains in watts, calculated for each month (83)m = Sum(74)m (82)m (83)m = 30.18   59.04   97.24   141.82   173.8   177.92   169.38   145.5   113.09   70.06   37.63   24.82   (83)   70.00   37.63   37.15   415.38   444.06   460.2   448.87   430.2   411.24   386.92   359.95   345.93   346.64   (84)   7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C)	East	0.9x	0.77	х	5.2	8	X	1	6.15	Х	0.4	Ħ۱	X	0.7		=	16.55	(76)
(83) m= 30.18 59.04 97.24 141.82 173.8 177.92 169.38 145.5 113.09 70.06 37.63 24.82  Total gains – internal and solar (84) m = (73) m + (83) m , watts  (84) m= 360.05 387.15 415.38 444.06 460.2 448.87 430.2 411.24 386.92 359.95 345.93 346.64  7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86) m= 0.99 0.98 0.94 0.81 0.63 0.44 0.31 0.34 0.55 0.85 0.97 0.99 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87) m= 20.63 20.72 20.85 20.96 21 21 21 21 21 22 20.96 20.79 20.62 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88) m= 20.41 20.41 20.41 20.42 20.43 20.44 20.44 20.44 20.43 20.43 20.42 20.42 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (89) m= 0.99 0.97 0.92 0.79 0.59 0.4 0.27 0.3 0.5 0.81 0.96 0.99 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90) m= 19.92 20.05 20.23 20.39 20.42 20.44 20.44 20.44 20.43 20.38 20.16 19.91 (90)  **ELA = Living area + (4) = 0.45 (91)  Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2  (92) m= 20.24 20.35 20.51 20.65 20.68 20.69 20.69 20.69 20.69 20.69 20.64 20.45 20.23 (92)	East	0.9x	0.77	x	2.6	4	x	1	6.15	х	0.4	司	×	0.7		=	8.27	(76)
(83) m= 30.18 59.04 97.24 141.82 173.8 177.92 169.38 145.5 113.09 70.06 37.63 24.82 (83) Total gains – internal and solar (84) m = (73) m + (83) m , watts (84) m = 360.05 387.15 415.38 444.06 460.2 448.87 430.2 411.24 386.92 359.95 345.93 346.64 (84)    7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) (86) m= 0.99 0.98 0.94 0.81 0.63 0.44 0.31 0.34 0.55 0.85 0.97 0.99 (86)    Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87) m= 20.63 20.72 20.85 20.96 21 21 21 21 21 21 20.96 20.79 20.62 (87)    Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88) m= 20.41 20.41 20.41 20.42 20.43 20.44 20.44 20.44 20.43 20.43 20.42 20.42 (88)    Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89) m= 0.99 0.97 0.92 0.79 0.59 0.4 0.27 0.3 0.5 0.81 0.96 0.99 (89)    Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (89) m= 19.92 20.05 20.23 20.39 20.42 20.44 20.44 20.44 20.43 20.38 20.16 19.91 (90)    **ELA = Living area + (4) = 0.45 (91)    Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2 (92) m= 20.24 20.35 20.51 20.65 20.68 20.69 20.69 20.69 20.69 20.69 20.64 20.45 20.23 (92)		_																
Total gains – internal and solar (84)m = (73)m + (83)m , waits  (84)m = 360.05 387.15 415.38 444.06 460.2 448.87 430.2 411.24 886.92 359.95 345.93 346.64  7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C)  21 (85)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m = 0.99 0.98 0.94 0.81 0.63 0.44 0.31 0.34 0.55 0.85 0.97 0.99 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m = 20.63 20.72 20.85 20.96 21 21 21 21 21 21 20.96 20.79 20.62 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m = 20.41 20.41 20.41 20.42 20.43 20.44 20.44 20.44 20.43 20.43 20.42 20.42 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m = 0.99 0.97 0.92 0.79 0.59 0.4 0.27 0.3 0.5 0.81 0.96 0.99 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m = 19.92 20.05 20.23 20.39 20.42 20.44 20.44 20.44 20.43 20.88 20.16 19.91 (90)  Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2  (92)m = 20.24 20.35 20.51 20.65 20.68 20.69 20.69 20.69 20.69 20.64 20.45 20.23 (92)	Solar g	ains in v	watts, calc	ulated	for each	n mont	h			(83)m	= Sum(74)m	า(82	2)m					
(84)m= 360.05 387.15 415.38 444.06 460.2 448.87 430.2 411.24 386.92 359.95 345.93 346.64 (84)  7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C)	ĭ						$\overline{}$	77.92	169.38	145	5.5 113.09	70	0.06	37.63	24.8	2		(83)
7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C)  21 (85)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.99 0.98 0.94 0.81 0.63 0.44 0.31 0.34 0.55 0.85 0.97 0.99 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 20.63 20.72 20.85 20.96 21 21 21 21 21 21 20.96 20.79 20.62 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m= 20.41 20.41 20.41 20.42 20.43 20.44 20.44 20.44 20.43 20.43 20.42 20.42 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.99 0.97 0.92 0.79 0.59 0.4 0.27 0.3 0.5 0.81 0.96 0.99 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 19.92 20.05 20.23 20.39 20.42 20.44 20.44 20.44 20.43 20.38 20.16 19.91 (90)  FLA = Living area + (4) = 0.45 (91)  Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2  (92)m= 20.24 20.35 20.51 20.65 20.68 20.69 20.69 20.69 20.69 20.64 20.45 20.23 (92)	Total g	ains – ir	nternal and	d solar	(84)m =	: (73)m	+ (	83)m	watts									
Temperature during heating periods in the living area from Table 9, Th1 (°C)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.99 0.98 0.94 0.81 0.63 0.44 0.31 0.34 0.55 0.85 0.97 0.99 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 20.63 20.72 20.85 20.96 21 21 21 21 21 21 20.96 20.79 20.62 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m= 20.41 20.41 20.41 20.42 20.43 20.44 20.44 20.44 20.43 20.43 20.42 20.42 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.99 0.97 0.92 0.79 0.59 0.4 0.27 0.3 0.5 0.81 0.96 0.99 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 19.92 20.05 20.23 20.39 20.42 20.44 20.44 20.44 20.43 20.38 20.16 19.91 (90)  Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2  (92)m= 20.24 20.35 20.51 20.65 20.68 20.69 20.69 20.69 20.69 20.69 20.64 20.45 20.23 (92)	(84)m=	360.05	387.15	115.38	444.06	460.2	4	48.87	430.2	411	.24 386.92	359	9.95	345.93	346.6	64		(84)
Temperature during heating periods in the living area from Table 9, Th1 (°C)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.99 0.98 0.94 0.81 0.63 0.44 0.31 0.34 0.55 0.85 0.97 0.99 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 20.63 20.72 20.85 20.96 21 21 21 21 21 21 20.96 20.79 20.62 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m= 20.41 20.41 20.41 20.42 20.43 20.44 20.44 20.44 20.43 20.43 20.42 20.42 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.99 0.97 0.92 0.79 0.59 0.4 0.27 0.3 0.5 0.81 0.96 0.99 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 19.92 20.05 20.23 20.39 20.42 20.44 20.44 20.44 20.43 20.38 20.16 19.91 (90)  Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2  (92)m= 20.24 20.35 20.51 20.65 20.68 20.69 20.69 20.69 20.69 20.69 20.64 20.45 20.23 (92)	7. Me	an inter	nal tempe	rature	(heating	seaso	n)											
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec								area f	rom Tab	ole 9,	Th1 (°C)						21	(85)
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	Utilisa	ition fac	tor for gair	ns for li	iving are	a, h1,r	า ท (s	ee Ta	ble 9a)		, ,					ı		
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 20.63 20.72 20.85 20.96 21 21 21 21 21 21 20.96 20.79 20.62  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m= 20.41 20.41 20.41 20.42 20.43 20.44 20.44 20.44 20.44 20.43 20.43 20.42 20.42  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.99 0.97 0.92 0.79 0.59 0.4 0.27 0.3 0.5 0.81 0.96 0.99  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 19.92 20.05 20.23 20.39 20.42 20.44 20.44 20.44 20.44 20.43 20.38 20.16 19.91 (90)  Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2  (92)m= 20.24 20.35 20.51 20.65 20.68 20.69 20.69 20.69 20.69 20.69 20.64 20.45 20.23 (92)			<u>_</u> _		_ <del>_</del>		T			A	ug Sep		Oct	Nov	De	c		
(87)m= 20.63 20.72 20.85 20.96 21 21 21 21 21 20.96 20.79 20.62 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m= 20.41 20.41 20.41 20.42 20.43 20.44 20.44 20.44 20.43 20.43 20.42 20.42 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.99 0.97 0.92 0.79 0.59 0.4 0.27 0.3 0.5 0.81 0.96 0.99 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 19.92 20.05 20.23 20.39 20.42 20.44 20.44 20.44 20.44 20.43 20.38 20.16 19.91 (90)  Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2  (92)m= 20.24 20.35 20.51 20.65 20.68 20.69 20.69 20.69 20.69 20.64 20.45 20.23 (92)	(86)m=	0.99	0.98	0.94		0.63	١,	0.44	0.31	0.3	4 0.55	0.	.85	0.97	0.99	)		(86)
(87)m= 20.63 20.72 20.85 20.96 21 21 21 21 21 20.96 20.79 20.62 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m= 20.41 20.41 20.41 20.42 20.43 20.44 20.44 20.44 20.43 20.43 20.42 20.42 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.99 0.97 0.92 0.79 0.59 0.4 0.27 0.3 0.5 0.81 0.96 0.99 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 19.92 20.05 20.23 20.39 20.42 20.44 20.44 20.44 20.44 20.43 20.38 20.16 19.91 (90)  ELA = Living area ÷ (4) = 0.45 (91)  Mean internal temperature (for the whole dwelling) = FLA x T1 + (1 - FLA) x T2  (92)m= 20.24 20.35 20.51 20.65 20.68 20.69 20.69 20.69 20.69 20.64 20.45 20.23 (92)	Mean	internal	temperat	ure in l	iving are	a T1 (	follo	w ste	ns 3 to 7	in T	ahle 9c)	-						
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m= 20.41 20.41 20.41 20.42 20.43 20.44 20.44 20.44 20.43 20.43 20.43 20.42 20.42 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.99 0.97 0.92 0.79 0.59 0.4 0.27 0.3 0.5 0.81 0.96 0.99 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 19.92 20.05 20.23 20.39 20.42 20.44 20.44 20.44 20.44 20.43 20.38 20.16 19.91 (90)  ### FLA = Living area ÷ (4) = 0.45 (91)  Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2  (92)m= 20.24 20.35 20.51 20.65 20.68 20.69 20.69 20.69 20.69 20.69 20.64 20.45 20.23 (92)	1			1			T					20	0.96	20.79	20.6	2		(87)
(88)m= 20.41 20.41 20.41 20.42 20.43 20.44 20.44 20.44 20.43 20.43 20.42 20.42 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.99 0.97 0.92 0.79 0.59 0.4 0.27 0.3 0.5 0.81 0.96 0.99 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 19.92 20.05 20.23 20.39 20.42 20.44 20.44 20.44 20.43 20.38 20.16 19.91 (90)  ### Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2  (92)m= 20.24 20.35 20.51 20.65 20.68 20.69 20.69 20.69 20.69 20.64 20.45 20.23 (92)							f 4			<u> </u>								
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.99 0.97 0.92 0.79 0.59 0.4 0.27 0.3 0.5 0.81 0.96 0.99  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 19.92 20.05 20.23 20.39 20.42 20.44 20.44 20.44 20.44 20.43 20.38 20.16 19.91 (90)  Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2  (92)m= 20.24 20.35 20.51 20.65 20.68 20.69 20.69 20.69 20.69 20.64 20.45 20.23 (92)		T T					_			ī			) ፈՉ	20.42	20.4	2		(88)
(89)m= 0.99 0.97 0.92 0.79 0.59 0.4 0.27 0.3 0.5 0.81 0.96 0.99 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 19.92 20.05 20.23 20.39 20.42 20.44 20.44 20.44 20.44 20.43 20.38 20.16 19.91 (90)  Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2  (92)m= 20.24 20.35 20.51 20.65 20.68 20.69 20.69 20.69 20.69 20.64 20.45 20.23 (92)										<u> </u>	77 20.73	1 20	7.40	20.42	20.4			(00)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 19.92 20.05 20.23 20.39 20.42 20.44 20.44 20.44 20.43 20.38 20.16 19.91 (90)  ### FLA = Living area ÷ (4) = 0.45 (91)  Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2  (92)m= 20.24 20.35 20.51 20.65 20.68 20.69 20.69 20.69 20.69 20.64 20.45 20.23 (92)	1			ī			$\neg$			r –		_		1				(00)
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	(89)m=	0.99	0.97	0.92	0.79	0.59		0.4	0.27	0.3	3 0.5	0.	.81	0.96	0.99	9		(89)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$ (92)m= 20.24 20.35 20.51 20.65 20.68 20.69 20.69 20.69 20.69 20.64 20.45 20.23 (92)	Mean	internal	temperat	ure in t	he rest	of dwe	lling	T2 (f		ps 3	to 7 in Tal	ble 9	c)					
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$ (92)m= 20.24 20.35 20.51 20.65 20.68 20.69 20.69 20.69 20.69 20.64 20.45 20.23 (92)	(90)m=	19.92	20.05	20.23	20.39	20.42	2	20.44	20.44	20.	44 20.43			ļ		1		(90)
(92)m= 20.24 20.35 20.51 20.65 20.68 20.69 20.69 20.69 20.69 20.64 20.45 20.23 (92)		$fLA = Living area \div (4) = 0.45 \tag{91}$																
(92)m= 20.24 20.35 20.51 20.65 20.68 20.69 20.69 20.69 20.69 20.64 20.45 20.23 (92)	Mean	Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$																
Apply adjustment to the mean internal temperature from Table 4e, where appropriate	ı						_			<del></del>			).64	20.45	20.2	3		(92)
	vlaaA	adjustm	ent to the	mean	internal	tempe	eratu	re fro	m Table	4e,	where app	ropria	ate	•				



(02)~	20.24	20.25	20.54	20.65	20.60	20.60	20.60	20.60	20.60	20.64	20.45	20.22		(93)
(93)m=		20.35	20.51 uirement	20.65	20.68	20.69	20.69	20.69	20.69	20.64	20.45	20.23		(93)
					ra ohtair	and at et	ep 11 of <sup>-</sup>	Tahla Or	so tha	t Ti m-/	76)m an	d re-calc	ulato	
			or gains	•		ica at st	SP 11 01	i abic or	), 30 tila	( 11,111–(	r Ojiii aii	a ic caic	diate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	1:									1	
(94)m=	0.98	0.97	0.93	0.8	0.61	0.42	0.29	0.32	0.52	0.83	0.96	0.99		(94)
			, W = (9	<del></del>		Γ		- 1			Ι	I	ı	(0-1)
(95)m=	354.57	375.78	384.67	353.79	279.37	186.38	125.23	130.81	203.05	297.32	332.51	342.42		(95)
(96)m=	aly avera	age exte	ernal tem	perature 8.9	11.7	able 8 14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
` ′				<u> </u>		l	[ <sup>16.6</sup> [ =[(39)m x				7.1	4.2		(90)
(97)m=	515.64	497.7	449.37	368.92	280.89	186.43	125.23	130.81	203.4	314.08	421.01	509.85		(97)
		<u> </u>	Į	l		<u> </u>	th = 0.024				<u> </u>	000.00		(= )
(98)m=	119.84	81.93	48.13	10.89	1.14	0	0	0	0	12.48	63.72	124.57		
				ļ			<u> </u>	Tota	l per year	l (kWh/yeaı	) = Sum(9	8) <sub>15,912</sub> =	462.69	(98)
Space	e heatin	a requir	ement in	kWh/m²	?/vear								8.93	(99)
·		• .			•	0 0 0 0 00 0							0.93	
			nts – Coi	· ·	Ĭ		ater heati	ng prov	idad by	o comm	unity cok	oomo		
							neating (				urnity SCI	lerrie.	0	(301)
Fractio	n of spa	ace heat	from co	mmunity	svstem	1 - (30	1) =						1	(302)
							orocedure a	allows for i	CHP and i	ın to four	other heat	sources: ti	he latter	` ′
	-						r stations. S			ap to rour	stror riout	000, 1	io iditor	
Fractio	n of hea	at from (	Commun	ity boiler	s								1	(303a)
Fractio	n of tota	al space	heat fro	m Comn	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor	for cont	rol and	charging	method	(Table	4c(3)) fo	r commu	nity hea	ting sys	tem			1	(305)
Distrib	ution los	ss factor	(Table 1	12c) for o	commun	ity heatiı	ng systen	n					1.05	(306)
	heating		`	,		•	0 ,						kWh/yea	 r
-		_	requiren	nent									462.69	
Space	heat fro	m Com	munity b	oilers					(98) x (30	04a) x (30	5) x (306) :	=	485.83	(307a)
Efficier	ncy of se	econdar	y/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)		0	(308
Space	heating	require	ment fro	m secon	dary/su	plemen	tary syste	em	(98) x (30	· · 01) x 100 -	÷ (308) =		0	(309)
·	_				, ,	•	, ,							
	<b>heating</b> I water h		requirem	ent									1840.33	
If DHW	/ from c	ommuni	ty schen	ne:										<b>_</b>
Water	heat fro	m Comr	nunity bo	oilers					(64) x (30	)3a) x (30	5) x (306) :	=	1932.34	(310a)
Electric	city used	d for hea	at distrib	ution				0.01	× [(307a).	(307e) +	· (310a)(	[310e)] =	24.18	(313)
Cooling	g Systei	m Energ	y Efficie	ncy Rati	0								0	(314)
Space	cooling	(if there	is a fixe	d coolin	g systen	n, if not e	enter 0)		= (107) ÷	(314) =			0	(315)
			nd fans									'		_
mecha	nical ve	ntilation	- balanc	ed, extra	act or po	sitive in	put from	outside					106.64	(330a)

# FHP (C

warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	b) + (330g) =		106.64	(331)
Energy for lighting (calculated in Appendix L)				251.82	(332)
12b. CO2 Emissions – Community heating scheme					
	Energy kWh/year	Emission fact kg CO2/kWh		nissions CO2/year	
CO2 from other sources of space and water heating (not CHP)  Efficiency of heat source 1 (%)  If there is CHP using to	two fuels repeat (363) to	(366) for the second	fuel	95.7	(367a)
CO2 associated with heat source 1 [(307b)+(3	310b)] x 100 ÷ (367b) x	0.22	= [	545.79	(367)
Electrical energy for heat distribution [(3	313) x	0.52	= [	12.55	(372)
Total CO2 associated with community systems (3	363)(366) + (368)(372	2)	= [	558.34	(373)
CO2 associated with space heating (secondary) (3	809) x	0	= [	0	(374)
CO2 associated with water from immersion heater or instantaneo	ous heater (312) x	0.52	= [	0	(375)
Total CO2 associated with space and water heating (3	373) + (374) + (375) =		[	558.34	(376)
CO2 associated with electricity for pumps and fans within dwelling	g (331)) x	0.52	= [	55.35	(378)
CO2 associated with electricity for lighting (3	332))) x	0.52	= [	130.69	(379)
Total CO2, kg/year sum of (376)(382) =				744.39	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =				14.37	(384)
El rating (section 14)				89.7	(385)



User Details: **Assessor Name:** Stroma Number: **Software Version: Software Name:** Stroma FSAP 2012 Version: 1.0.5.12 Property Address: W4-09 , 156 West End Lane, Camden, London Address: 1. Overall dwelling dimensions Av. Height(m) Volume(m³) Area(m<sup>2</sup>) Ground floor 86.4 (1a) x 2.7 (2a) = (3a) 233.28 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)(4)86.4 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =233.28 (5) total m³ per hour main secondary other heating heating x 40 =Number of chimneys (6a) 0 0 x 20 =Number of open flues 0 0 0 (6b) Number of intermittent fans x 10 =(7a)0 0 x 10 =Number of passive vents (7b) 0 0 x 40 =Number of flueless gas fires 0 (7c)Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =(8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9)0 Additional infiltration [(9)-1]x0.1 =0 (10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)0 if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12)If no draught lobby, enter 0.05, else enter 0 (13)0 Percentage of windows and doors draught stripped (14)0 Window infiltration  $0.25 - [0.2 \times (14) \div 100] =$ 0 (15)Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =O (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)3 If based on air permeability value, then  $(18) = [(17) \div 20] + (8)$ , otherwise (18) = (16)0.15 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)2  $(20) = 1 - [0.075 \times (19)] =$ Shelter factor (20)0.85  $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.13 Infiltration rate modified for monthly wind speed Jan Feb Sep Mar Apr May Jun Jul Aug Oct Nov Dec Monthly average wind speed from Table 7 (22)m =5.1 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor  $(22a)m = (22)m \div 4$ (22a)m 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18



Adjusted infiltr	ation rate	(allowii	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15	]	
Calculate effe		-	rate for t	he appli	cable ca	se	•	•	•	•	•	-	(co. )
If mechanical If exhaust air h			andiv N (2	3h) - (23a	a) × Fmv (e	Aguation (1	NSN othe	rwisa (23h	n) – (23a)			0.5	(23a)
If balanced with									) = (23a)			0.5	(23b)
a) If balance		-	-	_					2h)m + (	23h) <b>v</b> [	1 <b>–</b> (23c)	76.5 \ ± 1001	(23c)
(24a)m= 0.28		0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	]	(24a)
b) If balance	ed mechan	nical ve	ntilation	without	heat red	coverv (N	I ЛV) (24t	$\frac{1}{2}$	2b)m + (	L 23b)		J	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(24b)
c) If whole h if (22b)r	nouse extra n < 0.5 × (2			•	•				.5 × (23b	))		J	
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24c)
d) If natural if (22b)r	ventilation n = 1, then								0.5]	•	'	•	
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24d)
Effective air	change ra	ate - en	iter (24a	) or (24b	o) or (24	c) or (24	d) in bo	x (25)				_	
(25)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27		(25)
3. Heat losse	s and heat	t loss p	paramete	er:							_	_	_
ELEMENT	Gross area (n		Openin m	gs	Net Ar A ,r		U-val W/m2		A X U (W/I	K)	k-valu kJ/m²·		A X k kJ/K
Doors													
					1.89	Х	1.4	=	2.646				(26)
Windows Type	e 1				1.89 5.28		1.4 /[1/( 1.2 )+		2.646 6.05				(26) (27)
Windows Type Windows Type						x1,		0.04] =					
	e 2				5.28	x1,	/[1/( 1.2 )+	· 0.04] = · 0.04] =	6.05				(27)
Windows Type	e 2 e 3				5.28	x1, x1, x1,	/[1/( 1.2 )+ /[1/( 1.2 )+	0.04] = 0.04] = 0.04] =	6.05				(27) (27)
Windows Type	e 2 e 3		18.48	3	5.28 2.64 5.28	x1, x1, x1, x1,	/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	0.04] = 0.04] = 0.04] =	6.05 3.02 6.05				(27) (27) (27)
Windows Type Windows Type Windows Type	e 2 e 3 e 4		18.48	=	5.28 2.64 5.28 2.64	x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	0.04] = 0.04] = 0.04] = 0.04] =	6.05 3.02 6.05 3.02				(27) (27) (27) (27)
Windows Type Windows Type Windows Type Walls Type1	e 2 e 3 e 4			=	5.28 2.64 5.28 2.64 30.12	x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	6.05 3.02 6.05 3.02 4.82				(27) (27) (27) (27) (29)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2	48.6 48.6 14.31		1.89	=	5.28 2.64 5.28 2.64 30.12	x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.16	0.04] = 0.04] = 0.04] = - 0.04] = - 0.04] = =	6.05 3.02 6.05 3.02 4.82 1.86				(27) (27) (27) (27) (29) (29)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Roof	48.6 48.6 14.31		1.89	=	5.28 2.64 5.28 2.64 30.12 12.42	x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.16	0.04] = 0.04] = 0.04] = - 0.04] = - 0.04] = =	6.05 3.02 6.05 3.02 4.82 1.86				(27) (27) (27) (27) (29) (29) (30)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Roof Total area of e	48.6 48.6 14.31		1.89	=	5.28 2.64 5.28 2.64 30.12 12.42 18.7 81.61	x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.16 0.15	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04]	6.05 3.02 6.05 3.02 4.82 1.86 3.74				(27) (27) (27) (27) (29) (29) (30) (31)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Roof Total area of e	48.6 48.6 14.31		1.89	=	5.28 2.64 5.28 2.64 30.12 12.42 18.7 81.61	x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.16 0.15	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04]	6.05 3.02 6.05 3.02 4.82 1.86 3.74				(27) (27) (27) (27) (29) (29) (30) (31) (32)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Roof Total area of e Party wall Party floor	48.6 14.31 18.7 Elements, n	/s, use e	1.89	ndow U-va	5.28 2.64 5.28 2.64 30.12 12.42 18.7 81.61 43.75 86.4 67.7 alue calcul	x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.16 0.15 0.2	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04]	6.05 3.02 6.05 3.02 4.82 1.86 3.74	as given in	n paragrapi		(27) (27) (27) (27) (29) (29) (30) (31) (32) (32a)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Roof Total area of e Party wall Party floor Party ceiling * for windows and	48.6 48.6 14.31 18.7 elements, n	/s, use e des of in	1.89 0	ndow U-va	5.28 2.64 5.28 2.64 30.12 12.42 18.7 81.61 43.75 86.4 67.7 alue calcul	x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.16 0.15 0.2	- 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04	6.05 3.02 6.05 3.02 4.82 1.86 3.74	as given in	n paragrapi	h 3.2	(27) (27) (27) (27) (29) (29) (30) (31) (32) (32a) (32b)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Roof Total area of e Party wall Party floor Party ceiling * for windows and ** include the area	48.6  48.6  14.31  18.7  elements, not a roof window as on both sides, W/K = \$1.000 at 1.000	/s, use eades of in S (A x	1.89 0	ndow U-va	5.28 2.64 5.28 2.64 30.12 12.42 18.7 81.61 43.75 86.4 67.7 alue calcul	x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.16 0.15 0.2	- 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04	6.05 3.02 6.05 3.02 4.82 1.86 3.74				(27) (27) (27) (29) (29) (30) (31) (32) (32a) (32b)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Roof Total area of e Party wall Party floor Party ceiling * for windows and ** include the area Fabric heat los Heat capacity Thermal mass	48.6 48.6 14.31 18.7 elements, not so the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the	/s, use e des of in S (A x x k ) er (TMF	1.89 0  ffective will ternal wall U)  P = Cm ÷	ndow U-vals and part	5.28 2.64 5.28 2.64 30.12 12.42 18.7 81.61 43.75 86.4 67.7 alue calculatitions	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.16 0.15 0.2 0 formula 1 (26)(30	- 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04	6.05 3.02 6.05 3.02 4.82 1.86 3.74 0	2) + (32a). : Medium	(32e) =	34.22	(27) (27) (27) (27) (29) (29) (30) (31) (32) (32a) (32b)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Roof Total area of e Party wall Party floor Party ceiling * for windows and ** include the area Fabric heat los Heat capacity	48.6  48.6  14.31  18.7  Elements, not window as on both sides, W/K = \$ Cm = S(A)  s paramete sments where and of a detail	vs, use eades of in S (A x x x k ) er (TMF e the det	1.89 0  ffective winternal wall U)  P = Cm ÷ tails of the ulation.	ndow U-vals and part	5.28 2.64 5.28 2.64 30.12 12.42 18.7 81.61 43.75 86.4 67.7 alue calculatitions	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.16 0.15 0.2 0 formula 1 (26)(30	- 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04	6.05 3.02 6.05 3.02 4.82 1.86 3.74 0	2) + (32a). : Medium	(32e) =	34.22	(27) (27) (27) (27) (29) (29) (30) (31) (32) (32a) (32b)

if details of thermal bridging are not known (36) = 0.05 x (31)



Total fabric heat loss	(33) + (36) -			7(27)
Ventilation heat loss calculated monthly	(33) + (36) = $(38)m = 0.33 \times$	(25)m v (5)	49.91	(37)
Jan Feb Mar Apr May Jun Jul	Aug Sep Oct	Nov Dec	1	
(38)m= 21.56 21.31 21.07 19.84 19.6 18.37 18.37	18.12 18.86 19.6	20.09 20.58	<u> </u> 	(38)
Heat transfer coefficient, W/K	(39)m = (37) +		J	
(39)m= 71.47 71.23 70.98 69.76 69.51 68.28 68.28	68.04 68.77 69.51	70 70.49	1	
		= Sum(39) <sub>112</sub> /12=	69.69	(39)
Heat loss parameter (HLP), W/m²K	(40)m = $(39)$ m	÷ (4)	_	_
(40)m= 0.83 0.82 0.82 0.81 0.8 0.79 0.79	0.79 0.8 0.8	0.81 0.82		<b>-</b>
Number of days in month (Table 1a)	Average :	= Sum(40) <sub>112</sub> /12=	0.81	(40)
Jan Feb Mar Apr May Jun Jul	Aug Sep Oct	Nov Dec		
(41)m= 31 28 31 30 31 30 31	31 30 31	30 31		(41)
4. Water heating energy requirement:		kWh/y	ear:	
Assumed occupancy, N		2.57	1	(42)
if TFA > 13.9, $N = 1 + 1.76 \times [1 - \exp(-0.000349 \times (TFA - 13.9))]$	9)2)] + 0.0013 x (TFA -13			(42)
if TFA £ 13.9, N = 1	(05 × N) + 20			(12)
Annual average hot water usage in litres per day Vd,average = Reduce the annual average hot water usage by 5% if the dwelling is designed		95.31		(43)
not more that 125 litres per person per day (all water use, hot and cold)				
Jan Feb Mar Apr May Jun Jul	Aug Sep Oct	Nov Dec		
Hot water usage in litres per day for each month Vd,m = factor from Table 1c	x (43)		,	
(44)m= 104.84 101.03 97.22 93.41 89.59 85.78 85.78	89.59 93.41 97.22	101.03 104.84		<b>-</b>
Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x		um(44) <sub>112</sub> = ables 1b, 1c, 1d)	1143.75	(44)
(45)m= 155.48 135.98 140.32 122.34 117.39 101.3 93.86	107.71 109 127.03	138.66 150.57		
		um(45) <sub>112</sub> =	1499.64	(45)
If instantaneous water heating at point of use (no hot water storage), enter 0 i		T T	1	(40)
(46)m= 23.32 20.4 21.05 18.35 17.61 15.19 14.08 Water storage loss:	16.16 16.35 19.05	20.8 22.59		(46)
Storage volume (litres) including any solar or WWHRS storage	e within same vessel	0	]	(47)
If community heating and no tank in dwelling, enter 110 litres i	n (47)			
Otherwise if no stored hot water (this includes instantaneous of	combi boilers) enter '0' in	(47)		
Water storage loss:		_	1	(45)
a) If manufacturer's declared loss factor is known (kWh/day):		0	<u> </u> 	(48)
Temperature factor from Table 2b	(49) v (40) —	0	] 1	(49)
Energy lost from water storage, kWh/year b) If manufacturer's declared cylinder loss factor is not known	(48) x (49) =	110		(50)
Hot water storage loss factor from Table 2 (kWh/litre/day)		0.02	]	(51)
If community heating see section 4.3			•	
Volume factor from Table 2a		1.03		(52)
Temperature factor from Table 2b	(47) - (54) (50) (50)	0.6	]	(53)
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	1 4 00	î .	(54)
Enter (50) or (54) in (55)	(11) x (01) x (02) x (00) =	1.03	1	(55)



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



Orientation	on:	Access Factor Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	X	5.28	x	10.63	x	0.4	x	0.7	=	10.89	(74)
North	0.9x	0.77	x	2.64	x	10.63	x	0.4	x	0.7	=	5.45	(74)
North	0.9x	0.77	x	5.28	x	20.32	х	0.4	x	0.7	=	20.82	(74)
North	0.9x	0.77	x	2.64	x	20.32	x	0.4	x	0.7	=	10.41	(74)
North	0.9x	0.77	x	5.28	x	34.53	x	0.4	x	0.7	=	35.38	(74)
North	0.9x	0.77	x	2.64	х	34.53	х	0.4	x	0.7	=	17.69	(74)
North	0.9x	0.77	x	5.28	х	55.46	х	0.4	x	0.7	=	56.83	(74)
North	0.9x	0.77	X	2.64	x	55.46	х	0.4	x	0.7	=	28.41	(74)
North	0.9x	0.77	X	5.28	x	74.72	x	0.4	x	0.7	=	76.55	(74)
North	0.9x	0.77	x	2.64	x	74.72	x	0.4	X	0.7	=	38.27	(74)
North	0.9x	0.77	X	5.28	x	79.99	x	0.4	X	0.7	=	81.95	(74)
North	0.9x	0.77	X	2.64	x	79.99	x	0.4	X	0.7	=	40.97	(74)
North	0.9x	0.77	X	5.28	x	74.68	x	0.4	X	0.7	=	76.51	(74)
North	0.9x	0.77	X	2.64	X	74.68	X	0.4	X	0.7	=	38.25	(74)
North	0.9x	0.77	X	5.28	X	59.25	x	0.4	X	0.7	=	60.7	(74)
North	0.9x	0.77	X	2.64	X	59.25	Х	0.4	X	0.7	=	30.35	(74)
North	0.9x	0.77	X	5.28	х	41.52	×	0.4	x	0.7	=	42.54	(74)
North	0.9x	0.77	X	2.64	х	41.52	×	0.4	x	0.7	=	21.27	(74)
North	0.9x	0.77	X	5.28	X	24.19	x	0.4	x	0.7	=	24.78	(74)
North	0.9x	0.77	X	2.64	x	24.19	Х	0.4	x	0.7	=	12.39	(74)
North	0.9x	0.77	X	5.28	x	13.12	X	0.4	x	0.7	=	13.44	(74)
North	0.9x	0.77	X	2.64	х	13.12	x	0.4	x	0.7	=	6.72	(74)
North	0.9x	0.77	X	5.28	X	8.86	X	0.4	X	0.7	=	9.08	(74)
North	0.9x	0.77	X	2.64	X	8.86	Х	0.4	X	0.7	=	4.54	(74)
South	0.9x	0.77	X	5.28	X	46.75	X	0.4	X	0.7	=	47.9	(78)
South	0.9x	0.77	X	2.64	X	46.75	х	0.4	X	0.7	=	47.9	(78)
	0.9x	0.77	X	5.28	x	76.57	x	0.4	X	0.7	=	78.45	(78)
	0.9x	0.77	X	2.64	x	76.57	х	0.4	X	0.7	=	78.45	(78)
	0.9x	0.77	X	5.28	x	97.53	x	0.4	X	0.7	=	99.93	(78)
	0.9x	0.77	X	2.64	X	97.53	X	0.4	X	0.7	=	99.93	(78)
	0.9x	0.77	X	5.28	x	110.23	x	0.4	X	0.7	=	112.94	(78)
	0.9x	0.77	X	2.64	X	110.23	х	0.4	X	0.7	=	112.94	(78)
	0.9x	0.77	X	5.28	x	114.87	x	0.4	X	0.7	=	117.69	(78)
	0.9x	0.77	X	2.64	X	114.87	х	0.4	X	0.7	=	117.69	(78)
	0.9x	0.77	X	5.28	x	110.55	x	0.4	X	0.7	=	113.26	(78)
	0.9x	0.77	X	2.64	x	110.55	x	0.4	X	0.7	=	113.26	(78)
	0.9x	0.77	X	5.28	x	108.01	х	0.4	X	0.7	=	110.66	(78)
	0.9x		X	2.64	x	108.01	х	0.4	X	0.7	=	110.66	(78)
South	0.9x	0.77	X	5.28	X	104.89	X	0.4	X	0.7	=	107.47	(78)



South	0.9x	0.77	X	2.6	64	x	10	04.89	x		0.4	x	0.7	=	107.47	(78)
South	0.9x	0.77	X	5.2	28	x	10	01.89	x		0.4	x	0.7	=	104.39	(78)
South	0.9x	0.77	X	2.6	64	x	10	01.89	x		0.4	x	0.7	=	104.39	(78)
South	0.9x	0.77	X	5.2	28	x	8	2.59	x		0.4	x	0.7	=	84.61	(78)
South	0.9x	0.77	X	2.6	64	x	8	2.59	x		0.4	x	0.7	=	84.61	(78)
South	0.9x	0.77	X	5.2	28	x	5	5.42	x		0.4	x [	0.7	=	56.78	(78)
South	0.9x	0.77	X	2.6	64	x	5	5.42	x		0.4	x	0.7	=	56.78	(78)
South	0.9x	0.77	X	5.2	28	x	4	40.4	x		0.4	x	0.7	=	41.39	(78)
South	0.9x	0.77	X	2.6	64	x	4	40.4	x		0.4	x	0.7	=	41.39	(78)
Solar g	ains in	watts, ca	alculated	for eac	h month				(83)m	= Sur	m(74)m .	(82)m	,		•	
(83)m=	112.14	188.12	252.92	311.11	350.2	Ľ	49.44	336.09	305.9	99	272.57	206.4	133.71	96.4		(83)
Total g		nternal a	nd sola	r (84)m =	= (73)m	+ (8	33)m	, watts					1	ı	ı	
(84)m=	555.7	629.57	680.28	715.69	731.55	70	08.45	680.59	656.	59	634.89	591.72	545.48	528.1		(84)
7. Me	an inter	nal temp	erature	(heating	seasor	n)										
Temp	erature	during h	eating p	eriods i	n the livi	ng	area f	from Tab	ole 9,	Th1	(°C)				21	(85)
Utilisa	ition fac	tor for g	ains for	living are	ea, h1,m	ı (s	ee Ta	ble 9a)								
	Jan	Feb	Mar	Apr	May		Jun	Jul	Au	ıg	Sep	Oct	Nov	Dec		
(86)m=	1	0.99	0.98	0.93	0.81		0.61	0.44	0.48	8	0.72	0.94	0.99	1		(86)
Mean	interna	l temper	ature in	living ar	ea T1 (f	ollo	w ste	ps 3 to 7	in Ta	able	9c)					
(87)m=	20.26	20.4	20.58	20.79	20.94	2	0.99	21	21	T	20.98	20.81	20.5	20.24		(87)
Temp	erature	during h	eating r	eriods i	rest of	dw	ellina	from Ta	ble 9	. Th:	2 (°C)					
(88)m=	20.23	20.23	20.23	20.25	20.25		0.26	20.26	20.2	_	20.26	20.25	20.24	20.24		(88)
ا دونال <del>ا</del> ا ا	tion fac	tor for g	aine for	rest of d	welling	h2	m (se	a Table	(c0							
(89)m=	1	0.99	0.97	0.91	0.77	$\overline{}$	0.54	0.37	0.4		0.65	0.92	0.99	1		(89)
\	:			<u> </u>	امد اسما	:	TO (5	مامید مده		<u> </u>	: Tabl	- 0-)				
(90)m=	19.24	l temper	19.7	20.01	20.19	┰	0.26	20.26	20.2	_	20.24	20.03	19.6	19.22		(90)
(00)=	10.21	10.11	10	20.01			0.20	20.20					g area ÷ (4	<u> </u>	0.23	(91)
									,,					,	0.20	(0.7)
Ī		l temper	· `	1	ĭ	1	-		r `	-		00.04	T 40.04	40.45	1	(02)
(92)m=	19.48	19.66	19.91	20.19	20.37		0.43	20.43	20.4		20.41	20.21	19.81	19.45		(92)
(93)m=	19.48	19.66	19.91	20.19	20.37	_	0.43	20.43	20.4	$\overline{}$	e appro	20.21	19.81	19.45		(93)
		ting requ			20.07		0.40	20.40	20.4		20.41	20.21	10.01	10.40		(33)
					re obtaiı	ned	at ste	en 11 of	Table	9h	so that	t Ti m=(	76)m an	d re-cald	culate	
		factor fo				100	at ott	5p 11 01	rabic	, 00,	, 00 1110		7 0)111 011	a ro oare	diato	
	Jan	Feb	Mar	Apr	May		Jun	Jul	Au	ıg	Sep	Oct	Nov	Dec		
Utilisa	ition fac	tor for g	ains, hm	1:									-		•	
(94)m=	0.99	0.99	0.97	0.91	0.77		0.56	0.38	0.42	2	0.67	0.92	0.99	1		(94)
r		hmGm	<del>`</del>	<del>- ` ` </del>	<del></del>	_					-				Ī	
(95)m=	552.39	620.91	657.62	650.17	565.59		94.64	261.56	274.	17	423.34	542.93	537.39	525.75		(95)
		age exte	i	i –	ı	_		40.0		<u>, I</u>	<u>,,, l</u>	40.5	<u> </u>		Ī	(06)
(96)m=	4.3	4.9	6.5	8.9	11.7		14.6	16.6	16.4		14.1	10.6	7.1	4.2		(96)
Heat I (97)m=		for mea	an intern 951.63	787.7	602.37	$\overline{}$	98.02	=[(39)m : 261.79	x [(93 274.		(96)m 434.2	668.29	889.57	1075.31		(97)
(31)111=	1004.65	1001.43	331.03	101.1	002.37	1 3	50.02	201.79	214.	JI	404.2	000.29	009.57	10/0.31		(31)



Space heating require	ement fo	r each n	nonth, k\	Wh/mon	th = 0.02	24 x [(97	)m – (95	5)m] x (4	1)m			
(98)m= 396.14 289.31	218.74	99.02	27.37	0	0	0	0	93.27	253.57	408.87		
						Tota	al per year	(kWh/yea	r) = Sum(9	8) <sub>15,912</sub> =	1786.3	(98)
Space heating requir	ement in	kWh/m²	<sup>2</sup> /year								20.67	(99)
9b. Energy requireme			Ĭ									
This part is used for s Fraction of space hea	•	• .		_		<b>.</b>	•		unity sch	neme.	0	(301)
Fraction of space hea	t from co	mmunity	system	1 – (30	1) =						1	(302)
The community scheme ma includes boilers, heat pump Fraction of heat from	sources; th	e latter	(303a)									
Fraction of total space		•		oilers				(3	02) x (303	a) =	1	(304a)
Factor for control and			•		r commi	unity hea	ating sys	tem		L [	1	(305)
Distribution loss factor	r (Table 1	2c) for c	commun	ity heati	ng syste	em				L [	1.05	(306)
Space heating	`	,		•						L	kWh/yeaı	<u>-</u>
Annual space heating	requirem	nent								[	1786.3	
Space heat from Com	munity b	oilers					(98) x (3	04a) x (30	5) x (306)	= [	1875.62	(307a)
Efficiency of secondar	y/supple	mentary	heating	system	in % (fro	om Table	4a or A	ppendix	E)		0	(308
Spa <mark>ce he</mark> ating require	ment fro	m secon	dary/sup	plemen	tary sys	tem	(98) x (3	01) x 100 ·	÷ (308) =		0	(309)
Water heating Annual water heating											2150.48	
If DHW from commun Water heat from Com							(64) x (3	03a) x (30	5) x (306)	= [	2258.01	(310a)
Electricity used for he	at distribu	ution				0.01	× [(307a)	(307e) +	- (310a)	(310e)] =	41.34	(313)
Cooling System Energ	gy Efficie	ncy Rati	0								0	(314)
Space cooling (if there	e is a fixe	d cooling	g system	n, if not e	enter 0)		= (107) ÷	- (314) =			0	(315)
Electricity for pumps a mechanical ventilation			• •	,		outside				Γ	188.55	(330a)
warm air heating syste	em fans									Ī	0	(330b)
pump for solar water h	neating									Ī	0	(330g)
Total electricity for the	above, l	kWh/yea	r				=(330a)	+ (330b) +	(330g) =	Ī	188.55	(331)
Energy for lighting (ca	lculated i	in Apper	ndix L)							Ī	366.31	(332)
12b. CO2 Emissions -	- Commu	ınity hea	ting sch	eme						_		
							ergy h/year		missior g CO2/k		Emissions kg CO2/year	
CO2 from other source Efficiency of heat source			water he			g two fuel	s repeat (3	63) to (36	6) for the s	econd fuel	95.7	(367a)
CO2 associated with I	neat sour	ce 1			[(307b)+	+(310b)] x	100 ÷ (367	'b) x	0.22	=	932.98	(367)
Electrical energy for h	eat distri	bution				[(313) x		Ē	0.52	=	21.45	(372)



Total CO2 associated with community systems	(363)(366) + (368)(372)		=	954.43	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or ins	stantaneous heater (312) x	0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			954.43	(376)
CO2 associated with electricity for pumps and fans withi	n dwelling (331)) x	0.52	=	97.86	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	190.12	(379)
Total CO2, kg/year sum of (376)(382	2) =			1242.41	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =				14.38	(384)
El rating (section 14)				87.33	(385)





User Details: **Assessor Name:** Stroma Number: **Software Version: Software Name:** Stroma FSAP 2012 Version: 1.0.5.12 Property Address: W5-12 , 156 West End Lane, Camden, London Address: 1. Overall dwelling dimensions Av. Height(m) Volume(m³) Area(m<sup>2</sup>) Ground floor 51.8 (1a) x 2.7 (2a) = (3a) 139.86 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)(4)51.8 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =139.86 (5) total m³ per hour main secondary other heating heating x 40 =Number of chimneys (6a) 0 0 x 20 =Number of open flues 0 0 0 (6b) Number of intermittent fans x 10 =(7a)0 0 x 10 =Number of passive vents (7b) 0 0 x 40 =Number of flueless gas fires 0 (7c)Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = $\div (5)$ (8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9)0 Additional infiltration [(9)-1]x0.1 =0 (10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)0 if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12)If no draught lobby, enter 0.05, else enter 0 (13)0 Percentage of windows and doors draught stripped (14)0 Window infiltration  $0.25 - [0.2 \times (14) \div 100] =$ 0 (15)Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =O (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)3 If based on air permeability value, then  $(18) = [(17) \div 20] + (8)$ , otherwise (18) = (16)0.15 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)3  $(20) = 1 - [0.075 \times (19)] =$ Shelter factor (20)0.78  $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.12 Infiltration rate modified for monthly wind speed Jan Feb Sep Mar Apr May Jun Jul Aug Oct Nov Dec Monthly average wind speed from Table 7 (22)m =5.1 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor  $(22a)m = (22)m \div 4$ (22a)m 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18



