

### Project No: 15690d Bournemouth, Christchurch and Poole Council Energy & Resources Statement

Proposed Construction of 8 No. Dwellings, Redhorn Close, Poole, BH16 5BE (Infill Site)

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SAP Calculations – SBEM Calculations – Renewable Energy Statements – Energy Performance Certificates Air Tightness Testing – Extract Fan Testing – Water Calculations – DEC Assessments - Room Integrity Testing













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#### **Executive Summary**

This report has been commissioned in response to the Sustainable and Low Carbon Planning Policy requirements of Bournemouth, Christchurch and Poole Council in respect to the proposed construction of 8 No. Dwellings at Redhorn Close (Infill Site), Poole, BH16 5BE.

The statement outlines an overall commitment to reducing energy consumption under occupancy through the adoption of enhanced insulation standards and system efficiencies in comparison to the standard requirements of Approved Document L1 2021 of the Building Regulations. Further improvements are then proposed through the installation of Air Source Heat Pumps.

SAP 10 calculations for the proposed development firmly demonstrate that **50.03%** of the proposed development's energy demand will be met through the use of on-site Low Carbon and renewable sources, which far exceeds the mandatory planning requirements of '*Policy PP37 Building sustainable homes and businesses*' of the Poole Local Plan (adopted November 2018).

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### **1.0 Introduction**

- 1.1 EPS Group have been appointed to provide an Energy & Resources Statement in response to the Sustainable and Low Carbon Planning Policy requirements of Bournemouth, Christchurch and Poole Council in respect to the proposed construction of 8 No. Dwellings at Redhorn Close (Infill Site), Poole, BH16 5BE.
- 1.2 The planning application relates to the proposed construction of new dwellings which will therefore need to comply with the requirements of Approved Document L1 2021 of the Building Regulations, if the application is approved.
- 1.3 The energy consumption of the proposed dwellings has therefore been assessed using the National Calculations Method (NCM) SAP 10 (Standard Assessment Procedure), in order to determine the predicted annual carbon dioxide (CO<sub>2</sub>) emissions of the development and the associated reduction targets.
- 1.4 The following fuel emissions factors have been utilised within the supporting calculations as defined by the updated National Calculations Method:

Fuel	CO <sub>2</sub> emission factor (kgCO <sub>2</sub> /kWh)
Natural gas	0.210
Grid supplied electricity	0.136
Grid displaced electricity	0.136

- 1.5 This document should be used for planning purposes only and should be reassessed and where necessary, resubmitted at the Building Control stage if alternative building specifications or proposed HVAC systems are adopted as oppose to those outlined within the report.
- 1.6 It is also highlighted that the SAP calculations utilised within the report rely on a number of standard operational parameters which may not ultimately match the actual measures adopted within the finalised dwellings. Whilst they provide a 'like for like' comparison for the purpose of this Energy & Resources Statement, they are not valid for Building Control applications or for the actual operation of the development post completion.
- 1.7 The dimensions for all dwellings that are referenced within this report are based upon SAP measurement conventions which may result in slight differences with other dimensions quoted elsewhere.

### 2.0 Planning Policy Context

#### 2.1 National

The National Planning Policy Framework (NPPF) outlines the Government's planning policies for England and how these are expected to be applied by local authorities. Section 14 of this document details how local policies should address climate change through the promotion of energy efficiency and the adoption of low carbon and renewable technologies. It states:

#### "14.0 Meeting the challenge of climate change, flooding and coastal change

152. Plans should take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk, coastal change, water supply, biodiversity and landscapes, and the risk of overheating from rising temperatures. Policies should support appropriate measures to ensure the future resilience of communities and infrastructure to climate change impacts, such as providing space for physical protection measures, or making provision for the possible future relocation of vulnerable development and infrastructure.

#### Planning for climate change

- 153. Plans should take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk, coastal change, water supply, biodiversity and landscapes, and the risk of overheating from rising temperatures. Policies should support appropriate measures to ensure the future resilience of communities and infrastructure to climate change impacts, such as providing space for physical protection measures, or making provision for the possible future relocation of vulnerable development and infrastructure.
- 154. New development should be planned for in ways that:

a) avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through the planning of green infrastructure; and

b) can help to reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards.

155. To help increase the use and supply of renewable and low carbon energy and heat, plans should:

*a)* provide a positive strategy for energy from these sources, that maximises the potential for suitable development, while ensuring that adverse impacts are addressed satisfactorily (including cumulative landscape and visual impacts);

*b)* consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and

c) identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for co-locating potential heat customers and suppliers.

- 156. Local planning authorities should support community-led initiatives for renewable and low carbon energy, including developments outside areas identified in local plans or other strategic policies that are being taken forward through neighbourhood planning.
- 157. In determining planning applications, local planning authorities should expect new development to:

a) comply with any development plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable; and

*b)* take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption.

158. When determining planning applications for renewable and low carbon development, local planning authorities should:

a) not require applicants to demonstrate the overall need for renewable or low carbon energy, and recognise that even small-scale projects provide a valuable contribution to cutting greenhouse gas emissions; and

b) approve the application if its impacts are (or can be made) acceptable. Once suitable areas for renewable and low carbon energy have been identified in plans, local planning authorities should expect subsequent applications for commercial scale projects outside these areas to demonstrate that the proposed location meets the criteria used in identifying suitable areas."

#### 2.2 Local

Policy 'PP37 Building sustainable homes and businesses' of the Poole Local Plan (Adopted November 2018) states:

*"(1)* New development

*Proposals for new homes and commercial development must contribute to tackling climate change by ensuring that:* 

(a) the orientation and design of the development uses passive design features to minimise the need for artificial light, heating and cooling and maximises solar gain;

*(b) the layout of the development maximises opportunities for use of common walls to limit winter heat loss;* 

(c) the design, construction method and materials achieve an energy efficient building, including (but not limited to):

(i) low U-values for walls, floors and roof;
(ii) 'A' rated windows and doors;
(iii) lighting sensors, individual heating controls, metering equipment; and
(iv) adequate mechanical ventilation with heat recovery systems.

(d) the best practicable option is taken for securing renewable energy generation, either through on-site provision or by linking with/contributing to available local off-site renewable energy sources, where the opportunity to do so exists.

(2) Renewable energy

(a) where appropriate, new development should incorporate a proportion of future energy use from renewable energy sources with:

(i) a minimum of 10% for proposals of 1-10 homes (net) or under 1,000 sq. m (net) commercial floor space; and
(ii) a minimum of 20% for proposals of 11 or more homes or over 1,000 sq. m commercial floor space.

(b) the Council will support proposals for renewable energy (except wind turbines) provided that the technology is:

(i) suitable for the location; and

(ii) would not cause harm to residential amenity by virtue of noise, vibration, overshadowing or other harmful emissions.

(3) Commercial buildings

*Proposals for new commercial development will be expected to meet the following BREEAM ratings:* 

(a) Very Good' up to 1,000 sq. m (net) floor space; and

(b) 'Excellent' over 1,000 sq. m (net) floor space."