44.7β<sub>age 2 φ</sub>(3<del>/</del>9)

Average =  $Sum(39)_{1...12}/12=$ 

# DER WorkSheet: New dwelling design stage

Adjusted infiltre	ation rot	o (allowi	na for ol	ooltor on	ad wind o	rpood) –	(21a) v	(22a)m					
Adjusted infiltra	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14	1	
Calculate effec		•	rate for t	l	cable ca	1	<u> </u>		<u> </u>	1	1	]	_
If mechanica			and the NL (C	10l-) (00-	-) <b>- - - - - - - - - -</b>	C (1	\(\f\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\		) (00-)			0.5	(23a)
If exhaust air he		0		, ,	,	. ,	,, .	,	) = (23a)			0.5	(23b)
If balanced with		-	-	_					2h\ma /	'00k\ [	4 (00.0)	76.5	(23c)
a) If balance	0.26	anicai ve	0.25	0.24	at recov	0.23	0.23	m = (22) 0.23	2b)m + ( 0.24	23b) × [ 0.25	0.25	100j 	(24a)
b) If balance			<u> </u>	l .			ļ	ļ		ļ	1 0.20	J	(= 15)
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24b)
c) If whole h	ouse ex	tract ver	tilation o	r positiv	/e input	ventilatio	on from (	utside	l	<u> </u>		ı	
if (22b)m									.5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural v if (22b)m									0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effective air	change	rate - er	nter (24a	) or (24k	o) or (24	c) or (24	d) in bo	x (25)				_	
(25)m = 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.23	0.23	0.24	0.25	0.25		(25)
3. Heat losses	s and he	eat loss	oaram <b>e</b> t	er:				\			_	_	
ELEMENT	Gros		Openin	gs	Net Ar		U-val		ΑXU		k-value		λΧk
_	area	(m²)	m	) <sup>2</sup>	A ,r	m²	W/m2	2K	(W/	K)	kJ/m²-	K k	J/K
Doors					1.89		1.4	<u> </u>	2.646				(26)
Windows Type					5.28		/[1/( 1.2 )+		6.05	H			(27)
Windows Type	2			\	2.64	x1	/[1/( 1.2 )+	0.04] =	3.02	닏.			(27)
Walls Type1	18.3	36	7.92	2	10.44	4 X	0.16	=	1.67	_		_	(29)
Walls Type2	18.3	36	1.89		16.47	7 X	0.15	=	2.47	<u> </u>		┥	(29)
Roof	51.		0		51.8	X	0.12	=	6.22				(30)
Total area of el	lements	s, m²			88.52	2							(31)
Party wall					37.5	X	0	=	0			┫	(32)
Party floor			. ee - et		51.8			1/5/4/11 1	) . 0 0 47 .				(32a)
* for windows and ** include the area						atea using	j tormula 1	/[(1/U-vail	ie)+0.04] a	as given in	paragrapr	1 3.2	
Fabric heat los	s, W/K	= S (A x	U)				(26)(30	) + (32) =				22.07	(33)
Heat capacity (	Cm = S	(A x k )						((28)	.(30) + (3	2) + (32a).	(32e) =	0	(34)
Thermal mass	parame	eter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
For design assess				construct	ion are no	t known pr	ecisely the	e indicative	values of	TMP in T	able 1f		
can be used insteat Thermal bridge				usina Ar	nendix l	K						11.37	(36)
if details of therma	,	•		• .	•	•						11.57	(00)
Total fabric hea	at loss							(33) +	(36) =			33.43	(37)
Ventilation hea	t loss c	alculated	monthl	У				(38)m	= 0.33 × (	(25)m x (5)	)	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 12.26	12.13	12	11.32	11.19	10.52	10.52	10.39	10.79	11.19	11.46	11.73		(38)
Heat transfer c				T					= (37) + (	38)m		1	
(39)m= 45.7	45.56	45.43	44.76	44.62	43.95	43.95	43.82	44.22	44.62	44.89	45.16		

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com



Number of days i  Jan  (41)m= 31  4. Water heating  Assumed occupa if TFA > 13.9, I if TFA £ 13.9, I Annual average I Reduce the annual a not more that 125 litte  Jan  Hot water usage in lit	Feb Ma  28 31  g energy reconnection of the second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second	Apr 30  uirement:  x [1 - exp age in litre er usage by her day (all v Apr each month	es per da 5% if the d vater use, l	ay Vd,av Iwelling is	erage = designed	(25 x N)	Sep 30  0013 x (7	Oct 31	.9)	0.87  Dec 31  kWh/yea 74	0.86	(40) (41) (42)
Jan  Jan  Jan  4. Water heating  Assumed occupa  if TFA > 13.9, I  if TFA £ 13.9, I  Annual average I  Reduce the annual a  not more that 125 litre  Jan  Hot water usage in lit  (44)m=  83.16	Feb Ma  28 31  g energy reconnection of the second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second	Apr 30  uirement:  x [1 - exp age in litre er usage by her day (all v Apr each month	31  o(-0.0003  es per da 5% if the ovater use, i	30 349 x (TF ay Vd,av twelling is hot and co	31 -A -13.9 erage = designed	31 )2)] + 0.0 (25 x N)	Sep 30  0013 x (7	Oct 31	Nov 30	Dec 31 kWh/yea		(41)
Jan  Jan  Jan  4. Water heating  Assumed occupa  if TFA > 13.9, I  if TFA £ 13.9, I  Annual average I  Reduce the annual a  not more that 125 litre  Jan  Hot water usage in lit  (44)m=  83.16	Feb Ma  28 31  g energy reconnection of the second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second	Apr 30  uirement:  x [1 - exp age in litre er usage by her day (all v Apr each month	31  o(-0.0003  es per da 5% if the ovater use, i	30 349 x (TF ay Vd,av twelling is hot and co	31 -A -13.9 erage = designed	31 )2)] + 0.0 (25 x N)	30 0013 x ( <sup>7</sup> + 36	31 TFA -13.	30 1. 9)	31 kWh/yea	ar:	(42)
4. Water heating Assumed occupa if TFA > 13.9, I if TFA £ 13.9, I Annual average I Reduce the annual a not more that 125 litre  Jan  Hot water usage in lit  (44)m=  83.16	g energy red ancy, N N = 1 + 1.76 N = 1 hot water us verage hot wat es per person p Feb Ma tres per day for 30.14 77.11	x [1 - expands in litre or usage by her day (all verteach month)	o(-0.0003 es per da 5% if the d vater use, l May	349 x (TF ay Vd,av dwelling is thot and co	FA -13.9 erage = designed i	)2)] + 0.0 (25 x N)	0013 x ( <sup>-</sup> + 36	TFA -13.	.9)	kWh/yea	ar:	(42)
Assumed occupa  if TFA > 13.9, I  if TFA £ 13.9, I  Annual average I  Reduce the annual a  not more that 125 litre  Jan  Hot water usage in lit  (44)m= 83.16 8	ancy, N N = 1 + 1.76 N = 1 not water us verage hot wat es per person p Feb Ma tres per day for 30.14 77.11	x [1 - expage in litre er usage by er day (all v Apreach month	es per da 5% if the d vater use, l	ay Vd,av Iwelling is thot and co	erage = designed	(25 x N)	+ 36		.9)	74	ar:	,
Assumed occupa  if TFA > 13.9, I  if TFA £ 13.9, I  Annual average I  Reduce the annual a  not more that 125 litre  Jan  Hot water usage in lit  (44)m= 83.16 8	ancy, N N = 1 + 1.76 N = 1 not water us verage hot wat es per person p Feb Ma tres per day for 30.14 77.11	x [1 - expage in litre er usage by er day (all v Apreach month	es per da 5% if the d vater use, l	ay Vd,av Iwelling is thot and co	erage = designed	(25 x N)	+ 36		.9)	74	ar:	,
if TFA > 13.9, I if TFA £ 13.9, I Annual average I Reduce the annual a not more that 125 litre  Jan  Hot water usage in lit  (44)m= 83.16 8	N = 1 + 1.76 N = 1 hot water us verage hot wat es per person p Feb Ma tres per day for 30.14 77.11	age in litre er usage by er day (all v Apr each month	es per da 5% if the d vater use, l	ay Vd,av Iwelling is thot and co	erage = designed	(25 x N)	+ 36		.9)			,
Reduce the annual a not more that 125 litre  Jan  Hot water usage in lit  (44)m= 83.16 8	verage hot wat es per person p Feb Ma tres per day for 30.14 77.11	er usage by er day (all v Apr each month	5% if the divater use, I	lwelling is hot and co	designed			se target o		5.6		
Hot water usage in lit	tres per day for 30.14 77.11	each month		Jun	r			se laryel 0	or			(43)
(44)m= 83.16 8	30.14 77.11		Vd m - fo		Jul	Aug	Sep	Oct	Nov	Dec		
` '		74.00	T	ctor from T	Table 1c x	(43)						
Energy content of ho	t water used - o	74.09	71.06	68.04	68.04	71.06	74.09	77.11	80.14	83.16	007.0	7(44)
		alculated m	onthly $= 4$ .	190 x Vd,r	n x nm x E	Tm / 3600			m(44) <sub>112</sub> = ables 1b, 1		907.2	(44)
(45)m= 123.32 1	07.86 111.3	97.04	93.11	80.35	74.45	85.43	86.45	100.75	109.98	119.43		
W								Total = Su	m(45) <sub>112</sub> =		1189.49	(45)
If inst <mark>antane</mark> ous wate			$\leftarrow$						40.5	47.04		(46)
(46)m= 18.5 1 Water storage los	16.18 16.7 SS:	14.56	13.97	12.05	11.17	12.82	12.97	15.11	16.5	17.91		(46)
Storage volume (		ling any s	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community hea	-		_									
Otherwise if no s Water storage los		iter (this ir	ncludes i	nstantar	neous co	mbi boil	ers) ente	er 'O' in (	(47)			
a) If manufacture		l loss fact	or is kno	wn (kWł	n/day):					0		(48)
Temperature fact	tor from Tab	le 2b								0		(49)
Energy lost from						(48) x (49)	) =		1	10		(50)
<ul><li>b) If manufacture</li><li>Hot water storage</li></ul>		•								00		(E1)
f community hea			16 Z (KVV	ii/iiii <del>c</del> /uc	iy <i>)</i>				0.	02		(51)
Volume factor fro	•								1.	03		(52)
Temperature fact	tor from Tab	le 2b							0	.6		(53)
Energy lost from		ge, kWh/y	ear			(47) x (51)	) x (52) x (	53) =	1.	03		(54)
Enter (50) or (54	, , ,								1.	03		(55)
Nater storage los	ss calculate	d for each	month			((56)m = (	55) × (41)	m				
56)m= 32.01 2 f cylinder contains de	28.92 32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	.11	(56)
			· · ·								. П	(57)
57)m= 32.01 2	28.92 32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit los	, ,			F0\	(EO) - 00	NE /44\				0		(58)
Primary circuit log modified by fa			,	•	. ,	, ,		r thermo	stat)			
` —	21.01 23.26		23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)



Combi loss o	alculated	for each	month (	′61)m =	(60) ÷ 3	65 × (41	)m							
(61)m= 0	0	0	0	0	0	0	)   0	)	0	0	0	0	1	(61)
	L auired for	water h	Leating ca	Lulated	L I for eac	h month	(62)	—— m =	0 85 x (	 ′45)m +	(46)m +	(57)m +	ı · (59)m + (61)m	
(62)m= 178.6	<del></del>	166.58	150.53	148.39	133.84	129.73	140	_	139.95	156.03	163.48	174.71	]	(62)
Solar DHW inpu	t calculated	using App	endix G o	· Appendix	H (negat	ive quantity	y) (ent	er '0'	if no sola	r contribu	tion to wate	r heating)	<b>.</b>	
(add addition												•		
(63)m= 0	0	0	0	0	0	0	0	)	0	0	0	0	]	(63)
Output from	water hea	ter	•			•	•				•	•	•	
(64)m= 178.6	157.79	166.58	150.53	148.39	133.84	129.73	140	.71	139.95	156.03	163.48	174.71	]	
	•	•	•	•		•		Outp	out from wa	ater heate	r (annual)	l12	1840.33	(64)
Heat gains fr	om water	heating	, kWh/m	onth 0.2	5 ´ [0.85	5 × (45)m	ı + (6	1)m	n] + 0.8 x	c [(46)m	+ (57)m	+ (59)m	n ]	
(65)m= 85.23	75.81	81.23	75.06	75.18	69.51	68.98	72.	63	71.54	77.72	79.36	83.93		(65)
include (57	7)m in cald	culation	of (65)m	only if c	ylinder	is in the	dwell	ing	or hot w	ater is f	rom com	munity h	neating	
5. Internal	gains (see	Table 5	and 5a	):										
Metabolic ga	ins (Table	5). Wat	ts											
Jan		Mar	Apr	May	Jun	Jul	A	ug	Sep	Oct	Nov	Dec		
(66)m= 87.16	87.16	87.16	87.16	87.16	87.16	87.16	87.	16	87.16	87.16	87.16	87.16		(66)
Ligh <mark>ting g</mark> ain	s (calcula	ted in A	opendix	L, equ <mark>a</mark> t	ion L9 c	r L9a), <mark>a</mark>	lso s	ee	Table 5					
(67)m= 14.26	12.66	10.3	7.8	5.83	4.92	5.32	6.9	1	9.28	11.78	13.75	14.66		(67)
Appliances g	ains (ca <mark>lc</mark>	<mark>ulat</mark> ed ir	Append	dix L, eq	uation L	.13 or L1	3a), a	also	see Tal	ble <mark>5</mark>				
(68)m= 151.9°	1 153.48	149.51	141.05	130.38	120.35	113.64	112	.07	116.04	124.5	135.17	145.2		(68)
Cooking gair	ns (calcula	ited in A	ppendix	L, equat	ion L15	or L15a	), als	o se	e Table	5		-		
(69)m= 31.72	31.72	31.72	31.72	31.72	31.72	31.72	31.	72	31.72	31.72	31.72	31.72		(69)
Pumps and f	ans gains	(Table	5a)										_	
(70)m= 0	0	0	0	0	0	0	0	)	0	0	0	0	]	(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)								_	
(71)m= -69.73	-69.73	-69.73	-69.73	-69.73	-69.73	-69.73	-69.	.73	-69.73	-69.73	-69.73	-69.73		(71)
Water heatin	g gains (T	able 5)											_	
(72)m= 114.5	5 112.81	109.18	104.25	101.05	96.54	92.71	97.	62	99.36	104.47	110.23	112.81		(72)
Total interna	al gains =	l			(66	5)m + (67)m	n + (68	3)m +	- (69)m + (	(70)m + (7	71)m + (72)	)m	_	
(73)m= 329.8°	7 328.1	318.14	302.25	286.4	270.96	260.82	265	.75	273.83	289.89	308.29	321.82		(73)
6. Solar gai	ns:													
Solar gains are		•				·	tions	to co	nvert to th	e applical		tion.		
Orientation:	Access F Table 6d		Area m²		Flu	ux ible 6a		т	g_ able 6b	т	FF able 6c		Gains (W)	
F							1							٦
East 0.9x		×			_	19.64	X		0.4	_  ×	0.7	=	20.12	(76)
East 0.9x		×				19.64	X		0.4	x	0.7	_ =	10.06	(76)
East 0.9x		×				38.42	X		0.4	X	0.7	=	39.36	(76)
East 0.9x		×				38.42	X		0.4	x	0.7	=	19.68	(76)
East 0.9x	0.77	X	5.2	28	x	63.27	X		0.4	X	0.7	=	64.83	(76)



East	0.9x	0.77	X	2.6	54	X	6	3.27	x	0.4	X	0.7	=	32.41	(76)
East	0.9x	0.77	X	5.2	28	X	9:	2.28	x	0.4	x	0.7	=	94.54	(76)
East	0.9x	0.77	x	2.6	34	X	9:	2.28	x	0.4	x	0.7	=	47.27	(76)
East	0.9x	0.77	x	5.2	.8	X	11	3.09	x	0.4	x	0.7	=	115.87	(76)
East	0.9x	0.77	x	2.6	64	X	11	3.09	x	0.4	х	0.7	=	57.93	(76)
East	0.9x	0.77	X	5.2	!8	X	11	5.77	х	0.4	x	0.7	=	118.61	(76)
East	0.9x	0.77	x	2.6	34	X	11	5.77	x	0.4	x	0.7	=	59.31	(76)
East	0.9x	0.77	X	5.2	28	X	11	0.22	x	0.4	x	0.7	=	112.92	(76)
East	0.9x	0.77	X	2.6	54	X	11	0.22	x	0.4	X	0.7	=	56.46	(76)
East	0.9x	0.77	X	5.2	.8	X	9.	4.68	X	0.4	X	0.7	=	97	(76)
East	0.9x	0.77	X	2.6	54	X	9	4.68	x	0.4	X	0.7	=	48.5	(76)
East	0.9x	0.77	X	5.2	28	X	7	3.59	X	0.4	X	0.7	=	75.39	(76)
East	0.9x	0.77	X	2.6	54	X	7	3.59	x	0.4	x	0.7	=	37.7	(76)
East	0.9x	0.77	X	5.2	28	X	4:	5.59	X	0.4	X	0.7	=	46.71	(76)
East	0.9x	0.77	X	2.6	54	X	4:	5.59	X	0.4	X	0.7	=	23.35	(76)
East	0.9x	0.77	X	5.2	28	X	2	4.49	x	0.4	x	0.7	=	25.09	(76)
East	0.9x	0.77	X	2.6	64	X	2	4.49	X	0.4	X	0.7	=	12.54	(76)
East	0.9x	0.77	X	5.2	.8	X	1	6.15	Х	0.4	X	0.7	=	16.55	(76)
East	0.9x	0.77	X	2.6	64	X	1	6.15	x	0.4	x	0.7	=	8.27	(76)
Solar	gains in	watts, <mark>calc</mark> ı	ulated	for eacl	n month	<u> </u>			(83)m	= Sum(74)m .	(82)m				
(83)m=	30.18		7.24	141.82	173.8	<u> </u>	77.92	169.38	145	.5 113.09	70.06	37.63	24.82		(83)
Total (		nternal and	-	` '	` \	_								,	
(84)m=	360.05	387.15 4	15.38	444.06	460.2	4	48.87	430.2	411.	24 386.92	359.9	345.93	346.64		(84)
7. Me	ean inter	nal tempera	ature (	(heating	seasor	า)									
Temp	perature	during hea	ting p	eriods ir	the liv	ing	area f	rom Tab	ole 9,	Th1 (°C)				21	(85)
Utilis	ation fac	tor for gain	s for li	iving are	ea, h1,n	n (s	ee Ta	ble 9a)						_	
	Jan	Feb	Mar	Apr	May	┖	Jun	Jul	Αι	ug Sep	Oct	Nov	Dec		
(86)m=	1	0.99 (	0.98	0.93	0.82	(	0.61	0.45	0.4	9 0.74	0.95	0.99	1		(86)
Mear	n internal	temperatu	ıre in I	iving are	ea T1 (f	ollo	w step	os 3 to 7	' in T	able 9c)				_	
(87)m=	20.23	20.33 2	0.52	20.76	20.92	2	0.99	21	2	20.97	20.76	20.46	20.21		(87)
Temp	perature	during hea	ting p	eriods ir	rest of	f dw	elling	from Ta	ıble 9	), Th2 (°C)					
(88)m=	20.18	20.18 2	0.19	20.2	20.2	2	0.21	20.21	20.2	21 20.21	20.2	20.2	20.19	]	(88)
Utilis	ation fac	tor for gain	s for r	est of d	wellina.	h2.	m (se	e Table	9a)	•	•	•	•	_	
(89)m=	0.99		0.97	0.91	0.77	_	0.54	0.37	0.4	1 0.68	0.93	0.99	0.99	]	(89)
Moor	internal	temperatu	ıra in t	ho roct	of dwal	lina	T2 (fc	ollow sto	ne 3	to 7 in Tabl	0.00		<u>!</u>	_	
(90)m=	19.16		9.58	19.92	20.13	Ť	20.2	20.21	20.		19.93	19.5	19.14	1	(90)
(/				- +-								/ing area ÷ (₄		0.45	(91)
			/5	. 41 '	ادماء	. 111 -	) ('	A T4	. /4			•			` ′
(92)m=						_	<del></del>	_A × 11	<u> </u>	– fLA) × T2		_	<del> </del>	7	
	10167	10 77 I	ე∩ I	20 2	20 40	1 ^	ו בב ו	20.57	20	57 20 54	20 24	10.04	10 60		(02)
	19.64		20 mean	20.3	20.49		0.56	20.57 m Table	20.	where appro	20.31		19.62		(92)



		(00)
(93)m= 19.64 19.77 20 20.3 20.49 20.56 20.57 20.57 20.54 20.31 19.94 19.62		(93)
8. Space heating requirement Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calc	ulate	
the utilisation factor for gains using Table 9a	diato	
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec		
Utilisation factor for gains, hm:		
(94)m= 0.99 0.99 0.97 0.92 0.79 0.58 0.4 0.44 0.71 0.93 0.98 0.99		(94)
Useful gains, hmGm , W = (94)m x (84)m		
(95)m= 357.3 382.08 403.06 406.83 361.97 258.51 174.06 182.09 272.99 334.88 340.36 344.5		(95)
Monthly average external temperature from Table 8		(00)
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2		(96)
Heat loss rate for mean internal temperature, Lm , W = $[(39)$ m x $[(93)$ m – $(96)$ m $]$ $(97)$ m = $\begin{bmatrix} 701 & 677.59 & 613.43 & 510.11 & 392.16 & 261.94 & 174.36 & 182.62 & 284.67 & 433.29 & 576.27 & 696.45 \end{bmatrix}$		(97)
(97)m= 701 677.59 613.43 510.11 392.16 261.94 174.36 182.62 284.67 433.29 576.27 696.45 Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m		(97)
(98)m= 255.71 198.59 156.52 74.36 22.46 0 0 0 73.22 169.85 261.85		
Total per year (kWh/year) = Sum(98) <sub>15812</sub> =	1212.56	(98)
		╡`
Space heating requirement in kWh/m²/year	23.41	(99)
9b. Energy requirements – Community heating scheme		
This part is used for space heating, space cooling or water heating provided by a community scheme.		7(204)
Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none	0	(301)
Fraction of space heat from community system 1 – (301) =	1	(302)
The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the	he latter	
includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.  Fraction of heat from Community boilers	1	(303a)
		╡`
Fraction of total space heat from Community boilers (302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community heating system	1	(305)
Distribution loss factor (Table 12c) for community heating system	1.05	(306)
Space heating	kWh/year	<b>-</b>
Annual space heating requirement	1212.56	7
Space heat from Community boilers (98) x (304a) x (305) x (306) =	1273.19	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0	(308
Space heating requirement from secondary/supplementary system (98) x (301) x 100 ÷ (308) =	0	」` □(309)
Copace reduing requirement from Secondary/Supplementary System (65) x (65) x (65)		
Water heating Annual water heating requirement	1840.33	7
If DHW from community scheme:		<b>-</b> '
Water heat from Community boilers (64) x (303a) x (305) x (306) =	1932.34	(310a)
Electricity used for heat distribution $0.01 \times [(307a)(307e) + (310a)(310e)] = \begin{bmatrix} 0.01 \times [(307a)(307e) + (310a)(310e)] \end{bmatrix}$	32.06	(313)
Cooling System Energy Efficiency Ratio	0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0) = $(107) \div (314) =$	0	(315)
Electricity for pumps and fans within dwelling (Table 4f):		_
mechanical ventilation - balanced, extract or positive input from outside	106.64	(330a)

# FHP (C

#### **DER WorkSheet: New dwelling design stage**

warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	b) + (330g) =	106.64	(331)
Energy for lighting (calculated in Appendix L)			251.82	(332)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission facto	r Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP)  Efficiency of heat source 1 (%)  If there is CHP using	two fuels repeat (363) to	(366) for the second f	uel 95.7	(367a)
CO2 associated with heat source 1 [(307b)+(	(310b)] x 100 ÷ (367b) x	0.22	<b>=</b> 723.51	(367)
Electrical energy for heat distribution	(313) x	0.52	= 16.64	(372)
Total CO2 associated with community systems	(363)(366) + (368)(372	2)	= 740.14	(373)
CO2 associated with space heating (secondary)	(309) x	0	= 0	(374)
CO2 associated with water from immersion heater or instantane	ous heater (312) x	0.52	= 0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =		740.14	(376)
CO2 associated with electricity for pumps and fans within dwelling	ng (331)) x	0.52	= 55.35	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	130.69	(379)
Total CO2, kg/year sum of (376)(382) =			926.19	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			17.88	(384)

El rating (section 14)

(385)

87.18

Energy Strategy



**Be Green DER** 



User Details: **Assessor Name:** Stroma Number: Stroma FSAP 2012 **Software Version: Software Name:** Version: 1.0.5.12 Property Address: E0-01 Address: 1. Overall dwelling dimensions Av. Height(m) Area(m²) Volume(m³) Ground floor 71 (1a) x 2.7 (2a) =191.7 (3a) Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)(4)71 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =191.7 (5) total m³ per hour main secondary other heating heating x 40 =Number of chimneys (6a) 0 0 x 20 =Number of open flues 0 0 0 (6b) Number of intermittent fans x 10 =(7a)0 0 x 10 =Number of passive vents (7b) 0 0 x 40 =Number of flueless gas fires 0 (7c)Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = $\div (5)$ (8) If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9)0 Additional infiltration [(9)-1]x0.1 =0 (10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)0 if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12)If no draught lobby, enter 0.05, else enter 0 (13)0 Percentage of windows and doors draught stripped (14)0 Window infiltration  $0.25 - [0.2 \times (14) \div 100] =$ 0 (15)Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =O (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)3 If based on air permeability value, then  $(18) = [(17) \div 20] + (8)$ , otherwise (18) = (16)0.15 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)1  $(20) = 1 - [0.075 \times (19)] =$ Shelter factor (20)0.92  $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.14 Infiltration rate modified for monthly wind speed Jan Feb Jul Sep Mar Apr May Jun Aug Oct Nov Dec Monthly average wind speed from Table 7 (22)m =5.1 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor  $(22a)m = (22)m \div 4$ (22a)m 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18



Adjusted infiltration rate (allowing for shelter and wind	speed) = (21a)	x (22a)m					
0.18 0.17 0.17 0.15 0.15 0.13	0.13 0.13	<del>`</del>	0.15	0.16	0.16	]	
Calculate effective air change rate for the applicable c	ase		<u> </u>		<u> </u>	J	
If mechanical ventilation:	(		\ (00 \			0.5	(23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv			) = (23a)			0.5	(23b)
If balanced with heat recovery: efficiency in % allowing for in-use						76.5	(23c)
a) If balanced mechanical ventilation with heat recovery	<del>, , , , , , , , , , , , , , , , , , , </del>	<del></del>	<del> </del>		<u> </u>	) ÷ 100] 1	(0.1.)
(24a)m= 0.29 0.29 0.29 0.27 0.27 0.25	0.25 0.25		0.27	0.27	0.28		(24a)
b) If balanced mechanical ventilation without heat re	<del>                                     </del>	<del>i `</del>	<del>r i</del>	•	1	1	(0.41.)
(24b)m= 0 0 0 0 0 0	0 0	0	0	0	0		(24b)
c) If whole house extract ventilation or positive input			F (22h	`			
if $(22b)m < 0.5 \times (23b)$ , then $(24c) = (23b)$ ; othe	$\frac{\text{TWISE } (240) = (240)}{100}$	26) III + 0.	5 <b>x</b> (230	0	0	]	(24c)
` '			0	0		J	(240)
<ul> <li>d) If natural ventilation or whole house positive input if (22b)m = 1, then (24d)m = (22b)m otherwise (</li> </ul>			0.5]				
(24d)m= 0 0 0 0 0 0	0 0	0	0	0	0		(24d)
Effective air change rate - enter (24a) or (24b) or (24	4c) or (24d) in b	ox (25)					
(25)m= 0.29 0.29 0.29 0.27 0.27 0.25	0.25	0.26	0.27	0.27	0.28		(25)
3. Heat losses and heat loss parameter:							_
ELEMENT Gross Openings Net A	rea U-v	alue	AXU		k-value	е А	Χk
		n2K	(W/ł	<)	kJ/m <sup>2</sup> ·l		J/K
Doo <mark>rs</mark>	9 x 1.	4 =	2.646				(26)
Windows Type 4	_						
Windows Type 1 7.5	8 x1/[1/( 1.2	)+ 0.04] =	8.68				(27)
Windows Type 1  Windows Type 2  2.7	1,174,1/4 0	)+0.04] = [ $)+0.04] = [$	3.11				(27) (27)
	2 x1/[1/( 1.2						` ,
Windows Type 2	2 x1/[1/( 1.2 2 x1/[1/( 1.2	)+ 0.04] =	3.11				(27)
Windows Type 2  Windows Type 3  2.7	2 x1/[1/( 1.2 2 x1/[1/( 1.2 2 x1/[1/( 1.2	)+ 0.04] = [ )+ 0.04] = [ )+ 0.04] = [	3.11				(27) (27)
Windows Type 2  Windows Type 3  Windows Type 4  Floor  Type 4  Floor  Wells Type 4	2 x1/[1/( 1.2 2 x1/[1/( 1.2 2 x1/[1/( 1.2 2 x 0.2	)+ 0.04] = [ )+ 0.04] = [ )+ 0.04] = [ 2 = [	3.11 3.11 3.11 8.52				(27) (27) (27) (27)
Windows Type 2       2.7         Windows Type 3       2.7         Windows Type 4       2.7         Floor       71         Walls Type 1       65.34       21.18       44.7	2 x1/[1/( 1.2 2 x1/[1/( 1.2 2 x1/[1/( 1.2 2 x 0.4 6 x 0.4	)+ 0.04] = [ )+ 0.04] = [ )+ 0.04] = [ 2 = [ 6 = [	3.11 3.11 3.11 8.52 7.07				(27) (27) (27) (28) (29)
Windows Type 2       2.7         Windows Type 3       2.7         Windows Type 4       2.7         Floor       71         Walls Type1       65.34       21.18       44.1         Walls Type2       4.32       1.89       2.4	2 x1/[1/( 1.2 2 x1/[1/( 1.2 2 x1/[1/( 1.2 2 x 0.2 16 x 0.2 3 x 0.2	)+ 0.04] = [ )+ 0.04] = [ )+ 0.04] = [ 2 = [ 6 = [	3.11 3.11 3.11 8.52 7.07 0.37				(27) (27) (27) (28) (29) (29)
Windows Type 2       2.7         Windows Type 3       2.7         Windows Type 4       2.7         Floor       71         Walls Type1       65.34       21.18       44.1         Walls Type2       4.32       1.89       2.4         Walls Type3       7.29       0       7.2	x1/[1/(1.2 x1/[1/(1.2 x1/[1/(1.2 x 0.3 x 0.3 x 0.3 y x 0.3	)+ 0.04] = [ )+ 0.04] = [ )+ 0.04] = [ 2	3.11 3.11 3.11 8.52 7.07 0.37 1.17				(27) (27) (27) (28) (29) (29) (29)
Windows Type 2       2.7         Windows Type 3       2.7         Windows Type 4       2.7         Floor       71         Walls Type1       65.34       21.18       44.3         Walls Type2       4.32       1.89       2.4         Walls Type3       7.29       0       7.2         Roof       6       0       6	2 x1/[1/( 1.2 2 x1/[1/( 1.2 2 x1/[1/( 1.2 2 x 0.4 3 x 0.4 3 x 0.4 9 x 0.4 9 x 0.4	)+ 0.04] = [ )+ 0.04] = [ )+ 0.04] = [ 2	3.11 3.11 3.11 8.52 7.07 0.37				(27) (27) (27) (28) (29) (29) (29) (30)
Windows Type 2       2.7         Windows Type 3       2.7         Windows Type 4       2.7         Floor       71         Walls Type1       65.34       21.18       44.1         Walls Type2       4.32       1.89       2.4         Walls Type3       7.29       0       7.2         Roof       6       0       6         Total area of elements, m²       153.	x1/[1/(1.2 x1/[1/(1.2 x1/[1/(1.2 x 0.4 x 0.4 x 0.4 x 0.4 x 0.4 x 0.4 x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x 0.4 y x	)+ 0.04] = [ )+ 0.04] = [ )+ 0.04] = [ 2	3.11 3.11 3.11 8.52 7.07 0.37 1.17				(27) (27) (27) (28) (29) (29) (29) (30) (31)
Windows Type 2       2.7         Windows Type 3       2.7         Windows Type 4       2.7         Floor       71         Walls Type1       65.34       21.18       44.1         Walls Type2       4.32       1.89       2.4         Walls Type3       7.29       0       7.2         Roof       6       0       6         Total area of elements, m²       153.         Party wall       19.1	x1/[1/(1.2 x1/[1/(1.2 x1/[1/(1.2 x 0.2 x 0.2	)+ 0.04] = [ )+ 0.04] = [ )+ 0.04] = [ 2	3.11 3.11 3.11 8.52 7.07 0.37 1.17				(27) (27) (27) (28) (29) (29) (29) (30) (31)
Windows Type 2       2.7         Windows Type 3       2.7         Windows Type 4       2.7         Floor       71         Walls Type1       65.34       21.18       44.1         Walls Type2       4.32       1.89       2.4         Walls Type3       7.29       0       7.2         Roof       6       0       6         Total area of elements, m²       153.         Party wall       19.1         Party ceiling       65         * for windows and roof windows, use effective window U-value calculations	x1/[1/(1.2 x1/[1/(1.2 x1/[1/(1.2 x 0.3 x 0.3 x 0.3 x 0.3 y x 0.3 y x 0.3 x 0.3	)+ 0.04] = [ )+ 0.04] = [ )+ 0.04] = [ 2	3.11 3.11 3.11 8.52 7.07 0.37 1.17 0.72	s given in	paragraph		(27) (27) (27) (28) (29) (29) (29) (30) (31)
Windows Type 2       2.7         Windows Type 3       2.7         Windows Type 4       2.7         Floor       71         Walls Type1       65.34       21.18       44.1         Walls Type2       4.32       1.89       2.4         Walls Type3       7.29       0       7.2         Roof       6       0       6         Total area of elements, m²       153.         Party wall       19.1         Party ceiling       65	x1/[1/(1.2 x1/[1/(1.2 x1/[1/(1.2 x 0.2 x	)+ 0.04] = [ )+ 0.04] = [ )+ 0.04] = [ 2	3.11 3.11 3.11 8.52 7.07 0.37 1.17 0.72	s given in	paragraph	13.2	(27) (27) (27) (28) (29) (29) (29) (30) (31)
Windows Type 2  Windows Type 3  Windows Type 4  Floor  Walls Type1  65.34  Walls Type2  4.32  Name of 6  Total area of elements, m²  Party wall  Party ceiling  * for windows and roof windows, use effective window U-value calculations  * include the areas on both sides of internal walls and partitions	x1/[1/( 1.2 x1/[1/( 1.2 x1/[1/( 1.2 x	$\begin{array}{c} (1) + 0.04 \\ (2) + 0.04 \\ (3) + 0.04 \\ (4) = [ \\ (4) + 0.04 ] \\ (5) = [ \\ (6) = [ \\ (6) = [ \\ (6) = [ \\ (12) = [ \\ (12) = [ \\ (13) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (14) + (1$	3.11 3.11 3.11 8.52 7.07 0.37 1.17 0.72				(27) (27) (27) (28) (29) (29) (30) (31) (32) (32b)
Windows Type 2       2.7         Windows Type 3       2.7         Windows Type 4       2.7         Floor       71         Walls Type1       65.34       21.18       44.1         Walls Type2       4.32       1.89       2.4         Walls Type3       7.29       0       7.2         Roof       6       0       6         Total area of elements, m²       153.         Party wall       19.1         Party ceiling       65         ** for windows and roof windows, use effective window U-value calculations         *** include the areas on both sides of internal walls and partitions         Fabric heat loss, W/K = S (A x U)	2 x1/[1/( 1.2 2 x1/[1/( 1.2 2 x1/[1/( 1.2 2 x1/[1/( 1.2 2 x 0.4 3 x 0.4 9 x 0.4 9 x 0.4 95 x 0.4 95 y 0.4 95 y 0.4 95 y 0.4 95 y 0.4 95 y 0.4 95 y 0.4 96 y 0.4 97 y 0.4 98 y 0.4 99 y 0.4 99 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y 0.4 90 y	$\begin{array}{c} )+0.04] = [\\ )+0.04] = [\\ )+0.04] = [\\ \hline 2                                 $	3.11 3.11 3.11 8.52 7.07 0.37 1.17 0.72 0	?) + (32a).		44.74	(27) (27) (27) (28) (29) (29) (30) (31) (32) (32b)
Windows Type 2       2.7         Windows Type 3       2.7         Windows Type 4       2.7         Floor       71         Walls Type1       65.34       21.18       44.1         Walls Type2       4.32       1.89       2.4         Walls Type3       7.29       0       7.2         Roof       6       0       6         Total area of elements, m²       153.         Party wall       19.1         Party ceiling       65         * for windows and roof windows, use effective window U-value calculations         ** include the areas on both sides of internal walls and partitions         Fabric heat loss, W/K = S (A x U)         Heat capacity Cm = S(A x k)	2 x1/[1/( 1.2 2 x1/[1/( 1.2 2 x1/[1/( 1.2 2 x 1/[1/( 1.2 2 x 0.7 3 x 0.7 9 x 0.7 9 x 0.7 95 x 0.7 17 x (26)(4	+0.04  = [ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$	3.11 3.11 3.11 8.52 7.07 0.37 1.17 0.72  0  1e)+0.04] a  1.(30) + (32)  tive Value:	?) + (32a). Medium	(32e) =	44.74	(27) (27) (27) (28) (29) (29) (29) (30) (31) (32) (32b)
Windows Type 3  Windows Type 4  Floor  Walls Type1  65.34  Walls Type2  4.32  Walls Type3  Roof  6  Total area of elements, m²  Party wall  Party ceiling  * for windows and roof windows, use effective window U-value calculations  Fabric heat loss, W/K = S (A x U)  Heat capacity Cm = S(A x k)  Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²l	2 x1/[1/( 1.2 2 x1/[1/( 1.2 2 x1/[1/( 1.2 2 x1/[1/( 1.2 2 x 0.2 3 x 0.2 9 x 0.2 9 x 0.2 17 x 0.2 17 x 0.2 17 x 0.2 17 x 0.2 17 x 0.2 18 (26)(3	+0.04  = [ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$ $ +0.04  = [$	3.11 3.11 3.11 8.52 7.07 0.37 1.17 0.72  0  1e)+0.04] a  1.(30) + (32)  tive Value:	?) + (32a). Medium	(32e) =	44.74	(27) (27) (27) (28) (29) (29) (30) (31) (32) (32b)



if details o		0 0	are not kn	own (36) =	= 0.05 x (3	11)						ī		_
Total fab									(33) +	(36) =			64.58	(37)
Ventilation	on hea		1		<del>Í – –</del>	ı	1	1	·	= 0.33 × (	25)m x (5)	<u> </u>	1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(0.0)
(38)m=	18.62	18.4	18.19	17.09	16.87	15.77	15.77	15.55	16.21	16.87	17.31	17.75		(38)
Heat trai	nsfer c	oefficier	nt, W/K						(39)m	= (37) + (	38)m		•	
(39)m=	83.2	82.98	82.77	81.67	81.45	80.35	80.35	80.13	80.79	81.45	81.89	82.33		_
Heat los	s para	meter (H	HLP), W	′m²K						Average = = (39)m ÷	Sum(39) <sub>1</sub> · (4)	12 /12=	81.61	(39)
(40)m=	1.17	1.17	1.17	1.15	1.15	1.13	1.13	1.13	1.14	1.15	1.15	1.16		
Number	of day	s in moi	nth (Tab	le 1a)					,	Average =	Sum(40) <sub>1</sub>	12 /12=	1.15	(40)
Γ	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
<u> </u>			l	<u> </u>	ļ	<u>!</u>			l	<u> </u>	ļ	ı		
4. Wate	er heat	ina ener	rgy requi	rement:								kWh/ye	ear:	
Assume				[1 - exp	( <u>-</u> 0 0003	849 v (TI	=Δ <b>-</b> 13 9	)2)] + 0.0	1013 x (	ΓFΔ -13		27		(42)
		0, N = 1 $0, N = 1$	+ 1.70 X	[I - exp	(-0.000	) A CFC	A - 10.3	) <u>Z)</u> ] + 0.0	) X C10X	II A - 13.	.9)			
Annual a												3.12		(43)
Reduce th not more t		_					-	to achieve	a water us	se target o	f			
not more a	. 1								0	0.1	NI.	<b>D</b>		
Hot water	Jan J	Feb	Mar day for ea	Apr	Vd m = fa	Jun	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
	96.93	93.4	89.88	86.35	82.83	79.3	79.3	82.83	86.35	89.88	93.4	96.93		
(44)111=	90.93	95.4	09.00	00.55	02.03	79.5	19.3	02.03			m(44) <sub>112</sub> =		1057.39	(44)
Energy co	ntent of	hot water	used - cal	culated m	onthly $= 4$ .	190 x Vd,i	m x nm x E	OTm / 3600			. ,		1007.00	
(45)m=	143.74	125.72	129.73	113.1	108.52	93.65	86.78	99.58	100.77	117.44	128.19	139.21		
16 in a tau ta		- ( t C		- 6 /		( )		h (40		Total = Su	m(45) <sub>112</sub> =	=	1386.41	(45)
If instantar					ı	r storage), T				1			Ī	
(46)m= Water st	21.56	18.86	19.46	16.97	16.28	14.05	13.02	14.94	15.12	17.62	19.23	20.88		(46)
Storage	•		includir	ig any so	olar or W	WHRS	storage	within sa	ame ves	sel		0		(47)
If commi		, ,					_							, ,
Otherwis	-	_			_			, ,	ers) ente	er '0' in (	47)			
Water st	orage	loss:												
a) If ma	nufact	urer's de	eclared I	oss facto	or is kno	wn (kWl	n/day):					0		(48)
Tempera	ature fa	actor fro	m Table	2b								0		(49)
Energy I			_					(48) x (49)	) =		1	10		(50)
b) If ma Hot wate				-	loss fact									(54)
If commi		_			ie z (KVV	11/11116/06	ay <i>)</i>				0.	.02		(51)
Volume	-	_									1.	.03		(52)
Tempera	ature fa	actor fro	m Table	2b								.6		(53)
Energy I	ost fro	m water	storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	1.	.03		(54)
Enter (5	60) or (	54) in (5	55)	-							<b>—</b>	.03		(55)



Water storage loss calculated for each month $((56)m = (55) \times (41)m)$	
(56)m= 32.01 28.92 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01	(56)
If cylinder contains dedicated solar storage, (57)m = (56)m x [(50) – (H11)] ÷ (50), else (57)m = (56)m where (H11) is from Appendix H	
(57)m= 32.01 28.92 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01	(57)
Primary circuit loss (annual) from Table 3	(58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m	
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26	(59)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m	
(61)m= 0 0 0 0 0 0 0 0 0 0 0 0 0	(61)
Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m + (46)m + (57)m + (59)m + (61)m$	
(62)m= 199.02 175.64 185.01 166.59 163.8 147.14 142.05 154.86 154.26 172.71 181.68 194.48	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)	
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	
(63)m= 0 0 0 0 0 0 0 0 0 0 0	(63)
Output from water heater	
(64)m= 199.02 175.64 185.01 166.59 163.8 147.14 142.05 154.86 154.26 172.71 181.68 194.48	
Output from water heater (annual) <sub>112</sub> 2037.25	(64)
Heat gains from water heating, kWh/month 0.25 [0.85 x (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]	
(65)m= 92.02 81.74 87.36 80.4 80.31 73.93 73.07 77.33 76.3 83.27 85.42 90.51	(65)
in <mark>clude</mark> (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating	
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating  5. Internal gains (see Table 5 and 5a):	
5. Internal gains (see Table 5 and 5a):	
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)
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)
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) (67)
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	, ,
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	, ,
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	(67)
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= 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.5	(67)
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= 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.5	(67) (68)
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	(67) (68)
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	(67) (68) (69)
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= 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.5	(67) (68) (69)
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	(67) (68) (69) (70)
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= 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.5	(67) (68) (69) (70)
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= 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.51 113.5	(67) (68) (69) (70) (71)
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	(67) (68) (69) (70) (71)