#### 2.3 Conclusions

On review of the above planning policies it is evident that there is a need to construct dwellings with an energy performance standard beyond the mandatory requirements of Approved Document L1 2021 of the Building Regulations.

As a minor development, the proposed development will need to utilise localised low carbon or renewable technologies to meet a minimum of 10% of its predicted energy demand.

Furthermore, the development should consider energy efficiency and resilience to climate change through all aspects of the design including orientation, internal layout and glazing.

### 3.0 **Proposed Energy Strategy and Performance**

- 3.1 The proposed dwellings will benefit from a range of passive design features including the amount of glazing which will provide beneficial solar gains to the dwellings during the winter months.
- 3.2 The risk of overheating has been reduced by adopting internal layouts that facilitate natural cross ventilation. This will reduce the likelihood of mechanical cooling being required to be installed in the future.
- 3.3 In accordance with the 'Lean' principles of the Energy Hierarchy, it is proposed to adopt the following minimum fabric, lighting and heating standards within the dwellings as a means of reducing the overall energy demand:

Table 1: Proposed Build Standards					
Element / Feature	Approved Document L1 2021 Minimal Acceptable Standard	Proposed Development Target			
Ground Floors U-value	0.18 W/m²K	0.14 W/m²K			
External Walls U-value	0.26 W/m <sup>2</sup> K	0.18 W/m²K			
Party Walls U-value	0.20 W/m²k	0.00 W/m²K			
Pitched Roofs U-value	0.16 W/m²k	0.13 W/m²K			
Windows and Glazed Doors U-value	2.00 W/m <sup>2</sup> K	1.20 W/m <sup>2</sup> K			
Entrance Doors U-value	3.00 W/m <sup>2</sup> K	1.30 W/m²K			
Air Permeability	8.00 m³/m².h	4.00 m³/m².h			
Thermal Bridging	-	Use of Kingspan TEK Standard Detailing			
Lighting	Fixed Internal Lighting to have an Efficacy of 75 lm/W	Fixed Internal Lighting to have an Efficacy of 80 lm/W			
Heating Controls	Programmer, Room Thermostat & TRV's	Time & Temperature Zone Controls			
Ventilation	-	Individual Mechanical Ventilation with Heat Recovery Units (Brink Renovent Sky 150 or equivalent)			

- 3.4 The build standards proposed above will ensure that the dwellings have a reduced energy demand in comparison to the minimum requirements of Approved Document L1 2021 of the Building Regulations, whilst also reducing the associated CO<sub>2</sub> emissions arising from occupancy.
- 3.5 It is also noted that with the amount of glazing proposed, the dwellings have been designed to maximise the amount of natural daylight available, which in conjunction with the highly efficient lighting proposed will reduce the amount of energy consumed through artificial lighting.

### 4.0 Review of Low Carbon & Renewable Technologies

4.1 In response to the local planning policy requirements, a number of different renewable technologies were reviewed in terms of their overall suitability for inclusion within the proposed dwellings.

#### 4.2 Wind Turbine (Column or Roof Mounted)

Benefits	<ul> <li>When installed in optimum positions, wind turbines can generate a large amount of renewable electricity, the surplus of which can be exported at financial gain to the national grid via the Smart Export Guarantee Scheme.</li> </ul>
Site Limitations / Restrictions	<ul> <li>Not aesthetically pleasing and will not be in keeping with the immediate local area.</li> <li>The site is too sheltered as a result of its general urban location which would result in unreliable and insufficient outputs.</li> <li>The council state that they will support proposals for renewable energy (except wind turbines) within their planning policy.</li> <li>Require on-going maintenance which future occupants may neglect.</li> <li>Can produce unacceptable levels of noise to occupants and neighbours.</li> </ul>
Conclusion	• The technology is not deemed as being suitable for use within the proposed development.

#### 4.3 Solar Photovoltaic

Benefits	<ul> <li>When installed in optimum positions, photovoltaic (PV) arrays can generate a large amount of renewable electricity which can be used locally or exported to the national grid via the Smart Export Guarantee Scheme.</li> <li>South facing pitched roof is available to provide optimal positioning of PV panels in order to maximise their efficiency and generation capacity.</li> <li>Minimal ongoing costs &amp; maintenance issues following installation.</li> </ul>
Site Limitations / Restrictions	<ul> <li>PV panels are not always aesthetically pleasing and may detract from the visual appearance of the dwellings.</li> <li>As a result of the rapid decarbonisation of the national grid, the amount of CO<sub>2</sub> savings with this technology is limited as the CO<sub>2</sub> emission factor for grid displaced electricity is relatively low.</li> </ul>
Conclusion	• It is not currently proposed to utilise this technology within the proposed development. However, the client will consider the inclusion of PV panels at a later date if it proves to be cost effective to do so.

#### 4.4 Solar Thermal

Benefits	<ul> <li>Solar hot water systems can provide an efficient way of contributing to a dwelling's overall hot water requirements.</li> <li>South facing pitched roof space would provide an optimal location for the siting of the collectors.</li> </ul>
	<ul> <li>Minimal on-going costs &amp; maintenance issues following installation.</li> </ul>
Site Limitations / Restrictions	<ul> <li>There is no benefit to producing more hot water than is used within a dwelling which can restrict the savings via this technology.</li> <li>Solar collectors are not always aesthetically pleasing and may detract from the visual appearance of the dwellings.</li> </ul>
Conclusion	<ul> <li>It is not proposed to utilise this technology within the proposed development.</li> </ul>

#### 4.5 Ground Source Heat Pump

Benefits	<ul> <li>High operating efficiencies (CoPs).</li> <li>Flexible installation options for new build properties including trench and borehole installations.</li> <li>Reliable and proven technology.</li> <li>Generally low maintenance costs.</li> <li>No visual impact on the property.</li> </ul>
Site Limitations / Restrictions	<ul> <li>Detailed ground surveys required.</li> <li>Minimal space to facilitate an installation</li> <li>High capital installation costs rendering the technology financially unviable.</li> <li>If sufficient capacity isn't available within the Distribution Network then local upgrades may be required which could render the technology financially unviable.</li> </ul>
Conclusion	• The technology is not deemed as being suitable for use within the proposed development.

#### 4.6 Air Source Heat Pump

Benefits	<ul> <li>High operating efficiencies (CoPs).</li> <li>Reduced visual impact on the property.</li> <li>Reliable and proven technology.</li> <li>Generally low maintenance costs.</li> </ul>
Site Limitations / Restrictions	<ul> <li>The external units can result in some minor background noise although this can be limited through the careful selection of models with low operating acoustic levels and the potential use of acoustic cabinets.</li> <li>If sufficient capacity isn't available within the Distribution Network then local upgrades may be required which could render the technology financially unviable.</li> </ul>
Conclusion	• It is proposed to utilise this technology within the proposed development.

#### 4.7 **Biomass Boilers**

Benefits	Reliable and proven technology.
Site	<ul> <li>Require large storage facilities for the fuel.</li> </ul>
Limitations	<ul> <li>Ongoing cleaning, maintenance and management requirements.</li> </ul>
/	<ul> <li>Requires regular fuel deliveries.</li> </ul>
Restrictions	<ul> <li>Would contribute to poor urban air quality.</li> </ul>
Conclusion	• The technology is not deemed as being suitable for use within the
conclusion	proposed development.

4.8 On review of the above technologies, the installation of Air Source Heat Pumps (ASHPs) is recommended as a means of generating heating and hot water from a low carbon source. This will provide an affordable and significant reduction in the energy consumed by these dwellings.

### 5.0 Calculated Energy Performance

- 5.1 SAP 10 has been utilised as an appropriate method for calculating the predicted energy consumption arising from the proposed dwellings. The benefit of this method is that it enables improvements in both build fabric and system efficiencies to be fully quantified. As such, it is consistent with the Energy Hierarchy approach to energy conservation.
- 5.2 A set of SAP Calculations were produced for the development based upon the proposed design parameters outlined within Section 3 of this report, together with the installation of Daikin Altherma 3 Air Source Heat Pumps (ASHPs).
- 5.3 These calculations detail the overall energy demand of each of the proposed dwellings. The key results of which are illustrated in Table 2 below with a selection of the full calculations detailed within Appendix 1 of this report for review (all other instances are available upon request):

Table 2: Development Regulated Energy Demand (kWh/Year)					
Dwelling	No. of Iterations	Floor Area (m²)	Space Heating	Hot Water	Lighting
А	1	113.40	3,298.01	3,001.32	249.43
В	1	105.68	3,123.91	2,971.92	235.84
С	3	92.22	2,819.79	2,890.65	216.46
C - Mirrored	3	92.22	2,752.89	2,890.65	216.46
Total Regulated Energy Demand (kWh/Year)					48,241.13

5.4 The SAP Calculations also provide the predicted energy consumption of the dwellings. Whilst it is noted that the final performance of the flats will vary subject to the actual 'Air Leakage Rates' achieved upon completion, the key results are summarised in Table 3 below with the full calculations provided within Appendix 1 of this report for detailed review:

Table 3: Development Regulated Energy Consumption (kWh/Year)					
Dwelling	No. of lterations	Floor Area (m²)	Space Heating (including any Auxillary consumption)	Hot Water	Lighting
А	1	113.4	2,113.53	1,115.24	249.43
В	1	105.68	1,992.67	1,104.25	235.84
С	3	92.22	1,777.45	1,074.83	216.46
C - Mirrored	3	92.22	1,741.62	1074.93	216.46
Total Regulated Energy Consumption (kWh/Year)					24,104.58

5.5 The results of the SAP Calculations have been collated within Table 4 below as a means of comparison between the overall predicted energy demand and the consumption of the proposed development based upon the design specification outlined within Section 3 and the installation of Air Source Heat Pumps as detailed in paragraph 5.2:

Table 4: Overall Development Annual Energy Summary				
Total Regulated Energy Demand	48,241.13 kWh/Year			
Total Regulated Energy Consumption	24,104.58 kWh/Year			
Percentage Annual Energy Contribution From Low Carbon or Renewable Sources	49.25%			

5.6 Upon review of the above, it is evident that **50.03%** of the proposed development's predicted energy demand will be met through the installation of on-site low carbon or renewable energy sources. This improvement far exceeds the mandatory planning requirements of *'Policy PP37 Building sustainable homes and businesses*' of the Poole Local Plan (adopted November 2018).



### **Appendix 1:**

Example Predicted DER Worksheets (SAP 10 Derived)



#### Dwelling Reference: Dwelling Type: Redhorn Close Poole BH16 5BE

15690 RHA New Dwelling Design Stage

т.	Overall	uwening	unnensions	

	Area(m²)	ļ	Av. He	eight(m)		Volume(m³)	
Basement Ground Floor Total floor area TFA Dwelling volume	56.7 ( 56.7 (	1a) x 1b) x	2.5 2.8	(2) (2)	a) = o) =	141.75 158.76 113.4 300.51	( 3a) ( 3b) ( 4) ( 5)
2. Ventilation Rate							
Chimneys/Flues	0	х	80	=		0	(6a)
Open chimneys	0	х	20	=		0	(6b)
Chimneys / flues attached to closed fire	0	х	10	=		0	(6c)
Flues attached to solid fuel boiler	0	х	20	=		0	(6d)
Flues attached to other heater	0	х	35	=		0	(6e)
Number of blocked chimneys	0	х	20	=		0	(6f)
Number of intermittent extract fans	0	х	10	=		0	(7a)
Number of passive vents	0	x	10	=		0	(7b)
Number of flueless gas fires	0	Х	40	=		0	(7c)
		ŀ	Air ch	anges per hou	r		( - )
Number of storeys in the dwelling (ns)				0		0	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc				0		0	(9)
Additional infiltration				0		0	(10)
Structural infiltration				0		0	(11)
Suspended wooden ground floor				0		0	(12)
No uraught hobby Percentage of windows and doors draught proofed				0		0	(13)
Window infiltration				0		0	(14)
Infiltration rate				0		0	(15)
Air permeability value, AP50, (m <sup>3</sup> /h/m <sup>2</sup> )				4		4	(17)
Air permeability value, AP4, (m <sup>3</sup> /h/m <sup>2</sup> )				0		0	(17a
Air permeability value)				0.2		0.2	(18)
Number of sides on which dwelling is sheltered				1		1	(19)





Shelter fa Infiltratio Infiltratio	actor on rate inc on rate m	corporati odified fo	ing shelte or month	er factor ly wind sp	peed								0.92 0.19	(20) (21)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	(22)
Monthly	average	wind spe	ed from 1	Table U2										
Wind Fac	5.1 ctor	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Adjusted	1.28 infiltratio	1.25 on rate (a	1.23 allowing f	1.1 or shelte	1.08 r and win	0.95 nd speed)	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Calculate	0.24 e effective	0.23 e air chan	0.23 Ige rate fo	0.2 or the ap	0.2 plicable c	0.18 ase:	0.18	0.17	0.19	0.2	0.21	0.22	2.43	(22b)
a) If bala	nced mec	chanical v	ventilatio	n with he	at recove	ery (MVH	R)						0.5 0.5 42.5	(23a) (23b) (23c)
b) If bala	0.52 nced med	0.52 chanical v	0.51 /entilatio	0.49 n without	0.49 t heat red	0.46 covery (N	0.46 1V)	0.46	0.47	0.49	0.5	0.5		(24a)
c) lf who	0 le house e	0 extract ve	0 entilation	0 or positi	0 ve input	0 ventilatio	0 on from c	0 outside	0	0	0	0		(24b)
d) lf natu	0 Iral ventil	0 ation or v	0 whole ho	0 use posit	0 ive input	0 ventilatio	0 on from l	0 oft	0	0	0	0		(24c)
Effective	0 air chang	0 ge rate	0	0	0	0	0	0	0	0	0	0		(24d)
Effective	0.52 air chang	0.52 ge rate fro	0.51 om PCDB	0.49 :	0.49	0.46	0.46	0.46	0.47	0.49	0.5	0.5		(25)
	0.52	0.52	0.51	0.49	0.49	0.46	0.46	0.46	0.47	0.49	0.5	0.5		(25)