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

6. Solar gains:



Orientati	ion:	Access Factor Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	X	2.72	x	10.63	x	0.4	x	0.7	=	11.22	(74)
North	0.9x	0.77	x	2.72	x	20.32	х	0.4	x	0.7	=	21.45	(74)
North	0.9x	0.77	x	2.72	x	34.53	х	0.4	x	0.7	=	36.45	(74)
North	0.9x	0.77	x	2.72	x	55.46	x	0.4	x	0.7	=	58.55	(74)
North	0.9x	0.77	x	2.72	x	74.72	x	0.4	x	0.7	=	78.87	(74)
North	0.9x	0.77	x	2.72	x	79.99	х	0.4	x	0.7	=	84.43	(74)
North	0.9x	0.77	x	2.72	x	74.68	х	0.4	x	0.7	=	78.83	(74)
North	0.9x	0.77	x	2.72	x	59.25	x	0.4	x	0.7	=	62.54	(74)
North	0.9x	0.77	x	2.72	x	41.52	x	0.4	x	0.7	=	43.82	(74)
North	0.9x	0.77	x	2.72	x	24.19	x	0.4	x	0.7	=	25.53	(74)
North	0.9x	0.77	X	2.72	X	13.12	X	0.4	X	0.7	=	13.85	(74)
North	0.9x	0.77	X	2.72	x	8.86	x	0.4	x	0.7	=	9.36	(74)
South	0.9x	0.77	x	7.58	x	46.75	X	0.4	x	0.7	=	68.76	(78)
South	0.9x	0.77	x	2.72	x	46.75	x	0.4	x	0.7	=	49.35	(78)
South	0.9x	0.77	X	7.58	x	76.57	x	0.4	x	0.7	=	112.62	(78)
South	0.9x	0.77	X	2.72	X	76.57	X	0.4	X	0.7		80.82	(78)
Sout <mark>h</mark>	0.9x	0.77	X	7.58	х	97.53	x	0.4	x	0.7		143.46	(78)
Sout <mark>h</mark>	0.9x	0.77	x	2.72	х	97.53	×	0.4	x	0.7	=	102.95	(78)
Sout <mark>h</mark>	0.9x	0.77	X	7.58	X	110.23	x	0.4	x	0.7	=	162.14	(78)
Sout <mark>h</mark>	0.9x	0.77	X	2.72	x	110.23	Х	0.4	x	0.7	=	116.36	(78)
Sout <mark>h</mark>	0.9x	0.77	x	7.58	x	114.87	x	0.4	x	0.7	=	168.96	(78)
Sout <mark>h</mark>	0.9x	0.77	X	2.72	х	114.87	X	0.4	x	0.7	=	121.26	(78)
South	0.9x	0.77	X	7.58	X	110.55	X	0.4	X	0.7	=	162.6	(78)
South	0.9x	0.77	X	2.72	X	110.55	X	0.4	X	0.7	=	116.69	(78)
South	0.9x	0.77	X	7.58	x	108.01	x	0.4	X	0.7	=	158.87	(78)
South	0.9x	0.77	X	2.72	x	108.01	x	0.4	x	0.7	=	114.01	(78)
South	0.9x	0.77	X	7.58	x	104.89	x	0.4	X	0.7	=	154.28	(78)
South	0.9x	0.77	X	2.72	x	104.89	x	0.4	x	0.7	=	110.72	(78)
South	0.9x	0.77	X	7.58	X	101.89	X	0.4	X	0.7	=	149.86	(78)
South	0.9x	0.77	X	2.72	X	101.89	X	0.4	X	0.7	=	107.55	(78)
South	0.9x	0.77	X	7.58	X	82.59	X	0.4	X	0.7	=	121.47	(78)
South	0.9x	0.77	X	2.72	X	82.59	X	0.4	X	0.7	=	87.18	(78)
South	0.9x	0.77	X	7.58	X	55.42	X	0.4	X	0.7	=	81.51	(78)
South	0.9x	0.77	X	2.72	X	55.42	X	0.4	X	0.7	=	58.5	(78)
South	0.9x	0.77	X	7.58	x	40.4	x	0.4	x	0.7	] =	59.42	(78)
South	0.9x	0.77	X	2.72	X	40.4	x	0.4	X	0.7	=	42.64	(78)
West	0.9x	0.77	X	2.72	x	19.64	x	0.4	x	0.7	=	10.37	(80)
West	0.9x	0.77	X	2.72	X	38.42	x	0.4	X	0.7	=	20.28	(80)
West	0.9x	0.77	X	2.72	X	63.27	X	0.4	X	0.7	] =	33.39	(80)



West	0.9x	0.77	X	2.7	72	x	9	2.28	x [	(	0.4	x	0.7	=	48.7	(80)
West	0.9x	0.77	X	2.7	72	x	1	13.09	] x [	(	0.4	x	0.7	=	59.69	(80)
West	0.9x	0.77	Х	2.7	72	x	1	15.77	x [	(	0.4	x [	0.7	=	61.1	(80)
West	0.9x	0.77	X	2.7	72	x	1	10.22	_ x [	(	0.4	x	0.7	=	58.17	(80)
West	0.9x	0.77	Х	2.7	72	x	9	4.68	x [	(	0.4	x	0.7	=	49.97	(80)
West	0.9x	0.77	Х	2.7	72	x	7	3.59	x [	(	0.4	x [	0.7	=	38.84	(80)
West	0.9x	0.77	X	2.7	72	x	4	5.59	x [		0.4	x	0.7	=	24.06	(80)
West	0.9x	0.77	Х	2.7	72	x	2	4.49	] x [	(	0.4	x	0.7	=	12.93	(80)
West	0.9x	0.77	X	2.7	72	x	1	6.15	_ x [	(	0.4	x	0.7	=	8.52	(80)
ĭ	ains in	watts, ca	alculated	for eac	h month				(83)m	= Sum	n(74)m .	(82)m	1		1	
(83)m=	139.7	235.17	316.25	385.75	428.77		24.82	409.88	377.	51 3	340.07	258.24	166.78	119.94		(83)
ŗ				r (84)m =	<u> </u>	·				ı			1		1	(0.1)
(84)m=	537.85	631.36	700.05	749.56	772.36	74	48.85	721.13	694.	4 6	67.16	605.51	537.25	507.75		(84)
7. Mea	an inter	nal temp	perature	(heating	seasor	1)										
Temp	erature	during h	neating p	eriods i	n the livi	ng	area f	rom Tab	ole 9,	Th1	(°C)				21	(85)
Utilisa	ition fac	tor for g	ains for	living are	ea, h1,m	า (s	ee Ta	ble 9a)			-				1	
	Jan	Feb	Mar	Apr	May		Jun	Jul	Au	ıg	Sep	Oct	Nov	Dec		
(86)m=	0.99	0.99	0.97	0.93	0.83		0.65	0.48	0.52	2	0.75	0.94	0.99	1		(86)
Me <mark>an</mark>	interna	l temp <mark>e</mark> r	ature in	living ar	ea T1 (f	ollo	w ste	ps 3 t <mark>o 7</mark>	in Ta	able 9	9c)					
(87)m=	19.87	20.06	20.31	20.61	20.84	2	0.96	20.99	20.9	9 :	20.93	20.63	20.2	19.84		(87)
Temp	erature	during h	neating p	periods in	n rest of	dw	elling	from Ta	able 9	, Th2	(°C)					
(88)m=	19.94	19.95	19.95	19.96	19.96	1	9.98	19.98	19.9	8	19.97	19.96	19.96	19.95		(88)
Utilisa	ition fac	tor for q	ains for	rest of d	welling.	h2,	m (se	e Table	9a)							
(89)m=	0.99	0.98	0.96	0.9	0.77	$\overline{}$	0.56	0.37	0.41	1	0.67	0.91	0.98	0.99		(89)
Mean	interna	l temper	ature in	the rest	of dwell	ina	T2 (fd	ollow ste	ens 3	to 7 i	n Tabl	e 9c)	•	•	1	
(90)m=	18.46	18.73	19.1	19.52	19.81	┰	9.95	19.97	19.9		19.92	19.56	18.94	18.42		(90)
L		<u> </u>	<u>l</u>		<u> </u>						f	LA = Livir	ig area ÷ (4	4) =	0.37	(91)
Mean	intorna	l tompor	aturo (fo	or the wh	olo dwa	llin	a) – fl	Λ <b>ν</b> Τ1	<b></b> (1 _	_ fΙ Λ'	\ <b>v</b> T2					
(92)m=	18.98	19.22	19.54	19.92	20.19	т —	20.32	20.35	20.3		20.29	19.95	19.4	18.94		(92)
				n interna					<u> </u>				10.1	10.01		(3 )
(93)m=	18.98	19.22	19.54	19.92	20.19	_	0.32	20.35	20.3	$\overline{}$	20.29	19.95	19.4	18.94		(93)
8. Spa	ace hea	ting requ	uiremen	t												
Set Ti	to the i	mean int	ernal te	mperatu	re obtaiı	ned	at ste	ep 11 of	Table	9b,	so that	t Ti,m=(	76)m an	d re-cald	culate	
the uti	ilisation	factor fo	or gains	using Ta	able 9a	_									Ī	
	Jan	Feb	Mar	Apr	May		Jun	Jul	Au	ıg	Sep	Oct	Nov	Dec		
Г		tor for g		1		Ι.				_					1	(0.4)
(94)m=	0.99	0.98	0.96	0.9	0.79		0.59	0.41	0.45		0.7	0.91	0.98	0.99		(94)
Г	1 gains, 532.62	618.21	, VV = (9- 669.14	4)m x (8 674.69	4)m 606.34	1 4	44.25	298.98	313.0	ng /	164.69	553.35	526.28	503.92	]	(95)
(95)m=   Month		l		perature		1		230.30	J 313.0	00   4	104.09	JJJ.JJ	320.20	303.82		(90)
(96)m=	4.3	4.9	6.5	8.9	11.7	$\overline{}$	14.6	16.6	16.4	<sub>4</sub> T	14.1	10.6	7.1	4.2		(96)
L		<u> </u>	<u> </u>	nal temp	Į								I	L	I	<b>\ -</b> /
(97)m=		1188.24		899.88	691.53		59.88	301.04	316.2		199.77	761.61	1007.31	1213.57		(97)
٠ ، ا		I	L	1	L	_			Ц				I	L	ı	



Space heating req	uirement	for each n	nonth, kV	Vh/mon	th = 0.0	24 x [(97	)m – (9:	5)m] x (4	1)m			
(98)m= 512.39 383.0		1	63.38	0	0	0	0	154.95	346.34 527.98		_	
	2455.5	(98)										
Space heating req	34.58	(99)										
9b. Energy requiren												
This part is used for Fraction of space he	0	(301)										
Fraction of space he	1	(302)										
The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.  Fraction of heat from Community heat pump  0.7  (30												
			(303a)									
Fraction of commun	•			-1				(0	00) (000 )	0.3	(303b)	
Fraction of total spa			•	•	•				02) x (303a) =	0.7	(304a)	
Fraction of total spa			•					•	02) x (303b) =	0.3	(304b)	
Factor for control ar	_	_	,	. , ,		•	ating sys	stem		1	(305)	
Distribution loss factor (Table 12c) for community heating system											(306)	
Space heating	kWh/year 2455.5	7										
Annual space heating requirement  Space heat from Community heat pump  (98) x (304a) x (305) x (306) =											_ ☐(307a)	
Space heat from he									5) x (306) =	1890.73 810.31	(307b)	
Efficiency of second			heating	svstem	in % (fr	om Table				0	(308	
Space heating requ								301) x 100 -	<u> </u>	0	(309)	
Water heating											_	
Annual water heating	g require	ment								2037.25	7	
If DHW from commo			0				(64) x (3	303a) x (30	5) x (306) =	1568.68	(310a)	
Water heat from hea	at source	2					(64) x (3	303b) x (30	5) x (306) =	672.29	] (310b)	
Electricity used for h	eat distri	bution				0.01			· (310a)(310e)] =	49.42	(313)	
Cooling System End	ergy Effici	ency Rati	0							0	(314)	
Space cooling (if the	ere is a fix	ed coolin	g system	, if not	enter 0)		= (107)	÷ (314) =		0	(315)	
Electricity for pumps mechanical ventilati			• •		•	o outcido				454.04	(330a)	
		·	act of po	Silive III	put IIOII	i outside				154.94	_	
warm air heating sy		•								0	(330b)	
pump for solar water heating											(330g)	
Total electricity for the above, $kWh/year = (330a) + (330b) + (330g) = 154.94$											(331)	
Energy for lighting (										314.29	(332)	
12b. CO2 Emission	s – Comn	nunity hea	iting sche	eme								

Energy kWh/year

kg CO2/year

**Emission factor Emissions** 

kg CO2/kWh



CO2 from other sources of space a Efficiency of heat source 1 (%)		CHP) HP using two fuels repeat (363) to	(366) for the second	nd fuel	294	(367a)
Efficiency of heat source 2 (%)	nd fuel	95.6	(367b)			
CO2 associated with heat source 1	[[	(307b)+(310b)] x 100 ÷ (367b) x	0.52	] = [	610.69	(367)
CO2 associated with heat source 2	[[	(307b)+(310b)] x 100 ÷ (367b) x	0.22	] = [	334.98	(368)
Electrical energy for heat distribution	on	[(313) x	0.52	] = [	25.65	(372)
Total CO2 associated with commun	nity systems	(363)(366) + (368)(372	2)	=	971.32	(373)
CO2 associated with space heating	g (secondary)	(309) x	0	] = [	0	(374)
CO2 associated with water from im	] = [	0	(375)			
Total CO2 associated with space a	nd water heating	(373) + (374) + (375) =		[	971.32	(376)
CO2 associated with electricity for	pumps and fans within	dwelling (331)) x	0.52	] = [	80.41	(378)
CO2 associated with electricity for	lighting	(332))) x	0.52	] = [	163.12	(379)
Total CO2, kg/year	sum of (376)(382)	=			1214.85	(383)
Dwelling CO2 Emission Ra	te $(383) \div (4) =$				17.11	(384)
El rating (section 14)					85.97	(385)





User Details: **Assessor Name:** Stroma Number: Stroma FSAP 2012 **Software Version: Software Name:** Version: 1.0.5.12 Property Address: E1-18 Address: 1. Overall dwelling dimensions Av. Height(m) Area(m²) Volume(m³) Ground floor (1a) x 2.7 (2a) =135 (3a) 50 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)(4)50 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =135 (5) total m³ per hour main secondary other heating heating x 40 =Number of chimneys (6a) 0 0 x 20 =Number of open flues 0 0 0 (6b) Number of intermittent fans x 10 =(7a)0 0 x 10 =Number of passive vents (7b) 0 0 x 40 =Number of flueless gas fires 0 (7c)Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = $\div (5)$ (8) If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9)0 Additional infiltration [(9)-1]x0.1 =0 (10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)0 if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12)If no draught lobby, enter 0.05, else enter 0 (13)0 Percentage of windows and doors draught stripped (14)0 Window infiltration  $0.25 - [0.2 \times (14) \div 100] =$ 0 (15)Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =O (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)3 If based on air permeability value, then  $(18) = [(17) \div 20] + (8)$ , otherwise (18) = (16)0.15 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)3  $(20) = 1 - [0.075 \times (19)] =$ Shelter factor (20)0.78  $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.12 Infiltration rate modified for monthly wind speed Jan Feb Jul Sep Mar Apr May Jun Aug Oct Nov Dec Monthly average wind speed from Table 7 (22)m =5.1 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor  $(22a)m = (22)m \div 4$ (22a)m 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18



Aujusteu IIIIIII a	ation rat	e (allowi	ng for sh	nelter an	nd wind s	peed) =	(21a) x	(22a)m				,	
0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14	]	
Calculate effed If mechanica		•	iale ioi l	пе аррп	Cable Ca	SE						0.5	(23
If exhaust air he			endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b	) = (23a)			0.5	(23
If balanced with	heat reco	overy: effic	iency in %	allowing f	for in-use f	actor (fron	n Table 4h	) =				76.5	(23
a) If balance	d mecha	anical ve	entilation	with he	at recov	ery (MVI	HR) (24a	a)m = (22)	2b)m + (2	23b) × [1	1 – (23c)		
24a)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.23	0.23	0.24	0.25	0.25	]	(24
b) If balance	d mech	anical ve	ntilation	without	heat red	covery (N	лV) (24b	)m = (22	2b)m + (2	23b)	<u>I</u>		
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24
c) If whole he				•	•				5 × (23b	))		•	
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24
d) If natural v					•				0.5]		I	1	
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24
Effective air	change	rate - er	nter (24a	) or (24b	o) or (24	c) or (24	d) in box	(25)				•	
25)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.23	0.23	0.24	0.25	0.25		(25
3. Heat losses	and he	eat loss r	naramete	or.					_				•
ELEMENT	Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/I	<)	k-value kJ/m²-		A X k kJ/K
Doors					1.89	x	1.4	= [	2.646				(26
Vin <mark>dows</mark> Type	1				5.42	x1.	/[1/( 1.2 )+	0.04] =	6.21	Ħ			(27
Windows Type	2				2.72	x1.	/[1/( 1.2 )+	0.04] =	3.11	Ħ			(27
Vindows Type	3				2.72	x1.	/[1/( 1.2 )+	0.04] =	3.11	5			(27
Valls Type1	22.9	95	10.80	3	12.09	) x	0.16	=	1.93				(29
Walls Type2	20.7	<b>'</b> 9	1.89		18.9	x	0.15	<u> </u>	2.84	<b>-</b>			(29
Total area of e	lements	, m²			43.74	二							(3:
Party wall					35.37	, x	0		0				(3:
Party floor					50							7 F	(32
Party ceiling					50					Ī		7 F	(32
for windows and it include the area						ated using	ı formula 1	/[(1/U-valu	ıe)+0.04] a	s given in	paragrapl	h 3.2	
abric heat los	s, W/K :	= S (A x	U)				(26)(30)	+ (32) =				19.86	(3:
leat capacity (	Cm = S(	(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	0	(3
hermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value:	Medium		250	(3
or design assess an be used instea				construct	ion are no	t known pr	ecisely the	e indicative	values of	TMP in Ta	able 1f		
Thermal bridge	,	,		• .	•	<						6.55	(3
details of therma otal fabric hea		are not kn	own (36) =	= 0.05 x (3	31)			(33) +	(36) =			26.41	(3
entilation hea		alculated	l monthly	,					$= 0.33 \times ($	25)m x (5)		26.41	(3
				,				(-0)	(	-, (3)			



(38)m= 11.84 11.71 11.58 10.93 10.8 10.15 10.15 10.03 10.41 10.8 11.06 11.32	(38)										
Heat transfer coefficient, W/K (39)m = (37) + (38)m											
(39)m= 38.25 38.12 37.99 37.34 37.21 36.57 36.57 36.44 36.82 37.21 37.47 37.73											
Average = Sum(39) <sub>112</sub> /12= Heat loss parameter (HLP), W/m <sup>2</sup> K $(40)m = (39)m \div (4)$	37.31 (39)										
(40)m= 0.76 0.76 0.76 0.75 0.74 0.73 0.73 0.73 0.74 0.74 0.75 0.75											
Average = Sum(40) <sub>112</sub> /12=	0.75 (40)										
Number of days in month (Table 1a)	_										
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec											
(41)m= 31 28 31 30 31 30 31 30 31 30 31	(41)										
4. Water heating energy requirement: kWh/year	:										
Assumed occupancy, N 1.69	(42)										
if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1											
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36	(43)										
Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of	(10)										
not more that 125 litres per person per day (all water use, hot and cold)											
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	_										
Hot water usage in litres per day for each month $Vd,m = \frac{1}{1}$ from Table 1c x (43)											
(44)m= 81.77 78.8 75.83 72.85 69.88 66.91 66.91 69.88 72.85 75.83 78.8 81.77	892.08 (44)										
Total = Sum(44) <sub>112</sub> = 892.08 Energy content of hot water used - calculated monthly = $4.190 \times Vd$ , $m \times nm \times DTm / 3600 \times Wh/month$ (see Tables 1b, 1c, 1d)											
(45)m= 121.27 106.06 109.45 95.42 91.56 79.01 73.21 84.01 85.01 99.08 108.15 117.44											
Total = Sum(45) <sub>112</sub> =	1169.66 (45)										
If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)											
(46)m= 18.19 15.91 16.42 14.31 13.73 11.85 10.98 12.6 12.75 14.86 16.22 17.62	(46)										
Water storage loss:											
Others and the Allinean Control of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the second of the secon											
	(47)										
If community heating and no tank in dwelling, enter 110 litres in (47)	(47)										
If community heating and no tank in dwelling, enter 110 litres in (47)  Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)	(47)										
If community heating and no tank in dwelling, enter 110 litres in (47)  Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)	(47)										
If community heating and no tank in dwelling, enter 110 litres in (47)  Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)  Water storage loss:											
If community heating and no tank in dwelling, enter 110 litres in (47)  Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)  Water storage loss:  a) If manufacturer's declared loss factor is known (kWh/day):  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  (48) × (49) = 110	(48)										
If community heating and no tank in dwelling, enter 110 litres in (47)  Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)  Water storage loss:  a) If manufacturer's declared loss factor is known (kWh/day):  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  b) If manufacturer's declared cylinder loss factor is not known:	(48) (49) (50)										
If community heating and no tank in dwelling, enter 110 litres in (47)  Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)  Water storage loss:  a) If manufacturer's declared loss factor is known (kWh/day):  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day)  0  0  0  0  0  0  0  0  0  0  0  0  0	(48) (49)										
If community heating and no tank in dwelling, enter 110 litres in (47)  Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)  Water storage loss:  a) If manufacturer's declared loss factor is known (kWh/day):  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day)  If community heating see section 4.3	(48) (49) (50)										
If community heating and no tank in dwelling, enter 110 litres in (47)  Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)  Water storage loss:  a) If manufacturer's declared loss factor is known (kWh/day):  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day)  If community heating see section 4.3  Volume factor from Table 2a  1.03	(48) (49) (50) (51)										
If community heating and no tank in dwelling, enter 110 litres in (47)  Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)  Water storage loss:  a) If manufacturer's declared loss factor is known (kWh/day):  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day)  If community heating see section 4.3  Volume factor from Table 2a  Temperature factor from Table 2b  0  1.03  1.03  Temperature factor from Table 2b	(48) (49) (50) (51)										
If community heating and no tank in dwelling, enter 110 litres in (47)  Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)  Water storage loss:  a) If manufacturer's declared loss factor is known (kWh/day):  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day)  If community heating see section 4.3  Volume factor from Table 2a  Temperature factor from Table 2b  0.02	(48) (49) (50) (51) (52) (53)										
If community heating and no tank in dwelling, enter 110 litres in (47)  Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)  Water storage loss:  a) If manufacturer's declared loss factor is known (kWh/day):  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day)  If community heating see section 4.3  Volume factor from Table 2a  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  (47) × (51) × (52) × (53) =  1.03	(48) (49) (50) (51) (52) (53) (54)										
If community heating and no tank in dwelling, enter 110 litres in (47)  Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)  Water storage loss:  a) If manufacturer's declared loss factor is known (kWh/day):  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day)  If community heating see section 4.3  Volume factor from Table 2a  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  Energy lost from water storage, kWh/year  Enter (50) or (54) in (55)  Water storage loss calculated for each month  ((56)m=	(48) (49) (50) (51) (52) (53) (54) (55)										
If community heating and no tank in dwelling, enter 110 litres in (47)  Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)  Water storage loss:  a) If manufacturer's declared loss factor is known (kWh/day):  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  b) If manufacturer's declared cylinder loss factor is not known:  Hot water storage loss factor from Table 2 (kWh/litre/day)  If community heating see section 4.3  Volume factor from Table 2a  Temperature factor from Table 2b  Energy lost from water storage, kWh/year  Enter (50) or (54) in (55)  Water storage loss calculated for each month  ((56)m = (55) × (41)m)	(48) (49) (50) (51) (52) (53) (54) (55)										



Primary circuit loss (annual) from Table 3	58)											
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m												
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)												
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 22.51 23.26 (59)m= 23.26 21.01 23.26 22.51 23.26	59)											
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m												
	51)											
Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m + (46)m + (57)m + (59)m + (61)m$												
	52)											
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)												
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)												
	53)											
Output from water heater												
(64)m= 176.55 155.99 164.72 148.91 146.83 132.5 128.49 139.29 138.51 154.35 161.64 172.72												
Output from water heater (annual) <sub>112</sub> 1820.5 (6	64)											
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m ]												
	65)											
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating												
5. Internal gains (see Table 5 and 5a):												
Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec												
	66)											
	,											
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5  (67)m= 13.14 11.67 9.49 7.18 5.37 4.53 4.9 6.37 8.55 10.85 12.67 13.5 (6	67)											
	,,											
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	20)											
	58)											
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	20)											
	59)											
Pumps and fans gains (Table 5a)												
(70) m =	70)											
Losses e.g. evaporation (negative values) (Table 5)												
(71)m=	71)											
Water heating gains (Table 5)												
(72)m= 113.63 111.92 108.35 103.5 100.35 95.92 92.16 96.98 98.7 103.71 109.38 111.92 (73)	72)											
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m$												
(73)m= 322.36 320.7 311.1 295.75 280.44 265.45 255.55 260.32 268.07 283.59 301.41 314.51 (73)m=	73)											
6. Solar gains:												
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.												
Orientation: Access Factor Area Flux g_ FF Gains												
Table 6d m² Table 6a Table 6b Table 6c (W)												
	78)											
South $0.9x$ 0.77 x 2.72 x 76.57 x 0.4 x 0.7 = 40.41 (7)	78)											



South	0.9x	0.77		x	2.72	2	X	9	7.53	x		0.4	x	0.7	=	51.48	(78)
South	0.9x	0.77		x	2.72	2	X	1	10.23	x		0.4	x	0.7	=	58.18	(78)
South	0.9x	0.77		x	2.72	2	X	1	14.87	X		0.4	x	0.7	=	60.63	(78)
South	0.9x	0.77		x	2.72	2	X	1	10.55	x		0.4	x	0.7	=	58.35	(78)
South	0.9x	0.77		x	2.72	2	X	10	08.01	x		0.4	x	0.7	=	57.01	(78)
South	0.9x	0.77		x	2.72	2	X	10	04.89	X		0.4	x	0.7	=	55.36	(78)
South	0.9x	0.77		x	2.72	2	X	10	01.89	x		0.4	x	0.7	=	53.77	(78)
South	0.9x	0.77		x	2.72	2	X	8	2.59	X		0.4	x	0.7	=	43.59	(78)
South	0.9x	0.77		x	2.72	2	X	5	5.42	X		0.4	x	0.7	=	29.25	(78)
South	0.9x	0.77		x	2.72	2	X	4	10.4	x		0.4	x	0.7	=	21.32	(78)
West	0.9x	0.77		x	5.42	2	X	1	9.64	x		0.4	x	0.7	=	20.66	(80)
West	0.9x	0.77		x	2.72	2	X	1	9.64	x		0.4	x	0.7	=	10.37	(80)
West	0.9x	0.77		x	5.42	2	X	3	8.42	x		0.4	x	0.7	=	40.41	(80)
West	0.9x	0.77		x	2.72	2	X	3	8.42	x		0.4	x	0.7	=	20.28	(80)
West	0.9x	0.77		x	5.42	2	X	6	3.27	X		0.4	x	0.7	=	66.54	(80)
West	0.9x	0.77		x	2.72	2	X	6	3.27	x		0.4	x	0.7	=	33.39	(80)
West	0.9x	0.77		x	5.42	2	X	9	2.28	X		0.4	x	0.7	=	97.05	(80)
West	0.9x	0.77		X	2.72	2	X	9	2.28	Х		0.4	X	0.7	=	48.7	(80)
West	0.9x	0.77		x	5.42	2	Х	1	13.09	] x		0.4	x	0.7	=	118.94	(80)
West	0.9x	0.77		x	2.72	2	Х	1	13.09	] x		0.4	x	0.7	=	59.69	(80)
West	0.9x	0.77		x	5.42	2	X	1	15.77	] x		0.4	x	0.7	=	121.76	(80)
West	0.9x	0.77		x	2.72	2	X	1	15.77	Х		0.4	x	0.7	=	61.1	(80)
West	0.9x	0.77		x	5.42	2	X	1	10.22	х		0.4	x	0.7		115.92	(80)
West	0.9x	0.77		x	2.72	2	х	1	10.22	x		0.4	x	0.7	=	58.17	(80)
West	0.9x	0.77		x	5.42	2	X	9	4.68	x		0.4	x	0.7	=	99.57	(80)
West	0.9x	0.77		x	2.72	2	X	9	4.68	X		0.4	x	0.7	=	49.97	(80)
West	0.9x	0.77		x	5.42	2	X	7	3.59	X		0.4	x	0.7	=	77.39	(80)
West	0.9x	0.77		x	2.72	2	X	7	3.59	X		0.4	x	0.7	=	38.84	(80)
West	0.9x	0.77		x	5.42	2	X	4	5.59	X		0.4	x	0.7	=	47.95	(80)
West	0.9x	0.77		x	2.72	2	X	4	5.59	X		0.4	x	0.7	=	24.06	(80)
West	0.9x	0.77		x	5.42	2	X	2	4.49	X		0.4	x	0.7	=	25.76	(80)
West	0.9x	0.77		x	2.72	2	X	2	4.49	x		0.4	x	0.7	=	12.93	(80)
West	0.9x	0.77		x	5.42	2	X	1	6.15	x		0.4	x	0.7	=	16.99	(80)
West	0.9x	0.77		x	2.72	2	X	1	6.15	x		0.4	x	0.7	=	8.52	(80)
T		watts, ca		$\overline{}$			$\overline{}$			<del></del>	$\overline{}$	m(74)m				_	
(83)m=	55.7	101.1	151.4		203.94	239.26		241.2	231.1	204	1.9	170.01	115.6	67.93	46.83		(83)
Ī		nternal a		_	<u>`                                    </u>	• •	_				<u> </u>	100 - 1				7	(0.1)
(84)m=	378.05	421.79	462.5	2	499.69	519.7	5	506.66	486.65	465	.22	438.07	399.18	369.34	361.35		(84)
		nal temp															
•		during h					-			ole 9	, Th1	(°C)				21	(85)
Utilisa		tor for ga		$\neg$			Ť					Т		_	1	7	
	Jan	Feb	Ma	r	Apr	May	<u>'                                    </u>	Jun	Jul	A	ug	Sep	Oct	Nov	Dec	_	



_						_	-							
(86)m=	0.99	0.98	0.94	0.83	0.65	0.46	0.33	0.36	0.58	0.86	0.97	0.99		(86)
Mean	internal	temper	ature in	living ar	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)					
(87)m=	20.47	20.59	20.76	20.92	20.99	21	21	21	21	20.91	20.67	20.44		(87)
Tempe	erature	during h	neating p	eriods ir	n rest of	dwelling	from Ta	able 9, T	h2 (°C)					
(88)m=	20.28	20.29	20.29	20.3	20.3	20.31	20.31	20.32	20.31	20.3	20.3	20.29		(88)
- Utilisa	Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)													
(89)m=	0.99	0.97	0.92	0.8	0.61	0.41	0.28	0.31	0.52	0.83	0.97	0.99		(89)
Mean	Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)													
(90)m=	19.58	19.76	20	20.22	20.29	20.31	20.31	20.32	20.31	20.21	19.89	19.55		(90)
_						!		!	f	LA = Livin	g area ÷ (4	1) =	0.47	(91)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$													<u>_</u>	
(92)m=	20	20.16	20.36	20.55	20.62	20.64	20.64	20.64	20.63	20.55	20.26	19.97		(92)
Apply_	adjustn	nent to t	he mear	interna	temper	ature fro	m Table	4e, whe	re appro	priate				
(93)m=	20	20.16	20.36	20.55	20.62	20.64	20.64	20.64	20.63	20.55	20.26	19.97		(93)
8. Spa	ace hea	ting requ	uirement											
			ernal ter or gains			ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
L Utilisa		$\overline{}$	ains, hm		ividy	Juli	l our	/ rug	ОСР	001	1101	DCO		
(94)m=	0.99	0.97	0.93	0.81	0.63	0.44	0.3	0.33	0.55	0.84	0.97	0.99		(94)
Useful	l gains,	hmGm	, W = (94	4)m x (8	4)m									
(95)m=	372.56	408.87	428.05	404.53	327.13	220.5	147.66	154.45	239.18	336.38	356.49	357.24		(95)
			rnal tem	_										
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Г			r	al tempe		r	=[(39)m :	<del>- `                                   </del>	·	ī	402.44	505.40		(97)
` ′ L	600.47	581.52	526.66		331.97	220.78	147.68 th = $0.02$	154.48	240.57	370.12	493.14	595.19		(97)
(98)m=	169.56	116.02	73.37	22.05	3.6	0	0.02	0	0	25.1	98.39	177.03		
` ′ L				<u> </u>		<u> </u>	<u> </u>	ITota	l per year	L (kWh/year	) = Sum(9	8) <sub>15,912</sub> =	685.12	(98)
Space	heatin	a require	ement in	k\Wh/m²	?/vear					` •	,		13.7	(99)
·		•				cohomo							10.7	
			nts – Cor pace hea	·	Ĭ		ater heat	ting prov	ided by	a comm	unity sch	neme.		
							heating (				•		0	(301)
Fraction	n of spa	ice heat	from co	mmunity	system	1 – (30	1) =						1	(302)
includes i	boilers, h	eat pumps	s, geotherr	mal and wa	aste heat f		orocedure r stations.			up to four (	other heat	sources; ti	he latter	<b></b>
			Commun	-									0.7	(303a)
		-	heat from				•			/0	00) (000	<b>5</b> )	0.3	(303b)
		•	heat from		•					•	02) x (303	,	0.7	(304a)
		•	heat fro		•				e .	•	02) x (303	D) =	0.3	(304b)
⊢actor f	Factor for control and charging method (Table 4c(3)) for community heating system												1	(305)



Distribution loss factor (Table 12c) for community heating system		1.1	(306)
Space heating		kWh/y	ear
Annual space heating requirement		685.12	
Space heat from Community heat pump (98) x (304a) x (	305) x (306) =	527.54	(307a)
Space heat from heat source 2 (98) x (304b) x (	305) x (306) =	226.09	(307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Append	dix E)	0	(308
Space heating requirement from secondary/supplementary system (98) x (301) x 10	00 ÷ (308) =	0	(309)
Water heating Annual water heating requirement		1820.5	
If DHW from community scheme: Water heat from Community heat pump (64) x (303a) x (64)	305) x (306) =	1401.78	(310a)
Water heat from heat source 2 (64) x (303b) x (	305) x (306) =	600.76	(310b)
Electricity used for heat distribution 0.01 × [(307a)(307e	e) + (310a)(310e)]	= 27.56	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0) = $(107) \div (314) =$	=	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside		109.11	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year =(330a) + (330b)	) + (330g) =	109.11	(331)
Energy for lighting (calculated in Appendix L)		232	(332)
12b. CO2 Emissions – Community heating scheme			
Energy kWh/year	Emission factor kg CO2/kWh	or Emissions kg CO2/ye	
CO2 from other sources of space and water heating (not CHP)  Efficiency of heat source 1 (%)  If there is CHP using two fuels repeat (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363)	366) for the second	fuel 294	(367a)
Efficiency of heat source 2 (%) If there is CHP using two fuels repeat (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363) to (363	366) for the second	fuel 95.6	(367b)
CO2 associated with heat source 1 [(307b)+(310b)] x 100 ÷ (367b) x	0.52	= 340.59	9 (367)
CO2 associated with heat source 2 [(307b)+(310b)] x 100 ÷ (367b) x	0.22	= 186.82	(368)
Electrical energy for heat distribution [(313) x	0.52	= 14.3	(372)
Total CO2 associated with community systems (363)(366) + (368)(372)	)	= 541.7	1 (373)
CO2 associated with space heating (secondary) (309) x	0	= 0	(374)
CO2 associated with water from immersion heater or instantaneous heater (312) x	0.22	= 0	(375)
Total CO2 associated with space and water heating (373) + (374) + (375) =		541.7	1 (376)
CO2 associated with electricity for pumps and fans within dwelling (331)) x	0.52	= 56.63	(378)
CO2 associated with electricity for lighting (332))) x	0.52	= 120.4	1 (379)
Total CO2, kg/year sum of (376)(382) =		718.7	5 (383)





Dwelling CO2 Emission Rate  $(383) \div (4) =$  El rating (section 14)

14.37 (384) 89.86 (385)



User Details: **Assessor Name:** Stroma Number: Stroma FSAP 2012 **Software Version: Software Name:** Version: 1.0.5.12 Property Address: E2-07 Address: 1. Overall dwelling dimensions Av. Height(m) Area(m²) Volume(m³) Ground floor 50.3 (1a) x 2.7 (2a) =135.81 (3a) Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)(4)50.3 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =135.81 (5) total m<sup>3</sup> per hour main secondary other heating heating x 40 =Number of chimneys (6a) 0 0 x 20 =Number of open flues 0 0 0 (6b) Number of intermittent fans x 10 =(7a)0 0 x 10 =Number of passive vents (7b) 0 0 x 40 =Number of flueless gas fires 0 (7c)Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = $\div (5)$ (8) If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9)0 Additional infiltration [(9)-1]x0.1 =0 (10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)0 if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12)If no draught lobby, enter 0.05, else enter 0 (13)0 Percentage of windows and doors draught stripped (14)0 Window infiltration  $0.25 - [0.2 \times (14) \div 100] =$ 0 (15)Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =O (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)3 If based on air permeability value, then  $(18) = [(17) \div 20] + (8)$ , otherwise (18) = (16)0.15 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)3  $(20) = 1 - [0.075 \times (19)] =$ Shelter factor (20)0.78  $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.12 Infiltration rate modified for monthly wind speed Jan Feb Jul Sep Mar Apr May Jun Aug Oct Nov Dec Monthly average wind speed from Table 7 (22)m =5.1 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor  $(22a)m = (22)m \div 4$ (22a)m 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18



Adjusted infiltra	ation rate (a	allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.15	<u>`</u>	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14	]	
Calculate effect		-	ate for t	he appli	cable ca	se	<u>I</u>	!	<u> </u>	<u> </u>	!		
If mechanica							.=					0.5	
If exhaust air he									) = (23a)			0.5	(23b)
If balanced with		-	-	_								76.5	(23c)
a) If balance						<u> </u>	<del>- ` ` - </del>	<del>í `</del>	<del> </del>	<del></del>	<del>``</del>	) ÷ 100] 1	(0.4
(24a)m= 0.27		0.26	0.25	0.24	0.23	0.23	0.23	0.23	0.24	0.25	0.25	]	(24a)
b) If balance								<del>i `</del>	<del>r Ó T</del>	<del></del>	ı	1	(0.4)
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	J	(24b
c) If whole he				•	•				E (22h	. \			
(24c)m = 0	$\frac{1 < 0.5 \times (2)}{0}$	0	nen (240 0	(23L) 0	o), other	vise (24	C) = (221)	0 111	5 × (23L	0	0	1	(240
` '												J	(240
d) If natural v if (22b)m	t = 1, then			•	•				0.5]			-	
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24d
Effective air	change rat	te - en	ter (24a	) or (24b	o) or (24	c) or (24	d) in box	x (25)				_	
(25)m = 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.23	0.23	0.24	0.25	0.25		(25)
3. Heat losses	and heat	loss	aramete	er:							_	_	_
ELEMENT	Gross		Openin		Net Ar	ea	U-val	ue	AXU		k-value	е	ΑΧk
	area (m	1 <sup>2</sup> )	m		A ,r	n²	W/m2	2K	(W/I	K)	kJ/m².	K	kJ/K
Doo <mark>rs</mark>					1.89	Х	1.4	=	2.646				(26)
Windows Type	1				8.16	x1	/[1/( 1.2 )+	0.04] =	9.34				(27)
Windows Type	2				2.72	x1	/[1/( 1.2 )+	0.04] =	3.11				(27)
Walls Type1	15.93		10.88	3	5.05	X	0.16	=	0.81				(29)
Walls Type2	25.11		1.89		23.22	<u>x</u>	0.15	= [	3.49				(29)
Walls Type3	13.77		0		13.77	×	0.14	=	1.93				(29)
Total area of e	ements, m	1 <sup>2</sup>			54.81								(31)
Party wall					23.49	) x	0	_ [	0			$\neg$	(32)
Party floor					50.3							<b>7</b> 7	(32a
Party ceiling					50.3					Ī		7 F	(32b
* for windows and ** include the area						ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragrapl	h 3.2	
Fabric heat los				s and pan			(26)(30)	) + (32) =				21.3	3 (33)
Heat capacity (		•	-,				, , , ,		(30) + (32	2) + (32a).	(32e) =	0	(34)
Thermal mass	•	•	? = Cm ÷	- TFA) ir	n kJ/m²K			., ,	tive Value	, , ,	(= -)	250	<del></del>
For design assess can be used instead	ments where	the de	tails of the	,			ecisely the				able 1f		(00)
Thermal bridge				ısina Ar	pendix k	<						7.88	(36)
if details of therma	,	,		• .	•	•						1.00	,(30)
Total fabric hea			(/	(0	,			(33) +	(36) =			29.2	1 (37)
Ventilation hea	t loss calcu	ulated	monthly	/				(38)m	= 0.33 × (	25)m x (5)	)		
		Mar						Sep	1	1	ì	7	



(38)m= 11.91	11.78	11.65	11	10.87	10.22	10.22	10.09	10.48	10.87	11.13	11.39		(38)
Heat transfer	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m= 41.12	40.99	40.86	40.2	40.07	39.42	39.42	39.29	39.68	40.07	40.33	40.59		
Heat loss pa	rameter (l	HIP) W	/m²K						Average = = (39)m ÷	Sum(39) <sub>1</sub>	12 /12=	40.17	(39)
(40)m= 0.82	<del></del>	0.81	0.8	0.8	0.78	0.78	0.78	0.79	0.8	0.8	0.81		
` /		!	<u> </u>		ļ	ļ	!		L Average =	Sum(40) <sub>1</sub>	12 /12=	0.8	(40)
Number of d	ays in mo	nth (Tab	le 1a)										_
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water he	ating ene	rgy requi	irement:								kWh/ye	ear:	
Assumed oc	cupancy.	N								1	.7		(42)
if TFA > 13	3.9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (	ΓFA -13.		.1	I	(12)
if TFA £ 13	•						(O.E. N.I)	00				1	
Annual avera Reduce the ann									se target o		.55		(43)
not more that 12	_				_	_							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage	e in litres pe	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m= 82	79.02	76.04	73.06	70.08	67.09	67.09	70.08	73.06	76.04	79.02	82		
										m(44) <sub>112</sub> =		894.6	(44)
Energy content	of hot water	used - cal	culated m	onthly $= 4$ .	190 x Vd,r	n x nm x E	OTm / 3600	kWh/mor	th (see Ta	bles 1b, 1	c, 1d)		
(45)m= 121.6	1 106.36	109.76	95.69	91.81	79.23	73.42	84.25	85.25	99.35	108.45	117.77		_
If instantaneous	water heati	ina at point	of use (no	hot wate	r storage).	enter 0 in	boxes (46		Total = Su	m(45) <sub>112</sub> =	=	1172.96	(45)
(46)m= 18.24	-	16.46	14.35	13.77	11.88	11.01	12.64	12.79	14.9	16.27	17.67		(46)
Water storage	1	10.40	14.33	13.77	11.00	11.01	12.04	12.79	14.5	10.27	17.07	I	(40)
Storage volu	me (litres	) includir	ng any so	olar or W	WHRS	storage	within sa	ame ves	sel		0		(47)
If community	heating a	and no ta	ınk in dw	elling, e	enter 110	litres in	(47)						
Otherwise if		hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	47)			
Water storag			(	!	(1.) (1.)	- /-l · · \ ·						l	(10)
a) If manufa				JI IS KIIO	WII (KVVI	i/uay).					0	] 	(48)
Temperature							(40) (40)				0	 	(49)
Energy lost f b) If manufa		-	-		or is not		(48) x (49)	) =		1	10		(50)
Hot water sto			-							0.	02		(51)
If community	_		on 4.3										
Volume factor			O.L							1.	.03		(52)
Temperature										0	.6		(53)
Energy lost f		_	, kWh/ye	ear			(47) x (51)	x (52) x (	53) =	-	.03		(54)
Enter (50) o	, , ,	•	for oach	month			((56) <del>~</del> = (	55) × (44):	<b>m</b>	1.	.03	J	(55)
Water storag		i		i	00.55		((56)m = (			00.5-	00.5	l	(50)
(56)m= 32.01 If cylinder conta		32.01	30.98	32.01 m = (56)m	30.98 x [(50) = (	32.01 H11)1 ÷ (5	32.01 0) else (5	30.98 7)m = (56)	32.01 m where (	30.98 H11) is fro	32.01	 ix H	(56)
				· ·								N   1	( <del></del> )
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)



Primary circuit loss (annual) from Table 3	0 (58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 x (41)m	
(modified by factor from Table H5 if there is solar water heating and a cylinder thermost	at)
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 23.26 23.26 23.26	22.51 23.26 (59)
Combi loss calculated for each month (61)m = (60) ÷ 365 x (41)m	
(61)m= 0 0 0 0 0 0 0 0 0 0	0 0 (61)
Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m + (45)m + (45)m + (45)m + (45)m + (45)m + (45)m + (45)m + (45)m + (45)m + (45)m + (45)m + (45)m $	6)m + (57)m + (59)m + (61)m
(62)m= 176.89 156.29 165.03 149.18 147.09 132.72 128.69 139.52 138.75 154.63	161.95 173.05 (62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution	n to water heating)
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	
(63)m= 0 0 0 0 0 0 0 0 0 0	0 0 (63)
Output from water heater	
(64)m= 176.89 156.29 165.03 149.18 147.09 132.72 128.69 139.52 138.75 154.63	161.95 173.05
Output from water heater (a	annual) <sub>112</sub> 1823.8 (64)
Heat gains from water heating, kWh/month 0.25 $^{\prime}$ [0.85 $\times$ (45)m + (61)m] + 0.8 $\times$ [(46)m +	(57)m + (59)m ]
(65)m= 84.66 75.31 80.72 74.61 74.75 69.14 68.63 72.23 71.14 77.26	78.86 83.38 (65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from	n community heating
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= 84.95 84.95 84.95 84.95 84.95 84.95 84.95 84.95 84.95 84.95	84.95 84.95 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
(67)m= 13.21 11.73 9.54 7.22 5.4 4.56 4.93 6.4 8.59 10.91	12.73 13.58 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	
(68)m= 148.01 149.55 145.68 137.44 127.04 117.26 110.73 109.2 113.07 121.31	131.71 141.48 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	
(69)m= 31.49 31.49 31.49 31.49 31.49 31.49 31.49 31.49 31.49 31.49	31.49 31.49 (69)
Pumps and fans gains (Table 5a)	· · · · · · · · · · · · · · · · · · ·
(70)m= 0 0 0 0 0 0 0 0 0 0	0 0 (70)
Losses e.g. evaporation (negative values) (Table 5)	<del></del>
(71)m= -67.96 -67.96 -67.96 -67.96 -67.96 -67.96 -67.96 -67.96 -67.96 -67.96 -67.96	-67.96 -67.96 (71)
Water heating gains (Table 5)	<u> </u>
(72)m= 113.79 112.06 108.49 103.63 100.47 96.03 92.25 97.09 98.81 103.84	109.52 112.07 (72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (71)m$	m + (72)m
(73)m= 323.49 321.83 312.19 296.77 281.39 266.33 256.39 261.17 268.95 284.54 3	302.45 315.61 (73)
6. Solar gains:	
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable	orientation.
Orientation: Access Factor Area Flux g_	FF Gains
	ole 6c (W)
East 0.9x 0.77 x 8.16 x 19.64 x 0.4 x	0.7 = 31.1 (76)
East 0.9x 0.77 x 2.72 x 19.64 x 0.4 x	0.7 = 10.37 (76)



East	0.9x	0.77		X	8.1	6	X	3	8.42	X		0.4	x	0.7	-	= [	60.83	(76)
East	0.9x	0.77		X	2.7	2	X	3	8.42	x		0.4	x	0.7		<u> </u>	20.28	(76)
East	0.9x	0.77		X	8.1	6	X	6	3.27	X		0.4	x	0.7		- [	100.18	(76)
East	0.9x	0.77		X	2.7	2	X	6	3.27	X		0.4	x	0.7		- [	33.39	(76)
East	0.9x	0.77		X	8.1	6	X	9	2.28	X		0.4	x	0.7	-	- [	146.11	(76)
East	0.9x	0.77		X	2.7	2	X	9	2.28	X		0.4	х	0.7		= [	48.7	(76)
East	0.9x	0.77		X	8.1	6	X	11	13.09	X		0.4	x	0.7		= [	179.07	(76)
East	0.9x	0.77		X	2.7	2	X	11	13.09	x		0.4	x	0.7		= [	59.69	(76)
East	0.9x	0.77		X	8.1	6	X	11	15.77	X		0.4	x	0.7		= [	183.31	(76)
East	0.9x	0.77		X	2.7	2	X	11	15.77	X		0.4	x	0.7		- [	61.1	(76)
East	0.9x	0.77		X	8.1	6	X	11	10.22	X		0.4	x	0.7	-	= [	174.52	(76)
East	0.9x	0.77		X	2.7	2	X	11	10.22	X		0.4	x	0.7		= [	58.17	(76)
East	0.9x	0.77		X	8.1	6	X	9	4.68	X		0.4	x	0.7		- [	149.91	(76)
East	0.9x	0.77		X	2.7	2	X	9	4.68	X		0.4	x	0.7	-	- [	49.97	(76)
East	0.9x	0.77		X	8.1	6	X	7	3.59	X		0.4	x	0.7		= [	116.52	(76)
East	0.9x	0.77		X	2.7	2	X	7	3.59	X		0.4	x	0.7		= [	38.84	(76)
East	0.9x	0.77		X	8.1	6	X	4	5.59	X		0.4	x	0.7		= [	72.18	(76)
East	0.9x	0.77		X	2.7	2	X	4	5.59	Х		0.4	X	0.7	-	= [	24.06	(76)
East	0.9x	0.77		X	8.1	6	х	2	4.49	x		0.4	x	0.7		- [	38.78	(76)
East	0.9x	0.77		X	2.7	2	X	2	4.49	x		0.4	x	0.7	=	= [	12.93	(76)
East	0.9x	0.77		X	8.1	6	X	1	6.15	x		0.4	x	0.7	=	- [	25.57	(76)
East	0.9x	0.77		X	2.7	2	X	1	6.15	Х		0.4	x	0.7		= [	8.52	(76)
Solar	gains in	watts, ca	alcula	ted	for eacl	n month	1			(83)m	= Sun	n(74)m .	(82)m		1	_		
(83)m=	41.46	81.11	133.		194.82	238.76		44.41	232.69	199.	.88	155.36	96.25	51.7	34.1			(83)
	_	nternal a		_	<del>`                                    </del>		<del>`</del>							1				(0.4)
(84)m=	364.96	402.94	445.	//	491.59	520.15	5	10.74	489.08	461.	.05   4	424.31	380.79	354.15	349.7	1		(84)
		nal temp																_
Temp	perature	during h	eatin	g pe	eriods ir	the liv	ing	area f	rom Tab	ole 9,	Th1	(°C)					21	(85)
Utilis		tor for ga		$\neg$			Ť							_	1	_		
	Jan	Feb	Ma	$\rightarrow$	Apr	May	+	Jun	Jul	_	ug	Sep	Oct	_	Ded	=		(2.5)
(86)m=	0.99	0.99	0.9	6	0.87	0.69	(	0.49	0.35	0.3	39	0.63	0.91	0.98	0.99			(86)
Mear		l temper	ature	in I	iving are	ea T1 (f	ollo	w ste	os 3 to 7	in T	able	9c)		_		_		
(87)m=	20.36	20.48	20.6	37	20.88	20.98		21	21	21	1	20.99	20.86	20.58	20.33	3		(87)
Temp	erature	during h	eatin	g pe	eriods ir	rest of	dw	elling	from Ta	able 9	9, Th2	2 (°C)						
(88)m=	20.24	20.24	20.2	24	20.25	20.26	2	20.27	20.27	20.2	27	20.26	20.26	20.25	20.25	5		(88)
Utilis	ation fac	tor for ga	ains f	or r	est of d	welling,	h2,	,m (se	e Table	9a)						_		
(89)m=	0.99	0.98	0.9		0.84	0.65	_	0.44	0.3	0.3	33	0.57	0.88	0.98	0.99			(89)
Mear	interna	l tempera	ature	in t	he rest	of dwel	lina	T2 (fc	ollow ste	eps 3	to 7	in Table	e 9c)	-				
(90)m=	19.38	19.56	19.8	$\overline{}$	20.12	20.24	Ť	20.27	20.27	20.2		20.26	20.1	19.71	19.36	3		(90)
			<u> </u>	!		<u> </u>			<u> </u>			fl	LA = Liv	ing area ÷ (	4) =	寸	0.59	(91)
																L		_



Mean internal temperature (for the whole dwelling) = fLA	× T1 + (1 – fL	A) × T2					
	0.7 20.7	20.69	20.55	20.22	19.93		(92)
Apply adjustment to the mean internal temperature from T	Table 4e, whe	ere appro	opriate				
(93)m= 19.95 20.1 20.33 20.57 20.67 20.7 2	0.7 20.7	20.69	20.55	20.22	19.93		(93)
8. Space heating requirement							
Set Ti to the mean internal temperature obtained at step 1	11 of Table 9l	b, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
the utilisation factor for gains using Table 9a  Jan Feb Mar Apr May Jun C	Jul Aug	Sep	Oct	Nov	Dec		
Utilisation factor for gains, hm:	di   Aug	Оер	Oct	INOV	Dec		
	.33 0.37	0.61	0.89	0.98	0.99		(94)
Useful gains, hmGm , W = (94)m x (84)m			ı				
(95)m= 361.3 394.91 422.83 418.01 349.97 239.6 16	1.46 168.77	257.69	339.27	346.08	346.95		(95)
Monthly average external temperature from Table 8							
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 1	6.6 16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate for mean internal temperature, Lm , W =[(3	1	<del> </del>	<del> </del>				(07)
(* /	1.51 168.87	261.37	398.58	529.17	638.62		(97)
Space heating requirement for each month, kWh/month = (98)m= 210.04 153.21 105.68 36.75 7.06 0	0.024 X [(97]	)m – (95 0	)MJ X (4 44.12	1)m 131.83	217		
(50)111- 210.04 133.21 103.00 30.73 7.00 0		l per year	<u> </u>		Ц	905.7	(98)
Coppe heating requirement in IdMh/m2/year	Tota	ii pei yeai	(KWII/yeai	) = Sum(9	O)15,912 —		=
Space heating requirement in kWh/m²/year			_			18.01	(99)
9b. Energy requirements – Community heating scheme			-	., ,		_	
This part is used for space heating, space cooling or water Fraction of space heat from secondary/supplementary hea				unity scr	neme.	0	(301)
Fraction of space heat from community system 1 – (301) =						1	(302)
The community scheme may obtain heat from several sources. The process	edure allows for	CHP and t	up to four	other heat	sources; th	ne latter	
includes boilers, heat pumps, geothermal and waste heat from power state			•		,		_
Fraction of heat from Community heat pump						0.7	(303a)
Fraction of community heat from heat source 2						0.3	(303b)
Fraction of total space heat from Community heat pump			(3	02) x (303	a) =	0.7	(304a)
Fraction of total space heat from community heat source 2			(3	02) x (303	b) =	0.3	(304b)
Factor for control and charging method (Table 4c(3)) for co	mmunity hea	ating sys	tem			1	(305)
Distribution loss factor (Table 12c) for community heating s	system					1.1	(306)
Space heating					_	kWh/yea	<u>r_</u>
Annual space heating requirement						905.7	
Space heat from Community heat pump		(98) x (30	04a) x (30	5) x (306)	= [	697.39	(307a)
Space heat from heat source 2		(98) x (30	04b) x (30	5) x (306)	= [	298.88	(307b)
Efficiency of secondary/supplementary heating system in %	% (from Table	4a or A	ppendix	E)		0	(308
Space heating requirement from secondary/supplementary	system	(98) x (30	01) x 100 -	÷ (308) =		0	(309)
Water heating					=		
Annual water heating requirement							1
14 T 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1						1823.8	
If DHW from community scheme: Water heat from Community heat pump		(64) × (0)	12a) w (20)	5) x (306) :	] 	1823.8	(310a)



Water heat from heat source 2	(64) x (303b) x (305) x (306) =	601.85	(310b)
Electricity used for heat distribution	0.01 × [(307a)(307e) + (310a)(310e)] =	30.02	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from	m outside	109.77	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	☐ (330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	109.77	(331)
Energy for lighting (calculated in Appendix L)		233.27	(332)
12b. CO2 Emissions – Community heating scheme			
	Energy Emission factor kWh/year kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHF Efficiency of heat source 1 (%)  If there is CHP us	) ing two fuels repeat (363) to (366) for the second fue	294	(367a)
, , ,	ing two fuels repeat (363) to (366) for the second fue		](367b)
	)+(310b)] x 100 ÷ (367b) x 0.52 =	371.02	(367)
	)+(310b)] x 100 ÷ (367b) x 0.22 =		](368)
Electrical energy for heat distribution	[(313) x 0.52		](372)
Total CO2 associated with community systems	(363)(366) + (368)(372)		](373)
CO2 associated with space heating (secondary)	(309) x 0 =		(374)
CO2 associated with water from immersion heater or instanta	neous heater (312) x 0.22	0	」 [375]
Total CO2 associated with space and water heating	(373) + (374) + (375) =	590.11	] (376)
CO2 associated with electricity for pumps and fans within dwe	elling (331)) x 0.52 =	56.97	] (378)
CO2 associated with electricity for lighting	(332))) x 0.52 =	121.07	(379)
Total CO2, kg/year sum of (376)(382) =		768.15	(383)
Total CO2, kg/year $sum of (376)(382) =$ Dwelling CO2 Emission Rate $(383) \div (4) =$		768.15 15.27	(383) (384)

El rating (section 14)

(385)



User Details: **Assessor Name:** Stroma Number: Stroma FSAP 2012 **Software Version: Software Name:** Version: 1.0.5.12 Property Address: E5-03 Address: 1. Overall dwelling dimensions Av. Height(m) Area(m²) Volume(m³) Ground floor 74.5 (1a) x 2.7 (2a) =201.15 (3a) Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)(4)74.5 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =201.15 (5) total m<sup>3</sup> per hour main secondary other heating heating x 40 =Number of chimneys (6a) 0 0 x 20 =Number of open flues 0 0 0 (6b) Number of intermittent fans x 10 =(7a)0 0 x 10 =Number of passive vents (7b) 0 0 x 40 =Number of flueless gas fires 0 (7c)Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = $\div (5)$ (8) If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9)0 Additional infiltration [(9)-1]x0.1 =0 (10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)0 if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12)If no draught lobby, enter 0.05, else enter 0 (13)0 Percentage of windows and doors draught stripped (14)0 Window infiltration  $0.25 - [0.2 \times (14) \div 100] =$ 0 (15)Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =O (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)3 If based on air permeability value, then  $(18) = [(17) \div 20] + (8)$ , otherwise (18) = (16)0.15 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)2  $(20) = 1 - [0.075 \times (19)] =$ Shelter factor (20)0.85  $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.13 Infiltration rate modified for monthly wind speed Jan Feb Jul Sep Mar Apr May Jun Aug Oct Nov Dec Monthly average wind speed from Table 7 (22)m =5.1 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor  $(22a)m = (22)m \div 4$ (22a)m 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18



Adjusted infiltration rate (allow	ving for shelter ar	nd wind sn	need) =	(21a) x	(22a)m					
0.16 0.16 0.16	0.14 0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15	]	
Calculate effective air change	rate for the appl	icable cas	se		ļ				]	
If mechanical ventilation:									0.5	(23a)
If exhaust air heat pump using App						) = (23a)			0.5	(23b)
If balanced with heat recovery: effi									76.5	(23c)
a) If balanced mechanical v	1		<del>-                                    </del>		<del>í `</del>	<del> </del>	<del>-                                    </del>	<del>``</del>	÷ 100]	4
(24a)m= 0.28 0.28 0.27	0.26 0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27		(24a)
b) If balanced mechanical v	1 1			, ` <u> </u>	<del>i `</del>	<del> </del>	<del>-                                    </del>	ı	1	4- 44
(24b)m= 0 0 0	0 0	0	0	0	0	0	0	0		(24b)
c) If whole house extract ve	•	•				F (00k				
if $(22b)m < 0.5 \times (23b)$ ,	then $(24c) = (23c)$	o); otnerw	1se (240	(22)	o) m + 0.	$5 \times (230)$	0		1	(24c)
( 1)		با ــــــــــــــــــــــــــــــــــــ				U	0	0	J	(240)
d) If natural ventilation or wif (22b)m = 1, then (24d	•					0.5]			_	
(24d)m = 0 0 0	0 0	0	0	0	0	0	0	0		(24d)
Effective air change rate - e	enter (24a) or (24	b) or (24c)	or (24	d) in box	x (25)				_	
(25)m= 0.28 0.28 0.27	0.26 0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27		(25)
3. Heat losses and heat loss	parameter:								_	
ELEMENT Gross	Openings	Net Are	a	U-val	ue	AXU		k-value	9	ΑΧk
area (m²)	m <sup>2</sup>	A ,m	2	W/m2	2K	(VV/I	<)	kJ/m².	K	kJ/K
Doo <mark>rs</mark>		1.89	х	1.4	= [	2.646				(26)
Windows Type 1		5.42	x1/	[1/( 1.2 )+	0.04] =	6.21				(27)
Windows Type 2		2.72	x1/	[1/( 1.2 )+	0.04] =	3.11				(27)
Windows Type 3		5.42	x1/	[1/( 1.2 )+	0.04] =	6.21				(27)
Walls Type1 46.17	24.4	21.77	х	0.16		3.48				(29)
Walls Type2 11.07	1.89	9.18	x	0.15		1.38				(29)
Roof 74.5	0	74.5	x	0.12	<b>=</b> i	8.94	Ħ i		7 <b>7</b>	(30)
Total area of elements, m <sup>2</sup>		131.74	= '							(31)
Party wall		35.64	x	0		0				(32)
Party floor		74.5	╡ '						<b>=</b>	(32a)
* for windows and roof windows, use		alue calcula	ted using	formula 1	/[(1/U-valu	ıe)+0.04] a	L ns given in	paragrapl	1 3.2	\` ′
** include the areas on both sides of	•	rtitions		(26)(30)	)					
Fabric heat loss, $W/K = S(A)$	( 0)			(20)(30)		(00) - (00	2) - (00-)	(00-)	44.39	(33)
Heat capacity $Cm = S(A \times k)$	ID O TEA):	. l. 1/2226			., ,	.(30) + (32	, , ,	(32e) =	0	(34)
Thermal mass parameter (TM	,		l	:		tive Value:		-61- 45	250	(35)
For design assessments where the d can be used instead of a detailed call		uon are not r	Kriowri pre	ecisely trie	e indicative	values of	IIVIP III T	арте п		
Thermal bridges : S (L x Y) ca	lculated using A	opendix K							20.56	(36)
if details of thermal bridging are not k Total fabric heat loss	$(36) = 0.05 \times (36)$	31)			(33) +	(36) =			64.05	(37)
Ventilation heat loss calculate	d monthly					$= 0.33 \times ($	25)m x (5)	1	64.95	(37)
Jan Feb Mar	Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
L Gail   1 GD   Wal	I THI I Way	Juli	Jui	Aug	Годр	1 001	1 1100	l Dec	J	



(38)m=	18.59	18.38	18.17	17.11	16.9	15.84	15.84	15.63	16.26	16.9	17.32	17.74		(38)
Heat trai	nsfer c	oefficier	nt, W/K						(39)m	= (37) + (	38)m			
(39)m=	83.54	83.32	83.11	82.05	81.84	80.78	80.78	80.57	81.21	81.84	82.27	82.69		_
Heat los	s para	meter (H	HP) W/	/m²K						Average = = (39)m ÷	Sum(39) <sub>1.</sub>	12 /12=	82	(39)
	1.12	1.12	1.12	1.1	1.1	1.08	1.08	1.08	1.09	1.1	1.1	1.11		
<u> </u>				!			Į.		,	Average =	Sum(40) <sub>1</sub> .	12 /12=	1.1	(40)
Number	<del>.                                    </del>		<del>`</del>	<del></del>			<del></del>				·		I	
(41)m-	Jan 31	Feb 28	Mar 31	Apr 30	May 31	Jun 30	Jul 31	Aug 31	Sep 30	Oct 31	Nov 30	Dec 31		(41)
(41)m=	31	20	31	30	31	30	31	31	30	31	30	31		(41)
4 Wate	er heat	ing ener	rgy requi	irement:								kWh/ye	ar.	
				nomont.								1 ( V V I I / Y V	par.	
Assumed if TFA				:[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x ( <sup>-</sup>	ΓFA -13.		35		(42)
if TFA	£ 13.9	9, N = 1				·		, , <u>-</u>	,				•	
Annual a										se target o		0.02		(43)
not more t		_				_	_			J				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water	usage ir	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m=	99.02	95.42	91.82	88.22	84.62	81.02	81.02	84.62	88.22	91.82	95.42	99.02		_
Energy co	ntent of	hot water	used - cal	culated mo	onthly = $4$ .	190 x Vd.r	n x nm x E	OTm / 3600			m(44) <sub>112</sub> =		1080.22	(44)
	146.84	128.43	132.53	115.54	110.87	95.67	88.65	101.73	102.94	119.97	130.96	142.21		
` '   L								l	-	Γotal = Su	m(45) <sub>112</sub> =	  -	1416.34	(45)
If instantar	neous w	ater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)	) to (61)				•	
` '	22.03	19.26	19.88	17.33	16.63	14.35	13.3	15.26	15.44	18	19.64	21.33		(46)
Water st Storage			includin	na anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If commi		` ,		•			•					0	I	(,
Otherwis	-	•			_			. ,	ers) ente	er '0' in (	47)			
Water st	-		ا لم معمام م	foot	ممادة	/1.\^/b	- /d · \ .						l	(40)
a) If ma					or is kno	wn (Kvvr	i/day):					0	<u> </u>	(48)
Tempera Energy l					aar			(48) x (49)	١ –			0	] <b>[</b>	(49)
b) If ma			•	-		or is not		(40) X (43)	, –		1	10		(50)
Hot water		_			e 2 (kW	h/litre/da	ıy)				0.	02		(51)
If common	-	•		on 4.3									l	(50)
Tempera				2b								.6		(52) (53)
Energy I					ear			(47) x (51)	) x (52) x (	53) =		.03		(54)
Enter (5			-	,				, , , ,		,		.03		(55)
Water st	orage	loss cal	culated f	for each	month			((56)m = (	55) × (41)ı	m				
(56)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder	contains	dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	ix H	
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)



Primary circuit loss (annual) from Table 3	(58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 x (41)m	
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26	(59)
Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$	
(61)m= 0 0 0 0 0 0 0 0 0 0 0 0	(61)
Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m + (46)m + (57)m + (59)m + (61)m$	1
(62)m= 202.12 178.36 187.81 169.04 166.14 149.16 143.93 157 156.44 175.25 184.45 197.49	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)	
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	
(63)m= 0 0 0 0 0 0 0 0 0 0 0 0	(63)
Output from water heater	
(64)m= 202.12 178.36 187.81 169.04 166.14 149.16 143.93 157 156.44 175.25 184.45 197.49	
Output from water heater (annual) <sub>112</sub> 2067.18	(64)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 × (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]	
(65)m= 93.05 82.65 88.29 81.21 81.08 74.6 73.7 78.05 77.02 84.11 86.34 91.51	(65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating	
5. Internal gains (see Table 5 and 5a):	
Metabolic gains (Table 5), Watts	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
(66)m= 117.51 117.51 117.51 117.51 117.51 117.51 117.51 117.51 117.51 117.51 117.51 117.51	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
(67)m= 18.5 16.44 13.37 10.12 7.56 6.39 6.9 8.97 12.04 15.29 17.84 19.02	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	
(68)m= 207.56 209.72 204.29 192.74 178.15 164.44 155.28 153.13 158.56 170.11 184.7 198.41	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	
(69)m= 34.75 34.75 34.75 34.75 34.75 34.75 34.75 34.75 34.75 34.75 34.75 34.75	(69)
Pumps and fans gains (Table 5a)	
(70)m= 0 0 0 0 0 0 0 0 0 0 0	(70)
Losses e.g. evaporation (negative values) (Table 5)	
(71)m= -94.01 -94.01 -94.01 -94.01 -94.01 -94.01 -94.01 -94.01 -94.01 -94.01 -94.01 -94.01 -94.01	(71)
Water heating gains (Table 5)	
(72)m= 125.06 122.98 118.67 112.8 108.98 103.62 99.06 104.9 106.98 113.05 119.91 122.99	(72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m$	
(73)m= 409.39 407.39 394.58 373.9 352.95 332.7 319.49 325.25 335.83 356.7 380.71 398.67	(73)
6. Solar gains:	
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.	
Orientation: Access Factor Area Flux g_ FF Gains	
Table 6d m² Table 6a Table 6b Table 6c (W)	
South 0.9x 0.77 x 2.72 x 46.75 x 0.4 x 0.7 = 24.68	(78)
South 0.9x 0.77 x 5.42 x 46.75 x 0.4 x 0.7 = 98.34	(78)



South	0.9x	0.77	)		2.72	X	7	6.57	X		0.4	x	0.7	=	40.41	(78)
South	0.9x	0.77	)		5.42	X	7	6.57	X		0.4	x	0.7	=	161.05	(78)
South	0.9x	0.77	)		2.72	X	9	7.53	X		0.4	x	0.7	=	51.48	(78)
South	0.9x	0.77	)		5.42	X	9	7.53	X		0.4	x	0.7	=	205.15	(78)
South	0.9x	0.77	<b>)</b>		2.72	X	1	10.23	X		0.4	x	0.7	=	58.18	(78)
South	0.9x	0.77	)		5.42	X	1	10.23	X		0.4	x	0.7	=	231.87	(78)
South	0.9x	0.77	)		2.72	X	1	14.87	X		0.4	x	0.7	=	60.63	(78)
South	0.9x	0.77	)		5.42	X	1	14.87	X		0.4	x	0.7	=	241.62	(78)
South	0.9x	0.77	)		2.72	X	1	10.55	X		0.4	x	0.7	=	58.35	(78)
South	0.9x	0.77	)		5.42	X	1	10.55	X		0.4	x	0.7	=	232.53	(78)
South	0.9x	0.77	)		2.72	X	10	08.01	X		0.4	x	0.7	=	57.01	(78)
South	0.9x	0.77	)		5.42	X	10	08.01	X		0.4	x	0.7	=	227.19	(78)
South	0.9x	0.77	)		2.72	X	10	04.89	X		0.4	x	0.7	=	55.36	(78)
South	0.9x	0.77	)		5.42	X	10	04.89	X		0.4	x	0.7	=	220.63	(78)
South	0.9x	0.77	)		2.72	X	10	01.89	X		0.4	x	0.7	=	53.77	(78)
South	0.9x	0.77	>		5.42	X	10	01.89	X		0.4	x	0.7	=	214.31	(78)
South	0.9x	0.77	)		2.72	X	8	2.59	X		0.4	x	0.7	=	43.59	(78)
South	0.9x	0.77	)		5.42	X	8	2.59	Х		0.4	X	0.7	=	173.71	(78)
South	0.9x	0.77	,		2.72	х	5	5.42	] x		0.4	x	0.7	=	29.25	(78)
South	0.9x	0.77	<b>)</b>		5.42	Х	5	5.42	] x		0.4	x	0.7	=	116.56	(78)
South	0.9x	0.77	)		2.72	X	4	10.4	x		0.4	x	0.7	=	21.32	(78)
Sout <mark>h</mark>	0.9x	0.77	<b>)</b>		5.42	x	4	10.4	Х		0.4	x	0.7	=	84.97	(78)
West	0.9x	0.77	<b>)</b>		5.42	х	1	9.64	X		0.4	x	0.7	=	41.31	(80)
West	0.9x	0.77	)		5.42	х	3	8.42	X		0.4	x	0.7	=	80.81	(80)
West	0.9x	0.77	)		5.42	X	6	3.27	X		0.4	x	0.7	=	133.09	(80)
West	0.9x	0.77	)		5.42	X	9	2.28	X		0.4	x	0.7	=	194.1	(80)
West	0.9x	0.77	)		5.42	X	1	13.09	X		0.4	x	0.7	=	237.88	(80)
West	0.9x	0.77	)		5.42	X	1	15.77	X		0.4	x	0.7	=	243.51	(80)
West	0.9x	0.77	)		5.42	X	1	10.22	X		0.4	x	0.7	=	231.83	(80)
West	0.9x	0.77	>		5.42	X	9	4.68	X		0.4	x	0.7	=	199.14	(80)
West	0.9x	0.77	)		5.42	X	7	3.59	X		0.4	x	0.7	=	154.79	(80)
West	0.9x	0.77	)		5.42	X	4	5.59	X		0.4	x	0.7	=	95.89	(80)
West	0.9x	0.77	)		5.42	X	2	4.49	X		0.4	x	0.7	=	51.51	(80)
West	0.9x	0.77	)		5.42	X	1	6.15	X		0.4	x	0.7	=	33.97	(80)
ו				_	r each mont	$\overline{}$			<del></del>		m(74)m				1	
(83)m=	164.32	282.28	389.72		84.15 540.13	L_	534.38	516.03	475	5.14	422.87	313.19	197.32	140.27		(83)
Ĭ				·	4)m = (73)m	_			T 000		750.00	000.00	570.00	500.04	1	(04)
(84)m=	573.71	689.67	784.29		58.05 893.08		867.08	835.52	800	1.39	758.69	669.89	578.03	538.94		(84)
					eating seaso											
-		_	_		ods in the li	_			ble 9	, Th1	(°C)				21	(85)
Utilisa I		Ť		т —	ng area, h1,	Ť				Т			T		l	
	Jan	Feb	Mar		Apr May	/	Jun	Jul	<u> </u>	ug	Sep	Oct	Nov	Dec		



(86)m= 0.99 0.98 0.96 0.89 0.77 0.58 0.42 0.46 0.69 0.92 0.99 1		(86)
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)		
(87)m= 19.95 20.16 20.43 20.71 20.9 20.98 21 21 20.96 20.7 20.27 19.92		(87)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)		
(88)m= 19.98 19.99 19.99 20 20 20.01 20.01 20.02 20.01 20 20 19.99		(88)
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)		
(89)m= 0.99 0.98 0.95 0.86 0.71 0.5 0.33 0.36 0.61 0.89 0.98 0.99		(89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)		
(90)m= 18.61 18.91 19.28 19.68 19.91 20 20.01 20.01 19.98 19.68 19.08 18.56		(90)
fLA = Living area ÷ (4) =	0.36	(91)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$		_
(92)m= 19.09 19.36 19.69 20.05 20.27 20.35 20.37 20.37 20.33 20.05 19.51 19.05		(92)
Apply adjustment to the mean internal temperature from Table 4e, where appropriate		
(93)m= 19.09 19.36 19.69 20.05 20.27 20.35 20.37 20.37 20.33 20.05 19.51 19.05		(93)
8. Space heating requirement		
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate utilisation factor for gains using Table 9a	ulate	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec		
Utilisation factor for gains, hm:		
(94)m= 0.99 0.97 0.94 0.86 0.72 0.53 0.36 0.4 0.64 0.89 0.98 0.99		(94)
Useful gains, hmGm , W = (94)m x (84)m		
(95)m= 567.65 672.32 738.75 741.82 646.35 456.66 303.35 318.15 484.03 598.08 564.54 534.63		(95)
Monthly average external temperature from Table 8		(00)
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2		(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m] (97)m= 1235.69 1204.56 1096.64 915.12 701.26 464.9 304.3 319.66 505.86 773.25 1020.6 1227.8		(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m		(01)
(98)m= 497.02 357.66 266.27 124.77 40.86 0 0 0 130.33 328.37 515.71		
Total per year (kWh/year) = Sum(98) <sub>15912</sub> =	2260.99	(98)
Space heating requirement in kWh/m²/year	30.35	(99)
9b. Energy requirements – Community heating scheme		
This part is used for space heating, space cooling or water heating provided by a community scheme.		
Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none	0	(301)
Fraction of space heat from community system 1 – (301) =	1	(302)
The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; th	e latter	
includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.		_
Fraction of heat from Community heat pump	0.7	(303a)
Fraction of community heat from heat source 2	0.3	(303b)
Fraction of total space heat from Community heat pump (302) x (303a) =	0.7	(304a)
Fraction of total space heat from community heat source 2 (302) x (303b) =	0.3	(304b)
Factor for control and charging method (Table 4c(3)) for community heating system	1	(305)
· · · · · · · L		



Distribution loss factor (Table 12c) for community heating sys	tem		1.1	(306)
Space heating			kWh/yea	r
Annual space heating requirement			2260.99	
Space heat from Community heat pump	(98) x (304a) x	(305) x (306) =	1740.97	(307a)
Space heat from heat source 2	(98) x (304b) x	(305) x (306) =	746.13	(307b)
Efficiency of secondary/supplementary heating system in % (	from Table 4a or Apper	ndix E)	0	(308
Space heating requirement from secondary/supplementary sy	ystem (98) x (301) x 1	100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement			2067.18	7
If DHW from community scheme: Water heat from Community heat pump	(64) x (303a) x	(305) x (306) =	1591.73	(310a)
Water heat from heat source 2	(64) x (303b) x	(305) x (306) =	682.17	(310b)
Electricity used for heat distribution	0.01 × [(307a)(307	'e) + (310a)(310e)] =	47.61	(313)
Cooling System Energy Efficiency Ratio			0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0	= (107) ÷ (314)	=	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from	om outside		162.58	(330a)
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	b) + (330g) =	162.58	(331)
Energy for lighting (calculated in Appendix L)			326.8	(332)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission facto kg CO2/kWh	r Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHR	P) sing two fuels repeat (363) to	(366) for the second fi	uol -	<b>7</b>
	sing two fuels repeat (363) to		204	(367a)
Emolority of float obtained 2 (70)		,	95.0	(367b)
	o)+(310b)] x 100 ÷ (367b) x	0.52	588.32	(367)
·	o)+(310b)] x 100 ÷ (367b) x	0.22	322.71	(368)
Electrical energy for heat distribution	[(313) x	0.52	= 24.71	(372)
Total CO2 associated with community systems	(363)(366) + (368)(373	2)	935.74	(373)
CO2 associated with space heating (secondary)	(309) x	0	= 0	(374)
CO2 associated with water from immersion heater or instanta	ineous heater (312) x	0.52	= 0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =		935.74	(376)
CO2 associated with electricity for pumps and fans within dw	elling (331)) x	0.52	= 84.38	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	169.61	(379)
<b>Total CO2, kg/year</b> sum of (376)(382) =			1189.73	(383)





Dwelling CO2 Emission Rate  $(383) \div (4) =$  El rating (section 14)

15.97 (384) 86.66 (385)



User Details: **Assessor Name:** Stroma Number: Stroma FSAP 2012 **Software Version: Software Name:** Version: 1.0.5.12 Property Address: EB1-04 Address: 1. Overall dwelling dimensions Av. Height(m) Area(m²) Volume(m³) Ground floor 72.7 (1a) x 2.7 (2a) =196.29 (3a) Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)(4)72.7 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =196.29 (5) total m<sup>3</sup> per hour main secondary other heating heating x 40 =Number of chimneys (6a) 0 0 x 20 =Number of open flues 0 0 0 (6b) Number of intermittent fans x 10 =(7a)0 0 x 10 =Number of passive vents (7b) 0 0 x 40 =Number of flueless gas fires 0 (7c)Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = $\div (5)$ (8) If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9)0 Additional infiltration [(9)-1]x0.1 =0 (10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)0 if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12)If no draught lobby, enter 0.05, else enter 0 (13)0 Percentage of windows and doors draught stripped (14)0 Window infiltration  $0.25 - [0.2 \times (14) \div 100] =$ 0 (15)Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =O (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)3 If based on air permeability value, then  $(18) = [(17) \div 20] + (8)$ , otherwise (18) = (16)0.15 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)2  $(20) = 1 - [0.075 \times (19)] =$ Shelter factor (20)0.85  $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.13 Infiltration rate modified for monthly wind speed Jan Feb Jul Sep Mar Apr May Jun Aug Oct Nov Dec Monthly average wind speed from Table 7 (22)m =5.1 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor  $(22a)m = (22)m \div 4$ (22a)m 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18



Adjusted infiltration rate (allowing for shelter and wind speed) =	21a) x (22a)m
0.16	0.12 0.13 0.14 0.14 0.15
Calculate effective air change rate for the applicable case	
If mechanical ventilation:	0.5 (23
If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N	- 11 · 11 ·
If balanced with heat recovery: efficiency in % allowing for in-use factor (from	10.0
a) If balanced mechanical ventilation with heat recovery (MVH	
(24a)m= 0.28 0.28 0.27 0.26 0.25 0.24 0.24	0.24   0.24   0.25   0.26   0.27   (24
b) If balanced mechanical ventilation without heat recovery (M	<del></del>
(24b)m= 0 0 0 0 0 0 0 0	0 0 0 0 0
c) If whole house extract ventilation or positive input ventilation if $(22b)m < 0.5 \times (23b)$ , then $(24c) = (23b)$ ; otherwise $(24c)$	
(24c)m =	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$
d) If natural ventilation or whole house positive input ventilatio	
if $(22b)m = 1$ , then $(24d)m = (22b)m$ otherwise $(24d)m = 0$	
(24d)m= 0 0 0 0 0 0 0	0 0 0 0 0 (24
Effective air change rate - enter (24a) or (24b) or (24c) or (24c)	) in box (25)
(25)m= 0.28 0.28 0.27 0.26 0.25 0.24 0.24	0.24 0.24 0.25 0.26 0.27 (25
3. Heat losses and heat loss parameter:	
ELEMENT Gross Openings Net Area	U-value A X U k-value A X k
area (m²) m² A ,m²	W/m2K
Death	
Doors 1.89 x	1.4 = 2.646
1.00	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$
Windows Type 1	
Windows Type 1 2.72 x1/1 Windows Type 2 2.72 x1/1	$\frac{1}{(1.2) + 0.04} = 3.11 \tag{27}$
Windows Type 1  Windows Type 2  Windows Type 3  2.72  x1/[  2.72  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[  x1/[	$\frac{1}{(1.2) + 0.04} = 3.11$ $\frac{1}{(1.2) + 0.04} = 3.11$ (27)
Windows Type 1       2.72       x1/1         Windows Type 2       2.72       x1/1         Windows Type 3       5.42       x1/1         Windows Type 4       2.18       x1/1	$\frac{1}{(1.2) + 0.04} = 3.11$ $\frac{1}{(1.2) + 0.04} = 3.11$ $\frac{1}{(1.2) + 0.04} = 6.21$ (27)
Windows Type 1       2.72       x1/I         Windows Type 2       2.72       x1/I         Windows Type 3       5.42       x1/I         Windows Type 4       2.18       x1/I	$\frac{1}{(1.2) + 0.04} = 3.11$ $\frac{1}{(1.2) + 0.04} = 3.11$ $\frac{1}{(1.2) + 0.04} = 6.21$ $\frac{1}{(1.2) + 0.04} = 2.5$ (27)
Windows Type 1       2.72       x1/1         Windows Type 2       2.72       x1/1         Windows Type 3       5.42       x1/1         Windows Type 4       2.18       x1/1         Windows Type 5       2.18       x1/1	$ \frac{1}{(1.2) + 0.04} = 3.11 \qquad (27) $ $ \frac{1}{(1.2) + 0.04} = 3.11 \qquad (27) $ $ \frac{1}{(1.2) + 0.04} = 6.21 \qquad (27) $ $ \frac{1}{(1.2) + 0.04} = 2.5 \qquad (27) $ $ \frac{1}{(1.2) + 0.04} = 2.5 \qquad (27) $
Windows Type 1       2.72       x1/I         Windows Type 2       2.72       x1/I         Windows Type 3       5.42       x1/I         Windows Type 4       2.18       x1/I         Windows Type 5       2.18       x1/I         Floor       72.7       x	$ \frac{1}{(1.2) + 0.04} = 3.11 \qquad (27) $ $ \frac{1}{(1.2) + 0.04} = 3.11 \qquad (27) $ $ \frac{1}{(1.2) + 0.04} = 6.21 \qquad (27) $ $ \frac{1}{(1.2) + 0.04} = 2.5 \qquad (27) $ $ \frac{1}{(1.2) + 0.04} = 2.5 \qquad (27) $ $ \frac{1}{(1.2) + 0.04} = 8.723999 \qquad (28) $
Windows Type 1       2.72       x1/I         Windows Type 2       2.72       x1/I         Windows Type 3       5.42       x1/I         Windows Type 4       2.18       x1/I         Windows Type 5       2.18       x1/I         Floor       72.7       x         Walls       43.2       19.29       23.91       x	$ \frac{1}{(1.2) + 0.04} = 3.11  \frac{1}{(1.2) + 0.04} = 3.11  \frac{1}{(1.2) + 0.04} = 6.21  \frac{1}{(1.2) + 0.04} = 2.5  \frac{1}{(1.2) + 0.04} = 2.5  \frac{1}{(1.2) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = 3.83  \frac{1}{(29) + 0.04} = $
Windows Type 1       2.72       x1/I         Windows Type 2       2.72       x1/I         Windows Type 3       5.42       x1/I         Windows Type 4       2.18       x1/I         Windows Type 5       2.18       x1/I         Floor       72.7       x         Walls       43.2       19.29       23.91       x         Total area of elements, m²       115.9       115.9	$ \frac{1}{(1.2) + 0.04} = 3.11  \frac{1}{(1.2) + 0.04} = 3.11  \frac{1}{(1.2) + 0.04} = 6.21  \frac{1}{(1.2) + 0.04} = 2.5  \frac{1}{(1.2) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(27) + 0.04} = 2.5  \frac{1}{(2$
Windows Type 1       2.72       x1/I         Windows Type 2       2.72       x1/I         Windows Type 3       5.42       x1/I         Windows Type 4       2.18       x1/I         Windows Type 5       2.18       x1/I         Floor       72.7       x [         Walls       43.2       19.29       23.91       x [         Total area of elements, m²       115.9       49.14       x [         Party wall       49.14       x [	$ \frac{1}{(1.2) + 0.04} = 3.11 $ $ \frac{1}{(1.2) + 0.04} = 3.11 $ $ \frac{1}{(1.2) + 0.04} = 6.21 $ $ \frac{1}{(1.2) + 0.04} = 2.5 $ $ \frac{1}{(1.2) + 0.04} = 2.5 $ $ \frac{1}{(1.2) + 0.04} = 3.83 $ $ \frac{1}{(29)} $ $ \frac{1}{(29)} $ $ \frac{1}{(29)} $ $ \frac{1}{(29)} $ $ \frac{1}{(29)} $ $ \frac{1}{(29)} $ $ \frac{1}{(32)} $ $ \frac{1}{(32)} $
Windows Type 1  Windows Type 2  Windows Type 3  Windows Type 4  Windows Type 5  Floor  Walls  43.2  Total area of elements, m²  Party wall  Party ceiling  * for windows and roof windows, use effective window U-value calculated using the include the areas on both sides of internal walls and partitions	$ \frac{1}{(1.2) + 0.04} = 3.11                                 $
Windows Type 1  Windows Type 2  Windows Type 3  Windows Type 4  Windows Type 5  Floor  Walls  43.2  Total area of elements, m²  Party wall  Party ceiling  * for windows and roof windows, use effective window U-value calculated using the include the areas on both sides of internal walls and partitions  Fabric heat loss, W/K = S (A x U)	1/(1.2) + 0.04] = 3.11 (27) 1/(1.2) + 0.04] = 6.21 (27) 1/(1.2) + 0.04] = 6.21 (27) 1/(1.2) + 0.04] = 2.5 (27) 1/(1.2) + 0.04] = 2.5 (27) 0.12 = 8.723999 (28) 0.16 = 3.83 (29) 0.16 = 0 (31) 0 = 0 (32) 0 = 0 (33)
Windows Type 1  Windows Type 2  Windows Type 3  Windows Type 4  Windows Type 5  Floor  Walls  43.2  Total area of elements, m²  Party wall  Party ceiling  * for windows and roof windows, use effective window U-value calculated using the include the areas on both sides of internal walls and partitions  Fabric heat loss, W/K = S (A x U)  Heat capacity Cm = S(A x k)	$ \frac{1}{(1.2) + 0.04} = 3.11                                 $
Windows Type 1  Windows Type 2  Windows Type 3  Windows Type 4  Windows Type 5  Floor  Walls  43.2  Total area of elements, m²  Party wall  Party ceiling  * for windows and roof windows, use effective window U-value calculated using ** include the areas on both sides of internal walls and partitions  Fabric heat loss, W/K = S (A x U)  Heat capacity Cm = S(A x k)  Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K	1/(1.2) + 0.04] = 3.11 (27 1/(1.2) + 0.04] = 3.11 (27 1/(1.2) + 0.04] = 6.21 (27 1/(1.2) + 0.04] = 2.5 (27 1/(1.2) + 0.04] = 2.5 (27 0.12 = 8.723999 (28 0.16 = 3.83 (29 0.16 = 3.83 (31 0 = 0 (32 0 = 0 (33 0 = 0 (34) 0 = 0 (35) 0 = 0 (35) 0 = 0 (36) 0 = 0 (37) 0 = 0 (38) 0 = 0 (39) 0 = 0 (30) 0 = 0 (31) 0 = 0 (32) 0 = 0 (33) 0 = 0 (34) 0 = 0 (35) 0 = 0 (35) 0 = 0 (35) 0 = 0 (36) 0 = 0 (37) 0 = 0 (37) 0 = 0 (38) 0 = 0 (39) 0 = 0 (39) 0 = 0 (30) 0 = 0 (31) 0 = 0 (32) 0 = 0 (33)
Windows Type 1  Windows Type 2  Windows Type 3  Windows Type 4  Windows Type 5  Floor  Walls  43.2  Total area of elements, m²  Party wall  Party ceiling  * for windows and roof windows, use effective window U-value calculated using the include the areas on both sides of internal walls and partitions  Fabric heat loss, W/K = S (A x U)  Heat capacity Cm = S(A x k)	1/(1.2) + 0.04] = 3.11 (27 1/(1.2) + 0.04] = 3.11 (27 1/(1.2) + 0.04] = 6.21 (27 1/(1.2) + 0.04] = 2.5 (27 1/(1.2) + 0.04] = 2.5 (27 0.12 = 8.723999 (28 0.16 = 3.83 (29 0.16 = 3.83 (31 0 = 0 (32 0 = 0 (33 0 = 0 (34) 0 = 0 (35) 0 = 0 (35) 0 = 0 (36) 0 = 0 (37) 0 = 0 (38) 0 = 0 (39) 0 = 0 (30) 0 = 0 (31) 0 = 0 (32) 0 = 0 (33) 0 = 0 (34) 0 = 0 (35) 0 = 0 (35) 0 = 0 (35) 0 = 0 (36) 0 = 0 (37) 0 = 0 (37) 0 = 0 (38) 0 = 0 (39) 0 = 0 (39) 0 = 0 (30) 0 = 0 (31) 0 = 0 (32) 0 = 0 (33)
Windows Type 2  Windows Type 3  Windows Type 4  Windows Type 5  Floor  Walls  43.2  Total area of elements, m²  Party wall  Party ceiling  * for windows and roof windows, use effective window U-value calculated using the include the areas on both sides of internal walls and partitions  Fabric heat loss, W/K = S (A x U)  Heat capacity Cm = S(A x k)  Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K  For design assessments where the details of the construction are not known presented.	1/(1.2) + 0.04] = 3.11 (27 1/(1.2) + 0.04] = 3.11 (27 1/(1.2) + 0.04] = 6.21 (27 1/(1.2) + 0.04] = 2.5 (27 1/(1.2) + 0.04] = 2.5 (27 0.12 = 8.723999 (28 0.16 = 3.83 (29 0.16 = 3.83 (31 0 = 0 (32 0 = 0 (33 0 = 0 (34) 0 = 0 (35) 0 = 0 (35) 0 = 0 (36) 0 = 0 (37) 0 = 0 (38) 0 = 0 (39) 0 = 0 (30) 0 = 0 (31) 0 = 0 (32) 0 = 0 (33) 0 = 0 (34) 0 = 0 (35) 0 = 0 (35) 0 = 0 (35) 0 = 0 (36) 0 = 0 (37) 0 = 0 (37) 0 = 0 (38) 0 = 0 (39) 0 = 0 (39) 0 = 0 (30) 0 = 0 (31) 0 = 0 (32) 0 = 0 (33)
Windows Type 1  Windows Type 2  Windows Type 3  Windows Type 4  Windows Type 5  Floor  Walls  43.2  Total area of elements, m²  Party wall  Party ceiling  * for windows and roof windows, use effective window U-value calculated using * include the areas on both sides of internal walls and partitions  Fabric heat loss, W/K = S (A x U)  Heat capacity Cm = S(A x k)  Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K  For design assessments where the details of the construction are not known precan be used instead of a detailed calculation.	1/(1.2) + 0.04] = 3.11 (27 1/(1.2) + 0.04] = 3.11 (27 1/(1.2) + 0.04] = 6.21 (27 1/(1.2) + 0.04] = 2.5 (27 1/(1.2) + 0.04] = 2.5 (27 0.12 = 8.723999 (28 0.16 = 3.83 (29 0.16 = 3.83 (31 0 = 0 (32 0 = 0 (33 0 = 0 (34 0 = 0 (35) (35) (35) (35) (35) (35) (35) (35)