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

#### Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

			•			• • • •		
ELEMENT Solid door	Gross area (m²)	Openings m²	Net Area A ,m²	U-value W/m2K	A X U (W/K)	k-value kJ/m²·K	2.6	A X k kJ/K <sub>(26)</sub>
Semi-glazed door							2.6	(26a)
Window							18.63	(27)
Roof window							0	(27a)
Basement floor				0			0	(28)
Ground floor				4252.5			7.94	(28a)
Exposed floor				0			0	(28b)
Basement wall				0			0	(29)
External wall				880.2			17.6	(29a)







Roof 510.3													7.37	(30)
Total ar	ea of exte	rnal elen	nents ∑A,	m²									229.47	(31)
Party W	all												0	(32)
Party flo	or												0	(32a)
Party ce	iling												0	(32b)
Internal	wall **												0	(33c)
Internal	floor												0	(32d)
Internal	ceiling flo	oor											0	(32e)
Fabric h	eat loss, V	N/K = ∑ (A	A x U)										54.14	(33)
Heat ca	pacity Cm	= ∑(A x k	()										7646.4	(34)
Therma	l mass par	rameter (	TMP = Cr	m ÷ TFA)	in kJ/m²k	< Comparison of the second sec							100	(35)
Linear T	hermal br	ridges:∑	(L x Ψ) ca	lculated	using App	oendix K							8.62	(36)
Point Th	ermal bri	dges: ∑χ	(W/K) if s	ignifican	t point th	ermal br	idge pres	ent and v	alues av	ailable			8.62	(36a)
Total fal	bric heat l	oss H = ∑	(A × U) +	$\Sigma(L \times \Psi)$	+∑χ								62.77	(37)
Ventilat	ion heat l	oss calcu	lated mo	nthly										
Heat tra	51.9 Insfer coe	51.44 fficient, \	50.98 N/К	48.69	48.23	45.94	45.94	45.48	46.86	48.23	49.15	50.07		(38)
Heat los	114.67 s parame	114.21 ter (HLP)	113.75 , W/m²K	111.46	111	108.71	108.71	108.25	109.62	111	111.92	112.83		(39)
	1 01	1 01	1	0 98	0 98	0.96	0.96	0.95	0 97	0 98	0 99	1		(40)
Number	of days in	n month	(Table 1a	)	0.50	0.50	0.50	0.55	0.57	0.50	0.55	1		( )
	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ater heat	ing ener	rgy requi	irement										
Assume	d occupar	ncy, N											2.83	(42)
Hot wat	er usage i	n litres p	er day fo	r mixer sl	howers, \	/d,showe	er (from A	Appendix	1)					
Hot wat	98.63 er usage i	97.15 n litres p	94.99 er day fo	90.86 r baths, \	87.81 /d,bath (f	84.41 from App	82.47 endix J)	84.62	86.97	90.62	94.84	98.25		(42a)
Hot wat	30.97 er usage i	30.51 n litres p	29.86 er day fo	28.67 r other u	27.77 ses, Vd,o	26.78 ther (fror	26.25 n Append	26.89 dix J)	27.59	28.65	29.87	30.87		(42b)
	43.65	42.06	40.48	38.89	37.3	35.71	35.71	37.3	38.89	40.48	42.06	43.65		(42c)
Annual	average h	ot water	usage in	litres per	day Vd,a	average (1	from App	endix J)	30.03	10110	12.00	13103	159.59	(43)
Hot wat	er usage i	n litres p	er day fo	r each m	onth Vd,r	m = (42a)	+ (42b) +	+ (42c)						( - )
	173 25	169 72	165 33	158 42	152 88	146 9	144 44	148 81	153 45	159 75	166 77	172 77	1912 49	(44)
Energy content of hot water used = $4.18 \times Vd,m \times nm \times DTm / 3600 kWh/month (from Appendix J)$													1912.49	()
Distribu	274.39 tion loss (	241.69 46) = 0.1	254.11 5 x (45)	216.86	205.81	180.64	174.68	184.26	189.21	216.77	237.6	270.52	2646.54	(45)
	41.16	36.25	38.12	32.53	30.87	27.1	26.2	27.64	28.38	32.52	35.64	40.58		(46)

 41.16
 36.25
 38.12
 32.53
 30.87
 27.1
 26.2
 27.64
 28.38
 32.52
 35.64
 40.58
 (46)

 Storage volume (litres) including any solar or WWHRS storage within same vessel
 0
 (47)

 Water storage loss (or HIU loss)
 0
 (47)





a) If manufacturer's declared loss factor is known (kWh/day): Temperature factor from Table 2b Energy lost from water storage, kWh/day (48) x (49) =	1.8 0.54 0	(48) (49) (50)											
b) If manufacturer's declared loss factor is not known : Hot water storage loss factor from Table 2 (kWh/litre/day) Volume factor from Table 2a Temperature factor from Table 2b Energy lost from water storage, kWh/day Enter (50) or (54) in (55)	0 0 0 0	(51) (52) (53) (54)											
Water storage (or HIU) loss calculated for each month (56) = (55) × (41)	0.97	(55)											
30.13 27.22 30.13 29.16 30.13 29.16 30.13 29.16 30.13 29.16 30.13 29.16 30.13 29.16 30.13 1f the vessel contains dedicated solar storage or dedicated WWHRS storage, (57)m = (56)m ☑ [(47) – Vs] ÷ (47), else (57)m = (56)m where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).		(56)											
30.13 27.22 30.13 29.16 30.13 29.16 30.13 29.16 30.13 29.16 30.13 29.16 30.13 Primary circuit loss for each month from Table 3 modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only h	neat networ	(57) rks)											
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat networks 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)													
0 $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$		(61)											
304.52 268.9 284.24 246.02 235.94 209.8 204.81 214.39 218.37 246.91 266.76 300.65 CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heat	3001.32 ing)	(62)											
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		(63a)											
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		(63b)											
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		(63c)											
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		(63d)											
304.52 268.9 284.24 246.02 235.94 209.8 204.81 214.39 218.37 246.91 266.76 300.65 Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)	3001.32	(64)											
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		(64a)											
91.24 80.36 84.49 72.11 68.43 60.06 58.08 61.27 62.91 72.08 79 89.95 include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network		(65)											

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

Metabolic gains (Table 5), watts

141.69 141.69 141.69 141.69 141.69 141.69 141.69 141.69 141.69 141.69 141.69 141.69 141.69