Ventilation hea	at loss ca	alculated	l monthly	<b>/</b>				(38)m	= 0.33 × (	25)m x (5)	)		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 18.14	17.93	17.73	16.7	16.49	15.46	15.46	15.25	15.87	16.49	16.9	17.32		(38)
Heat transfer of	coefficie	nt, W/K						(39)m	= (37) + (	38)m			
(39)m= 68.34	68.13	67.93	66.89	66.69	65.66	65.66	65.45	66.07	66.69	67.1	67.51		
Heat loss para	meter (H	HLP), W/	m²K						Average = = (39)m ÷	Sum(39) <sub>1</sub> .	12 /12=	66.84	(39)
(40)m= 0.94	0.94	0.93	0.92	0.92	0.9	0.9	0.9	0.91	0.92	0.92	0.93		
Number of day	s in mo	nth (Tab	le 1a)					,	Average =	Sum(40) <sub>1</sub>	12 /12=	0.92	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heat	ting ene	rgy requi	rement:								kWh/ye	ar:	
Assumed occu			[1 - exp	(-0 0003	149 x (TF	-A -13 9	)2)] + O (	0013 x ( <sup>-</sup>	ΓFA -13		.31		(42)
if TFA £ 13.9		1 1.70 X	ι σχρ	( 0.0000	73 X (11	70.0	<i>)</i>	) X 010 X (	1177 10	.0)			
Annual averag									e target o		0.06		(43)
not more that 125						-	o acmeve	a water us	e targer o	'			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in								ООР					
(44)m= 97.96	94.4	90.84	87.28	83.72	80.15	80.15	83.72	87.28	90.84	94.4	97.96		
Energy content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	m x nm x E	)Tm / 3600			m(44) <sub>112</sub> = ables 1b, 1		1068.71	(44)
(45)m= 145.28	127.06	131.12	114.31	109.68	94.65	87.71	100.64	101.85	118.69	129.56	140.69		
							l.		Total = Su	m(45) <sub>112</sub> =	=	1401.24	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46	) to (61)					
(46)m= 21.79 Water storage	19.06	19.67	17.15	16.45	14.2	13.16	15.1	15.28	17.8	19.43	21.1		(46)
Storage volum		includin	ia anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	, ,					•					<u> </u>		(,
Otherwise if no Water storage	stored			•			` '	ers) ente	er '0' in (	47)			
a) If manufact		eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature fa	actor fro	m Table	2b								0		(49)
Energy lost fro							(48) x (49)	) =		1	10		(50)
<ul><li>b) If manufact</li><li>Hot water stora</li></ul>			-								02		(51)
If community h	_			C 2 (KVV)	11/11110/00	·y <i>)</i>				0.	.02		(31)
Volume factor	-									1.	.03		(52)
Temperature fa	actor fro	m Table	2b							0	.6		(53)
Energy lost fro		-	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	1.	.03		(54)
Enter (50) or (	. , .	,								1.	.03		(55)
Water storage							((56)m = (						
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)



If cylinder contains dedicated solar storage, $(57)$ m = $(56)$ m x $[(50) - (H11)] \div (50)$ , else $(57)$ m = $(56)$ m where $(H11)$ is from Appendix H	
(57)m= 32.01 28.92 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01 30.98 32.01	(57)
Primary circuit loss (annual) from Table 3	(58)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m	
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	
(59)m= 23.26 21.01 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26 22.51 23.26	(59)
Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m	
(61)m= 0 0 0 0 0 0 0 0 0 0 0 0	(61)
Total heat required for water heating calculated for each month $(62)m = 0.85 \times (45)m + (46)m + (57)m + (59)m + (61)m$	
(62)m= 200.56 176.99 186.39 167.8 164.96 148.14 142.98 155.92 155.34 173.97 183.05 195.97	(62)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating)	
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G)	
(63)m= 0 0 0 0 0 0 0 0 0 0 0	(63)
Output from water heater	
(64)m= 200.56 176.99 186.39 167.8 164.96 148.14 142.98 155.92 155.34 173.97 183.05 195.97	,
Output from water heater (annual) <sub>112</sub> 2052.08	(64)
Heat gains from water heating, kWh/month 0.25 ´ [0.85 x (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m]	
(65)m= 92.53 82.19 87.82 80.8 80.69 74.27 73.38 77.69 76.66 83.69 85.87 91	(65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating	
5. Internal gains (see Table 5 and 5a):	
o. Internal gams (see Table 6 and 6a).	
Metabolic gains (Table 5), Watts	
Metabolic gains (Table 5), Watts	(66)
Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	(66)
Metabolic gains (Table 5), Watts         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         (66)m=       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49	(66) (67)
Metabolic gains (Table 5), Watts    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	, ,
Metabolic gains (Table 5), Watts         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         (66)m=       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49	, ,
Metabolic gains (Table 5), Watts    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	(67)
Metabolic gains (Table 5), Watts           Jan         Feb         Mar         Apr         May         Jun         Jul         Aug         Sep         Oct         Nov         Dec           (66)m=         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49	(67)
Metabolic gains (Table 5), Watts    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	(67) (68)
Metabolic gains (Table 5), Watts    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	(67) (68)
Metabolic gains (Table 5), Watts  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  (66)m= 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115.49 115	(67) (68) (69)
Metabolic gains (Table 5), Watts         Jan         Feb         Mar         Apr         May         Jun         Jul         Aug         Sep         Oct         Nov         Dec           (66)m=         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49 <t< td=""><td>(67) (68) (69)</td></t<>	(67) (68) (69)
Metabolic gains (Table 5), Watts         Jan       Feb       Mar       Apr       May       Jun       Jul       Aug       Sep       Oct       Nov       Dec         (66)m=       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49       115.49	(67) (68) (69) (70)
Metabolic gains (Table 5), Watts           Jan         Feb         Mar         Apr         May         Jun         Jul         Aug         Sep         Oct         Nov         Dec           (66)m=         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49	(67) (68) (69) (70)
Metabolic gains (Table 5), Watts           Jan         Feb         Mar         Apr         May         Jun         Jul         Aug         Sep         Oct         Nov         Dec           (66)m=         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49	(67) (68) (69) (70) (71)
Metabolic gains (Table 5), Watts           Jan         Feb         Mar         Apr         May         Jun         Jul         Aug         Sep         Oct         Nov         Dec           (66)m=         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49         115.49	(67) (68) (69) (70) (71)
Metabolic gains (Table 5), Watts    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	(67) (68) (69) (70) (71)

Flux

Orientation: Access Factor Area Flux g\_ FF
Table 6d m² Table 6a Table 6b Table 6c

Gains (W)



North	0.9x	0.77	X	2.72	x	10.63	X	0.4	x	0.7	=	5.61	(74)
North	0.9x	0.77	X	2.18	x	10.63	X	0.4	x	0.7	=	4.5	(74)
North	0.9x	0.77	X	2.72	x	20.32	x	0.4	x	0.7	=	10.73	(74)
North	0.9x	0.77	X	2.18	x	20.32	x	0.4	x	0.7	=	8.6	(74)
North	0.9x	0.77	X	2.72	x	34.53	x	0.4	x	0.7	=	18.22	(74)
North	0.9x	0.77	X	2.18	x	34.53	X	0.4	x	0.7	=	14.61	(74)
North	0.9x	0.77	X	2.72	X	55.46	X	0.4	x	0.7	=	29.27	(74)
North	0.9x	0.77	X	2.18	X	55.46	X	0.4	x	0.7	] =	23.46	(74)
North	0.9x	0.77	X	2.72	x	74.72	X	0.4	x	0.7	=	39.43	(74)
North	0.9x	0.77	X	2.18	x	74.72	X	0.4	x	0.7	=	31.61	(74)
North	0.9x	0.77	X	2.72	x	79.99	X	0.4	x	0.7	=	42.22	(74)
North	0.9x	0.77	X	2.18	x	79.99	X	0.4	x	0.7	=	33.83	(74)
North	0.9x	0.77	X	2.72	x	74.68	X	0.4	x	0.7	=	39.41	(74)
North	0.9x	0.77	X	2.18	x	74.68	X	0.4	x	0.7	=	31.59	(74)
North	0.9x	0.77	X	2.72	x	59.25	X	0.4	x	0.7	=	31.27	(74)
North	0.9x	0.77	X	2.18	x	59.25	X	0.4	x	0.7	=	25.06	(74)
North	0.9x	0.77	X	2.72	X	41.52	X	0.4	X	0.7	=	21.91	(74)
North	0.9x	0.77	X	2.18	X	41.52	Х	0.4	X	0.7	-	17.56	(74)
North	0.9x	0.77	X	2.72	х	24.19	x	0.4	x	0.7	=	12.77	(74)
North	0.9x	0.77	X	2.18	х	24.19	X	0.4	x	0.7	=	10.23	(74)
North	0.9x	0.77	X	2.72	X	13.12	X	0.4	x	0.7	=	6.92	(74)
North	0.9x	0.77	X	2.18	X	13.12	Х	0.4	x	0.7	=	5.55	(74)
North	0.9x	0.77	X	2.72	х	8.86	X	0.4	x	0.7	=	4.68	(74)
North	0.9x	0.77	X	2.18	Х	8.86	X	0.4	X	0.7	=	3.75	(74)
South	0.9x	0.77	X	2.72	X	46.75	X	0.4	X	0.7	=	24.68	(78)
South	0.9x	0.77	X	5.42	x	46.75	X	0.4	X	0.7	=	49.17	(78)
South	0.9x	0.77	X	2.18	x	46.75	X	0.4	X	0.7	=	39.55	(78)
South	0.9x	0.77	X	2.72	x	76.57	X	0.4	X	0.7	=	40.41	(78)
South	0.9x	0.77	X	5.42	x	76.57	x	0.4	X	0.7	=	80.53	(78)
South	0.9x	0.77	X	2.18	X	76.57	X	0.4	X	0.7	=	64.78	(78)
South	0.9x	0.77	X	2.72	x	97.53	X	0.4	X	0.7	=	51.48	(78)
South	0.9x	0.77	X	5.42	x	97.53	x	0.4	X	0.7	=	102.58	(78)
South	0.9x	0.77	X	2.18	X	97.53	X	0.4	X	0.7	=	82.52	(78)
South	0.9x	0.77	X	2.72	X	110.23	X	0.4	X	0.7	=	58.18	(78)
South	0.9x	0.77	X	5.42	X	110.23	X	0.4	X	0.7	=	115.93	(78)
South	0.9x	0.77	X	2.18	x	110.23	x	0.4	X	0.7	=	93.26	(78)
South	0.9x	0.77	X	2.72	x	114.87	x	0.4	X	0.7	=	60.63	(78)
South	0.9x	0.77	X	5.42	x	114.87	x	0.4	X	0.7	=	120.81	(78)
South	0.9x	0.77	X	2.18	x	114.87	X	0.4	X	0.7	=	97.18	(78)
South	0.9x	0.77	X	2.72	x	110.55	X	0.4	x	0.7	=	58.35	(78)
South	0.9x	0.77	X	5.42	X	110.55	X	0.4	X	0.7	=	116.26	(78)



South	0.9x	0.77	X	2.1	8	X	1	10.55	X	0.4	X	0.7	=	93.53	(78)
South	0.9x	0.77	x	2.7	′2	X	10	08.01	x	0.4	X	0.7	=	57.01	(78)
South	0.9x	0.77	X	5.4	12	X	10	08.01	X	0.4	X	0.7	=	113.6	(78)
South	0.9x	0.77	X	2.1	8	X	10	08.01	X	0.4	X	0.7	=	91.38	(78)
South	0.9x	0.77	X	2.7	'2	X	10	04.89	X	0.4	X	0.7	=	55.36	(78)
South	0.9x	0.77	X	5.4	12	X	10	04.89	X	0.4	X	0.7	=	110.32	(78)
South	0.9x	0.77	x	2.1	8	X	10	04.89	X	0.4	X	0.7	=	88.74	(78)
South	0.9x	0.77	X	2.7	'2	X	10	01.89	X	0.4	X	0.7	=	53.77	(78)
South	0.9x	0.77	X	5.4	12	X	10	01.89	X	0.4	X	0.7	=	107.15	(78)
South	0.9x	0.77	X	2.1	8	X	10	01.89	X	0.4	X	0.7	=	86.2	(78)
South	0.9x	0.77	X	2.7	<b>'</b> 2	X	8	2.59	X	0.4	X	0.7	=	43.59	(78)
South	0.9x	0.77	X	5.4	12	X	8	2.59	X	0.4	X	0.7	=	86.86	(78)
South	0.9x	0.77	X	2.1	8	X	8	2.59	X	0.4	X	0.7	=	69.87	(78)
South	0.9x	0.77	X	2.7	<b>'</b> 2	X	5	5.42	X	0.4	X	0.7	=	29.25	(78)
South	0.9x	0.77	X	5.4	12	X	5	5.42	X	0.4	X	0.7	=	58.28	(78)
South	0.9x	0.77	X	2.1	8	X	5	5.42	X	0.4	X	0.7	=	46.88	(78)
South	0.9x	0.77	X	2.7	'2	X	4	40.4	X	0.4	X	0.7	=	21.32	(78)
South	0.9x	0.77	X	5.4	2	X	4	40.4	X	0.4	X	0.7	=	42.49	(78)
South	0.9x	0.77	x	2.1	8	Х	4	40.4	x	0.4	X	0.7	=	34.18	(78)
Solar (	gains in	watts, calc	ulated	for eacl	h month	1/			(83)m	= Sum(74)m	(82)m			_	
(83)m=	123.51		269.4	320.11	349.66	<u> </u>	44.18	332.99	310.	.75 286.6	223.3	1 146.89	106.41		(83)
		nternal and		` '	· •	_								7	4
(84)m=	527.18	606.73	558.49	688.88	697.85	6	72.47	648.29	631	.75 617.98	575.2	2 522.39	499.56		(84)
7. Me	an inter	nal temper	rature (	(heating	seasor	า)									
Temp	erature	during hea	ating p	eriods ir	the liv	ing	area f	from Tab	ole 9,	Th1 (°C)				21	(85)
Utilisa	ation fac	tor for gair	ns for li	ving are	ea, h1,n	n (s	ee Ta	ble 9a)						_	
	Jan	Feb	Mar	Apr	May	<u> </u>	Jun	Jul	Αι	ug Sep	Oct	Nov	Dec	_	
(86)m=	0.99	0.99	0.97	0.92	0.8		0.61	0.44	0.4	7 0.7	0.92	0.99	1		(86)
Mean	interna	temperati	ure in I	iving are	ea T1 (f	ollo	w ste	ps 3 to 7	in T	able 9c)				_	
(87)m=	20.17	20.33	20.53	20.76	20.92	2	0.99	21	2'	1 20.97	20.78	3 20.44	20.14		(87)
Temp	erature	during hea	ating p	eriods ir	n rest of	dw	elling	from Ta	ble 9	), Th2 (°C)					
(88)m=	20.13	20.14	20.14	20.15	20.15	2	0.16	20.16	20.	17 20.16	20.15	20.15	20.14	]	(88)
Utilisa	ation fac	tor for gair	ns for r	est of d	wellina.	h2.	m (se	e Table	9a)	•	•	•	•	_	
(89)m=	0.99		0.96	0.89	0.75	_	0.54	0.36	0.3	9 0.63	0.9	0.98	0.99	]	(89)
Moan	interna	temperati	uro in t	ho roct	of dwal	lina	T2 (f	ollow etc	ne 3	to 7 in Tab	lo Oc)		<u>!</u>	_	
(90)m=	19.03		19.56	19.88	20.08	Ť	0.16	20.16	20.	T T	19.91	19.43	19	7	(90)
()							-					ving area ÷ (		0.5	(91)
	. laker :		/*:	ا - ما 4 س	ا- مام	. 11! -	~\	A <b>T</b> 4	. /4			`			<b></b> ` ′
				・ エロヘ いんり		aiiin.	(11 — fl	$\Delta \sim 11$	<b>+</b> (1)	ーTAVYI2					
		temperati				_						10.04	10.57	7	(92)
(92)m=	19.61	19.8	20.05	20.32	20.5	2	0.57	20.58	20.		20.35		19.57	]	(92)



(93)m=	19.61	19.8	20.05	20.32	20.5	20.57	20.58	20.58	20.56	20.35	19.94	19.57		(93)
` '			uirement		20.0	20.01	20.00	20.50	20.00	20.00	10.04	10.07		(00)
					re obtair	ned at st	ep 11 of	Table 9	o, so tha	t Ti.m=(	76)m an	d re-calc	ulate	
			or gains	•										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
			ains, hm	1								1	l	
(94)m=	0.99	0.98	0.96	0.9	0.77	0.57	0.4	0.43	0.67	0.9	0.98	0.99		(94)
i			, W = (94	r `	r e			I	==		l			(05)
(95)m=	522.63	594.93	630.2	618.71	540.4	386.08	260.91	272.91	411.73	520.55	511.93	496.28		(95)
(96)m=	11y avera	age exte	rnal tem	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
` ′								x [(93)m			7.1	4.2		(30)
	1045.95		920.18	764.02	586.85	392.22	261.51	273.82	426.61	650.22	861.35	1037.96		(97)
	heatin		ement fo		l	Mh/mon <sup>·</sup>	l	24 x [(97)	L )m – (95		<u>I</u> 1)m			
(98)m=	389.35	282.43	215.74	104.63	34.55	0	0	0	0	96.47	251.59	403.01		
							l .	Tota	l per year	(kWh/yea	) = Sum(9	8) <sub>15,912</sub> =	1777.77	(98)
Space	e heatin	g require	ement in	kWh/m²	²/year								24.45	(99)
·		• .	nts – Coi			scheme	<u> </u>							
This pa	art is us	ed for sp	ace hea	ating, spa	ace cool	ing or wa	ater hea	ting prov			unity sch	neme.		
Fractio	n of spa	ace heat	from se	condary	/suppler	nentary l	heating	(Table 1	1) '0' if n	one			0	(301)
Fractio	n of spa	ace heat	from co	<mark>mmu</mark> nity	syste <mark>m</mark>	1 - (30	1) =						1	(302)
The com	<mark>mu</mark> nity so	cheme ma	y obtain he	eat from se	everal soul	rces. The p	orocedure	allows for	CHP and t	up to four	other heat	sources; ti	he latter	
						rom powe	r stations.	See Apper	ndix C.				0.7	7(2020)
			Commun										0.7	(303a)
Fractio	n of cor	nmunity	heat fro	m heat s	source 2								0.3	(303b)
Fractio	n of tota	al space	heat fro	m Comn	nunity h	eat pump	)			(3	02) x (303	a) =	0.7	(304a)
Fractio	n of tota	al space	heat fro	m comm	nunity he	at sourc	e 2			(3	02) x (303	b) =	0.3	(304b)
Factor	for cont	rol and	charging	method	(Table	4c(3)) fo	r comm	unity hea	iting sys	tem			1	(305)
Distribu	ution los	ss factor	(Table 1	12c) for (	commun	ity heati	ng syste	m					1.1	(306)
Space	heating	g											kWh/yea	r
Annual	space	heating	requiren	nent									1777.77	
Space	heat fro	m Com	munity h	eat pum	р				(98) x (30	04a) x (30	5) x (306) :	=	1368.88	(307a)
Space	heat fro	m heat	source 2	2					(98) x (30	04b) x (30	5) x (306) :	=	586.66	(307b)
Efficier	ncy of se	econdar	y/supple	mentary	heating	system	in % (fro	om Table	4a or A	ppendix	E)		0	(308
Space	heating	require	ment fro	m secon	dary/su	oplemen	tary sys	tem	(98) x (30	01) x 100 ·	÷ (308) =		0	(309)
Water	heating	j												
Annual	water h	neating i	equirem	ent									2052.08	
			ty schem		0				(64) x (30	03a) x (30:	5) x (306) :	<u> </u>	1580.1	(310a)
			source 2		-						5) x (306) :		677.19	(310b)
								0.04						Ⅎ`
⊏iecti10	ity use	u ioi nea	at distrib	uliUH				0.01	x [(3∪7a).	(3078) <del>1</del>	· (310a)(	STUE)] =	42.13	(313)



Cooling System Energy Efficiency Ratio				0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314)	=		0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from	outside			158.65	(330a)
warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b	o) + (330g) =		158.65	(331)
Energy for lighting (calculated in Appendix L)				320.42	(332)
12b. CO2 Emissions – Community heating scheme					
	Energy kWh/year	Emission factor kg CO2/kWh		nissions CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%)  If there is CHP using	g two fuels repeat (363) to	(366) for the second f	fuel [	294	(367a)
Efficiency of heat source 2 (%)	g two fuels repeat (363) to	(366) for the second f	fuel	95.6	(367b)
CO2 associated with heat source 1 [(307b)+	(310b)] x 100 ÷ (367b) x	0.52	= [	520.59	(367)
CO2 associated with heat source 2 [(307b)+	(310b)] x 100 ÷ (367b) x	0.22	= [	285.56	(368)
Electrical energy for heat distribution	((313) x	0.52	= [	21.86	(372)
Total CO2 associated with community systems	(363)(366) + (368)(372	2)	= [	828.01	(373)
CO2 associated with space heating (secondary)	(309) x	0	= [	0	(374)
CO2 associated with water from immersion heater or instantane	ous heater (312) x	0.22	= [	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			828.01	(376)
CO2 associated with electricity for pumps and fans within dwelli	ng (331)) x	0.52	= [	82.34	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	= [	166.3	(379)
Total CO2, kg/year sum of (376)(382) =				1076.64	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =				14.81	(384)

El rating (section 14)

(385)

87.74



User Details: **Assessor Name:** Stroma Number: **Software Version: Software Name:** Stroma FSAP 2012 Version: 1.0.5.12 Property Address: W1-03 , 156 West End Lane, Camden, London Address: 1. Overall dwelling dimensions Av. Height(m) Volume(m³) Area(m<sup>2</sup>) Ground floor 86.4 (1a) x 2.7 (2a) = (3a) 233.28 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)(4)86.4 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =233.28 (5) total m³ per hour main secondary other heating heating x 40 =Number of chimneys (6a) 0 0 x 20 =Number of open flues 0 0 0 (6b) Number of intermittent fans x 10 =(7a)0 0 x 10 =Number of passive vents (7b) 0 0 x 40 =Number of flueless gas fires 0 (7c)Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =(8) If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9)0 Additional infiltration [(9)-1]x0.1 =0 (10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)0 if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12)If no draught lobby, enter 0.05, else enter 0 (13)0 Percentage of windows and doors draught stripped (14)0 Window infiltration  $0.25 - [0.2 \times (14) \div 100] =$ 0 (15)Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =O (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)3 If based on air permeability value, then  $(18) = [(17) \div 20] + (8)$ , otherwise (18) = (16)0.15 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)2  $(20) = 1 - [0.075 \times (19)] =$ Shelter factor (20)0.85  $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.13 Infiltration rate modified for monthly wind speed Jan Feb Sep Mar Apr May Jun Jul Aug Oct Nov Dec Monthly average wind speed from Table 7 (22)m =5.1 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor  $(22a)m = (22)m \div 4$ (22a)m 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18



/ lajaotea iriiliti	ation rate	(allowing	ng for sh	elter an	d wind s	peed) =	(21a) x	(22a)m					
0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15	]	
Calculate effect		-	rate for t	he appli	cable ca	se	•				•		((a.c. )
If mechanica			andiv N (2	3h) - (23a	a) v Emy (e	aguation (N	VSV) other	wice (23h	) <b>–</b> (23a)			0.5	(23a)
If balanced with									) = (25a)			0.5	(23b)
		-	-	_					2b\m , /	22h) v [	1 (226)	76.5	(23c)
a) If balance (24a)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24 0.24	0.24	0.25	0.26	0.27	) <del>-</del> 100] ]	(24a)
b) If balance	<u> </u>				<u> </u>	<u> </u>	<u> </u>		<b>!</b>		0.27	]	(214)
(24b)m= 0		o T	0	0	0	0	0	0	0	0	0	1	(24b)
c) If whole h	<u> </u>				<u> </u>	<u> </u>				0		J	(2.15)
,	ouse exila ∩ < 0.5 × (			•	•				5 × (23b	)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24c)
d) If natural	ventilation	or who	ole hous	e positiv	re input	ventilatio	on from I	oft	<u> </u>		Į.	J	
	n = 1, then								0.5]			_	
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24d)
Effective air	change ra	ate - en	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)				_	
(25)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27		(25)
3. Heat losse	s and hea	t loss p	paramete	er:								_	_
ELEMENT	Gross area (r		Openin m	gs	Net Ar		U-valu		AXU		k-valu		A X k
		,		-	A ,r	n²	W/m2	K	(W/ł	<)	kJ/m²•	K	kJ/K
Doors			- "		A ,r	_	W/m2 1.4	K = [	(W/ł 2.646	<) 	kJ/m².	K	(26)
Doo <mark>rs</mark> Windows Type	e 1			1		х		<b>-</b> [	`	<)	kJ/m²•	K	
			"		1.89	x x1	1.4	0.04] = [	2.646	<) 	kJ/m²•	K	(26)
Windows Type	2				1.89	x x1, x1,	1.4	= [ 0.04] = [ 0.04] = [	2.646	() 	kJ/m²·	ĸ	(26) (27)
Windows Type	2 2				1.89 5.28 2.64	x x1, x1, x1,	1.4 /[1/( 1.2 )+ /[1/( 1.2 )+	= [ 0.04] = [ 0.04] = [ 0.04] =	2.646 6.05 3.02	() 	kJ/m².	K	(26) (27) (27)
Windows Type Windows Type Windows Type	e 2 e 3 e 4				1.89 5.28 2.64 5.28	x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	1.4 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	$= \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix}$	2.646 6.05 3.02 6.05		kJ/m².	ĸ	(26) (27) (27) (27)
Windows Type Windows Type Windows Type Windows Type	e 2 e 3 e 4				1.89 5.28 2.64 5.28 2.64 2.18	x x1, x1, x1, x1, x1, x1, x1, x1, x1, x1	1.4 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	$= \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix}$	2.646 6.05 3.02 6.05 3.02 2.5		kJ/m².	к	(26) (27) (27) (27) (27) (27)
Windows Type Windows Type Windows Type Windows Type Windows Type Floor	2 2 2 3 4 4 4 5 5				1.89 5.28 2.64 5.28 2.64 2.18 86.4	x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	1.4 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [	2.646 6.05 3.02 6.05 3.02 2.5 8.64		kJ/m².	K	(26) (27) (27) (27) (27) (27) (28)
Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type1	2 2 2 3 4 4 2 5 48.6		18.02	2	1.89 5.28 2.64 5.28 2.64 2.18 86.4 30.58	x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	1.4 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.1	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [	2.646 6.05 3.02 6.05 3.02 2.5 8.64 4.89		kJ/m².	K	(26) (27) (27) (27) (27) (27) (28) (29)
Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2	48.6 48.6			2	1.89 5.28 2.64 5.28 2.64 2.18 86.4 30.58	x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	1.4 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [	2.646 6.05 3.02 6.05 3.02 2.5 8.64		kJ/m².	K	(26) (27) (27) (27) (27) (27) (28) (29)
Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2 Total area of e	48.6 48.6		18.02	2	1.89 5.28 2.64 5.28 2.64 2.18 86.4 30.58 12.42 149.3	x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	1.4 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.1 0.16	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [	2.646 6.05 3.02 6.05 3.02 2.5 8.64 4.89		kJ/m².	K E	(26) (27) (27) (27) (27) (28) (29) (29) (31)
Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2 Total area of e Party wall	48.6 48.6		18.02	2	1.89 5.28 2.64 5.28 2.64 2.18 86.4 30.58 12.42 149.3 43.75	x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	1.4 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.1	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [	2.646 6.05 3.02 6.05 3.02 2.5 8.64 4.89		kJ/m².	K E	(26) (27) (27) (27) (27) (28) (29) (29) (31) (32)
Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2 Total area of e Party wall Party ceiling	48.6 48.6 14.31	m²	18.02	2	1.89 5.28 2.64 5.28 2.64 2.18 86.4 30.58 12.42 149.3 43.75 86.4	x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	1.4 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+  0.1  0.16  0.15	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [	2.646 6.05 3.02 6.05 3.02 2.5 8.64 4.89 1.86				(26) (27) (27) (27) (27) (28) (29) (29) (31)
Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2 Total area of e Party wall	48.6 48.6 14.31 4 roof window	m²	18.02 1.89	2 ndow U-ve	1.89 5.28 2.64 5.28 2.64 2.18 86.4 30.58 12.42 149.3 43.75 86.4 alue calcul	x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	1.4 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+  0.1  0.16  0.15	= [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ 0.04] = [ = [ = [ = [	2.646 6.05 3.02 6.05 3.02 2.5 8.64 4.89 1.86				(26) (27) (27) (27) (27) (28) (29) (29) (31) (32)
Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2 Total area of e Party wall Party ceiling * for windows and	48.6 48.6 14.31 Lements, r	m² vs, use eades of index	18.02 1.89 ffective winternal wall	2 ndow U-ve	1.89 5.28 2.64 5.28 2.64 2.18 86.4 30.58 12.42 149.3 43.75 86.4 alue calcul	x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	1.4 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+  0.1  0.16  0.15		2.646 6.05 3.02 6.05 3.02 2.5 8.64 4.89 1.86				(26) (27) (27) (27) (27) (28) (29) (29) (31) (32) (32b)
Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2 Total area of e Party wall Party ceiling * for windows and ** include the area	48.6 48.6 14.31 Elements, r	m² vs, use eides of inits S (A x	18.02 1.89 ffective winternal wall	2 ndow U-ve	1.89 5.28 2.64 5.28 2.64 2.18 86.4 30.58 12.42 149.3 43.75 86.4 alue calcul	x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	1.4 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+  0.1  0.16  0.15		2.646 6.05 3.02 6.05 3.02 2.5 8.64 4.89 1.86	as given in	n paragrapi	] [ ] [ ] [ ] 3.2	(26) (27) (27) (27) (27) (28) (29) (31) (32) (32b)
Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2 Total area of e Party wall Party ceiling * for windows and ** include the area Fabric heat los	48.6 48.6 14.31 Elements, respectively. The second windows as on both sides, which seeds as the second windows as on both sides, which is seed as the second windows as on both sides. The second windows as on both sides, which is seed as the second windows as on both sides. The second windows are second windows as on both sides. The second windows are second windows as on both sides. The second windows are second windows as on both sides. The second windows are second windows as on both sides.	m²  vs, use endes of into S (A x X X X X X X X X X X X X X X X X X X	18.02 1.89  ffective winternal wall U)	ndow U-va	1.89 5.28 2.64 5.28 2.64 2.18 86.4 30.58 12.42 149.3 43.75 86.4 alue calculatitions	x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	1.4 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+  0.1  0.16  0.15		2.646 6.05 3.02 6.05 3.02 2.5 8.64 4.89 1.86 0		n paragrapi	n 3.2	(26) (27) (27) (27) (27) (28) (29) (31) (32) (32b)
Windows Type Windows Type Windows Type Windows Type Windows Type Windows Type Floor Walls Type1 Walls Type2 Total area of e Party wall Party ceiling * for windows and ** include the area Fabric heat los Heat capacity	48.6  48.6  14.31  Elements, respectively. The second both sides, W/K = S(A) parameters where	m²  s, use eldes of into S (A x x k )  er (TMP)  e the det	18.02 1.89  ffective winternal wall U)  P = Cm ÷ tails of the	ndow U-vals and part	1.89 5.28 2.64 5.28 2.64 2.18 86.4 30.58 12.42 149.3 43.75 86.4 alue calculatitions	x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	1.4 /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+  0.1  0.16  0.15  0  formula 1. (26)(30)	$= \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \\$	2.646 6.05 3.02 6.05 3.02 2.5 8.64 4.89 1.86 0 ue)+0.04] a		n paragraph (32e) =	38.67 6480	(26) (27) (27) (27) (27) (28) (29) (29) (31) (32) (32b)

if details of thermal bridging are not known (36) = 0.05 x (31)



Total fabric he	at locc							(22) 1	(36) =			50.40	(27)
Ventilation he		alculated	d monthly	/				` '	$= 0.33 \times ($	25)m x (5)		53.43	(37)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 21.56	21.31	21.07	19.84	19.6	18.37	18.37	18.12	18.86	19.6	20.09	20.58		(38)
Heat transfer	coefficie	nt, W/K				l.		(39)m	= (37) + (3	38)m		l	
(39)m= 74.99	74.75	74.5	73.27	73.03	71.8	71.8	71.56	72.29	73.03	73.52	74.01		
									Average =		12 /12=	73.21	(39)
Heat loss para	r `	<del></del>	r	0.05	T				= (39)m ÷	` '	0.00	l	
(40)m= 0.87	0.87	0.86	0.85	0.85	0.83	0.83	0.83	0.84	0.85 Average =	0.85	0.86	0.85	(40)
Number of day	ys in mo	nth (Tab	le 1a)					,	Average =	Sum(40) <sub>1.</sub>	12 / 12=	0.65	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
Assumed occ	unancv	N								2	57		(42)
if TFA > 13.	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (	TFA -13.		31		(42)
if TFA £ 13.			na in litua		\/al a		(OF v. M)	. 20					(12)
Ann <mark>ual averaç</mark> Redu <mark>ce the</mark> annu									se target o		.31		(43)
not m <mark>ore th</mark> at 125	litres per	person pe	r day (all w	rater use, l	hot and co	ld)							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage	in litres pe	r day for ea		Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m= 104.84	101.03	97.22	93.41	89.59	85.78	85.78	89.59	93.41	97.22	101.03	104.84		_
Energy content o	f hot water	used - cal	lculated mo	onthly = $4$ .	190 x Vd,r	n x nm x L	OTm / 3600		Total = Sui oth (see Ta	( /		1143.75	(44)
(45)m= 155.48	135.98	140.32	122.34	117.39	101.3	93.86	107.71	109	127.03	138.66	150.57		
									Total = Su	m(45) <sub>112</sub> =		1499.64	(45)
If instantaneous v	vater heati	ng at point	t of use (no	hot water	r storage),	enter 0 in	boxes (46,	) to (61)				ı	
(46)m= 23.32 Water storage	20.4	21.05	18.35	17.61	15.19	14.08	16.16	16.35	19.05	20.8	22.59		(46)
Storage volum		) includir	ng any so	olar or W	WHRS	storage	within sa	ame ves	sel		0		(47)
If community I	` '					_							, ,
Otherwise if n	-			_			` '	ers) ente	er '0' in (	47)			
Water storage													
a) If manufac				or is kno	wn (kWh	n/day):					0		(48)
Temperature t											0		(49)
Energy lost from b) If manufact		_	-		or is not	known:	(48) x (49)	) =		1	10		(50)
Hot water stor			-							0.	02		(51)
If community h	neating s	see secti	on 4.3	•									. ,
Volume factor										1.	03		(52)
Temperature t										0	.6		(53)
Energy lost fro Enter (50) or		_	, kWh/ye	ear			(47) x (51)	x (52) x (	53) =		03		(54)
HDTOT (b()) Or	1541 In (1	าวไ								1 1	03		(55)



	ulated for eac	n month			((56)m = (	55) × (41)ı	m				
(56)m= 32.01 28.92	32.01 30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contains dedicated s	solar storage, (5	')m = (56)m	x [(50) – (	[H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	ix H	
(57)m= 32.01 28.92	32.01 30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit loss (annu	ual) from Tab	le 3			=		=		0		(58)
Primary circuit loss calcu	•		59)m = (	(58) ÷ 36	65 × (41)	m					
(modified by factor from	m Table H5 i	there is s	solar wat	ter heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 23.26 21.01	23.26 22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi loss calculated fo	or each month	(61)m =	(60) ÷ 30	65 × (41)	)m						
(61)m= 0 0	0 0	0	0	0	0	0	0	0	0		(61)
Total heat required for w	ater heating	calculated	for eac	h month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	1
(62)m= 210.76 185.91	195.6 175.83	172.66	154.79	149.14	162.99	162.49	182.3	192.15	205.85		(62)
Solar DHW input calculated us	sing Appendix G	or Appendix	H (negati	ve quantity	/) (enter '0	if no sola	r contribut	ion to wate	er heating)		
(add additional lines if Fo	GHRS and/or	WWHRS	applies	, see Ap	pendix (	∋)					
(63)m= 0 0	0 0	0	0	0	0	0	0	0	0		(63)
Output from water heate	r	-			-		-	-	-	•	
(64)m= 210.76 185.91	195.6 175.83	172.66	154.79	149.14	162.99	162.49	182.3	192.15	205.85		_
					Outp	out from wa	ater heate	r (annual) <sub>1</sub>	12	2150.48	(64)
Heat gains from water he	eating <mark>, kWh/</mark> r	nonth 0.2	5 [0.85	× (45)m	+ (61)n	n] + 0.8 x	( [(46)m	+ (57)m	+ (59)m	1	
(65)m= 95.92 85.16	90.88 83.47	83.25	76.48	75.43	80.04	79.04	86.46	88.9	94.29		(65)
include (57)m in calcu	lation of (65)	1									
include (37 Jill ill calcu	iation of (03)	n only it c	ylinder i	s in the o	dwelling	or hot w	ate <mark>r is f</mark> r	om com	<mark>mu</mark> nity h	eating	
5. Internal gains (see T	•		ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	mu <mark>nity h</mark>	eating	
` '	Table 5 and 5		ylinder i	s in the d	dwelling	or hot w	ater is fr	om com	mu <mark>nity h</mark>	eating	
5. Internal gains (see T	Table 5 and 5		Jun	s in the o	dwelling	or hot w	oct	Nov	munity h	eating	
5. Internal gains (see T Metabolic gains (Table 5 Jan Feb	Table 5 and 5	a):								eating	(66)
5. Internal gains (see T Metabolic gains (Table 5 Jan Feb	Table 5 and 5 5), Watts Mar Apr 128.66 128.66	May 128.66	Jun 128.66	Jul 128.66	Aug 128.66	Sep 128.66	Oct	Nov	Dec	eating	(66)
5. Internal gains (see Total gains (Table 5)  Jan Feb  (66)m= 128.66 128.66	Table 5 and 5  Natts  Mar Apr  128.66 128.66  d in Appendix	May 128.66 x L, equat	Jun 128.66 ion L9 o	Jul 128.66 r L9a), a	Aug 128.66 Iso see	Sep 128.66 Table 5	Oct	Nov	Dec	neating	(66)
5. Internal gains (see Total gains (Table 5)  Jan Feb  (66)m= 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128.66 128	Mar Apr 128.66 128.66 d in Appendix 15.01 11.36	May 128.66 a L, equat 8.49	Jun 128.66 ion L9 o	Jul 128.66 r L9a), a	Aug 128.66 Iso see	Sep 128.66 Table 5 13.52	Oct 128.66	Nov 128.66	Dec 128.66	neating	, ,
5. Internal gains (see Total gains (Table 5)  Jan Feb  (66)m= 128.66 128.66 128.66  Lighting gains (calculate (67)m= 20.78 18.45  Appliances gains (calculate gains (calculate gains (calculate gains (calculate gains (calculate gains (calculate gains (calculate gains (calculate gains (calculate gains (calculate gains gains (calculate gains gains (calculate gains gains (calculate gains gains gains (calculate gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains	Mar Apr 128.66 128.66 d in Appendix 15.01 11.36	May 128.66 a L, equat 8.49	Jun 128.66 ion L9 o	Jul 128.66 r L9a), a	Aug 128.66 Iso see	Sep 128.66 Table 5 13.52	Oct 128.66	Nov 128.66	Dec 128.66	neating	, ,
5. Internal gains (see Total gains (Table 5)  Jan Feb  (66)m= 128.66 128.66 128.66  Lighting gains (calculate (67)m= 20.78 18.45  Appliances gains (calculate gains (calculate gains (calculate gains (calculate gains (calculate gains (calculate gains (calculate gains (calculate gains (calculate gains (calculate gains gains (calculate gains gains (calculate gains gains (calculate gains gains gains (calculate gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains gains	Mar Apr 128.66 128.66 d in Appendix 15.01 11.36 ated in Appe	May 128.66 x L, equat 8.49 ndix L, eq 199.38	Jun 128.66 ion L9 o 7.17 uation L 184.03	Jul 128.66 r L9a), a 7.75 13 or L1 173.79	Aug 128.66 Iso see 10.07 3a), also	Sep 128.66 Table 5 13.52 see Tal 177.45	Oct 128.66 17.16 ble 5 190.38	Nov 128.66 20.03	Dec 128.66	neating	(67)
Metabolic gains (Table 5  Jan Feb  (66)m= 128.66 128.66 2  Lighting gains (calculate (67)m= 20.78 18.45  Appliances gains (calculate (68)m= 232.3 234.71 2  Cooking gains (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calcu	Mar Apr 128.66 128.66 d in Appendix 15.01 11.36 ated in Appe	May 128.66 x L, equat 8.49 ndix L, eq 199.38	Jun 128.66 ion L9 o 7.17 uation L 184.03	Jul 128.66 r L9a), a 7.75 13 or L1 173.79	Aug 128.66 Iso see 10.07 3a), also	Sep 128.66 Table 5 13.52 see Tal 177.45	Oct 128.66 17.16 ble 5 190.38	Nov 128.66 20.03	Dec 128.66	neating	(67)
Metabolic gains (Table 5  Jan Feb  (66)m= 128.66 128.66 7  Lighting gains (calculate (67)m= 20.78 18.45  Appliances gains (calculate (68)m= 232.3 234.71 2  Cooking gains (calculate (69)m= 35.87 35.87	Mar Apr 128.66 128.66 d in Appendix 15.01 11.36 ated in Appe 228.63 215.7 ed in Appendix 35.87 35.87	May 128.66 x L, equat 8.49 ndix L, eq 199.38 x L, equat	Jun 128.66 ion L9 o 7.17 uation L 184.03	Jul 128.66 r L9a), a 7.75 13 or L1 173.79 or L15a)	Aug 128.66 Iso see 10.07 3a), also 171.37	Sep 128.66 Table 5 13.52 see Tal 177.45 ee Table	Oct 128.66 17.16 ble 5 190.38	Nov 128.66 20.03	Dec 128.66 21.35	neating	(67) (68)
Metabolic gains (Table 5  Jan Feb  (66)m= 128.66 128.66 1  Lighting gains (calculate (67)m= 20.78 18.45  Appliances gains (calculate (68)m= 232.3 234.71 2  Cooking gains (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calculate (calcu	Mar Apr 128.66 128.66 d in Appendix 15.01 11.36 ated in Appe 228.63 215.7 ed in Appendix 35.87 35.87	May 128.66 x L, equat 8.49 ndix L, eq 199.38 x L, equat	Jun 128.66 ion L9 o 7.17 uation L 184.03	Jul 128.66 r L9a), a 7.75 13 or L1 173.79 or L15a)	Aug 128.66 Iso see 10.07 3a), also 171.37	Sep 128.66 Table 5 13.52 see Tal 177.45 ee Table	Oct 128.66 17.16 ble 5 190.38	Nov 128.66 20.03	Dec 128.66 21.35	neating	(67) (68)
Metabolic gains (Table 5  Jan Feb  (66)m= 128.66 128.66 1  Lighting gains (calculate (67)m= 20.78 18.45  Appliances gains (calculate (68)m= 232.3 234.71 2  Cooking gains (calculate (69)m= 35.87 35.87  Pumps and fans gains (70)m= 0 0	Mar Apr 128.66 128.66 d in Appendix 15.01 11.36 ated in Appe 228.63 215.7 ed in Appendix 35.87 35.87 Table 5a)	May 128.66 x L, equat 8.49 ndix L, eq 199.38 x L, equat 35.87	Jun 128.66 ion L9 o 7.17 uation L 184.03 tion L15 35.87	Jul 128.66 r L9a), a 7.75 13 or L1 173.79 or L15a) 35.87	Aug 128.66 Iso see 10.07 3a), also 171.37 ), also se 35.87	Sep 128.66 Table 5 13.52 see Tal 177.45 ee Table 35.87	Oct 128.66 17.16 ble 5 190.38 5 35.87	Nov 128.66 20.03 206.7	Dec 128.66 21.35 222.05	neating	(67) (68) (69)
Metabolic gains (Table 5  Jan Feb  (66)m= 128.66 128.66 2  Lighting gains (calculate (67)m= 20.78 18.45  Appliances gains (calculate (68)m= 232.3 234.71 2  Cooking gains (calculate (69)m= 35.87 35.87  Pumps and fans gains (70)m= 0 0  Losses e.g. evaporation	Mar Apr 128.66 128.66 d in Appendix 15.01 11.36 ated in Appe 228.63 215.7 ed in Appendix 35.87 35.87 Table 5a)	May 128.66 a L, equat 8.49 ndix L, eq 199.38 a L, equat 35.87	Jun 128.66 ion L9 o 7.17 uation L 184.03 tion L15 35.87	Jul 128.66 r L9a), a 7.75 13 or L1 173.79 or L15a) 35.87	Aug 128.66 Iso see 10.07 3a), also 171.37 ), also se 35.87	Sep 128.66 Table 5 13.52 see Tal 177.45 ee Table 35.87	Oct 128.66 17.16 ble 5 190.38 5 35.87	Nov 128.66 20.03 206.7	Dec 128.66 21.35 222.05	neating	(67) (68) (69)
Metabolic gains (Table 5  Jan Feb  (66)m= 128.66 128.66 2  Lighting gains (calculate (67)m= 20.78 18.45  Appliances gains (calculate (68)m= 232.3 234.71 2  Cooking gains (calculate (69)m= 35.87 35.87  Pumps and fans gains (70)m= 0 0  Losses e.g. evaporation	Mar Apr 128.66 128.66 d in Appendix 15.01 11.36 ated in Appe 228.63 215.7 ed in Appendix 35.87 35.87 Table 5a) 0 0 (negative value)	May 128.66 a L, equat 8.49 ndix L, eq 199.38 a L, equat 35.87	Jun 128.66 ion L9 o 7.17 uation L 184.03 tion L15 35.87	Jul 128.66 r L9a), a 7.75 13 or L1 173.79 or L15a) 35.87	Aug 128.66 Iso see 10.07 3a), also 171.37 , also se 35.87	Sep 128.66 Table 5 13.52 see Tal 177.45 ee Table 35.87	Oct 128.66 17.16 ble 5 190.38 5 35.87	Nov 128.66 20.03 206.7	Dec 128.66 21.35 222.05 35.87	neating	(67) (68) (69) (70)
Metabolic gains (Table 5  Jan Feb  (66)m= 128.66 128.66 7  Lighting gains (calculate (67)m= 20.78 18.45  Appliances gains (calculate (68)m= 232.3 234.71 2  Cooking gains (calculate (69)m= 35.87 35.87  Pumps and fans gains (70)m= 0 0  Losses e.g. evaporation (71)m= -102.93 -102.93 -102.93 -102.93	Mar Apr 128.66 128.66 d in Appendix 15.01 11.36 ated in Appe 228.63 215.7 ed in Appendix 35.87 35.87 Table 5a) 0 0 (negative value)	May 128.66 a L, equat 8.49 ndix L, eq 199.38 a L, equat 35.87 0 ues) (Tab	Jun 128.66 ion L9 o 7.17 uation L 184.03 tion L15 35.87	Jul 128.66 r L9a), a 7.75 13 or L1 173.79 or L15a) 35.87	Aug 128.66 Iso see 10.07 3a), also 171.37 , also se 35.87	Sep 128.66 Table 5 13.52 see Tal 177.45 ee Table 35.87	Oct 128.66 17.16 ble 5 190.38 5 35.87	Nov 128.66 20.03 206.7	Dec 128.66 21.35 222.05 35.87	neating	(67) (68) (69) (70)
Metabolic gains (Table 5  Jan Feb  (66)m= 128.66 128.66 7  Lighting gains (calculate (67)m= 20.78 18.45  Appliances gains (calculate (68)m= 232.3 234.71 2  Cooking gains (calculate (69)m= 35.87 35.87  Pumps and fans gains (70)m= 0 0  Losses e.g. evaporation (71)m= -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.93 -102.	Mar Apr 128.66 128.66 d in Appendix 15.01 11.36 ated in Appe 228.63 215.7 ed in Appendix 35.87 35.87 Table 5a) 0 0 (negative value) 102.93 -102.93	May 128.66 a L, equat 8.49 ndix L, eq 199.38 a L, equat 35.87 0 ues) (Tab	Jun 128.66 ion L9 o 7.17 uation L 184.03 tion L15 35.87 0 ole 5) -102.93	Jul 128.66 r L9a), a 7.75 13 or L1 173.79 or L15a) 35.87	Aug 128.66 Iso see 10.07 3a), also 171.37 , also se 35.87 0	Sep 128.66 Table 5 13.52 see Tal 177.45 ee Table 35.87 0	Oct 128.66  17.16 ble 5 190.38 5 35.87 0 -102.93	Nov 128.66 20.03 206.7 35.87 0	Dec 128.66 21.35 222.05 35.87 0 -102.93	neating	(67) (68) (69) (70)
Metabolic gains (Table 5  Jan Feb  (66)m= 128.66 128.66 7  Lighting gains (calculate (67)m= 20.78 18.45 7  Appliances gains (calculate (68)m= 232.3 234.71 2  Cooking gains (calculate (69)m= 35.87 35.87 7  Pumps and fans gains (70)m= 0 0  Losses e.g. evaporation (71)m= -102.93 -102.93 -102.93 7  Water heating gains (Tal (72)m= 128.92 126.72 7  Total internal gains =	Mar Apr 128.66 128.66 d in Appendix 15.01 11.36 ated in Appe 228.63 215.7 ed in Appendix 35.87 35.87 Table 5a) 0 0 (negative value) 102.93 -102.93	May 128.66 x L, equat 8.49 ndix L, eq 199.38 x L, equat 35.87  0 ues) (Tab	Jun 128.66 ion L9 o 7.17 uation L 184.03 tion L15 35.87 0 ole 5) -102.93	Jul 128.66 r L9a), a 7.75 13 or L1 173.79 or L15a) 35.87 0	Aug 128.66 Iso see 10.07 3a), also 171.37 , also se 35.87 0	Sep 128.66 Table 5 13.52 see Tal 177.45 ee Table 35.87 0	Oct 128.66  17.16 ble 5 190.38 5 35.87 0 -102.93	Nov 128.66 20.03 206.7 35.87 0	Dec 128.66 21.35 222.05 35.87 0 -102.93	neating	(67) (68) (69) (70)
Metabolic gains (Table 5  Jan Feb  (66)m= 128.66   128.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28.66   28	Mar Apr 128.66 128.66 d in Appendix 15.01 11.36 ated in Appe 228.63 215.7 ed in Appendix 35.87 35.87 Table 5a) 0 0 (negative value) 102.93 -102.93 ble 5) 122.15 115.93	May 128.66 x L, equat 8.49 ndix L, eq 199.38 x L, equat 35.87  0 ues) (Tab	Jun 128.66 ion L9 o 7.17 uation L 184.03 tion L15 35.87 0 ole 5) -102.93	Jul 128.66 r L9a), a 7.75 13 or L1 173.79 or L15a) 35.87 0 -102.93	Aug 128.66 Iso see 10.07 3a), also 171.37 ), also se 35.87 0 -102.93	Sep 128.66 Table 5 13.52 see Tal 177.45 ee Table 35.87 0 -102.93	Oct 128.66 17.16 ble 5 190.38 5 35.87 0 -102.93 116.21 (70)m + (7	Nov 128.66 20.03 206.7 35.87 0 -102.93 123.47 1)m + (72)	Dec 128.66 21.35 222.05 35.87 0 -102.93	neating	(67) (68) (69) (70) (71) (72)

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



Orientati	on:	Access Factor Table 6d	•	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	X	5.28	x	10.63	x	0.4	x	0.7	] =	10.89	(74)
North	0.9x	0.77	X	2.64	x	10.63	x	0.4	x	0.7	] =	5.45	(74)
North	0.9x	0.77	X	5.28	x	20.32	x	0.4	x	0.7	<u> </u>	20.82	(74)
North	0.9x	0.77	X	2.64	x	20.32	x	0.4	x	0.7	] =	10.41	(74)
North	0.9x	0.77	X	5.28	x	34.53	x	0.4	x	0.7	<b>=</b>	35.38	(74)
North	0.9x	0.77	X	2.64	x	34.53	x	0.4	x	0.7	=	17.69	(74)
North	0.9x	0.77	X	5.28	x	55.46	x	0.4	x	0.7	=	56.83	(74)
North	0.9x	0.77	X	2.64	X	55.46	X	0.4	x	0.7	=	28.41	(74)
North	0.9x	0.77	X	5.28	x	74.72	x	0.4	x	0.7	=	76.55	(74)
North	0.9x	0.77	X	2.64	x	74.72	X	0.4	X	0.7	=	38.27	(74)
North	0.9x	0.77	X	5.28	x	79.99	x	0.4	x	0.7	=	81.95	(74)
North	0.9x	0.77	X	2.64	x	79.99	x	0.4	x	0.7	=	40.97	(74)
North	0.9x	0.77	X	5.28	X	74.68	X	0.4	x	0.7	=	76.51	(74)
North	0.9x	0.77	X	2.64	x	74.68	x	0.4	x	0.7	=	38.25	(74)
North	0.9x	0.77	X	5.28	x	59.25	x	0.4	x	0.7	=	60.7	(74)
North	0.9x	0.77	X	2.64	X	59.25	X	0.4	X	0.7	=	30.35	(74)
North	0.9x	0.77	X	5.28	х	41.52	X	0.4	X	0.7	=	42.54	(74)
North	0.9x	0.77	X	2.64	х	41.52	×	0.4	x	0.7	=	21.27	(74)
North	0.9x	0.77	X	5.28	Х	24.19	X	0.4	X	0.7	=	24.78	(74)
North	0.9x	0.77	X	2.64	x	24.19	х	0.4	x	0.7	=	12.39	(74)
North	0.9x	0.77	X	5.28	x	13.12	Х	0.4	X	0.7	=	13.44	(74)
North	0.9x	0.77	X	2.64	Х	13.12	X	0.4	X	0.7	=	6.72	(74)
North	0.9x	0.77	X	5.28	x	8.86	X	0.4	X	0.7	=	9.08	(74)
North	0.9x	0.77	X	2.64	x	8.86	X	0.4	X	0.7	=	4.54	(74)
South	0.9x	0.77	X	5.28	x	46.75	x	0.4	X	0.7	=	47.9	(78)
South	0.9x	0.77	X	2.64	X	46.75	X	0.4	X	0.7	=	23.95	(78)
South	0.9x	0.77	X	2.18	X	46.75	X	0.4	X	0.7	=	19.78	(78)
South	0.9x		X	5.28	X	76.57	X	0.4	X	0.7	=	78.45	(78)
South	0.9x	0.77	X	2.64	X	76.57	X	0.4	X	0.7	=	39.22	(78)
South	0.9x	0.77	X	2.18	X	76.57	X	0.4	X	0.7	=	32.39	(78)
South	0.9x		X	5.28	x	97.53	X	0.4	X	0.7	=	99.93	(78)
South	0.9x	0.77	X	2.64	X	97.53	X	0.4	X	0.7	=	49.96	(78)
South	0.9x		X	2.18	x	97.53	X	0.4	X	0.7	=	41.26	(78)
South	0.9x		X	5.28	X	110.23	X	0.4	X	0.7	=	112.94	(78)
South	0.9x		X	2.64	X	110.23	X	0.4	X	0.7	=	56.47	(78)
South	0.9x		X	2.18	x	110.23	x	0.4	X	0.7	=	46.63	(78)
South	0.9x		X	5.28	x	114.87	X	0.4	X	0.7	=	117.69	(78)
South	0.9x		X	2.64	x	114.87	X	0.4	X	0.7	=	58.84	(78)
South	0.9x	0.77	X	2.18	X	114.87	X	0.4	X	0.7	] =	48.59	(78)



South	0.9x	0.77	x	5.28	x	110.55	x	0.4	x	0.7	=	113.26	(78)
South	0.9x	0.77	х	2.64	x	110.55	x	0.4	x	0.7	=	56.63	(78)
South	0.9x	0.77	x	2.18	X	110.55	x	0.4	x	0.7	=	46.76	(78)
South	0.9x	0.77	x	5.28	x	108.01	x	0.4	x	0.7	=	110.66	(78)
South	0.9x	0.77	x	2.64	X	108.01	x	0.4	x [	0.7	=	55.33	(78)
South	0.9x	0.77	x	2.18	X	108.01	x	0.4	x	0.7	=	45.69	(78)
South	0.9x	0.77	x	5.28	x	104.89	x	0.4	x	0.7	=	107.47	(78)
South	0.9x	0.77	x	2.64	x	104.89	x	0.4	x	0.7	=	53.73	(78)
South	0.9x	0.77	x	2.18	X	104.89	x	0.4	x	0.7	=	44.37	(78)
South	0.9x	0.77	x	5.28	x	101.89	x	0.4	x [	0.7		104.39	(78)
South	0.9x	0.77	x	2.64	x	101.89	x	0.4	x [	0.7	=	52.19	(78)
South	0.9x	0.77	x	2.18	X	101.89	x	0.4	x	0.7	=	43.1	(78)
South	0.9x	0.77	x	5.28	X	82.59	x	0.4	x	0.7	=	84.61	(78)
South	0.9x	0.77	X	2.64	x	82.59	x	0.4	x	0.7	=	42.31	(78)
South	0.9x	0.77	X	2.18	x	82.59	x	0.4	x	0.7	=	34.93	(78)
South	0.9x	0.77	X	5.28	X	55.42	x	0.4	x	0.7	=	56.78	(78)
South	0.9x	0.77	X	2.64	X	55.42	x	0.4	x	0.7	=	28.39	(78)
South	0.9x	0.77	x	2.18	X	55.42	X	0.4	Х	0.7	=	23.44	(78)
South	0.9x	0.77	x	5.28	х	40.4	] x	0.4	x	0.7	=	41.39	(78)
South	0.9x	0.77	x	2.64	x	40.4	] x	0.4	х	0.7	=	20.69	(78)
South	0.9x	0.77	x	2.18	X	40.4	x	0.4	х	0.7	=	17.09	(78)
Solar g	ains in			for each mon			(83)m	n = Sum(74)m .	(8 <mark>2)m</mark>				
(83)m = 107.97 181.29 244.21 301.28 339.95 339.57 326.44 296.62 263.48 199.03 128.77 92.8 Total gains – internal and solar (84)m = (73)m + (83)m , watts											(83)		
r				<del> </del>	<del></del>	<del></del>	·				T 1		(0.4)
(84)m=	551.56	622.77 67	1.6	705.87 721.3	1 6	98.59 670.96	647	.24 625.81	584.37	540.57	524.52		(84)
		•		heating seaso									_
•		•	•		_	area from Tab	ole 9	, Th1 (°C)				21	(85)
Utilisa r				ving area, h1	Ť	<del></del>	_	- 1		1	i	1	
,	Jan		/lar	Apr Ma	_	Jun Jul	_	ug Sep	Oct	Nov	Dec		()
(86)m=	1	0.99 0.	98	0.94 0.84		0.64 0.47	0.5	0.75	0.95	0.99	1		(86)
r				<del></del>	<del>`</del>	w steps 3 to 7	in T	<del> </del>			, , , , , , , , , , , , , , , , , , ,	ı	
(87)m=	20.2	20.33 20	.52	20.75 20.91	1 2	20.99 21	2	1 20.97	20.77	20.44	20.17		(87)
Temp	erature	during heati	ng pe	eriods in rest	of dv	elling from Ta	able 9	9, Th2 (°C)					
(88)m=	20.19	20.2 20	).2	20.21 20.21	2	20.23 20.23	20.	23 20.22	20.21	20.21	20.2		(88)
Utilisa	tion fac	tor for gains	for r	est of dwelling	g, h2	,m (see Table	9a)						
(89)m=	1		98	0.92 0.79		0.57 0.39	0.4	0.68	0.93	0.99	1		(89)
Mean	interna	l temperatur	e in t	he rest of dwe	elling	T2 (follow ste	eps 3	to 7 in Tabl	e 9c)				
(90)m=	19.12		.59	19.92 20.13	Ť	20.22 20.23	20.		19.95	19.49	19.09		(90)
L			<u>I</u>					f	LA = Liv	ing area ÷ (	4) =	0.23	(91)
			,,									ı	_

Mean internal temperature (for the whole dwelling) =  $fLA \times T1 + (1 - fLA) \times T2$ 



(92)m= 19.37 19.55 19.8 20.11 20.31 20.4 20.41 20.41	20.38 20.14 19.71 19.34	(92)
Apply adjustment to the mean internal temperature from Table 4e, who	ere appropriate	
(93)m= 19.37 19.55 19.8 20.11 20.31 20.4 20.41 20.41	20.38   20.14   19.71   19.34	(93)
8. Space heating requirement	h as that Time (70) as and as aslaulate	
Set Ti to the mean internal temperature obtained at step 11 of Table 9 the utilisation factor for gains using Table 9a	b, so that 11,m=(76)m and re-calculate	
Jan Feb Mar Apr May Jun Jul Aug	Sep Oct Nov Dec	
Utilisation factor for gains, hm:		
(94)m= 0.99 0.99 0.97 0.92 0.8 0.59 0.41 0.44	0.7 0.93 0.99 1	(94)
Useful gains, hmGm , W = (94)m x (84)m		(05)
(95)m= 548.54 615.2 652.35 650.78 577.34 410.61 272.87 286.05	437.02 543.11 533.46 522.36	(95)
Monthly average external temperature from Table 8  (96)m=	14.1 10.6 7.1 4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m		(==)
(97)m= 1129.99 1095.05 991.07 821.34 629.12 416.33 273.32 286.79	453.79 696.64 927.08 1120.84	(97)
Space heating requirement for each month, kWh/month = 0.024 x [(97	7)m – (95)m] x (41)m	
(98)m= 432.6 322.46 252.01 122.8 38.53 0 0 0	0 114.23 283.41 445.27	_
Tota	al per year (kWh/year) = Sum(98) <sub>15,912</sub> = 2011.31	(98)
Space heating requirement in kWh/m²/year	23.28	(99)
9b. Energy requirements - Community heating scheme		
This part is used for space heating, space cooling or water heating prov		¬,,,,,
Fraction of space heat from secondary/supplementary heating (Table 1	1) '0' if none 0	(301)
Fraction of space heat from community system 1 – (301) =	1	(302)
The community scheme may obtain heat from several sources. The procedure allows for includes boilers, heat pumps, geothermal and waste heat from power stations. See Appe		
Fraction of heat from Community heat pump	0.7	(303a)
Fraction of community heat from heat source 2	0.3	(303b)
Fraction of total space heat from Community heat pump	(302) x (303a) = 0.7	(304a)
Fraction of total space heat from community heat source 2	(302) x (303b) = 0.3	(304b)
Factor for control and charging method (Table 4c(3)) for community hea	ating system 1	(305)
Distribution loss factor (Table 12c) for community heating system	1.1	(306)
Space heating	kWh/yea	<u>r</u>
Annual space heating requirement	2011.31	
Space heat from Community heat pump	(98) x (304a) x (305) x (306) = 1548.71	(307a)
Space heat from heat source 2	(98) x (304b) x (305) x (306) = 663.73	(307b)
Efficiency of secondary/supplementary heating system in % (from Table	e 4a or Appendix E) 0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) = 0	(309)
Water heating		_
Annual water heating requirement	2150.48	1
If DHW from community scheme:	2130.40	
Water heat from Community heat pump	(64) x (303a) x (305) x (306) = 1655.87	(310a)



Water heat from heat source 2	(64) x (303b) x (	305) x (306) =	709.66	(310b)
Electricity used for heat distribution	0.01 × [(307a)(307e	e) + (310a)(310e)] =	45.78	(313)
Cooling System Energy Efficiency Ratio			0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) :	=	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from	n outside		177.88	(330a)
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b	) + (330g) =	177.88	(331)
Energy for lighting (calculated in Appendix L)			366.92	(332)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%)  If there is CHP usi	) ng two fuels repeat (363) to (	366) for the second fue	294	(367a)
Efficiency of heat source 2 (%)  If there is CHP using	ng two fuels repeat (363) to (	366) for the second fue	95.6	(367b)
CO2 associated with heat source 1 [(307b)	+(310b)] x 100 ÷ (367b) x	0.52	565.71	(367)
CO2 associated with heat source 2 [(307b)	+(310b)] x 100 ÷ (367b) x	0.22 =	310.31	(368)
Electrical energy for heat distribution	[(313) x	0.52	23.76	(372)
Total CO2 associated with community systems	(363)(366) + (368)(372)	) =	899.77	(373)
CO2 associated with space heating (secondary)	(309) x	0 =	0	(374)
CO2 associated with water from immersion heater or instantan	neous heater (312) x	0.52 =	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =		899.77	(376)
CO2 associated with electricity for pumps and fans within dwel	0.52	92.32	(378)	
CO2 associated with electricity for lighting	(332))) x	0.52 =	190.43	(379)
Total CO2, kg/year sum of (376)(382) =			1182.52	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			13.69	(384)
•				_

El rating (section 14)

(385)



User Details: **Assessor Name:** Stroma Number: **Software Version: Software Name:** Stroma FSAP 2012 Version: 1.0.5.12 Property Address: W2-01 , 156 West End Lane, Camden, London Address: 1. Overall dwelling dimensions Av. Height(m) Volume(m³) Area(m<sup>2</sup>) Ground floor 94.3 (1a) x 2.7 (2a) = (3a) 254.61 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)(4)94.3 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =254.61 (5) total m³ per hour main secondary other heating heating x 40 =Number of chimneys (6a) 0 0 x 20 =Number of open flues 0 0 0 (6b) Number of intermittent fans x 10 =(7a)0 0 x 10 =Number of passive vents (7b) 0 0 x 40 =Number of flueless gas fires 0 (7c)Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =(8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9)0 Additional infiltration [(9)-1]x0.1 =0 (10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)0 if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12)If no draught lobby, enter 0.05, else enter 0 (13)0 Percentage of windows and doors draught stripped (14)0 Window infiltration  $0.25 - [0.2 \times (14) \div 100] =$ 0 (15)Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =O (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)3 If based on air permeability value, then  $(18) = [(17) \div 20] + (8)$ , otherwise (18) = (16)0.15 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)2  $(20) = 1 - [0.075 \times (19)] =$ Shelter factor (20)0.85  $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.13 Infiltration rate modified for monthly wind speed Jan Feb Jul Sep Mar Apr May Jun Aug Oct Nov Dec Monthly average wind speed from Table 7 (22)m =5.1 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor  $(22a)m = (22)m \div 4$ (22a)m 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18



0.16	0.16	0.16	0.14	0.14	0.12	0.12	(21a) x	0.13	0.14	0.14	0.15		
Calculate effe		•	rate for t	he appli	cable ca	ise		ļ					
If mechanica											ļ	0.5	(2
If exhaust air h		0		, ,	,	. `	,, .	,	) = (23a)		ļ	0.5	(2
If balanced with		-	•	_								76.5	(2
a) If balance						<del>-                                    </del>	<del>, ``</del>	<del>í `</del>	<del> </del>	<del></del>	<del>~ `                                   </del>	÷ 100] I	(2)
24a)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27		(2
b) If balance						<del></del>	<del>-                                    </del>	<del>i `</del>	<del> </del>	<del></del>		1	(2
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h if (22b)n				•					5 v (23h	<b>.</b> )			
$\frac{11(220)11}{24c)m} = 0$	0.5 7	0	0	0	0	0	0 = (221	0	0	0	0		(2
d) If natural													`
if (22b)n				•	•				0.5]				
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
Effective air	change	rate - er	nter (24a	) or (24k	o) or (24	c) or (24	d) in bo	x (25)	•	•		•	
25)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27		(2
Last less	and be	et loce i	o so so so t	0.51				•					
3. Heat losse					Net Ar		U-val		AXU		le volue		λΧk
LEMENT	Gros area		Openin m		A ,r		W/m2		A X U (W/I	<)	k-value kJ/m²-k		AXK (J/K
oors					1.89	x	1.4	= [	2.646				(
in <mark>dows</mark> Type	1				6.48	x1	/[1/( 1.2 )+	0.04] =	7.42	Ħ			(
indows Type	2				2.64	x1	/[1/( 1.2 )+	0.04] =	3.02	Ħ			(
oor					94.3		0.06	=	5.658	5 ,			) (2
/alls Type1	66.4	12	19.6	8	46.74	=	0.16	<u>-</u>	7.48	륵 ¦			<u> </u>
/alls Type2	5.6		1.89	_	3.78	=	0.15	<u> </u>	0.57	륵 ;			<u> </u>
otal area of e	L		1.00		166.3	=	0.10		0.01				\` (
arty wall	1011101110	,			42.75	=	0		0				(
arty wall						=							<u> </u>
or windows and	roof wind	ows use e	effective wi	ndow I I-va	94.3		n formula 1	/[(1/Ll-valu	ıe)+0 041 a	L os aiven in	naragranh		(
include the area						atou dome	, romiala i	/[(	10/10.04/0	io givori iii	paragrapii	. 0.2	
abric heat los	s, W/K	= S (A x	U)				(26)(30)	) + (32) =			I	38.88	(
eat capacity	Cm = S(	(Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	7072.5	
nermal mass	parame	ter (TMF	o = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	Medium	İ	250	
or design assess				construct	ion are no	t known pi	ecisely the	e indicative	values of	TMP in Ta	able 1f		
n be used inste						12							
nermal bridge	•	,		• .	-	K					l	14.75	(
J - ( - 'I ( )		are not kn	iown (36) =	= 0.05 X (3	11)			(33) +	(36) =		i	53.63	
	สเ เบรร									25)m x (5)		33.03	'
otal fabric he		alculated	monthly	/				انالمان	= U.SS X I	20/111 8 10	)		
details of therma otal fabric he entilation hea	at loss ca		·		Jun	Jul	Aua						
otal fabric he entilation hea		Alculated Mar	Apr 21.66	May	Jun 20.05	Jul 20.05	Aug	Sep 20.59	Oct	Nov	Dec 22.46		(:
otal fabric he entilation hea	Feb 23.26	Mar 23	Apr		Jun 20.05	1	<del>l                                     </del>	Sep 20.59		Nov 21.92	Dec		(

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com

Average =  $Sum(39)_{1...12}/12=$ 

75.28 age 2 (39)



Heat loss para	meter (l	HLP), W/	m²K					(40)m	= (39)m ÷	÷ (4)			
(40)m= 0.82	0.82	0.81	0.8	0.8	0.78	0.78	0.78	0.79	0.8	0.8	0.81		
Number of day	e in mo	nth (Tah	lo 1a)						Average =	Sum(40) <sub>1.</sub>	12 /12=	0.8	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heat	ing ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (	TFA -13		68		(42)
Annual averag Reduce the annua not more that 125	al average	hot water	usage by	5% if the c	lwelling is	designed			se target o		7.85		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage ii	n litres pei	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)		,				
(44)m= 107.64	103.72	99.81	95.9	91.98	88.07	88.07	91.98	95.9	99.81	103.72	107.64	4474.04	
Energy content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x E	Tm / 3600			ım(44) <sub>112</sub> = ables 1b, 1		1174.24	(44)
(45)m= 159.62	139.61	144.06	125.6	120.51	103.99	96.37	110.58	111.9	130.41	142.35	154.59		
			5 (		7 .				Total = Su	ım(45) <sub>112</sub> =		1539.61	(45)
If instantaneous w													(40)
(46)m= 23.94 Water storage	20.94 loss:	21.61	18.84	18.08	15.6	14.45	16.59	16.79	19.56	21.35	23.19		(46)
Storage volum		includin	ig any so	olar or W	WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	_			_									
Otherwise if no Water storage		hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	(47)			
a) If manufact		eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature fa	actor fro	m Table	2b								0		(49)
Energy lost fro		_	-				(48) x (49)	) =		1	10		(50)
b) If manufact Hot water stora			-								00		(E1)
If community h	-			6 Z (KVV	ii/iiti G/GC	iy <i>)</i>				0.	.02		(51)
Volume factor	_									1.	.03		(52)
Temperature fa	actor fro	m Table	2b							0	.6		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	1.	1.03		
Enter (50) or (	, ,	,								1.	.03		(55)
Water storage		culated t					((56)m = (	55) × (41)	m <del></del>				
(56)m= 32.01 If cylinder contains	28.92 s dedicate	32.01 d solar sto	30.98 rage, (57)	32.01 m = (56)m	30.98 x [(50) – (	32.01 H11)] ÷ (5	32.01 0), else (5	30.98 7)m = (56)	32.01 m where (	30.98 (H11) is fro	32.01 m Append	ix H	(56)
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit					<u> </u>	<u> </u>	<u> </u>	<u> </u>		ļ	0		(58)
Primary circuit	loss cal	culated f	or each	month (	•	. ,	, ,				~		(30)
(modified by							<del></del>	<u> </u>		ostat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)



Combi loss ca	lculated t	for each	month (	(61)m =	(60) ÷ 3	865 <b>x</b> (41	)m						
(61)m= 0	0	0	0	0	0	0	0	0	0	Ιο	0	1	(61)
	uired for	water he	eating ca	Lulated	L I for eac	h month	(62)m	$0 = 0.85 \times 10^{-1}$	L (45)m ⊣	. (46)m +	(57)m +	ı (59)m + (61)m	
(62)m= 214.9	189.54	199.34	179.09	175.79	157.49	1	165.8		185.69	<del>`                                    </del>	209.86	]	(62)
Solar DHW input of											l .	l	, ,
(add additiona													
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(63)
Output from wa	ater heat	ter										ı	
(64)m= 214.9	189.54	199.34	179.09	175.79	157.49	151.64	165.8	6 165.4	185.69	195.85	209.86	1	
							C	utput from w	ater heat	er (annual)	112	2190.45	(64)
Heat gains from	m water	heating,	kWh/m	onth 0.2	5 ′ [0.85	5 × (45)m	+ (61	)m] + 0.8 x	k [(46)n	n + (57)m	+ (59)m	 . ]	-
(65)m= 97.3	86.36	92.12	84.56	84.29	77.37	76.26	80.99	9 80	87.58	90.13	95.62	]	(65)
include (57)	m in calc	ulation o	of (65)m	only if c	ylinder	is in the	dwellir	ng or hot w	ater is	from com	munity h	ı neating	
5. Internal ga					-						•		
Metabolic gain	Ì												
Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec		
(66)m= 134.01	134.01	134.01	134.01	134.01	134.01	134.01	134.0	1 134.01	134.01	134.01	134.01		(66)
Lighting gains	(calculat	ed in Ap	pendix	L, equati	ion L9 d	or L9a), a	lso se	e Table 5					
(67)m= 22.07	19.6	15.94	12.07	9.02	7.62	8.23	10.7	14.36	18.23	21.28	22.68	1	(67)
App <mark>liance</mark> s gai	ins (ca <mark>lcı</mark>	ulated in	Append	dix L, eq	uation L	_13 or L1	3a), a	so see Ta	ble 5				
(68)m= 246.77	249.33	242.88	229.14	211.8	195.5	184.61	182.0	5 188.51	202.24	219.58	235.88		(68)
Cooking gains	(calcula	ted in A	opendix	L, equat	ion L15	or L15a	), also	see Table	5		•		
(69)m= 36.4	36.4	36.4	36.4	36.4	36.4	36.4	36.4	36.4	36.4	36.4	36.4		(69)
Pumps and far	ns gains	(Table 5	5a)							•	•		
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses e.g. ev	aporatio	n (negat	ive valu	es) (Tab	le 5)				•	•		•	
(71)m= -107.21	-107.21	-107.21	-107.21	-107.21	-107.21	-107.21	-107.2	1 -107.21	-107.21	-107.21	-107.21		(71)
Water heating	gains (T	able 5)						•		•			
(72)m= 130.77	128.51	123.82	117.44	113.3	107.46	102.5	108.8	6 111.11	117.72	125.18	128.52		(72)
Total internal	gains =				(66	6)m + (67)m	ı + (68)	m + (69)m +	(70)m + (	71)m + (72)	)m		
(73)m= 462.82	460.65	445.84	421.85	397.32	373.78	358.55	364.8	1 377.18	401.4	429.24	450.29		(73)
6. Solar gains	S:												
Solar gains are o	calculated u	using sola	r flux from	Table 6a	and asso	ciated equa	itions to	convert to th	ne applica	able orienta	tion.		
Orientation: A		actor	Area			ux		g_ Table Ch	_	FF		Gains	
_	Table 6d		m²		T &	able 6a	. –	Table 6b		Table 6c		(W)	_
West 0.9x	0.77	X	6.4	18	x	19.64	x	0.4	X	0.7	=	24.7	(80)
West 0.9x	0.77	X	2.6	64	х	19.64	×	0.4	x	0.7	=	50.31	(80)
West 0.9x	0.77	X	6.4	18	х	38.42	×	0.4	x [	0.7	=	48.31	(80)
West 0.9x	0.77	X	2.6	64	х	38.42	x	0.4	x [	0.7	=	98.41	(80)
West 0.9x	0.77	X	6.4	18	X	63.27	x	0.4	X	0.7	=	79.56	(80)



West	0.9x	0.77	X	2.6	64	X	6	3.27	X	0.4	X		0.7		= [	162.06	(80)
West	0.9x	0.77	X	6.4	18	X	9	2.28	x	0.4	x		0.7		= [	116.03	(80)
West	0.9x	0.77	X	2.6	64	X	9	2.28	X	0.4	X		0.7		= [	236.36	(80)
West	0.9x	0.77	X	6.4	18	X	1	13.09	X	0.4	x		0.7		= [	142.2	(80)
West	0.9x	0.77	X	2.6	64	X	1	13.09	x	0.4	x		0.7		= [	289.67	(80)
West	0.9x	0.77	X	6.4	18	X	1	15.77	X	0.4	x		0.7		= [	145.57	(80)
West	0.9x	0.77	X	2.6	64	X	1	15.77	x	0.4	x		0.7		= [	296.53	(80)
West	0.9x	0.77	X	6.4	18	X	1	10.22	X	0.4	X		0.7		= [	138.59	(80)
West	0.9x	0.77	X	2.6	64	X	1	10.22	X	0.4	X		0.7		= [	282.31	(80)
West	0.9x	0.77	X	6.4	18	X	9	4.68	X	0.4	X		0.7		= [	119.04	(80)
West	0.9x	0.77	X	2.6	64	X	9	4.68	X	0.4	X		0.7	:	= [	242.5	(80)
West	0.9x	0.77	X	6.4	18	X	7	3.59	X	0.4	X		0.7		= [	92.53	(80)
West	0.9x	0.77	X	2.6	64	X	7	3.59	x	0.4	X		0.7	:	= [	188.49	(80)
West	0.9x	0.77	X	6.4	l8	X	4	5.59	X	0.4	X		0.7		= [	57.32	(80)
West	0.9x	0.77	X	2.6	64	X	4	5.59	X	0.4	X		0.7		= [	116.77	(80)
West	0.9x	0.77	X	6.4	18	X	2	4.49	x	0.4	X		0.7	:	= [	30.79	(80)
West	0.9x	0.77	X	2.6	64	X	2	4.49	X	0.4	X		0.7		= [	62.72	(80)
West	0.9x	0.77	X	6.4	18	X	1	6.15	Х	0.4	X		0.7		= [	20.31	(80)
West	0.9x	0.77	x	2.6	64	Х	1	6.15	x	0.4	x		0.7		= [	41.37	(80)
Solar g	gains in	watts, <mark>cal</mark>	lculated	for eac	h month	<u> </u>			(83)m	= Sum(74)m	ո(82)r	n			_		
(83)m=	75		241.62	352.39	431.87	<u> </u>	42.09	420.89	361.	.54 281.02	174.	09	93.52	61.68	3		(83)
Total g		nternal ar		` '	•	_					_				_		
(84)m=	537.82	607.37	687.46	774.24	829.19	8	15.88	779.44	726	.35 658.2	575.	49	522.76	511.9	7		(84)
7. Me	an inter	nal tempe	erature	(heating	seasor	า)											
Temp	erature	during he	eating p	eriods ir	the liv	ing	area f	from Tab	ole 9,	Th1 (°C)						21	(85)
Utilisa	ation fac	tor for ga	ins for I	iving are	ea, h1,n	n (s	ee Ta	ble 9a)									
	Jan	Feb	Mar	Apr	May		Jun	Jul	Αι	ug Sep	00	ct	Nov	De	С		
(86)m=	1	1	0.98	0.93	0.79		0.57	0.42	0.4	6 0.74	0.9	6	1	1			(86)
Mean	interna	l tempera	ture in I	iving are	ea T1 (f	ollo	w ste	ps 3 to 7	in T	able 9c)							
(87)m=	20.2	20.33	20.54	20.8	20.95		21	21	2	1 20.98	20.7	<b>'</b> 6	20.44	20.19	9		(87)
Temp	erature	during he	eating p	eriods ir	n rest of	f dw	elling	from Ta	ble 9	), Th2 (°C)	)						
(88)m=	20.24	20.24	20.24	20.25	20.26	2	20.27	20.27	20.2	27 20.26	20.2	26	20.25	20.25	5		(88)
Utilisa	ation fac	tor for ga	ins for r	est of d	welling.	h2.	m (se	e Table	9a)	•							
(89)m=	1	0.99	0.98	0.91	0.74	_	0.51	0.35	0.3	9 0.68	0.9	5	0.99	1			(89)
Moan	intorna	l tempera	turo in t	ho rost	of dwal	lina	T2 (f	ollow etc	ne 3	to 7 in Tal	hla Oc)						
(90)m=	19.16	19.35	19.65	20.02	20.21	Ť	0.27	20.27	20.		<del></del>		19.51	19.14	4		(90)
(= j					L					1 =5.26			g area ÷ (4		十	0.38	(91)
						. 111 -	\ "	A T4	. /4	41 A\ <del></del>			·		L		` ′
N A							, 1 1 — †I		1 17	_ TI	,						
Mean			T T			$\overline{}$					_	,, 1	10.07	10.5	$\Box$		(02)
(92)m=	19.56	19.72	19.99	20.32	20.49	2	0.54	20.55	20.		20.2		19.87	19.54	4		(92)



` '	0.55 20.55	20.52	20.28	19.87	19.54		(93)
8. Space heating requirement	44 -	41	4 T: (	70)	-1	Jata	
Set Ti to the mean internal temperature obtained at step the utilisation factor for gains using Table 9a	TT OF TABLE 9	o, so ma	t 11,m=(	ro)m an	a re-caici	uiate	
	Jul Aug	Sep	Oct	Nov	Dec		
Utilisation factor for gains, hm:							
(94)m= 1 0.99 0.98 0.91 0.75 0.53 0	0.42	0.7	0.95	0.99	1		(94)
Useful gains, hmGm , W = (94)m x (84)m							
` '	90.7 304.18	461.26	546.26	518.96	510.85		(95)
Monthly average external temperature from Table 8	100 1 404	444	40.0	7.4			(06)
` '	16.6 16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate for mean internal temperature, Lm , $W = [(3 (97)m = 1177.41   1139.62   1033.73   859.59   659.7   438   29$	90.89 304.61	476.77	725.95	964.52	1167.27		(97)
Space heating requirement for each month, kWh/month =					1107.27		(0.)
(98)m= 477.04 360.55 269.28 110.21 25.33 0	0 0	0	133.69	320.81	488.38		
	Tota	l per year	(kWh/yeai	) = Sum(9	8) <sub>15,912</sub> =	2185.28	(98)
Space heating requirement in kWh/m²/year						23.17	<u> </u>    (99)
					L	25.17	
9b. Energy requirements – Community heating scheme This part is used for space heating, space cooling or water	r heati <mark>ng pr</mark> ov	rided by a	a comm	unity sch	neme		
Fraction of space heat from secondary/supplementary hea	<b>.</b>	•		unity con		0	(301)
Fraction of space heat from community system 1 – (301) =	_				Ī	1	(302)
The community scheme may obtain heat from several sources. The proc	edure allows for	CHP and u	up to four	other heat	sources; th	e latter	_
includes boilers, heat pumps, geothermal and waste heat from power sta					_		_
Fraction of heat from Community heat pump						0.7	(303a)
Fraction of community heat from heat source 2						0.3	(303b)
Fraction of total space heat from Community heat pump			(3	02) x (303	a) =	0.7	(304a)
Fraction of total space heat from community heat source 2	2		(3	02) x (303	b) =	0.3	(304b)
Factor for control and charging method (Table 4c(3)) for co	ommunity hea	ating sys	tem		Ī	1	(305)
Distribution loss factor (Table 12c) for community heating	system				Ī	1.1	(306)
Space heating					_	kWh/yea	•
Annual space heating requirement						2185.28	
Space heat from Community heat pump		(98) x (30	04a) x (30	5) x (306) =	-	1682.66	(307a)
Space heat from heat source 2		(98) x (30	04b) x (30	5) x (306) =	= [	721.14	(307b)
Efficiency of secondary/supplementary heating system in	% (from Table	4a or A	ppendix	E)	Ī	0	(308
Space heating requirement from secondary/supplementary	y system	(98) x (30	01) x 100 ·	÷ (308) =	Ī	0	(309)
Water heating					_		-
Annual water heating requirement						2190.45	
If DHW from community scheme:		(CA) :: (CA	) ) ) ) () )	E) v (200)		4000.00	- - - - -
Water heat from Community heat pump				5) x (306) =	L	1686.65	(310a)
Water heat from heat source 2				5) x (306) =	Ļ	722.85	(310b)
Electricity used for heat distribution	0.01	× [(307a).	(307e) +	· (310a)(	[310e)] =	48.13	(313)



Cooling System Energy Efficiency Ratio				0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314)	=		0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from	outside			205.79	(330a)
warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b	o) + (330g) =		205.79	(331)
Energy for lighting (calculated in Appendix L)				389.76	(332)
12b. CO2 Emissions – Community heating scheme					
	Energy kWh/year	Emission factor kg CO2/kWh		nissions CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%)  If there is CHP using	g two fuels repeat (363) to	(366) for the second t	fuel [	294	(367a)
Efficiency of heat source 2 (%)	g two fuels repeat (363) to	(366) for the second f	fuel	95.6	(367b)
CO2 associated with heat source 1 [(307b)+	(310b)] x 100 ÷ (367b) x	0.52	= [	594.79	(367)
CO2 associated with heat source 2 [(307b)+	(310b)] x 100 ÷ (367b) x	0.22	= [	326.26	(368)
Electrical energy for heat distribution	((313) x	0.52	= [	24.98	(372)
Total CO2 associated with community systems	(363)(366) + (368)(372	2)	= [	946.02	(373)
CO2 associated with space heating (secondary)	(309) x	0	= [	0	(374)
CO2 associated with water from immersion heater or instantane	ous heater (312) x	0.52	= [	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =		[	946.02	(376)
CO2 associated with electricity for pumps and fans within dwelli	ng (331)) x	0.52	= [	106.8	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	= [	202.29	(379)
Total CO2, kg/year sum of (376)(382) =				1255.12	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =				13.31	(384)

El rating (section 14)

(385)

87.93



User Details: **Assessor Name:** Stroma Number: **Software Version: Software Name:** Stroma FSAP 2012 Version: 1.0.5.12 Property Address: W3-12 , 156 West End Lane, Camden, London Address: 1. Overall dwelling dimensions Av. Height(m) Volume(m³) Area(m<sup>2</sup>) Ground floor 51.8 (1a) x 2.7 (2a) = (3a) 139.86 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)(4)51.8 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =139.86 (5) total m³ per hour main secondary other heating heating x 40 =Number of chimneys (6a) 0 0 x 20 =Number of open flues 0 0 0 (6b) Number of intermittent fans x 10 =(7a)0 0 x 10 =Number of passive vents (7b) 0 0 x 40 =Number of flueless gas fires 0 (7c)Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = $\div (5)$ (8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9)0 Additional infiltration [(9)-1]x0.1 =0 (10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)0 if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12)If no draught lobby, enter 0.05, else enter 0 (13)O Percentage of windows and doors draught stripped (14)0 Window infiltration  $0.25 - [0.2 \times (14) \div 100] =$ 0 (15)Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =O (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)3 If based on air permeability value, then  $(18) = [(17) \div 20] + (8)$ , otherwise (18) = (16)0.15 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)3  $(20) = 1 - [0.075 \times (19)] =$ Shelter factor (20)0.78  $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.12 Infiltration rate modified for monthly wind speed Jan Feb Sep Mar Apr May Jun Jul Aug Oct Nov Dec Monthly average wind speed from Table 7 (22)m =5.1 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor  $(22a)m = (22)m \div 4$ (22a)m 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18



0.15	0.15	e (allowi 0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14	1	
Calculate effec		_	rate for t	he appli	cable ca	se	<u> </u>	ļ	ļ	<u> </u>	ļ	ı	
If mechanica			l' N. (6		/		.15\\	. (20)	\ (00 \			0.5	(2
If exhaust air h		0		, ,	,	. ,	,, .	,	) = (23a)			0.5	(2
If balanced with		-	-	_								76.5	(2
a) If balance				<b>.</b>		<del>- ` ` </del>	<del>,                                    </del>	<del>``</del>	<del> </del>	<del></del>	<del>```</del>	· ÷ 100] I	(2
(4a)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.23	0.23	0.24	0.25	0.25	J	(2
b) If balance	ea mecna	anicai ve	ntilation	without	neat red	overy (r	0 (240	0) m = (22) $0$	2b)m + (2   0	23D) 0	0	1	(2
·		<u> </u>				<u> </u>				0		J	(-
c) If whole h if (22b)n				•					5 x (23h	<b>)</b>			
4c)m= 0	0.0 %	0	0	0	0	0	0) = (22.	0	0	0	0	1	(
d) If natural	ventilatio	n or wh	ole hous	Lse nositiv	ve input	ventilatio	n from l	oft.	<u> </u>			l	
if (22b)n				•	•				0.5]				
4d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(
Effective air	change	rate - er	iter (24a	) or (24k	o) or (24	c) or (24	d) in box	(25)				_	
5)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.23	0.23	0.24	0.25	0.25		(
. Heat losse	s and he	at loss	naramet	ar.					_		_		
LEMENT	Gros		Openin		Net Ar	ea	U-val	IE	AXU		k-value	a <i>E</i>	λΧk
	area		r		A ,r		W/m2		(W/I	<)	kJ/m²·l		J/K
oors					1.89	х	1.4	= [	2.646				
in <mark>dows</mark> Type	<del>)</del> 1				5.28	x1.	/[1/( 1.2 )+	0.04] =	6.05	П			(
indows Type	2				2.64	x1,	/[1/( 1.2 )+	0.04] =	3.02	Ħ			(
alls Type1	18.3	36	7.92	2	10.44	x	0.16	=	1.67	5 (		¬ <u> </u>	
alls Type2	18.3	36	1.89		16.47	7 X	0.15	<b>=</b>	2.47	T i		<b>i</b>	_
tal area of e	lements	, m²			36.72	2	•						
arty wall					37.5	x	0		0			$\neg \vdash$	
arty floor					51.8	=	<u> </u>					<b>i</b>	_
arty ceiling					51.8	=						╡ ├─	=
or windows and	roof wind	ows, use e	ffective wi	ndow U-va			formula 1	/[(1/U-valu	ıe)+0.04] a	L ns given in	paragraph		
include the area									, -	ŭ	, , ,		
bric heat los	ss, W/K =	= S (A x	U)				(26)(30)	+ (32) =				15.85	
eat capacity	Cm = S(	(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	0	
nermal mass	parame	ter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	Medium		250	(
r design assess				construct	ion are no	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
n be used inste nermal bridge				ueina Ar	nondiy l							1.00	
letails of therma	•	,		• .	-	`						4.23	
otal fabric he		are not kn		0.00 X (0	••/			(33) +	(36) =			20.08	
entilation has	at loss ca	alculated	l monthl	y				(38)m	= 0.33 × (	25)m x (5)	)		
		1		1	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
Jan	Feb	Mar	Apr	May	Juli	լ յա	l Aug	l OCB	1 000	INOV	ן טפט		
Jan	Feb 12.13	Mar 12	11.32	11.19	10.52	10.52	10.39	10.79	11.19	11.46	11.73		(
Jan	12.13	12		<u> </u>	<del>                                     </del>	-	<del>-</del>	10.79	-	11.46			1