(66)





Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

Appliance	148.75 es gains (	164.68 calculate	148.75 d in Appe	153.71 endix L, e	148.75 quation L	153.71 .16 or L16	148.75 5a), also s	148.75 see Table	153.71 5	148.75	153.71	148.75	(67)
Cooking §	276.35 gains (cal	279.22 culated in	271.99 n Appenc	256.61 lix L, equa	237.19 ation L18	218.94 or L18a)	206.74 , also see	203.88 Table 5	211.1	226.49	245.91	264.16	(68)
Pumps ar	37.17 nd fans ga	37.17 ains (Tabl	37.17 le 5a)	37.17	37.17	37.17	37.17	37.17	37.17	37.17	37.17	37.17	(69)
Losses e.	0 g. evapor	0 ation (ne	0 egative va	0 ilues) (Ta	0 ble 5	0	0	0	0	0	0	0	(70)
Water he	-113.35 ating gai	-113.35 ns (Table	-113.35 5)	-113.35	-113.35	-113.35	-113.35	-113.35	-113.35	-113.35	-113.35	-113.35	(71)
Total inte	122.63 ernal gain	119.58 IS	113.56	100.15	91.98	83.42	78.07	82.35	87.38	96.88	109.73	120.9	(72)
	613.23	629	599.81	575.97	543.42	521.57	499.06	500.48	517.7	537.62	574.84	599.31	(73)

6. Solar gains

 Solar gains in watts, calculated for each month
 160.37
 271.14
 367.81
 454.08
 509.75
 507.27
 488.5
 446.33
 397.34
 298.59
 191.66
 137.55
 (83)

 Total gains – internal and solar (watts)
 773.61
 900.13
 967.62
 1030.05
 1053.17
 1028.83
 987.57
 946.8
 915.04
 836.21
 766.51
 736.86
 (84)

7. Me	ean inter	nal tem	perature	e (heatin	ıg seasoı	า)								
Temper Utilisati	ature dur on factor	ing heati for gains	ng perioo for living	ds in the l g area, ⊡1	living are .,m (see 1	a from Ta Table 9a)	able 9, Th	1 (°C)					21	(85)
Mean in	0.95 Iternal te	0.93 mperatui	0.9 re in livin	0.83 g area T1	0.74 . (follow s	0.59 steps 3 ar	0.45 nd 4 in Ta	0.48 ible 9c)	0.67	0.85	0.93	0.96		(86)
Temper	19.86 ature dur	19.1 ing heati	19.52 ng perioc	20.06 Is in rest	20.51 of dwelli	20.82 ng from <sup>-</sup>	20.94 Table 9, T	20.93 h2 (°C)	20.72	20.15	19.39	19.06		(87)
Roof	20.07 20.08 20.08 20.1 20.1 20.12 20.12 20.12 20.11 20.1 20.													(88)
Roof	0.95	0.92	0.88	0.81	0.7 Me	0.53 ean inter	0.37 nal temp	0.4 erature in	0.61 n the rest	0.82 of dwell	0.92 ing T2	0.95		(89)
Living ar	19.03 rea fractio	17.88 on	18.4	19.08	19.61	19.97	20.08	20.07	19.87	19.2	18.26	17.91	0.17	(90) (91)
Mean in	ternal te	mperatui	re (for the	e whole o	dwelling)									
Adjuste	19.17 18.08 18.59 19.25 19.76 20.12 20.23 20.22 20.02 19.36 18.45 18.1 Adjusted mean internal temperature:													(92)
	19.17	18.08	18.59	19.25	19.76	20.12	20.23	20.22	20.02	19.36	18.45	18.1		(93)

8. Space heating requirement





# FSAP<sup>10</sup>

Utilisation factor for gains,

Useful ga	0.94 ins, mGm	0.89 N, W	0.85	0.78	0.68	0.53	0.38	0.41	0.61	0.8	0.89	0.94		(94)
Monthly	726.25 average e	802.57 external t	825.36 emperat	806.45 ure from	716.13 Table U1	541.42	377.79	392.12	554.96	665.79	683.75	689.3		(95)
Heat loss	4.3 rate for	4.9 mean inte	6.5 ernal tem	8.9 nperature	11.7 e	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Space hea	1705.59 ating req	1505.82 uirement	1375.16 for each	1153.4 month	895.14	599.85	394.28	413.28	648.45	972.5	1270.41	1568.57		(97)
Solar spa	728.63 ce heatin	472.58 g calculat	409.06 ted using	249.8 Appendi	133.19 ix H (nega	0 ative qua	0 ntity)	0	0	228.19	422.39	654.17		(98a)
Space hea	0 ating req	0 uirement	0 for each	0 month a	0 fter solar	0 contribu	0 Ition	0	0	0	0	0		(98b)
Space hea	728.63 ating req	472.58 uirement	409.06 in kWh/	249.8 m²/year	133.19	0	0	0	0	228.19	422.39	654.17	29.08	(98c) (99)

8c. Sp	ace Co	ooling rec	uireme	ent										
Heat loss	; rate,													
Utilisatio	0 n facto	0 or for loss	0	0	0	0	0	0	0	0	0	0		(100)
Useful lo	0 ss, mLr	0 m <b>(watts)</b>	0	0	0	0	0	0	0	0	0	0		(101)
Gains	0	0	0	0	0	0	0	0	0	0	0	0		(102)
Space co	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0													(103) (104)
Cooled fr Intermitt	0 action ency fa	0 actor	0	0	0	0	0	0	0	0	0	0	0	(104) (105)
Space co	0 oling r	0 equiremer	0 ht for me	0 onth	0	0	0	0	0	0	0	0	0	(106)
Space co	0       0       0       0       0       0       0       0       0       0       0       0       0       0       (107)         cooling requirement in kWh/m²/year       0       0       0       0       (108)													
8f. Spa	ace he	eating rec	uireme	nt										

Fabric Energy Efficiency,

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



0

(109)

DER WORKSHEET

0



Fraction of space heat from secondary/supplementary system, 0 Fraction of space heat from main system(s).														0	(201)
Fraction of space heat from main system(s), Fraction of main heating from main system 2,														1	(202)
Fraction of	of main h	eating fr	om main	system 2	<u>,</u>									0	(203)
Fraction of	of total sp	bace hea	t from m	ain syste	m 1,									1	(204)
Fraction of	of total sp	bace hea	t from m	ain syste	m 2,									0	(205)
Efficiency	of main	space he	eating sys	stem 1 (in	· %) <i>,</i>									191.81	(206)
Efficiency	of main	space he	eating sys	stem 2 (in	· %) <i>,</i>									0	(207)
Efficiency	of secon	dary/sup	oplement	tary heat	ing syster	n, %,								0	(208)
Cooling S	ystem Se	asonal Ei	nergy Eff	iciency R	atio,				0					0	(209)
Space he	ating requ	uirement	t (calcula	ted abov	e),										
	0	0	0	0	0	0	0	0		0	0	0	0		(210)
Space hea	ating fuel	(main h	eating sy	stem 1),	kWh/moi	nth			0					0	
	379.87	246.38	213.26	130.23	69.44	0	0	0		0	118.97	220.21	341.05		(211)
Space he	ating fuel	(main h	eating sy	stem 2),	kWh/moi	nth			0					0	
	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0														(213)
Space heating fuel (secondary), kWh/month													0		
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0													0		(215)
Output from water heater), 0 Efficiency of water heater														269.12	(216)
Efficiency of water heater															
<b>Fuel ferr</b>	269.12	269.12	269.12	269.12	269.12	269.12	269.12	26	9.12	269.12	269.12	269.12	269.12		(217)
Fuel for v	vater nea	ting													
Space Co	113.16 oling	99.92	105.62	91.42	87.67	77.96	76.11	79	.66	81.14	91.75	99.12	111.72	1115.24	(219)
Annual to	0 otals	0	0	0	0	0	0	0 kW	h/yea	0 Ir kW	0 /h/year	0	0		(221)
Space hea	ating fuel	used, m	ain syste	m 1										1719.41	(211)
Space hea	ating fuel	used, m	ain syste	m 2										0	(213)
Space hea	ating fuel	used, se	condary											0	(215)
Water he	ating fue	l used												1115.24	(219)
Electricity	y for insta	intaneou	is electric	shower	(s)									0	(64a)
Space coo	oling fuel	used												0	(221)
Electricity	y for pum	ps, fans	and elect	ric keep-	hot										
Mechanio	cal vent fa	ans - bala	anced, ex	tract or p	positive ir	nput from	n outside		0		0			394.12	(230a)
warm air	heating s	system fa	ins											0	(230b)
Heating c	rculatior	n pump c	or water p	oump wit	hin warm	h air heat	ing unit							0	(230c)
Oil boiler	auxiliary	(oil pum	p, flue fa	in, etc; ex	cludes ci	rculation	pump)							0	(230d)
Gas boile	r auxiliary	y (flue fa	n, etc; ex	cludes ci	rculation	pump)								0	(230e)
Maintaining electric keep-hot facility for gas combi boiler													0	(230f)	
Pump for solar water heating													0	(230g)	
Pump for	storage \	WWHRS												0	(230h)
Total electricity for the above												394.12	(231)		
Electricity	y for light	ing												249.43	(232)





Energy s	saving/g	generatio	on techno	ologies (A	ppendice	es M, N) -	Energy ι	ised in dv	velling					
Electrici	ty gene	rated by	PVs (Ap	pendix M)	) (negativ	ve quantit	:y)							
	0	0	0	0	0	0	0	0	0	0	0	0	0	(233a)
Electrici	ty gene	rated by	wind tu	rbines (Ap	pendix <b>N</b>	M) (negat	ive quant	tity)						
Flectrici	0 tv gene	0 rated by	0 hvdro-e	0 lectric ger	0 nerators	0	0	0	0	0	0	0	0	(234a)
	0	0	0	0	0	0	0	0	0	0	0	0	0	(235a)
Electrici	ty used	or net e	lectricity	generate	d by mic	ro-CHP								
Energy	0 saving/g	0 generatio	0 on techno	0 ologies (A	0 ppendice	0 es M, N) -	0 Energy e	0 exported	0	0	0	0	0	(235c)
Electrici	ty gene	rated by	PVs (Ap	pendix M)	) (negativ	ve quantit	:y)							
Electrici	0 ty gene	0 rated by	0 wind tui	0 rbines (Ap	0 pendix <b>I</b>	0 M) (negat	0 ive quant	0 tity)	0	0	0	0	0	(233b)
Electrici	0 ty gene	0 rated by	0 hydro-e	0 lectric ger	0 nerators	0	0	0	0	0	0	0	0	(234b)
Electrici	0 ty used	0 or net e	0 lectricity	0 generate	0 d by mic	0 cro-CHP	0	0	0	0	0	0	0	(235b)
Append	0 ix Q itei	0 ms: annu	0 Jal energ	0 <b>y</b>	0	0	0	0	0	0	0	0	0	(235d)
Append	ix Q, <it< td=""><td>em 1 de</td><td>scription</td><td>&gt;</td><td></td><td></td><td></td><td>Fue</td><td>el</td><td>kWh/year</td><td></td><td></td><td></td><td></td></it<>	em 1 de	scription	>				Fue	el	kWh/year				
energy	saved												0	(236a)
energy	used												0	(237a)
Total de	livered	energy f	or all use	25									3478.21	

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

Fuel required	kWh/year	Fuel price	Fuel cost £/yea	r
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		283.53	(240a)
Low-rate fraction	0		283.53	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		283.53	(241a)
Low-rate fraction	0		283.53	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		283.53	(242a)





Low-rate fraction	0		283.53	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		183.9	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247	)			
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		64.99	(249)
Energy For lighting	0		41.13	(250)
Additional standing charges	0		0	(251)
Energy saving/generation technologies	0		0	(252)
Appendix Q, <item 1="" description=""></item>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		573.56	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP		
Energy cost deflator	0.36	(256)
Energy cost factor (ECF)	1.3	(257)
SAP rating	78.87	(258)
12a. CO2 emissions – Individual heating systems including micro-CHP		

Energy	Emission factor	Emissions	
KWh/year	kg	kg CO2/year	
Space heating - main system 1		266.78	(261)
Space heating - main system 2		0	(262)
Space heating - secondary		0	(263)
Energy for water heating		157.52	(264)
Energy for instantaneous electric shower(s)		0	(264a)





Space and water heating		0	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		54.67	(267)
Electricity for lighting		36	(268)
energy saved or generated	0	0	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		514.97	(272)
Dwelling CO2 Emission Rate		4.54	(273)
El rating		96	(274)

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

Energy	Emission factor	Emissioner	
KWb /voor	Linission factor		
K vv n/ year	кg	kg CO2/year	
		2707	(275)
		0	(276)
		0	(277)
		1697.7	(278)
		0	(278a)
		0	(279)
		0	(280)
		596.22	(281)
		382.59	(282)
0		0	
0		0	
0		0	
0		0	(284b)
		0	(285b)
		5383.51	(286)
		47.47	(287)
	Energy KWh/year 0 0 0 0 0	Energy Emission factor KWh/year kg 0 0 0 0	Energy KWh/year         Emission factor         Emissionsr           kg         2707         0         5383.551 <td< td=""></td<>





Dwelling Reference: Dwelling Type: Redhorn Close Poole BH16 5BE 15690 RHB New Dwelling Design Stage