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com

Average =  $Sum(39)_{1...12}/12=$ 

31.37<sub>age 2 (39)</sub>



eat loss para	meter (H	HLP), W/	m²K					(40)m	= (39)m ÷	- (4)			
0.62	0.62	0.62	0.61	0.6	0.59	0.59	0.59	0.6	0.6	0.61	0.61		
umber of day	s in mor	nth (Tah	le 1a)						Average =	Sum(40) <sub>1</sub> .	12 /12=	0.61	(40
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
1)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41
4. Water heat	ing ener	gy requi	irement:								kWh/ye	ar:	
ssumed occu if TFA > 13.9 if TFA £ 13.9	, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (	TFA -13		74		(42
nnual averag educe the annua ot more that 125	e hot wa I average	hot water	usage by	5% if the c	lwelling is	designed t			se target c		5.6		(43
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
ot water usage ii	litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
4)m= 83.16	80.14	77.11	74.09	71.06	68.04	68.04	71.06	74.09	77.11	80.14	83.16		
nergy content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x E	Tm / 3600			m(44) <sub>112</sub> = ables 1b, 1		907.2	(44
5)m= 123.32	107.86	111.3	97.04	93.11	80.35	74.45	85.43	86.45	100.75	109.98	119.43		
									Total = Su	m(45) <sub>112</sub> =		1189.49	(4
instantaneous w							boxes (46						
6)m= 18.5 /ater storage	16.18	16.7	14.56	13.97	12.05	11.17	12.82	12.97	15.11	16.5	17.91		(4
torage volum		includin	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(4
community h	eating a	nd no ta	ınk in dw	elling, e	nter 110	litres in	(47)						
therwise if no		hot wate	er (this in	ıcludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	(47)			
/ater storage  i) If manufact		aclared l	nee facti	nr is kna	wn (k\//k	u/dav/).							(4
emperature fa				) 13 KHO	wii (ikwi	ı, day).					0		(4
nergy lost fro				ear			(48) x (49)	) =			10		(5
) If manufact		-	-		or is not	known:		•					(-
ot water stora	•			e 2 (kW	h/litre/da	ıy)				0.	02		(5
community holume factor	_		on 4.3								00		(E
emperature fa			2b								.6		(5. (5.
nergy lost fro				ear			(47) x (51)	) x (52) x (	53) =		03		(5
Inter (50) or (		_	,,	Jul			(11)11(01)	, (, (	,		03		(5
ater storage	loss cal	culated f	for each	month			((56)m = (	(55) × (41)	m				
6)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(5
cylinder contains												хН	V-
7)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(5
rimary circuit	loss (an	nual) fro	m Tahle	· 3	•		•	•	•		0		(5
rimary circuit	•	•			59)m = (	(58) ÷ 36	65 × (41)	ım					,
(modified by					•	. ,	, ,		r thermo	stat)			
(Inidamica by													



Combi loss o	alculated	for each	month (	′61)m =	(60) ÷ 3	65 × (41	)m							
(61)m= 0	0	0	0	0	0	0	)   0	)	0	0	0	0	1	(61)
	L auired for	water h	Leating ca	L	L I for eac	h month	(62)	—— m =	0 85 x (	 ′45)m +	(46)m +	(57)m +	ı · (59)m + (61)m	
(62)m= 178.6	<del></del>	166.58	150.53	148.39	133.84	129.73	140	_	139.95	156.03	163.48	174.71	]	(62)
Solar DHW inpu	t calculated	using App	endix G o	· Appendix	H (negat	ive quantity	y) (ent	er '0'	if no sola	r contribu	tion to wate	r heating)	<b>_</b>	
(add addition												•		
(63)m= 0	0	0	0	0	0	0	0	)	0	0	0	0	]	(63)
Output from	water hea	ter	•			•	•				•	•	•	
(64)m= 178.6	157.79	166.58	150.53	148.39	133.84	129.73	140	.71	139.95	156.03	163.48	174.71	]	
	•	•	•	•		•		Outp	out from wa	ater heate	r (annual)	l12	1840.33	(64)
Heat gains fr	om water	heating	, kWh/m	onth 0.2	5 ´ [0.85	5 × (45)m	ı + (6	1)m	n] + 0.8 x	c [(46)m	+ (57)m	+ (59)m	n ]	
(65)m= 85.23	75.81	81.23	75.06	75.18	69.51	68.98	72.	63	71.54	77.72	79.36	83.93		(65)
include (57	7)m in cald	culation	of (65)m	only if c	ylinder	is in the	dwell	ing	or hot w	ater is f	rom com	munity h	neating	
5. Internal	gains (see	Table 5	and 5a	):										
Metabolic ga	ins (Table	5). Wat	ts											
Jan		Mar	Apr	May	Jun	Jul	A	ug	Sep	Oct	Nov	Dec		
(66)m= 87.16	87.16	87.16	87.16	87.16	87.16	87.16	87.	16	87.16	87.16	87.16	87.16		(66)
Ligh <mark>ting g</mark> ain	s (calcula	ted in A	opendix	L, equ <mark>a</mark> t	ion L9 c	r L9a), <mark>a</mark>	lso s	ee	Table 5					
(67)m= 14.26	12.66	10.3	7.8	5.83	4.92	5.32	6.9	1	9.28	11.78	13.75	14.66		(67)
Appliances g	ains (ca <mark>lc</mark>	<mark>ulat</mark> ed ir	Append	dix L, eq	uation L	.13 or L1	3a), a	also	see Tal	ble <mark>5</mark>				
(68)m= 151.9°	1 153.48	149.51	141.05	130.38	120.35	113.64	112	.07	116.04	124.5	135.17	145.2		(68)
Cooking gair	ns (calcula	ited in A	ppendix	L, equat	ion L15	or L15a	), als	o se	e Table	5		-		
(69)m= 31.72	31.72	31.72	31.72	31.72	31.72	31.72	31.	72	31.72	31.72	31.72	31.72		(69)
Pumps and f	ans gains	(Table	5a)										_	
(70)m= 0	0	0	0	0	0	0	0	)	0	0	0	0	]	(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)								_	
(71)m= -69.73	-69.73	-69.73	-69.73	-69.73	-69.73	-69.73	-69.	.73	-69.73	-69.73	-69.73	-69.73		(71)
Water heatin	g gains (T	able 5)											_	
(72)m= 114.5	5 112.81	109.18	104.25	101.05	96.54	92.71	97.	62	99.36	104.47	110.23	112.81		(72)
Total interna	al gains =	l			(66	5)m + (67)m	n + (68	3)m +	- (69)m + (	(70)m + (7	71)m + (72)	)m	_	
(73)m= 329.8°	7 328.1	318.14	302.25	286.4	270.96	260.82	265	.75	273.83	289.89	308.29	321.82		(73)
6. Solar gai	ns:													
Solar gains are		•				·	tions	to co	nvert to th	e applical		tion.		
Orientation:	Access F Table 6d		Area m²		Flu	ux ible 6a		т	g_ able 6b	т	FF able 6c		Gains (W)	
F							1							٦
East 0.9x		×			_	19.64	X		0.4	_  ×	0.7	=	20.12	(76)
East 0.9x		×				19.64	X		0.4	x	0.7	_ =	10.06	(76)
East 0.9x		×				38.42	X		0.4	X	0.7	=	39.36	(76)
East 0.9x		x				38.42	X		0.4	x	0.7	=	19.68	(76)
East 0.9x	0.77	X	5.2	28	x	63.27	X		0.4	X	0.7	=	64.83	(76)



East													_					
East	East	0.9x	0.77	X	2.6	4	X	6	3.27	X	0.4		x	0.7		=	32.41	(76)
East	East	0.9x	0.77	X	5.2	8	x	9	2.28	X	0.4		x	0.7		=	94.54	(76)
East	East	0.9x	0.77	X	2.6	4	x	9	2.28	x	0.4		x	0.7		=	47.27	(76)
East	East	0.9x	0.77	X	5.2	8	x	1	13.09	X	0.4		x	0.7		=	115.87	(76)
East	East	0.9x	0.77	x	2.6	4	x	1	13.09	x	0.4		x [	0.7		=	57.93	(76)
East	East	0.9x	0.77	x	5.2	8	x	1	15.77	x	0.4		x F	0.7		=	118.61	(76)
East	East	0.9x	0.77	x	2.6	4	x	1	15.77	x	0.4		x $\lceil$	0.7		=	59.31	(76)
East	East	0.9x	0.77	x	5.2	8	x	1	10.22	x	0.4		x $\lceil$	0.7		=	112.92	(76)
East	East	0.9x	0.77	x	2.6	4	x	1	10.22	x	0.4		x F	0.7		=	56.46	(76)
East	East	0.9x	0.77	x	5.2	8	x	9	4.68	x	0.4		x [	0.7		=	97	(76)
East	East	0.9x	0.77	x	2.6	4	x	9	4.68	X	0.4		x F	0.7		=	48.5	(76)
East	East	0.9x	0.77	x	5.2	8	x	7	3.59	x	0.4		x F	0.7		=	75.39	(76)
East	East	0.9x	0.77	x	2.6	4	x	7	3.59	x	0.4		x F	0.7		=	37.7	(76)
East 0.9x 0.77 x 5.28 x 24.49 x 0.4 x 0.7 = 25.09 (76)  East 0.9x 0.77 x 5.28 x 16.15 x 0.4 x 0.7 = 12.54 (76)  East 0.9x 0.77 x 5.28 x 16.15 x 0.4 x 0.7 = 12.54 (76)  East 0.9x 0.77 x 2.64 x 16.15 x 0.4 x 0.7 = 12.54 (76)  East 0.9x 0.77 x 2.64 x 16.15 x 0.4 x 0.7 = 12.54 (76)  East 0.9x 0.77 x 2.64 x 16.15 x 0.4 x 0.7 = 12.54 (76)  East 0.9x 0.77 x 2.64 x 16.15 x 0.4 x 0.7 = 12.54 (76)  East 0.9x 0.77 x 2.64 x 16.15 x 0.4 x 0.7 = 12.54 (76)  Solar gains in watts, calculated for each month (83)m s Sum(74)m(82)m (83)m 30.18 59.04 97.24 141.82 173.8 177.92 169.38 145.5 113.09 70.06 37.63 24.82 (83)  Total gains - internal and solar (84)m = (73)m + (83)m , watts (84)m 360.05 387.15 415.38 444.06 460.2 448.87 430.2 411.24 386.92 359.95 345.93 346.64 (84)  7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m 20.63 20.72 20.85 20.96 21 21 21 21 21 20.96 20.79 20.62 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m 20.41 20.41 20.41 20.42 20.43 20.44 20.44 20.44 20.43 20.43 20.42 20.42 (88)  Wean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (89)m 20.99 0.97 0.92 0.79 0.59 0.4 0.27 0.3 0.5 0.81 0.96 0.99 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m 19.92 20.05 20.23 20.39 20.42 20.44 20.44 20.44 20.43 20.38 20.16 19.91 (90)  ILA = Living area + (4) = 0.45 (91)  Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92)m 20.64 20.45 20.23 (92) (92)	East	0.9x	0.77	x	5.2	8	x	4	5.59	x	0.4		x F	0.7		=	46.71	(76)
East	East	0.9x	0.77	х	2.6	4	x	4	5.59	x	0.4		x F	0.7		=	23.35	(76)
East 0.9x 0.77 x 2.64 x 16.15 x 0.4 x 0.7 = 8.27 (76)  Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83)m = 30.18 59.04 97.24 141.82 173.8 177.92 169.38 145.5 113.09 70.06 37.63 24.82 (83)  Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m = 360.05 387.15 415.38 444.06 460.2 448.87 430.2 411.24 386.92 359.95 345.93 346.64 (84)  7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9a, Th1 (°C) 21 (85)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m = 20.63 20.72 20.85 20.96 21 21 21 21 21 21 21 20.96 20.79 20.62 (87)  Temperature during heating periods in rest of dwelling, h2,m (see Table 9a) (88)m = 20.41 20.41 20.41 20.42 20.43 20.44 20.44 20.44 20.43 20.43 20.42 20.42 (88)  Mean internal temperature in the rest of dwelling, h2,m (see Table 9a) (89)m = 0.99 0.97 0.92 0.79 0.59 0.4 0.27 0.3 0.5 0.81 0.96 0.99 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (80)m = 19.92 20.05 20.23 20.39 20.42 20.44 20.44 20.44 20.43 20.38 20.16 19.91 (90) (90)m = 19.92 20.05 20.23 20.39 20.42 20.44 20.44 20.44 20.43 20.38 20.16 19.91 (90) (90)m = 19.92 20.05 20.23 20.39 20.42 20.44 20.44 20.44 20.43 20.38 20.16 19.91 (90) (90)m = 19.92 20.24 20.35 20.51 20.65 20.68 20.69 20.69 20.69 20.69 20.69 20.69 20.64 20.45 20.23 (92)	East	0.9x	0.77	x	5.2	8	x	2	4.49	x	0.4		x F	0.7		=	25.09	(76)
East 0.9x 0.77 x 2.64 x 16.15 x 0.4 x 0.7 = 8.27 (76)  Solar gains in watts, calculated for each month (83)m = Sum(74)m(62)m (83)m = 30.18 59.04 97.24 141.82 173.8 177.92 169.38 145.5 113.09 70.06 37.63 24.82 (83)  Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m = 360.05 387.15 415.38 444.06 460.2 448.87 430.2 411.24 386.92 359.95 345.93 346.64 (84)  7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m = 20.63 20.72 20.85 20.96 21 21 21 21 21 21 20.96 20.79 20.62 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m = 20.41 20.41 20.41 20.42 20.43 20.44 20.44 20.44 20.43 20.43 20.42 20.42 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m = 0.99 0.97 0.92 0.79 0.59 0.4 0.27 0.3 0.5 0.81 0.96 0.99 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m = 19.92 20.05 20.23 20.39 20.42 20.44 20.44 20.44 20.43 20.38 20.16 19.91 (90)  ### FLAT STOR STOR STOR STOR STOR STOR STOR STO	East	0.9x	0.77	x	2.6	4	x	2	4.49	x	0.4		x	0.7		=	12.54	(76)
Solar gains in watts, calculated for each month (83)m = Sum(74)m (82)m (83)m = 30.18   59.04   97.24   141.82   173.8   177.92   169.38   145.5   113.09   70.06   37.63   24.82   (83)   70.00   37.63   37.15   415.38   444.06   460.2   448.87   430.2   411.24   386.92   359.95   345.93   346.64   (84)   7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C)	East	0.9x	0.77	х	5.2	8	X	1	6.15	Х	0.4	Ħ۱	X	0.7		=	16.55	(76)
(83) m= 30.18 59.04 97.24 141.82 173.8 177.92 169.38 145.5 113.09 70.06 37.63 24.82  Total gains – internal and solar (84) m = (73) m + (83) m , watts  (84) m= 360.05 387.15 415.38 444.06 460.2 448.87 430.2 411.24 386.92 359.95 345.93 346.64  7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86) m= 0.99 0.98 0.94 0.81 0.63 0.44 0.31 0.34 0.55 0.85 0.97 0.99 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87) m= 20.63 20.72 20.85 20.96 21 21 21 21 21 22 20.96 20.79 20.62 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88) m= 20.41 20.41 20.41 20.42 20.43 20.44 20.44 20.44 20.43 20.43 20.42 20.42 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (89) m= 0.99 0.97 0.92 0.79 0.59 0.4 0.27 0.3 0.5 0.81 0.96 0.99 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90) m= 19.92 20.05 20.23 20.39 20.42 20.44 20.44 20.44 20.43 20.38 20.16 19.91 (90)  **ELA = Living area + (4) = 0.45 (91)  Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2  (92) m= 20.24 20.35 20.51 20.65 20.68 20.69 20.69 20.69 20.69 20.69 20.64 20.45 20.23 (92)	East	0.9x	0.77	x	2.6	4	x	1	6.15	х	0.4	司	×	0.7		=	8.27	(76)
(83) m= 30.18 59.04 97.24 141.82 173.8 177.92 169.38 145.5 113.09 70.06 37.63 24.82 (83) Total gains – internal and solar (84) m = (73) m + (83) m , watts (84) m = 360.05 387.15 415.38 444.06 460.2 448.87 430.2 411.24 386.92 359.95 345.93 346.64 (84)    7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) (86) m= 0.99 0.98 0.94 0.81 0.63 0.44 0.31 0.34 0.55 0.85 0.97 0.99 (86)    Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87) m= 20.63 20.72 20.85 20.96 21 21 21 21 21 21 20.96 20.79 20.62 (87)    Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88) m= 20.41 20.41 20.41 20.42 20.43 20.44 20.44 20.44 20.43 20.43 20.42 20.42 (88)    Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89) m= 0.99 0.97 0.92 0.79 0.59 0.4 0.27 0.3 0.5 0.81 0.96 0.99 (89)    Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (89) m= 19.92 20.05 20.23 20.39 20.42 20.44 20.44 20.44 20.43 20.38 20.16 19.91 (90)    **ELA = Living area + (4) = 0.45 (91)    Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2 (92) m= 20.24 20.35 20.51 20.65 20.68 20.69 20.69 20.69 20.69 20.69 20.64 20.45 20.23 (92)		_																
Total gains – internal and solar (84)m = (73)m + (83)m , waits  (84)m = 360.05 387.15 415.38 444.06 460.2 448.87 430.2 411.24 886.92 359.95 345.93 346.64  7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C)  21 (85)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m = 0.99 0.98 0.94 0.81 0.63 0.44 0.31 0.34 0.55 0.85 0.97 0.99 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m = 20.63 20.72 20.85 20.96 21 21 21 21 21 21 20.96 20.79 20.62 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m = 20.41 20.41 20.41 20.42 20.43 20.44 20.44 20.44 20.43 20.43 20.42 20.42 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m = 0.99 0.97 0.92 0.79 0.59 0.4 0.27 0.3 0.5 0.81 0.96 0.99 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m = 19.92 20.05 20.23 20.39 20.42 20.44 20.44 20.44 20.43 20.88 20.16 19.91 (90)  Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2  (92)m = 20.24 20.35 20.51 20.65 20.68 20.69 20.69 20.69 20.69 20.64 20.45 20.23 (92)	Solar g	ains in v	watts, calc	ulated	for each	n mont	h			(83)m	= Sum(74)m	า(82	2)m					
(84)m= 360.05 387.15 415.38 444.06 460.2 448.87 430.2 411.24 386.92 359.95 345.93 346.64 (84)  7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C)	ĭ						$\overline{}$	77.92	169.38	145	5.5 113.09	70	0.06	37.63	24.8	2		(83)
7. Mean internal temperature (heating season)  Temperature during heating periods in the living area from Table 9, Th1 (°C)  21 (85)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.99 0.98 0.94 0.81 0.63 0.44 0.31 0.34 0.55 0.85 0.97 0.99 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 20.63 20.72 20.85 20.96 21 21 21 21 21 21 20.96 20.79 20.62 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m= 20.41 20.41 20.41 20.42 20.43 20.44 20.44 20.44 20.43 20.43 20.42 20.42 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.99 0.97 0.92 0.79 0.59 0.4 0.27 0.3 0.5 0.81 0.96 0.99 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 19.92 20.05 20.23 20.39 20.42 20.44 20.44 20.44 20.43 20.38 20.16 19.91 (90)  FLA = Living area + (4) = 0.45 (91)  Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2  (92)m= 20.24 20.35 20.51 20.65 20.68 20.69 20.69 20.69 20.69 20.64 20.45 20.23 (92)	Total g	ains – ir	nternal and	d solar	(84)m =	: (73)m	+ (	83)m	watts									
Temperature during heating periods in the living area from Table 9, Th1 (°C)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.99 0.98 0.94 0.81 0.63 0.44 0.31 0.34 0.55 0.85 0.97 0.99 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 20.63 20.72 20.85 20.96 21 21 21 21 21 21 20.96 20.79 20.62 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m= 20.41 20.41 20.41 20.42 20.43 20.44 20.44 20.44 20.43 20.43 20.42 20.42 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.99 0.97 0.92 0.79 0.59 0.4 0.27 0.3 0.5 0.81 0.96 0.99 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 19.92 20.05 20.23 20.39 20.42 20.44 20.44 20.44 20.43 20.38 20.16 19.91 (90)  Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2  (92)m= 20.24 20.35 20.51 20.65 20.68 20.69 20.69 20.69 20.69 20.69 20.64 20.45 20.23 (92)	(84)m=	360.05	387.15	115.38	444.06	460.2	4	48.87	430.2	411	.24 386.92	359	9.95	345.93	346.6	64		(84)
Temperature during heating periods in the living area from Table 9, Th1 (°C)  Utilisation factor for gains for living area, h1,m (see Table 9a)  Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.99 0.98 0.94 0.81 0.63 0.44 0.31 0.34 0.55 0.85 0.97 0.99 (86)  Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 20.63 20.72 20.85 20.96 21 21 21 21 21 21 20.96 20.79 20.62 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m= 20.41 20.41 20.41 20.42 20.43 20.44 20.44 20.44 20.43 20.43 20.42 20.42 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.99 0.97 0.92 0.79 0.59 0.4 0.27 0.3 0.5 0.81 0.96 0.99 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 19.92 20.05 20.23 20.39 20.42 20.44 20.44 20.44 20.43 20.38 20.16 19.91 (90)  Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2  (92)m= 20.24 20.35 20.51 20.65 20.68 20.69 20.69 20.69 20.69 20.69 20.64 20.45 20.23 (92)	7. Me	an inter	nal tempe	rature	(heating	seaso	n)											
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec								area f	rom Tab	ole 9,	Th1 (°C)						21	(85)
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	Utilisa	ition fac	tor for gair	ns for li	iving are	a, h1,r	า ท (s	ee Ta	ble 9a)		, ,					ı		
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)  (87)m= 20.63 20.72 20.85 20.96 21 21 21 21 21 21 20.96 20.79 20.62  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m= 20.41 20.41 20.41 20.42 20.43 20.44 20.44 20.44 20.44 20.43 20.43 20.42 20.42  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.99 0.97 0.92 0.79 0.59 0.4 0.27 0.3 0.5 0.81 0.96 0.99  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 19.92 20.05 20.23 20.39 20.42 20.44 20.44 20.44 20.44 20.43 20.38 20.16 19.91 (90)  Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2  (92)m= 20.24 20.35 20.51 20.65 20.68 20.69 20.69 20.69 20.69 20.69 20.64 20.45 20.23 (92)			<u>_</u> _		_ <del>_</del>		T			A	ug Sep		Oct	Nov	De	c		
(87)m= 20.63 20.72 20.85 20.96 21 21 21 21 21 20.96 20.79 20.62 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m= 20.41 20.41 20.41 20.42 20.43 20.44 20.44 20.44 20.43 20.43 20.42 20.42 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.99 0.97 0.92 0.79 0.59 0.4 0.27 0.3 0.5 0.81 0.96 0.99 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 19.92 20.05 20.23 20.39 20.42 20.44 20.44 20.44 20.44 20.43 20.38 20.16 19.91 (90)  Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2  (92)m= 20.24 20.35 20.51 20.65 20.68 20.69 20.69 20.69 20.69 20.64 20.45 20.23 (92)	(86)m=	0.99	0.98	0.94		0.63	١,	0.44	0.31	0.3	4 0.55	0.	.85	0.97	0.99	)		(86)
(87)m= 20.63 20.72 20.85 20.96 21 21 21 21 21 20.96 20.79 20.62 (87)  Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m= 20.41 20.41 20.41 20.42 20.43 20.44 20.44 20.44 20.43 20.43 20.42 20.42 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.99 0.97 0.92 0.79 0.59 0.4 0.27 0.3 0.5 0.81 0.96 0.99 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 19.92 20.05 20.23 20.39 20.42 20.44 20.44 20.44 20.44 20.43 20.38 20.16 19.91 (90)  ELA = Living area ÷ (4) = 0.45 (91)  Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2  (92)m= 20.24 20.35 20.51 20.65 20.68 20.69 20.69 20.69 20.69 20.64 20.45 20.23 (92)	Mean	internal	temperat	ure in l	iving are	a T1 (	follo	w ste	ns 3 to 7	in T	ahle 9c)	-						
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)  (88)m= 20.41 20.41 20.41 20.42 20.43 20.44 20.44 20.44 20.43 20.43 20.43 20.42 20.42 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.99 0.97 0.92 0.79 0.59 0.4 0.27 0.3 0.5 0.81 0.96 0.99 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 19.92 20.05 20.23 20.39 20.42 20.44 20.44 20.44 20.44 20.43 20.38 20.16 19.91 (90)  ### FLA = Living area ÷ (4) = 0.45 (91)  Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2  (92)m= 20.24 20.35 20.51 20.65 20.68 20.69 20.69 20.69 20.69 20.69 20.64 20.45 20.23 (92)	1			1			T					20	0.96	20.79	20.6	2		(87)
(88)m= 20.41 20.41 20.41 20.42 20.43 20.44 20.44 20.44 20.43 20.43 20.42 20.42 (88)  Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.99 0.97 0.92 0.79 0.59 0.4 0.27 0.3 0.5 0.81 0.96 0.99 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 19.92 20.05 20.23 20.39 20.42 20.44 20.44 20.44 20.43 20.38 20.16 19.91 (90)  ### Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2  (92)m= 20.24 20.35 20.51 20.65 20.68 20.69 20.69 20.69 20.69 20.64 20.45 20.23 (92)							f 4			<u> </u>								
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)  (89)m= 0.99 0.97 0.92 0.79 0.59 0.4 0.27 0.3 0.5 0.81 0.96 0.99  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 19.92 20.05 20.23 20.39 20.42 20.44 20.44 20.44 20.44 20.43 20.38 20.16 19.91 (90)  Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2  (92)m= 20.24 20.35 20.51 20.65 20.68 20.69 20.69 20.69 20.69 20.64 20.45 20.23 (92)		T T					_			ī			) ፈՉ	20.42	20.4	2		(88)
(89)m= 0.99 0.97 0.92 0.79 0.59 0.4 0.27 0.3 0.5 0.81 0.96 0.99 (89)  Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 19.92 20.05 20.23 20.39 20.42 20.44 20.44 20.44 20.44 20.43 20.38 20.16 19.91 (90)  Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2  (92)m= 20.24 20.35 20.51 20.65 20.68 20.69 20.69 20.69 20.69 20.64 20.45 20.23 (92)										<u> </u>	77 20.73	1 20	7.40	20.42	20.4			(00)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)  (90)m= 19.92 20.05 20.23 20.39 20.42 20.44 20.44 20.44 20.43 20.38 20.16 19.91 (90)  ### FLA = Living area ÷ (4) = 0.45 (91)  Mean internal temperature (for the whole dwelling) = fLA × T1 + (1 - fLA) × T2  (92)m= 20.24 20.35 20.51 20.65 20.68 20.69 20.69 20.69 20.69 20.64 20.45 20.23 (92)	1			ī			$\neg$			r –		_		1				(00)
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	(89)m=	0.99	0.97	0.92	0.79	0.59		0.4	0.27	0.3	3 0.5	0.	.81	0.96	0.99	9		(89)
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$ (92)m= 20.24 20.35 20.51 20.65 20.68 20.69 20.69 20.69 20.69 20.64 20.45 20.23 (92)	Mean	internal	temperat	ure in t	he rest	of dwe	lling	T2 (f		ps 3	to 7 in Tal	ble 9	c)					
Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$ (92)m= 20.24 20.35 20.51 20.65 20.68 20.69 20.69 20.69 20.69 20.64 20.45 20.23 (92)	(90)m=	19.92	20.05	20.23	20.39	20.42	2	20.44	20.44	20.	44 20.43			ļ		1		(90)
(92)m= 20.24 20.35 20.51 20.65 20.68 20.69 20.69 20.69 20.69 20.64 20.45 20.23 (92)												fLA =	: Livir	ng area ÷ (4	4) =		0.45	(91)
(92)m= 20.24 20.35 20.51 20.65 20.68 20.69 20.69 20.69 20.69 20.64 20.45 20.23 (92)	Mean	internal	temperat	ure (fo	r the wh	ole dw	ellin	g) = fl	_A × T1	+ (1	– fLA) × T2	2				-		
Apply adjustment to the mean internal temperature from Table 4e, where appropriate	ı						_			<del></del>		_	).64	20.45	20.2	3		(92)
	vlaaA	adjustm	ent to the	mean	internal	tempe	eratu	re fro	m Table	4e,	where app	ropria	ate	•				



(93)m= 20.24	20.35	20.51	20.65	20.68	20.69	20.69	20.69	20.69	20.64	20.45	20.23		(93)
8. Space hea													
Set Ti to the the utilisation					ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac		l	<u> </u>				5						
(94)m= 0.98	0.97	0.93	0.8	0.61	0.42	0.29	0.32	0.52	0.83	0.96	0.99		(94)
Useful gains,	hmGm	, W = (9	4)m x (8	4)m									
(95)m= 354.57	375.78	384.67	353.79	279.37	186.38	125.23	130.81	203.05	297.32	332.51	342.42		(95)
Monthly aver	<del></del>	T T	<del>-</del>		r	ī	·			ī	<del></del>		
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate	i	i	<del> </del>			=[(39)m : 125.23	x [(93)m <sub>130.81</sub>	<u> </u>		404.04	500.05		(07)
(97)m= 515.64	497.7	449.37	368.92	280.89	186.43			203.4	314.08	421.01	509.85		(97)
Space heatin	81.93	48.13	10.89	1.14	0	0.02	0	0	12.48	63.72	124.57		
(66)=	01.00	10.10	10.00					l per year		<u> </u>	<u> </u>	462.69	(98)
Space heatin	a roquir	omont in	k\\/b/m2	2/voor			. 0.0	. poi you	(, ) ca.	<i>)</i> • • • • • • • • • • • • • • • • • • •	() 1		(99)
·	•			•							l	8.93	(99)
9b. Energy red			· ·	Ĭ				المالة والأ					
This part is us Fraction of spa					_		<b>.</b>	•		unity scr	neme.	0	(301)
Fraction of spa								ĺ			- L	1	(302)
The community so							allows for	CHD and	in to four	other heat	nouroon: th		(002)
includes boilers, h									ир тойг т	oliter neat	Sources, ii	ie ialler	
Fraction of hea	at from C	Commun	ity heat	pump								0.7	(303a)
Fraction of cor	mmunity	heat fro	m heat s	source 2								0.3	(303b)
Fraction of total	al space	heat fro	m Comn	nunity he	eat pump	0			(3	02) x (303	a) =	0.7	(304a)
Fraction of total	al space	heat fro	m comm	unity he	at sourc	e 2			(3	02) x (303	b) =	0.3	(304b)
Factor for conf	trol and	charging	method	(Table	4c(3)) fo	r commı	unity hea	iting sys	tem		Ī	1	(305)
Distribution los	ss factor	(Table 1	12c) for o	commun	ity heatir	ng syste	m				Ī	1.1	(306)
Space heating	g										•	kWh/yea	 r
Annual space	heating	requiren	nent									462.69	
Space heat fro	om Comi	munity h	eat pum	р				(98) x (30	04a) x (30	5) x (306)	=	356.27	(307a)
Space heat fro	m heat	source 2	2					(98) x (30	04b) x (30	5) x (306)	= [	152.69	(307b)
Efficiency of se	econdar	y/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)	[	0	(308
Space heating	require	ment fro	m secon	dary/su	oplemen	tary sys	tem	(98) x (30	01) x 100 -	÷ (308) =	[	0	(309)
Water heating													
Annual water l	_	•										1840.33	
If DHW from c Water heat fro				)				(64) x (30	03a) x (30	5) x (306) :	<u> </u>	1417.05	(310a)
Water heat fro		•								5) x (306) :	l r	607.31	(310b)
Electricity use							0.01	× [(307a).			L	25.33	(313)
								2. /	` ,		′ ′ l		<b>`</b> ′



Cooling System Energy Efficiency Ratio				0	(314)
Space cooling (if there is a fixed cooling system, if not enter	$0) = (107) \div (314)$	=		0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input fr	rom outside			106.64	(330a)
warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	b) + (330g) =		106.64	(331)
Energy for lighting (calculated in Appendix L)				251.82	(332)
12b. CO2 Emissions – Community heating scheme					
	Energy kWh/year	Emission fackg CO2/kWh		missions g CO2/year	
CO2 from other sources of space and water heating (not CF Efficiency of heat source 1 (%)  If there is CHP	IP) using two fuels repeat (363) to	(366) for the second	d fuel	294	(367a)
Efficiency of heat source 2 (%)	using two fuels repeat (363) to	(366) for the second	d fuel	95.6	(367b)
CO2 associated with heat source 1 [(30	7b)+(310b)] x 100 ÷ (367b) x	0.52	=	313.05	(367)
CO2 associated with heat source 2 [(30	7b)+(310b)] x 100 ÷ (367b) x	0.22	=	171.71	(368)
Electrical energy for heat distribution	((313) x	0.52	=	13.15	(372)
Total CO2 associated with community systems	(363)(366) + (368)(373	2)	=	497.91	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instant	taneous heater (312) x	0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			497.91	(376)
CO2 associated with electricity for pumps and fans within dv	velling (331)) x	0.52	=	55.35	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	130.69	(379)
Total CO2, kg/year sum of (376)(382) =				683.95	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =				13.2	(384)
El rating (section 14)				90.53	(385)



User Details: **Assessor Name:** Stroma Number: **Software Version: Software Name:** Stroma FSAP 2012 Version: 1.0.5.12 Property Address: W4-09 , 156 West End Lane, Camden, London Address: 1. Overall dwelling dimensions Av. Height(m) Volume(m³) Area(m<sup>2</sup>) Ground floor 86.4 (1a) x 2.7 (2a) = (3a) 233.28 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)(4)86.4 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =233.28 (5) total m³ per hour main secondary other heating heating x 40 =Number of chimneys (6a) 0 0 x 20 =Number of open flues 0 0 0 (6b) Number of intermittent fans x 10 =(7a)0 0 x 10 =Number of passive vents (7b) 0 0 x 40 =Number of flueless gas fires 0 (7c)Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =(8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9)0 Additional infiltration [(9)-1]x0.1 =0 (10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)0 if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12)If no draught lobby, enter 0.05, else enter 0 (13)O Percentage of windows and doors draught stripped (14)0 Window infiltration  $0.25 - [0.2 \times (14) \div 100] =$ 0 (15)Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =O (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)3 If based on air permeability value, then  $(18) = [(17) \div 20] + (8)$ , otherwise (18) = (16)0.15 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)2  $(20) = 1 - [0.075 \times (19)] =$ Shelter factor (20)0.85  $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.13 Infiltration rate modified for monthly wind speed Jan Feb Sep Mar Apr May Jun Jul Aug Oct Nov Dec Monthly average wind speed from Table 7 (22)m =5.1 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor  $(22a)m = (22)m \div 4$ (22a)m 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18



Adjusted infiltr	ation rate	(allowii	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15	]	
Calculate effe		-	rate for t	he appli	cable ca	se	•	•	•	•	•	-	(co. )
If mechanical If exhaust air h			andiv N (2	3h) - (23a	a) × Fmv (e	Aguation (1	NSN othe	rwisa (23h	n) – (23a)			0.5	(23a)
If balanced with									) = (23a)			0.5	(23b)
a) If balance		-	-	_					2h)m + (	23h) <b>v</b> [	1 <b>–</b> (23c)	76.5 \ ± 1001	(23c)
(24a)m= 0.28		0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27	]	(24a)
b) If balance	ed mechan	nical ve	ntilation	without	heat red	coverv (N	I ЛV) (24t	$\frac{1}{2}$	2b)m + (	L 23b)		J	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(24b)
c) If whole h if (22b)r	nouse extra n < 0.5 × (2			•	•				.5 × (23b	))		J	
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24c)
d) If natural if (22b)r	ventilation n = 1, then								0.5]	•	'	•	
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24d)
Effective air	change ra	ate - en	iter (24a	) or (24b	o) or (24	c) or (24	d) in bo	x (25)				_	
(25)m= 0.28	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.24	0.25	0.26	0.27		(25)
3. Heat losse	s and heat	t loss p	paramete	er:							_	_	_
ELEMENT	Gross area (n		Openin m	gs	Net Ar A ,r		U-val W/m2		A X U (W/I	K)	k-valu kJ/m²·		A X k kJ/K
Doors													
					1.89	Х	1.4	=	2.646				(26)
Windows Type	e 1				1.89 5.28		1.4 /[1/( 1.2 )+		2.646 6.05				(26) (27)
Windows Type Windows Type						x1,		0.04] =					
	e 2				5.28	x1,	/[1/( 1.2 )+	· 0.04] = · 0.04] =	6.05				(27)
Windows Type	e 2 e 3				5.28	x1, x1, x1,	/[1/( 1.2 )+ /[1/( 1.2 )+	0.04] = 0.04] = 0.04] =	6.05				(27) (27)
Windows Type	e 2 e 3		18.48	3	5.28 2.64 5.28	x1, x1, x1, x1,	/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	0.04] = 0.04] = 0.04] =	6.05 3.02 6.05				(27) (27) (27)
Windows Type Windows Type Windows Type	e 2 e 3 e 4		18.48	=	5.28 2.64 5.28 2.64	x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	0.04] = 0.04] = 0.04] = 0.04] =	6.05 3.02 6.05 3.02				(27) (27) (27) (27)
Windows Type Windows Type Windows Type Walls Type1	e 2 e 3 e 4			=	5.28 2.64 5.28 2.64 30.12	x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+	0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	6.05 3.02 6.05 3.02 4.82				(27) (27) (27) (27) (29)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2	48.6 48.6 14.31		1.89	=	5.28 2.64 5.28 2.64 30.12	x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.16	0.04] = 0.04] = 0.04] = - 0.04] = - 0.04] = =	6.05 3.02 6.05 3.02 4.82 1.86				(27) (27) (27) (27) (29) (29)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Roof	48.6 48.6 14.31		1.89	=	5.28 2.64 5.28 2.64 30.12 12.42	x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.16	0.04] = 0.04] = 0.04] = - 0.04] = - 0.04] = =	6.05 3.02 6.05 3.02 4.82 1.86				(27) (27) (27) (27) (29) (29) (30)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Roof Total area of e	48.6 48.6 14.31		1.89	=	5.28 2.64 5.28 2.64 30.12 12.42 18.7 81.61	x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.16 0.15	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04]	6.05 3.02 6.05 3.02 4.82 1.86 3.74				(27) (27) (27) (27) (29) (29) (30) (31)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Roof Total area of e	48.6 48.6 14.31		1.89	=	5.28 2.64 5.28 2.64 30.12 12.42 18.7 81.61	x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.16 0.15	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04]	6.05 3.02 6.05 3.02 4.82 1.86 3.74				(27) (27) (27) (27) (29) (29) (30) (31) (32)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Roof Total area of e Party wall Party floor	48.6 14.31 18.7 Elements, n	/s, use e	1.89	ndow U-va	5.28 2.64 5.28 2.64 30.12 12.42 18.7 81.61 43.75 86.4 67.7 alue calcul	x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.16 0.15 0.2	0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04]	6.05 3.02 6.05 3.02 4.82 1.86 3.74	as given in	n paragrapi		(27) (27) (27) (27) (29) (29) (30) (31) (32) (32a)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Roof Total area of e Party wall Party floor Party ceiling * for windows and	48.6 48.6 14.31 18.7 elements, n	/s, use e des of in	1.89 0	ndow U-va	5.28 2.64 5.28 2.64 30.12 12.42 18.7 81.61 43.75 86.4 67.7 alue calcul	x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.16 0.15 0.2	- 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04	6.05 3.02 6.05 3.02 4.82 1.86 3.74	as given in	n paragrapi	h 3.2	(27) (27) (27) (27) (29) (29) (30) (31) (32) (32a) (32b)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Roof Total area of e Party wall Party floor Party ceiling * for windows and ** include the area	48.6  48.6  14.31  18.7  elements, not a roof window as on both sides, W/K = \$100.0000000000000000000000000000000000	/s, use eades of in S (A x	1.89 0	ndow U-va	5.28 2.64 5.28 2.64 30.12 12.42 18.7 81.61 43.75 86.4 67.7 alue calcul	x1, x1, x1, x1, x1, x1, x1, x1, x1, x1,	/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.16 0.15 0.2	- 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04	6.05 3.02 6.05 3.02 4.82 1.86 3.74				(27) (27) (27) (29) (29) (30) (31) (32) (32a) (32b)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Roof Total area of e Party wall Party floor Party ceiling * for windows and ** include the area Fabric heat los Heat capacity Thermal mass	48.6 48.6 14.31 18.7 elements, not so the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the side of the	/s, use e des of in S (A x x k ) er (TMF	1.89 0  ffective will ternal wall U)  P = Cm ÷	ndow U-vals and part	5.28 2.64 5.28 2.64 30.12 12.42 18.7 81.61 43.75 86.4 67.7 alue calculatitions	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.16 0.15 0.2 0 formula 1 (26)(30	- 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04	6.05 3.02 6.05 3.02 4.82 1.86 3.74 0	2) + (32a). : Medium	(32e) =	34.22	(27) (27) (27) (27) (29) (29) (30) (31) (32) (32a) (32b)
Windows Type Windows Type Windows Type Walls Type1 Walls Type2 Roof Total area of e Party wall Party floor Party ceiling * for windows and ** include the area Fabric heat los Heat capacity	48.6  48.6  14.31  18.7  Elements, not window as on both sides, W/K = \$  Cm = S(A)  s paramete sments where and of a detail	vs, use eades of in S (A x x x k ) er (TMF e the det	1.89 0  ffective winternal wall U)  P = Cm ÷ tails of the ulation.	ndow U-vals and part	5.28 2.64 5.28 2.64 30.12 12.42 18.7 81.61 43.75 86.4 67.7 alue calculatitions	x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x1 x	/[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ /[1/( 1.2 )+ 0.16 0.15 0.2 0 formula 1 (26)(30	- 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04] =   - 0.04	6.05 3.02 6.05 3.02 4.82 1.86 3.74 0	2) + (32a). : Medium	(32e) =	34.22	(27) (27) (27) (27) (29) (29) (30) (31) (32) (32a) (32b)

if details of thermal bridging are not known (36) = 0.05 x (31)



Total fabric heat loss	(33) + (36) -			7(27)
Ventilation heat loss calculated monthly	(33) + (36) = $(38)m = 0.33 \times$	(25)m v (5)	49.91	(37)
Jan Feb Mar Apr May Jun Jul	Aug Sep Oct	Nov Dec	1	
(38)m= 21.56 21.31 21.07 19.84 19.6 18.37 18.37	18.12 18.86 19.6	20.09 20.58	<u> </u> 	(38)
Heat transfer coefficient, W/K	(39)m = (37) +		J	
(39)m= 71.47 71.23 70.98 69.76 69.51 68.28 68.28	68.04 68.77 69.51	70 70.49	1	
		= Sum(39) <sub>112</sub> /12=	69.69	(39)
Heat loss parameter (HLP), W/m²K	(40)m = $(39)$ m	÷ (4)	_	_
(40)m= 0.83 0.82 0.82 0.81 0.8 0.79 0.79	0.79 0.8 0.8	0.81 0.82		<b>-</b>
Number of days in month (Table 1a)	Average :	= Sum(40) <sub>112</sub> /12=	0.81	(40)
Jan Feb Mar Apr May Jun Jul	Aug Sep Oct	Nov Dec		
(41)m= 31 28 31 30 31 30 31	31 30 31	30 31		(41)
4. Water heating energy requirement:		kWh/y	ear:	
Assumed occupancy, N		2.57	1	(42)
if TFA > 13.9, $N = 1 + 1.76 \times [1 - exp(-0.000349 \times (TFA - 13.9)])$	9)2)] + 0.0013 x (TFA -13			(42)
if TFA £ 13.9, N = 1	(05 × N) + 20			(12)
Annual average hot water usage in litres per day Vd,average = Reduce the annual average hot water usage by 5% if the dwelling is designed		95.31		(43)
not more that 125 litres per person per day (all water use, hot and cold)				
Jan Feb Mar Apr May Jun Jul	Aug Sep Oct	Nov Dec		
Hot water usage in litres per day for each month Vd,m = factor from Table 1c	x (43)		,	
(44)m= 104.84 101.03 97.22 93.41 89.59 85.78 85.78	89.59 93.41 97.22	101.03 104.84		<b>-</b>
Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x		um(44) <sub>112</sub> = ables 1b, 1c, 1d)	1143.75	(44)
(45)m= 155.48 135.98 140.32 122.34 117.39 101.3 93.86	107.71 109 127.03	138.66 150.57		
		um(45) <sub>112</sub> =	1499.64	(45)
If instantaneous water heating at point of use (no hot water storage), enter 0 i		T T	1	(40)
(46)m= 23.32 20.4 21.05 18.35 17.61 15.19 14.08 Water storage loss:	16.16 16.35 19.05	20.8 22.59		(46)
Storage volume (litres) including any solar or WWHRS storage	e within same vessel	0	]	(47)
If community heating and no tank in dwelling, enter 110 litres i	n (47)			
Otherwise if no stored hot water (this includes instantaneous of	combi boilers) enter '0' in	(47)		
Water storage loss:		_	1	(45)
a) If manufacturer's declared loss factor is known (kWh/day):		0	<u> </u> 	(48)
Temperature factor from Table 2b	(49) v (40) —	0	] 1	(49)
Energy lost from water storage, kWh/year b) If manufacturer's declared cylinder loss factor is not known	$(48) \times (49) =$	110		(50)
Hot water storage loss factor from Table 2 (kWh/litre/day)		0.02	]	(51)
If community heating see section 4.3			•	
Volume factor from Table 2a		1.03		(52)
Temperature factor from Table 2b	(47) - (54) (50) (50)	0.6	]	(53)
Energy lost from water storage, kWh/year	(47) x (51) x (52) x (53) =	1 4 00	î .	(54)
Enter (50) or (54) in (55)	(11) x (01) x (02) x (00) =	1.03	1	(55)



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



Orientation	on:	Access Factor Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	X	5.28	x	10.63	x	0.4	x	0.7	=	10.89	(74)
North	0.9x	0.77	x	2.64	x	10.63	x	0.4	x	0.7	=	5.45	(74)
North	0.9x	0.77	x	5.28	x	20.32	х	0.4	x	0.7	=	20.82	(74)
North	0.9x	0.77	x	2.64	x	20.32	x	0.4	x	0.7	=	10.41	(74)
North	0.9x	0.77	x	5.28	x	34.53	x	0.4	x	0.7	=	35.38	(74)
North	0.9x	0.77	x	2.64	х	34.53	х	0.4	x	0.7	=	17.69	(74)
North	0.9x	0.77	x	5.28	x	55.46	х	0.4	x	0.7	=	56.83	(74)
North	0.9x	0.77	X	2.64	x	55.46	х	0.4	x	0.7	=	28.41	(74)
North	0.9x	0.77	X	5.28	x	74.72	x	0.4	x	0.7	=	76.55	(74)
North	0.9x	0.77	x	2.64	x	74.72	x	0.4	X	0.7	=	38.27	(74)
North	0.9x	0.77	X	5.28	x	79.99	x	0.4	X	0.7	=	81.95	(74)
North	0.9x	0.77	X	2.64	x	79.99	x	0.4	X	0.7	=	40.97	(74)
North	0.9x	0.77	X	5.28	x	74.68	x	0.4	X	0.7	=	76.51	(74)
North	0.9x	0.77	X	2.64	X	74.68	X	0.4	X	0.7	=	38.25	(74)
North	0.9x	0.77	X	5.28	X	59.25	x	0.4	X	0.7	=	60.7	(74)
North	0.9x	0.77	X	2.64	X	59.25	Х	0.4	X	0.7	=	30.35	(74)
North	0.9x	0.77	X	5.28	х	41.52	×	0.4	x	0.7	=	42.54	(74)
North	0.9x	0.77	X	2.64	х	41.52	×	0.4	x	0.7	=	21.27	(74)
North	0.9x	0.77	X	5.28	X	24.19	x	0.4	x	0.7	=	24.78	(74)
North	0.9x	0.77	X	2.64	x	24.19	Х	0.4	x	0.7	=	12.39	(74)
North	0.9x	0.77	X	5.28	x	13.12	X	0.4	x	0.7	=	13.44	(74)
North	0.9x	0.77	X	2.64	х	13.12	x	0.4	x	0.7	=	6.72	(74)
North	0.9x	0.77	X	5.28	X	8.86	x	0.4	X	0.7	=	9.08	(74)
North	0.9x	0.77	X	2.64	X	8.86	Х	0.4	X	0.7	=	4.54	(74)
South	0.9x	0.77	X	5.28	X	46.75	X	0.4	X	0.7	=	47.9	(78)
South	0.9x	0.77	X	2.64	X	46.75	х	0.4	X	0.7	=	47.9	(78)
	0.9x	0.77	X	5.28	x	76.57	x	0.4	X	0.7	=	78.45	(78)
	0.9x	0.77	X	2.64	x	76.57	х	0.4	X	0.7	=	78.45	(78)
	0.9x	0.77	X	5.28	x	97.53	x	0.4	X	0.7	=	99.93	(78)
	0.9x	0.77	X	2.64	X	97.53	X	0.4	X	0.7	=	99.93	(78)
	0.9x	0.77	X	5.28	x	110.23	x	0.4	X	0.7	=	112.94	(78)
	0.9x	0.77	X	2.64	X	110.23	х	0.4	X	0.7	=	112.94	(78)
	0.9x	0.77	X	5.28	x	114.87	x	0.4	X	0.7	=	117.69	(78)
	0.9x	0.77	X	2.64	X	114.87	х	0.4	X	0.7	=	117.69	(78)
	0.9x	0.77	X	5.28	x	110.55	x	0.4	X	0.7	=	113.26	(78)
	0.9x	0.77	X	2.64	x	110.55	x	0.4	X	0.7	=	113.26	(78)
	0.9x	0.77	X	5.28	x	108.01	x	0.4	X	0.7	=	110.66	(78)
	0.9x		X	2.64	x	108.01	х	0.4	X	0.7	=	110.66	(78)
South	0.9x	0.77	X	5.28	X	104.89	X	0.4	X	0.7	=	107.47	(78)



South	0.9x	0.77	X	2.6	64	x	10	04.89	x		0.4	x	0.7	=	107.47	(78)
South	0.9x	0.77	X	5.2	28	x	10	01.89	x		0.4	x	0.7	=	104.39	(78)
South	0.9x	0.77	X	2.6	64	x	10	01.89	x		0.4	x	0.7	=	104.39	(78)
South	0.9x	0.77	X	5.2	28	x	8	2.59	x		0.4	x	0.7	=	84.61	(78)
South	0.9x	0.77	X	2.6	64	x	8	2.59	x		0.4	x	0.7	=	84.61	(78)
South	0.9x	0.77	X	5.2	28	x	5	5.42	x		0.4	x	0.7	=	56.78	(78)
South	0.9x	0.77	X	2.6	64	x	5	5.42	x		0.4	x	0.7	=	56.78	(78)
South	0.9x	0.77	X	5.2	28	x	4	40.4	x		0.4	x	0.7	=	41.39	(78)
South	0.9x	0.77	X	2.6	64	x	4	40.4	x		0.4	x	0.7	=	41.39	(78)
Solar g	ains in	watts, ca	alculated	for eac	h month				(83)m	= Sur	m(74)m .	(82)m	,		•	
(83)m=	112.14	188.12	252.92	311.11	350.2	Ľ	49.44	336.09	305.9	99	272.57	206.4	133.71	96.4		(83)
Total g		nternal a	nd sola	r (84)m =	= (73)m	+ (8	33)m	, watts					1	ı	ı	
(84)m=	555.7	629.57	680.28	715.69	731.55	70	08.45	680.59	656.	59	634.89	591.72	545.48	528.1		(84)
7. Me	an inter	nal temp	erature	(heating	seasor	n)										
Temp	erature	during h	eating p	eriods i	n the livi	ng	area f	from Tab	ole 9,	Th1	(°C)				21	(85)
Utilisa	ition fac	tor for g	ains for	living are	ea, h1,m	ı (s	ee Ta	ble 9a)								
	Jan	Feb	Mar	Apr	May		Jun	Jul	Au	ıg	Sep	Oct	Nov	Dec		
(86)m=	1	0.99	0.98	0.93	0.81		0.61	0.44	0.48	8	0.72	0.94	0.99	1		(86)
Mean	interna	l temper	ature in	living ar	ea T1 (f	ollo	w ste	ps 3 to 7	in Ta	able	9c)					
(87)m=	20.26	20.4	20.58	20.79	20.94	2	0.99	21	21	T	20.98	20.81	20.5	20.24		(87)
Temp	erature	during h	eating r	eriods i	rest of	dw	ellina	from Ta	ble 9	. Th:	2 (°C)					
(88)m=	20.23	20.23	20.23	20.25	20.25		0.26	20.26	20.2	_	20.26	20.25	20.24	20.24		(88)
ا Selltilies	tion fac	tor for g	aine for	rest of d	welling	h2	m (se	a Table	(c0							
(89)m=	1	0.99	0.97	0.91	0.77	$\overline{}$	0.54	0.37	0.4		0.65	0.92	0.99	1		(89)
\	:			<u> </u>	ا مدادها	:	TO (5	مامید مده		<u> </u>	: Tabl	- 0-)				
(90)m=	19.24	l temper	19.7	20.01	20.19	┰	0.26	20.26	20.2	_	20.24	20.03	19.6	19.22		(90)
(00)=	10.21	10.11	10	20.01			0.20	20.20					g area ÷ (4	<u> </u>	0.23	(91)
									,,					,	0.20	(0.7)
Ī		l temper	· `	1	ĭ	1	-		r `	-		00.04	T 40.04	40.45	1	(02)
(92)m=	19.48	19.66	19.91	20.19	20.37		0.43	20.43	20.4		20.41	20.21	19.81	19.45		(92)
(93)m=	19.48	19.66	19.91	20.19	20.37	_	0.43	20.43	20.4	$\overline{}$	e appro	20.21	19.81	19.45		(93)
		ting requ			20.07		0.40	20.40	20.4		20.41	20.21	10.01	10.40		(33)
					re obtaiı	ned	at ste	en 11 of	Table	9h	so that	t Ti m=(	76)m an	d re-cald	culate	
		factor fo				100	at ott	5p 11 01	rabic	, 00,	, 00 1110		7 0)111 011	a ro oare	diato	
	Jan	Feb	Mar	Apr	May		Jun	Jul	Au	ıg	Sep	Oct	Nov	Dec		
Utilisa	ition fac	tor for g	ains, hm	1:									-		•	
(94)m=	0.99	0.99	0.97	0.91	0.77		0.56	0.38	0.42	2	0.67	0.92	0.99	1		(94)
r		hmGm	<del>`</del>	<del>- ` ` </del>	<del></del>	_					-				Ī	
(95)m=	552.39	620.91	657.62	650.17	565.59		94.64	261.56	274.	17	423.34	542.93	537.39	525.75		(95)
		age exte	i	i –	ı	_		40.0		<u>, I</u>	<u>,,, l</u>	40.5	<u> </u>		Ī	(06)
(96)m=	4.3	4.9	6.5	8.9	11.7		14.6	16.6	16.4		14.1	10.6	7.1	4.2		(96)
Heat I (97)m=		for mea	an intern 951.63	787.7	602.37	_	98.02	=[(39)m : 261.79	x [(93 274.		(96)m 434.2	668.29	889.57	1075.31		(97)
(31)111=	1004.65	1001.43	331.03	101.1	002.37	1 3	90.02	201.79	214.	JI	404.2	000.29	009.57	10/0.31		(31)



Space heating requirement for each month, kWh/month = 0.024	l x [(97	)m – (95	5)m] x (4 <sup>-</sup>	1)m						
(98)m= 396.14 289.31 218.74 99.02 27.37 0 0	0	0	93.27	253.57	408.87					
	Tota	l per year	(kWh/year	) = Sum(9	8) <sub>15,912</sub> =	1786.3	(98)			
Space heating requirement in kWh/m²/year						20.67	(99)			
9b. Energy requirements – Community heating scheme										
This part is used for space heating, space cooling or water heating Fraction of space heat from secondary/supplementary heating (T	<b>.</b>	•		unity sch	neme.	0	(301)			
Fraction of space heat from community system 1 – (301) =					[	1	(302)			
The community scheme may obtain heat from several sources. The procedure all includes boilers, heat pumps, geothermal and waste heat from power stations. So			up to four (	other heat	sources; th		<b>-</b>			
Fraction of heat from Community heat pump					[	0.7	(303a)			
Fraction of community heat from heat source 2					[	0.3	(303b)			
Fraction of total space heat from Community heat pump			(3	02) x (303	a) =	0.7	(304a)			
Fraction of total space heat from community heat source 2			(3	02) x (303	b) =	0.3	(304b)			
Factor for control and charging method (Table 4c(3)) for commun	nity hea	ting sys	tem			1	(305)			
Distribution loss factor (Table 12c) for community heating system	1					1.1	(306)			
Space heating						kWh/year	7			
Annual space heating requirement						1786.3	<u> </u>			
Space heat from Community heat pump			04a) x (30		Ļ	1375.45	(307a)			
Space heat from heat source 2			04b) x (30		= 	589.48	(307b)			
Efficiency of secondary/supplementary heating system in % (from	n Table	4a or A	Appendix	E)	Į	0	(308			
Space heating requirement from secondary/supplementary syste	em	(98) x (3	01) x 100 -	(308) =		0	(309)			
Water heating Annual water heating requirement					Γ	2150.48	7			
If DHW from community scheme:					L	2100.40	_			
Water heat from Community heat pump		(64) x (3	03a) x (30	5) x (306) :	= [	1655.87	(310a)			
Water heat from heat source 2		(64) x (3	03b) x (30	5) x (306) :	=	709.66	(310b)			
Electricity used for heat distribution	0.01	× [(307a)	(307e) +	(310a)(	[310e)] =	43.3	(313)			
Cooling System Energy Efficiency Ratio						0	(314)			
Space cooling (if there is a fixed cooling system, if not enter 0)		= (107) ÷	÷ (314) =			0	(315)			
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the control of the c	outside				[	188.55	(330a)			
warm air heating system fans					Ī	0	(330b)			
pump for solar water heating					Ī	0	(330g)			
Total electricity for the above, kWh/year		=(330a)	+ (330b) +	(330g) =	Ì	188.55	(331)			
Energy for lighting (calculated in Appendix L)					j	366.31	(332)			
12b. CO2 Emissions – Community heating scheme					L					

Energy kWh/year

kg CO2/year

**Emission factor Emissions** 

kg CO2/kWh



CO2 from other sources of space and water Efficiency of heat source 1 (%)	heating (not CHP)  If there is CHP using two fuels repeat (363) to (3	66) for the secor	nd fuel	294	(367a)
Efficiency of heat source 2 (%)	If there is CHP using two fuels repeat (363) to (3	66) for the secor	nd fuel	95.6	(367b)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x	0.52	=	535.12	(367)
CO2 associated with heat source 2	[(307b)+(310b)] x 100 ÷ (367b) x	0.22	=	293.53	(368)
Electrical energy for heat distribution	[(313) x	0.52	=	22.48	(372)
Total CO2 associated with community syste	ms (363)(366) + (368)(372)		=	851.13	(373)
CO2 associated with space heating (second	ary) (309) x	0	=	0	(374)
CO2 associated with water from immersion	heater or instantaneous heater (312) x	0.52	=	0	(375)
Total CO2 associated with space and water	heating (373) + (374) + (375) =			851.13	(376)
CO2 associated with electricity for pumps are	nd fans within dwelling (331)) x	0.52	=	97.86	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	190.12	(379)
Total CO2, kg/year sum	of (376)(382) =			1139.1	(383)
Dwelling CO2 Emission Rate (38)	3) ÷ (4) =			13.18	(384)
El rating (section 14)				88.38	(385)



User Details: **Assessor Name:** Stroma Number: **Software Version: Software Name:** Stroma FSAP 2012 Version: 1.0.5.12 Property Address: W5-12 , 156 West End Lane, Camden, London Address: 1. Overall dwelling dimensions Av. Height(m) Volume(m³) Area(m<sup>2</sup>) Ground floor 51.8 (1a) x 2.7 (2a) = (3a) 139.86 Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+....(1n)(4)51.8 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)+....(3n) =139.86 (5) total m³ per hour main secondary other heating heating x 40 =Number of chimneys (6a) 0 0 x 20 =Number of open flues 0 0 0 (6b) Number of intermittent fans x 10 =(7a)0 0 x 10 =Number of passive vents (7b) 0 0 x 40 =Number of flueless gas fires 0 (7c)Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = $\div (5)$ (8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) (9)0 Additional infiltration [(9)-1]x0.1 =0 (10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction (11)0 if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12)If no draught lobby, enter 0.05, else enter 0 (13)O Percentage of windows and doors draught stripped (14)0 Window infiltration  $0.25 - [0.2 \times (14) \div 100] =$ 0 (15)Infiltration rate (8) + (10) + (11) + (12) + (13) + (15) =O (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area (17)3 If based on air permeability value, then  $(18) = [(17) \div 20] + (8)$ , otherwise (18) = (16)0.15 (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered (19)3  $(20) = 1 - [0.075 \times (19)] =$ Shelter factor (20)0.78  $(21) = (18) \times (20) =$ Infiltration rate incorporating shelter factor (21)0.12 Infiltration rate modified for monthly wind speed Jan Feb Sep Mar Apr May Jun Jul Aug Oct Nov Dec Monthly average wind speed from Table 7 (22)m =5.1 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor  $(22a)m = (22)m \div 4$ (22a)m 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18



44.7β<sub>age 2 φ</sub>(3<del>/</del>9)

Average =  $Sum(39)_{1...12}/12=$ 

# DER WorkSheet: New dwelling design stage

Adjusted infiltre	ation rot	o (allowi	na for ol	ooltor on	ud wind o	rpood) –	(21a) v	(22a)m					
Adjusted infiltra	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14	1	
Calculate effec		•	rate for t	l	cable ca	1	<u> </u>		<u> </u>	1	1	]	_
If mechanica			and the NL (C	10l-) (00-	-) <b>- - - - - - - - - -</b>	C (1	\(\f\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\		) (00-)			0.5	(23a)
If exhaust air he		0		, ,	,	. ,	,, .	,	) = (23a)			0.5	(23b)
If balanced with		-	-	_					2h\ma /	'00k\ [	4 (00.0)	76.5	(23c)
a) If balance	0.26	anicai ve	0.25	0.24	at recov	0.23	0.23	m = (22) 0.23	2b)m + ( 0.24	23b) × [ 0.25	0.25	100j 	(24a)
b) If balance			<u> </u>	l .			ļ	ļ		ļ	1 0.20	J	(= 15)
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24b)
c) If whole h	ouse ex	tract ver	tilation o	r positiv	/e input	ventilatio	on from (	utside	l	<u> </u>		ı	
if (22b)m									.5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural v if (22b)m									0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effective air	change	rate - er	nter (24a	) or (24k	o) or (24	c) or (24	d) in bo	x (25)				_	
(25)m = 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.23	0.23	0.24	0.25	0.25		(25)
3. Heat losses	s and he	eat loss	oaram <b>e</b> t	er:				\			_	_	
ELEMENT	Gros		Openin	gs	Net Ar		U-val		ΑXU		k-value		λΧk
_	area	(m²)	m	) <sup>2</sup>	A ,r	m²	W/m2	2K	(W/	K)	kJ/m²-	K k	J/K
Doors					1.89		1.4	<u> </u>	2.646				(26)
Windows Type					5.28		/[1/( 1.2 )+		6.05	H			(27)
Windows Type	2			\	2.64	x1	/[1/( 1.2 )+	0.04] =	3.02	닏.			(27)
Walls Type1	18.3	36	7.92	2	10.44	4 X	0.16	=	1.67	_		_	(29)
Walls Type2	18.3	36	1.89		16.47	7 X	0.15	=	2.47	<u> </u>		┥	(29)
Roof	51.		0		51.8	X	0.12	=	6.22				(30)
Total area of el	lements	s, m²			88.52	2							(31)
Party wall					37.5	X	0	=	0			┫	(32)
Party floor			. ee - et		51.8			1/5/4/11 1	) . 0 0 47 .				(32a)
* for windows and ** include the area						atea using	j tormula 1	/[(1/U-vail	ie)+0.04] a	as given in	paragrapr	1 3.2	
Fabric heat los	s, W/K	= S (A x	U)				(26)(30	) + (32) =				22.07	(33)
Heat capacity (	Cm = S	(A x k )						((28)	.(30) + (3	2) + (32a).	(32e) =	0	(34)
Thermal mass	parame	eter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
For design assess				construct	ion are no	t known pr	ecisely the	e indicative	values of	TMP in T	able 1f		
can be used insteat Thermal bridge				usina Ar	nendix l	K						11.37	(36)
if details of therma	,	•		• .	•	•						11.57	(00)
Total fabric hea	at loss							(33) +	(36) =			33.43	(37)
Ventilation hea	t loss c	alculated	monthl	У				(38)m	= 0.33 × (	(25)m x (5)	)	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 12.26	12.13	12	11.32	11.19	10.52	10.52	10.39	10.79	11.19	11.46	11.73		(38)
Heat transfer c				T					= (37) + (	38)m		1	
(39)m= 45.7	45.56	45.43	44.76	44.62	43.95	43.95	43.82	44.22	44.62	44.89	45.16		

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com



Number of days i  Jan  (41)m= 31  4. Water heating  Assumed occupa if TFA > 13.9, I if TFA £ 13.9, I Annual average I Reduce the annual a not more that 125 litte  Jan  Hot water usage in lit	Feb Ma  28 31  g energy reconnection of the second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second	Apr 30  uirement:  x [1 - exp age in litre er usage by her day (all v Apr each month	es per da 5% if the d vater use, l	ay Vd,av Iwelling is	erage = designed	(25 x N)	Sep 30  0013 x (7	Oct 31	.9)	0.87  Dec 31  kWh/yea 74	0.86	(40) (41) (42)
Jan  Jan  Jan  4. Water heating  Assumed occupa  if TFA > 13.9, I  if TFA £ 13.9, I  Annual average I  Reduce the annual a  not more that 125 litre  Jan  Hot water usage in lit  (44)m=  83.16	Feb Ma  28 31  g energy reconnection of the second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second	Apr 30  uirement:  x [1 - exp age in litre er usage by her day (all v Apr each month	31 o(-0.0003 es per da 5% if the d vater use, l	30 349 x (TF ay Vd,av twelling is hot and co	31 -A -13.9 erage = designed	31 )2)] + 0.0 (25 x N)	Sep 30  0013 x (7	Oct 31	Nov 30	Dec 31 kWh/yea		(41)
Jan  Jan  Jan  4. Water heating  Assumed occupa  if TFA > 13.9, I  if TFA £ 13.9, I  Annual average I  Reduce the annual a  not more that 125 litre  Jan  Hot water usage in lit  (44)m=  83.16	Feb Ma  28 31  g energy reconnection of the second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second	Apr 30  uirement:  x [1 - exp age in litre er usage by her day (all v Apr each month	31 o(-0.0003 es per da 5% if the d vater use, l	30 349 x (TF ay Vd,av twelling is hot and co	31 -A -13.9 erage = designed	31 )2)] + 0.0 (25 x N)	30 0013 x ( <sup>7</sup> + 36	31 TFA -13.	30 1. 9)	31 kWh/yea	ar:	(42)
4. Water heating Assumed occupa if TFA > 13.9, I if TFA £ 13.9, I Annual average I Reduce the annual a not more that 125 litre  Jan  Hot water usage in lit  (44)m=  83.16	g energy red ancy, N N = 1 + 1.76 N = 1 hot water us verage hot wat es per person p Feb Ma tres per day for 30.14 77.11	x [1 - expands in litre or usage by her day (all verteach month)	o(-0.0003 es per da 5% if the d vater use, l May	349 x (TF ay Vd,av dwelling is thot and co	FA -13.9 erage = designed i	)2)] + 0.0 (25 x N)	0013 x ( <sup>-</sup> + 36	TFA -13.	.9)	kWh/yea	ar:	(42)
Assumed occupa  if TFA > 13.9, I  if TFA £ 13.9, I  Annual average I  Reduce the annual a  not more that 125 litre  Jan  Hot water usage in lit  (44)m= 83.16 8	ancy, N N = 1 + 1.76 N = 1 not water us verage hot wat es per person p Feb Ma tres per day for 30.14 77.11	x [1 - expage in litre er usage by er day (all v Apreach month	es per da 5% if the d vater use, l	ay Vd,av Iwelling is thot and co	erage = designed	(25 x N)	+ 36		.9)	74	ar:	,
Assumed occupa  if TFA > 13.9, I  if TFA £ 13.9, I  Annual average I  Reduce the annual a  not more that 125 litre  Jan  Hot water usage in lit  (44)m= 83.16 8	ancy, N N = 1 + 1.76 N = 1 not water us verage hot wat es per person p Feb Ma tres per day for 30.14 77.11	x [1 - expage in litre er usage by er day (all v Apreach month	es per da 5% if the d vater use, l	ay Vd,av Iwelling is thot and co	erage = designed	(25 x N)	+ 36		.9)	74	ar:	,
if TFA > 13.9, I if TFA £ 13.9, I Annual average I Reduce the annual a not more that 125 litre  Jan  Hot water usage in lit  (44)m= 83.16 8	N = 1 + 1.76 N = 1 hot water us verage hot wat es per person p Feb Ma tres per day for 30.14 77.11	age in litre er usage by er day (all v Apr each month	es per da 5% if the d vater use, l	ay Vd,av Iwelling is thot and co	erage = designed	(25 x N)	+ 36		.9)			,
Reduce the annual a not more that 125 litre  Jan  Hot water usage in lit  (44)m= 83.16 8	verage hot wates per person per person per person per day for a fres per day for a fres per day for a fres per day for a fres per day for a fres per day for a fres per day for a fres per day for a fres per day for a fres	er usage by er day (all v Apr each month	5% if the divater use, I	lwelling is hot and co	designed			se target o		5.6		
Hot water usage in lit	tres per day for 30.14 77.11	each month		Jun	r			se laryel 0	or			(43)
(44)m= 83.16 8	30.14 77.11		Vd m - fo		Jul	Aug	Sep	Oct	Nov	Dec		
` '		74 ^^	T	ctor from T	Table 1c x	(43)						
Energy content of ho	t water used - o	74.09	71.06	68.04	68.04	71.06	74.09	77.11	80.14	83.16	007.0	7(44)
		alculated m	onthly $= 4$ .	190 x Vd,r	n x nm x E	Tm / 3600			m(44) <sub>112</sub> = ables 1b, 1		907.2	(44)
(45)m= 123.32 1	07.86 111.3	97.04	93.11	80.35	74.45	85.43	86.45	100.75	109.98	119.43		
W								Total = Su	m(45) <sub>112</sub> =		1189.49	(45)
If inst <mark>antane</mark> ous wate			$\leftarrow$						40.5	47.04		(46)
(46)m= 18.5 1 Water storage los	16.18 16.7 SS:	14.56	13.97	12.05	11.17	12.82	12.97	15.11	16.5	17.91		(46)
Storage volume (		ling any s	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community hea	-		_									
Otherwise if no s Water storage los		iter (this ir	ncludes i	nstantar	neous co	mbi boil	ers) ente	er 'O' in (	(47)			
a) If manufacture		l loss fact	or is kno	wn (kWł	n/day):					0		(48)
Temperature fact	tor from Tab	le 2b								0		(49)
Energy lost from						(48) x (49)	) =		1	10		(50)
<ul><li>b) If manufacture</li><li>Hot water storage</li></ul>		•								00		(E1)
f community hea			IC Z (KVV	ii/iiii <del>c</del> /uc	iy <i>)</i>				0.	02		(51)
Volume factor fro	•								1.	03		(52)
Temperature fact	tor from Tab	le 2b							0	.6		(53)
Energy lost from		ge, kWh/y	ear			(47) x (51)	) x (52) x (	53) =	1.	03		(54)
Enter (50) or (54	, , ,								1.	03		(55)
Nater storage los	ss calculate	d for each	month			((56)m = (	55) × (41)	m				
56)m= 32.01 2 f cylinder contains de	28.92 32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01	.11	(56)
			· · ·								. П	(57)
57)m= 32.01 2	28.92 32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit los	, ,			F0\	(EO) - 00	NE /44\				0		(58)
Primary circuit log modified by fa			,	•	. ,	, ,		r thermo	stat)			
` —	21.01 23.26		23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)



Combi loss o	alculated	for each	month (	′61)m =	(60) ÷ 3	65 × (41	)m							
(61)m= 0	0	0	0	0	0	0	)   0	)	0	0	0	0	1	(61)
	L auired for	water h	Leating ca	Lulated	L I for eac	h month	(62)	—— m =	0 85 x (	 ′45)m +	(46)m +	(57)m +	ı · (59)m + (61)m	
(62)m= 178.6	<del></del>	166.58	150.53	148.39	133.84	129.73	140	_	139.95	156.03	163.48	174.71	]	(62)
Solar DHW inpu	t calculated	using App	endix G o	· Appendix	H (negat	ive quantity	y) (ent	er '0'	if no sola	r contribu	tion to wate	r heating)	<b>_</b>	
(add addition												•		
(63)m= 0	0	0	0	0	0	0	0	)	0	0	0	0	]	(63)
Output from	water hea	ter	•			•	•				•	•	•	
(64)m= 178.6	157.79	166.58	150.53	148.39	133.84	129.73	140	.71	139.95	156.03	163.48	174.71	]	
	•	•	•	•		•		Outp	out from wa	ater heate	r (annual)	l12	1840.33	(64)
Heat gains fr	om water	heating	, kWh/m	onth 0.2	5 ´ [0.85	5 × (45)m	ı + (6	1)m	n] + 0.8 x	c [(46)m	+ (57)m	+ (59)m	n ]	
(65)m= 85.23	75.81	81.23	75.06	75.18	69.51	68.98	72.	63	71.54	77.72	79.36	83.93		(65)
include (57	7)m in cald	culation	of (65)m	only if c	ylinder	is in the	dwell	ing	or hot w	ater is f	rom com	munity h	neating	
5. Internal	gains (see	Table 5	and 5a	):										
Metabolic ga	ins (Table	5). Wat	ts											
Jan		Mar	Apr	May	Jun	Jul	A	ug	Sep	Oct	Nov	Dec		
(66)m= 87.16	87.16	87.16	87.16	87.16	87.16	87.16	87.	16	87.16	87.16	87.16	87.16		(66)
Ligh <mark>ting g</mark> ain	s (calcula	ted in A	opendix	L, equ <mark>a</mark> t	ion L9 c	r L9a), <mark>a</mark>	lso s	ee	Table 5					
(67)m= 14.26	12.66	10.3	7.8	5.83	4.92	5.32	6.9	1	9.28	11.78	13.75	14.66		(67)
Appliances g	ains (ca <mark>lc</mark>	<mark>ulat</mark> ed ir	Append	dix L, eq	uation L	.13 or L1	3a), a	also	see Tal	ble <mark>5</mark>				
(68)m= 151.9°	1 153.48	149.51	141.05	130.38	120.35	113.64	112	.07	116.04	124.5	135.17	145.2		(68)
Cooking gair	ns (calcula	ited in A	ppendix	L, equat	ion L15	or L15a	), als	o se	e Table	5		-		
(69)m= 31.72	31.72	31.72	31.72	31.72	31.72	31.72	31.	72	31.72	31.72	31.72	31.72		(69)
Pumps and f	ans gains	(Table	5a)										_	
(70)m= 0	0	0	0	0	0	0	0	)	0	0	0	0	]	(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)								_	
(71)m= -69.73	-69.73	-69.73	-69.73	-69.73	-69.73	-69.73	-69.	.73	-69.73	-69.73	-69.73	-69.73		(71)
Water heatin	g gains (T	able 5)											_	
(72)m= 114.5	5 112.81	109.18	104.25	101.05	96.54	92.71	97.	62	99.36	104.47	110.23	112.81		(72)
Total interna	al gains =	l			(66	5)m + (67)m	n + (68	3)m +	- (69)m + (	(70)m + (7	71)m + (72)	)m	_	
(73)m= 329.8°	7 328.1	318.14	302.25	286.4	270.96	260.82	265	.75	273.83	289.89	308.29	321.82		(73)
6. Solar gai	ns:													
Solar gains are		•				·	tions	to co	nvert to th	e applical		tion.		
Orientation:	Access F Table 6d		Area m²		Flu	ux ible 6a		т	g_ able 6b	т	FF able 6c		Gains (W)	
F							1							٦
East 0.9x		×			_	19.64	X		0.4	_  ×	0.7	=	20.12	(76)
East 0.9x		×				19.64	X		0.4	x	0.7	=	10.06	(76)
East 0.9x		×				38.42	X		0.4	X	0.7	=	39.36	(76)
East 0.9x		×				38.42	X		0.4	x	0.7	=	19.68	(76)
East 0.9x	0.77	X	5.2	28	x	63.27	X		0.4	X	0.7	=	64.83	(76)



East	0.9x	0.77	X	2.6	54	X	6	3.27	x	0.4	X	0.7	=	32.41	(76)
East	0.9x	0.77	X	5.2	28	X	9:	2.28	x	0.4	x	0.7	=	94.54	(76)
East	0.9x	0.77	x	2.6	34	X	9:	2.28	x	0.4	x	0.7	=	47.27	(76)
East	0.9x	0.77	x	5.2	.8	X	11	3.09	x	0.4	x	0.7	=	115.87	(76)
East	0.9x	0.77	x	2.6	64	X	11	3.09	x	0.4	х	0.7	=	57.93	(76)
East	0.9x	0.77	X	5.2	!8	X	11	5.77	X	0.4	х	0.7	=	118.61	(76)
East	0.9x	0.77	x	2.6	34	X	11	5.77	x	0.4	x	0.7	=	59.31	(76)
East	0.9x	0.77	X	5.2	28	X	11	0.22	x	0.4	x	0.7	=	112.92	(76)
East	0.9x	0.77	X	2.6	54	X	11	0.22	X	0.4	X	0.7	=	56.46	(76)
East	0.9x	0.77	X	5.2	.8	X	9.	4.68	X	0.4	X	0.7	=	97	(76)
East	0.9x	0.77	X	2.6	54	X	9	4.68	x	0.4	X	0.7	=	48.5	(76)
East	0.9x	0.77	X	5.2	28	X	7	3.59	X	0.4	X	0.7	=	75.39	(76)
East	0.9x	0.77	X	2.6	54	X	7	3.59	x	0.4	x	0.7	=	37.7	(76)
East	0.9x	0.77	X	5.2	28	X	4:	5.59	X	0.4	X	0.7	=	46.71	(76)
East	0.9x	0.77	X	2.6	54	X	4:	5.59	X	0.4	X	0.7	=	23.35	(76)
East	0.9x	0.77	X	5.2	28	X	2	4.49	x	0.4	x	0.7	=	25.09	(76)
East	0.9x	0.77	X	2.6	64	X	2	4.49	X	0.4	X	0.7	=	12.54	(76)
East	0.9x	0.77	X	5.2	.8	X	1	6.15	Х	0.4	X	0.7	=	16.55	(76)
East	0.9x	0.77	X	2.6	64	X	1	6.15	x	0.4	x	0.7	=	8.27	(76)
Solar	gains in	watts, <mark>calc</mark> ı	ulated	for eacl	n month	<u> </u>			(83)m	= Sum(74)m .	(82)m				
(83)m=	30.18		7.24	141.82	173.8	<u> </u>	77.92	169.38	145	.5 113.09	70.06	37.63	24.82		(83)
Total (		nternal and	-	` '	` \	_								,	
(84)m=	360.05	387.15 4	15.38	444.06	460.2	4	48.87	430.2	411.	24 386.92	359.9	345.93	346.64		(84)
7. Me	ean inter	nal tempera	ature (	(heating	seasor	า)									
Temp	perature	during hea	ting p	eriods ir	the liv	ing	area f	rom Tab	ole 9,	Th1 (°C)				21	(85)
Utilis	ation fac	tor for gain	s for li	iving are	ea, h1,n	n (s	ee Ta	ble 9a)						_	
	Jan	Feb	Mar	Apr	May	┖	Jun	Jul	Αι	ug Sep	Oct	Nov	Dec		
(86)m=	1	0.99 (	0.98	0.93	0.82	(	0.61	0.45	0.4	9 0.74	0.95	0.99	1		(86)
Mear	n internal	temperatu	ıre in I	iving are	ea T1 (f	ollo	w step	os 3 to 7	' in T	able 9c)				_	
(87)m=	20.23	20.33 2	0.52	20.76	20.92	2	0.99	21	2	20.97	20.76	20.46	20.21		(87)
Temp	perature	during hea	ting p	eriods ir	rest of	f dw	elling	from Ta	ıble 9	), Th2 (°C)					
(88)m=	20.18	20.18 2	0.19	20.2	20.2	2	0.21	20.21	20.2	21 20.21	20.2	20.2	20.19	]	(88)
Utilis	ation fac	tor for gain	s for r	est of d	wellina.	h2.	m (se	e Table	9a)	•	•	•	•	_	
(89)m=	0.99		0.97	0.91	0.77	_	0.54	0.37	0.4	1 0.68	0.93	0.99	0.99	]	(89)
Moor	internal	temperatu	ıra in t	ho roct	of dwal	lina	T2 (fc	ollow sto	ne 3	to 7 in Tabl	0.00		<u>!</u>	_	
(90)m=	19.16		9.58	19.92	20.13	Ť	20.2	20.21	20.		19.93	19.5	19.14	1	(90)
(/				- +-								/ing area ÷ (		0.45	(91)
			/5	. 41 '	ادماء	. 111 -	) ('	A T4	. /4			•			` ′
(92)m=						_	<del></del>	_A × 11	<u> </u>	– fLA) × T2		_	<del> </del>	7	
	10167	10 77 I	ე∩ I	20 2	20 40	1 ^	ו בב ו	20.57	20	57 20 54	20 24	10.04	10.60		(02)
	19.64		20 mean	20.3	20.49		0.56	20.57 m Table	20.	where appro	20.31		19.62		(92)



						•							
(93)m= 19.64	19.77	20	20.3	20.49	20.56	20.57	20.57	20.54	20.31	19.94	19.62		(93)
8. Space hea													
Set Ti to the the utilisation					ed at ste	ep 11 of	Table 9b	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac													
(94)m= 0.99	0.99	0.97	0.92	0.79	0.58	0.4	0.44	0.71	0.93	0.98	0.99		(94)
Useful gains,	hmGm ,	W = (94	4)m x (8	4)m									
(95)m= 357.3	382.08	403.06	406.83	361.97	258.51	174.06	182.09	272.99	334.88	340.36	344.5		(95)
Monthly aver	_		<del></del>		r	•	ı						>
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate			·			=[(39)m : 174.36	<del>-``</del>	·		576.27	COC 45		(07)
(97)m= 701	677.59	613.43	510.11	392.16	261.94 Mb/mont		182.62	284.67	433.29		696.45		(97)
Space heatin (98)m= 255.71	198.59	156.52	74.36	22.46	0	0.02	0	0 0	73.22	169.85	261.85		
(00)111	100.00	100.02	7 1.00	22.10				l per year			L	1212.56	(98)
Space beatin	a roquire	mont in	k\//b/m2	2/voor			. 0.0	. poi youi	(11111111111111111111111111111111111111	<i>)</i> ••••••(•	C)10,312		= ' '
Space heatin	• .			•							Į	23.41	(99)
9b. Energy red			The state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the s	Ĭ				المالة عالي					
This part is us Fraction of spa					_		<b>.</b>	•		unity scr	neme.	0	(301)
Fraction of spa								ĺ				1	(302)
							allows for	CUD and	un to forum	other beet	aguraga th		(002)
The c <mark>ommu</mark> nity so includes boilers, h									ир то тошт	otner neat	sources, ir	ie ialler	
Fraction of hea	at from C	ommun	ity heat	pump								0.7	(303a)
Fraction of cor	mmunity	heat fro	m heat s	source 2								0.3	(303b)
Fraction of total	al space	heat fro	m Comn	nunity he	eat pump	0			(3	02) x (303	a) =	0.7	(304a)
Fraction of total	al space	heat fro	m comm	unity he	at sourc	e 2			(3	02) x (303	b) =	0.3	(304b)
Factor for con	trol and o	charging	method	(Table	4c(3)) fo	r comm	unity hea	iting sys	tem		ĺ	1	(305)
Distribution los	ss factor	(Table 1	2c) for o	commun	ity heatir	ng syste	m				ĺ	1.1	(306)
Space heatin	g											kWh/yea	r
Annual space	heating i	requirem	nent									1212.56	
Space heat fro	om Comr	nunity h	eat pum	р				(98) x (30	04a) x (30	5) x (306) :	= [	933.67	(307a)
Space heat fro	om heat s	source 2						(98) x (30	04b) x (30	5) x (306) :	= [	400.15	(307b)
Efficiency of s	econdary	//supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)		0	(308
Space heating	requirer	ment froi	m secon	dary/suլ	oplemen	tary sys	tem	(98) x (30	01) x 100 ·	÷ (308) =		0	(309)
Water heating											г		_
Annual water	_	-										1840.33	
If DHW from o				)				(64) x (30	03a) x (30	5) x (306) :	= [	1417.05	(310a)
Water heat fro	m heat s	ource 2						(64) x (30	03b) x (30	5) x (306) :	= [	607.31	(310b)
Electricity use	d for hea	t distribu	ution				0.01	× [(307a).	(307e) +	· (310a)(	(310e)] =	33.58	(313)
											L		_

Cooling System Energy Efficiency Ratio				0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314)	=		0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from	outside			106.64	(330a)
warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b	o) + (330g) =		106.64	(331)
Energy for lighting (calculated in Appendix L)				251.82	(332)
12b. CO2 Emissions – Community heating scheme					
	Energy kWh/year	Emission fact kg CO2/kWh		missions g CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%)  If there is CHP using	ng two fuels repeat (363) to	(366) for the second	d fuel	294	(367a)
Efficiency of heat source 2 (%)	ng two fuels repeat (363) to	(366) for the second	d fuel	95.6	(367b)
CO2 associated with heat source 1 [(307b)-	+(310b)] x 100 ÷ (367b) x	0.52	=	414.98	(367)
CO2 associated with heat source 2 [(307b)-	+(310b)] x 100 ÷ (367b) x	0.22	=	227.63	(368)
Electrical energy for heat distribution	((313) x	0.52	=	17.43	(372)
Total CO2 associated with community systems	(363)(366) + (368)(372	)	=	660.03	(373)
CO2 associated with space heating (secondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion heater or instantan	eous heater (312) x	0.52	=	0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =			660.03	(376)
CO2 associated with electricity for pumps and fans within dwell	ling (331)) x	0.52	=	55.35	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	=	130.69	(379)
Total CO2, kg/year sum of (376)(382) =				846.07	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =				16.33	(384)
El rating (section 14)				88.29	(385)

#### Energy Strategy



Appendix F – PV Specification





Higher output power



Lower LCOE



Less shading and lower resistive loss



Better mechanical loading tolerance

#### **Superior Warranty**



■ New linear power warranty
■ Standard module linear power warranty

#### **Comprehensive Certificates**

- IEC 61215, IEC 61730,UL 61215, UL 61730
- ISO 9001: 2015 Quality management systems
- ISO 14001: 2015 Environmental management systems
- ISO 45001: 2018 Occupational health and safety management systems
- IEC TS 62941: 2016 Terrestrial photovoltaic (PV) modules Guidelines for increased confidence in PV module design qualification and type approval









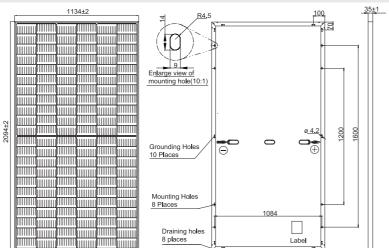




**MECHANICAL DIAGRAMS** 

#### JAM66S30 480-505/MR Series

#### **SPECIFICATIONS**



Cell	Mono
Weight	26.3kg±3%
Dimensions	2094±2mm×1134±2mm×35±1mm
Cable Cross Section Size	4mm² (IEC) , 12 AWG(UL)
No. of cells	132(6×22)
Junction Box	IP68, 3 diodes
Connector	QC 4.10(1000V) QC 4.10-35(1500V)
Cable Length (Including Connector)	Portrait: 300mm(+)/400mm(-); Landscape: 1200mm(+)/1200mm(-

Remark: customized frame color and cable length available upon request

Packaging Configuration 31pcs/Pallet, 682pcs/40ft Container

ELECTRICAL PARAMETERS AT STC										
TYPE	JAM66S30 -480/MR			JAM66S30 -495/MR	JAM66S30 -500/MR	JAM66S30 -505/MR				
Rated Maximum Power(Pmax) [W]	480	485	490	495	500	505				
Open Circuit Voltage(Voc) [V]	45.07	45.20 45.33		45.46	45.59	45.72				
Maximum Power Voltage(Vmp) [V]	37.62	37.81	37.99	38.17	38.35	38.53				
Short Circuit Current(Isc) [A]	13.65	13.72	13.79	13.86	13.93	14.00				
Maximum Power Current(Imp) [A]	12.76	12.83	12.90	12.97	13.04	13.11				
Module Efficiency [%]	20.2	20.4	20.6	20.8	21.1	21.3				
Power Tolerance			0~+5W							
Temperature Coefficient of Isc(α_Isc)	ture Coefficient of Isc(α_Isc) +0.045%°C									
Temperature Coefficient of $Voc(\beta_Voc)$	nperature Coefficient of Voc(β_Voc) -0.275%/°C									
Temperature Coefficient of Pmax(γ_Pmp)		-0.350%/°C	-0.350%/°C							

Remark: Electrical data in this catalog do not refer to a single module and they are not part of the offer. They only serve for comparison among different module types.

ELECTRICAL PARAI	METERS	OPERATING CONDITIONS						
TYPE	JAM66S30 -480/MR	JAM66S30 -485/MR	JAM66S30 -490/MR	JAM66S30 -495/MR	JAM66S30 -500/MR	JAM66S30 -505/MR	Maximum System Voltage	1000V/1500V DC
Rated Max Power(Pmax) [W]	363	367	370	374	378	382	Operating Temperature	-40°C~+85°C
Open Circuit Voltage(Voc) [V]	42.15	42.30	42.43	42.58	42.72	42.86	Maximum Series Fuse Rating	25A
Max Power Voltage(Vmp) [V]	35.54	35.67	35.76	35.84	35.93	36.02	Maximum Static Load,Front* Maximum Static Load,Back*	5400Pa(112lb/ft²) 2400Pa(50lb/ft²)
Short Circuit Current(Isc) [A]	10.99	11.06	11.13	11.20	11.27	11.34	NOCT	45±2°C
Max Power Current(Imp) [A]	10.21	10.28	10.36	10.44	10.52	10.60	Safety Class	Class Ⅱ
NOCT	Irradian	ce 800W/m²,	ambient tem	perature 20°C	wind speed	1m/s, AM1.5G	Fire Performance	UL Type 1

Irradiance 1000W/m², cell temperature 25°C, AM1.5G

#### **CHARACTERISTICS**

STC

Current-Voltage Curve JAM66S30-495/MR