1. Overall dwelling dimensions						
	Area(m <sup>2</sup> )	А	v. Height(m)	)	Volume(m <sup>3</sup> )	
Basement	52.84 (1a)	х	2.5	(2a) =	132.1	(3a)
Ground Floor	52.84 (1b)	х	2.8	(2b) =	147.95	(3b)
Total floor area TFA					105.68	(4)
Dwelling volume					280.05	(5)
2 Ventilation Rate						
Chimneys/Flues	0	х	80 =		0	(6a)
Open chimneys	0	х	20 =		0	(6b)
Chimneys / flues attached to closed fire	0	Х	10 =		0	(6c)
Flues attached to solid fuel boiler	0	х	20 =		0	(6d)
Flues attached to other heater	0	х	35 =		0	(6e)
Number of blocked chimneys	0	х	20 =		0	(6f)
Number of intermittent extract fans	0	х	10 =		0	(7a)
Number of passive vents	0	х	10 =		0	(7b)
Number of flueless gas fires	0	х	40 =		0	(7c)
		A	ir changes p	er hour		
Number of storeys in the dwelling (ns)				0	0	(8)
nfiltration due to chimneys, flues, fans, PSVs, etc				0	0	(9)
Additional infiltration				0	0	(10)
Structural infiltration				0	0	(11)
Suspended wooden ground hoor				0	0	(12)
Percentage of windows and doors draught proofed				0	0	(13)
Window infiltration				0	0	(14)
Infiltration rate				0	0	(16)
Air permeability value, AP50, (m³/h/m²)				4	4	(17)
Air permeability value, AP4, (m³/h/m²)				0	0	(17a)
Air permeability value) Number of sides on which due lives is shalt and				0.2	0.2	(18)
Number of sides on which dwelling is sheltered				1	1	(19)





Shelter fa Infiltratio Infiltratio	actor on rate in on rate m	corporati odified fo	ing shelte or month	er factor ly wind sp	peed								0.92 0.19	(20) (21)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	(22)
Monthly	Monthly average wind speed from Table U2													
Wind Fac	5.1 ctor	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Adjusted	1.28 infiltratio	1.25 on rate (a	1.23 allowing f	1.1 or shelte	1.08 r and win	0.95 nd speed)	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Calculate	0.24 e effective	0.23 e air chan	0.23 Ige rate fo	0.2 or the ap	0.2 plicable c	0.18 ase:	0.18	0.17	0.19	0.2	0.21	0.22	2.43	(22b)
a) If bala	nced mec	chanical v	ventilatio	n with he	at recove	ery (MVH	R)						0.5 0.5 42.5	(23a) (23b) (23c)
b) If bala	0.52 nced med	0.52 chanical v	0.51 /entilatio	0.49 n without	0.49 t heat red	0.46 covery (N	0.46 1V)	0.46	0.47	0.49	0.5	0.5		(24a)
c) lf who	0 le house e	0 extract ve	0 entilation	0 or positi	0 ve input	0 ventilatio	0 on from c	0 outside	0	0	0	0		(24b)
d) lf natu	0 Iral ventil	0 ation or v	0 whole ho	0 use posit	0 ive input	0 ventilatio	0 on from l	0 oft	0	0	0	0		(24c)
Effective	0 air chang	0 ge rate	0	0	0	0	0	0	0	0	0	0		(24d)
Effective	0.52 air chang	0.52 ge rate fro	0.51 om PCDB	0.49 :	0.49	0.46	0.46	0.46	0.47	0.49	0.5	0.5		(25)
	0.52	0.52	0.51	0.49	0.49	0.46	0.46	0.46	0.47	0.49	0.5	0.5		(25)

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

#### Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

			•	-		• • • •		
ELEMENT Solid door	Gross area (m²)	Openings m²	Net Area A ,m²	U-value W/m2K	A X U (W/K)	k-value kJ/m²·K	2.6	A X k kJ/K <sub>(26)</sub>
Semi-glazed door							2.6	(26a)
Window							18.63	(27)
Roof window							0	(27a)
Basement floor				0			0	(28)
Ground floor				3963			7.4	(28a)
Exposed floor				0			0	(28b)
Basement wall				0			0	(29)
External wall				836.28			16.73	(29a)







Roof			475.56					6.87	(30)
Total area of external elements ∑A, m <sup>2</sup>								216.87	(31)
Party Wall								0	(32)
Party floor								0	(32a)
Party ceiling								0	(32b
Internal wall **								0	(33c)
Internal floor								0	(32d
Internal ceiling floor								0	(32e)
Fabric heat loss, W/K = ∑ (A x U)								52.22	(33)
Heat capacity Cm = ∑(A x k )								7278.24	(34)
Thermal mass parameter (TMP = Cm $\div$ TFA) in kJ/m <sup>2</sup> l	<							100	(35)
Linear Thermal bridges: $\Sigma$ (L x $\Psi)$ calculated using Ap	pendix K							8.82	(36)
Point Thermal bridges: $\Sigma \chi$ (W/K) if significant point the second point the second point the second point the second point of the second point o	nermal bridg	ge prese	ent and v	alues ava	ilable			8.82	(36a)
Total fabric heat loss $H = \sum (A \times U) + \sum (L \times \Psi) + \sum \chi$ Ventilation heat loss calculated monthly								61.04	(37)
48.37 47.94 47.51 45.38 44.95 Heat transfer coefficient, W/K	42.81 4	12.81	42.38	43.67	44.95	45.8	46.66		(38)
109.41 108.98 108.56 106.42 105.99 Heat loss parameter (HLP), W/m <sup>2</sup> K	103.86 1	103.86	103.43	104.71	105.99	106.85	107.7		(39)
1.04 1.03 1.03 1.01 1 Number of days in month (Table 1a)	0.98 0	).98	0.98	0.99	1	1.01	1.02		(40)
31 28 31 30 31	30 3	31	31	30	31	30	31		(41)
4. Water heating energy requirement									
Assumed occupancy, N	Vd showor /	(from Ar	an an div I	<b>`</b>				2.79	(42)
Hot water usage in litres per day for mixer showers,	va,snower (	(Irom Ap	pendix i	)					(
97.54 96.07 93.94 89.85 86.83 Hot water usage in litres per day for baths, Vd,bath (	83.47 8 from Appen	31.56 ndix J)	83.68	86	89.61	93.79	97.16		(42a)
30.63 30.17 29.53 28.35 27.47 Hot water usage in litres per day for other uses, Vd,c	26.49 2 other (from <i>i</i>	25.96 Appendi	26.59 ix J)	27.29	28.33	29.54	30.52		(42b
43.16 41.59 40.02 38.46 36.89 Annual average hot water usage in litres per day Vd,	35.32 3 average (fro	35.32 om Appe	36.89 endix J)	38.46	40.02	41.59	43.16	157.82	(42c) (43)
Hot water usage in litres per day for each month Vd,	m = (42a) +	(42b) +	(42c)						
171.33 167.84 163.49 156.66 151.19 Energy content of hot water used = 4.18 x Vd,m x nm	145.27 1 n x DTm / 36	142.83 500 kWh	147.16 n/month	151.74 (from Ap	157.97 pendix J)	164.92	170.85	1891.25	(44)
271.34 239 251.28 214.45 203.52 Distribution loss (46) = 0.15 x (45)	178.63 1	172.74	182.21	187.11	214.37	234.96	267.51	2617.14	(45)
40.7 35.85 37.69 32.17 30.53 Storage volume (litres) including any solar or WWHR	26.79 2 S storage w	25.91 rithin sar	27.33 ne vesse	28.07	32.15	35.24	40.13	0	(46) (47)

Water storage loss (or HIU loss)





a) If manufacturer's declared loss factor is known (kWh/day): 1.8	(48)									
Temperature factor from Table 2b 0.54										
Energy lost from water storage, kWh/day (48) x (49) = 0										
b) If manufacturer's declared loss factor is not known :										
Hot water storage loss factor from Table 2 (kWh/litre/day) 0										
Volume factor from Table 2a 0	(52)									
Temperature factor from Table 2b 0	(53)									
Energy lost from water storage, kWh/day 0	(54)									
Enter (50) or (54) in (55) 0.97	(55)									
Water storage (or HIU) loss calculated for each month (56) = (55) × (41)										
30.13 27.22 30.13 29.16 30.13 29.16 30.13 30.13 29.16 30.13 29.16 30.13 If the vessel contains dedicated solar storage or dedicated WWHRS storage,	(56)									
(57)m = (56)m 🛛 [(47) − Vs] ÷ (47), else (57)m = (56)m										
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).										
30.13 27.22 30.13 29.16 30.13 29.16 30.13 30.13 29.16 30.13 29.16 30.13 Primary circuit loss for each month from Table 3	(57)									
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only heat r	networks)									
	(59)									
Combi loss for each month from Table 3a, 3b or 3c (enter 0 if not a combi boiler)	()									
0 $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$	(61)									
301.48 266.22 281.41 243.61 233.66 207.79 202.87 212.34 216.27 244.5 264.12 297.64 29 CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heating)	971.92 (62)									
0 0 0 0 0 0 0 0 0 0	(63a)									
PV diverter DHW input calculated using Appendix G (negative quantity) (enter 0 if no PV diverter contribution)	. ,									
0 0 0 0 0 0 0 0 0 0	(63b)									
Solar DHW input calculated using Appendix H (negative quantity) (enter 0 if no solar contribution to water heating)										
0 0 0 0 0 0 0 0 0 0	(63c)									
FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water heating)										
0 0 0 0 0 0 0 0 0 0	(63d)									
Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)										
301.48       266.22       281.41       243.61       233.66       207.79       202.87       212.34       216.27       244.5       264.12       297.64       29         Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)       (63c) + (63d)       297.64	971.92 (64)									
0 0 0 0 0 0 0 0 0 0	(64a)									
Heat gains from water heating, kWh/month 0.25 x [0.85 × (45) + (61) + (64a)] + 0.8 x [(46) + (57) + (59) ]										
90.22 79.47 83.55 71.31 67.67 59.39 57.44 60.58 62.22 71.28 78.12 88.95 include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network	(65)									

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

Metabolic gains (Table 5), watts

139.31 139.31 139.31 139.31 139.31 139.31 139.31 139.31 139.31 139.31 139.31 139.31

(66)





Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

Appliance	140.64 es gains (	155.71 calculate	140.64 d in Appe	145.33 endix L, e	140.64 quation L	145.33 .16 or L16	140.64 5a), also s	140.64 see Table	145.33 5	140.64	145.33	140.64	(67)
Cooking §	265.2 gains (cal	267.95 culated ir	261.01 n Append	246.25 lix L, equa	227.61 ation L18	210.1 or L18a)	198.4 , also see	195.65 Table 5	202.58	217.34	235.98	253.5	(68)
Pumps ar	36.93 nd fans ga	36.93 ains (Tabl	36.93 le 5a)	36.93	36.93	36.93	36.93	36.93	36.93	36.93	36.93	36.93	(69)
Losses e.;	0 g. evapor	0 ation (ne	0 gative va	0 ilues) (Ta	0 ble 5	0	0	0	0	0	0	0	(70)
Water he	-111.45 eating gai	-111.45 ns (Table	-111.45 5)	-111.45	-111.45	-111.45	-111.45	-111.45	-111.45	-111.45	-111.45	-111.45	(71)
Total inte	121.27 ernal gain	118.26 s	112.3	99.04	90.96	82.49	77.2	81.43	86.41	95.8	108.51	119.55	(72)
	591.89	606.7	578.75	555.41	524	502.71	481.03	482.51	499.11	518.58	554.61	578.48	(73)

6. Solar gains

 Solar gains in watts, calculated for each month
 150.99
 256.52
 351.45
 439.86
 499.32
 499.33
 479.85
 434.47
 381.66
 283.42
 180.67
 129.36
 (83)

 Total gains – internal and solar (watts)
 742.88
 863.23
 930.19
 995.26
 1023.32
 1002.04
 960.87
 916.98
 880.77
 802
 735.28
 707.84
 (84)

7. Me	ean inter	mal tem	perature	e (heatin	ig seasoi	n)								
Tempera Utilisatio	ature dur on factor	ing heati for gains	ng perioo for living	ds in the g area, ⊡1	living are L,m (see T	a from Ta Fable 9a)	able 9, Th	1 (°C)					21	(85)
Mean in	0.95 ternal te	0.92 mperatui	0.89 re in livin	0.83 g area T1	0.73 . (follow s	0.58 steps 3 ai	0.44 nd 4 in Ta	0.48 ble 9c)	0.66	0.84	0.93	0.96		(86)
Tempera	19.85 ature dur	19.08 ing heati	19.5 ng period	20.05 ds in rest	20.51 of dwelli	20.82 ng from <sup>-</sup>	20.94 Table 9, T	20.92 h2 (°C)	20.72	20.13	19.37	19.03		(87)
Roof	20.05 20.06 20.06 20.08 20.08 20.1 20.1 20.1 20.09 20.08 20.07 20.07 Of Utilisation factor for gains for rest of dwelling, 22,m (see Table 9a)											(88)		
Roof	0.94	0.91	0.88	0.8	0.69 Me	0.52 ean inter	0.36 nal tempo	0.4 erature ii	0.61 n the rest	0.82 of dwell	0.91 ing T2	0.95		(89)
Living ar	19 ea fractio	17.83 on	18.36	19.06	19.59	19.95	20.06	20.05	19.85	19.17	18.22	17.86	0.17	(90) (91)
Mean in	ternal te	mperatu	re (for th	e whole o	dwelling)									
Adjusted	19.14 d mean ir	18.04 nternal te	18.55 mperatu	19.22 re:	19.75	20.1	20.21	20.2	19.99	19.33	18.41	18.06		(92)
	19.14	18.04	18.55	19.22	19.75	20.1	20.21	20.2	19.99	19.33	18.41	18.06		(93)

8. Space heating requirement







Utilisation factor for gains,

Useful ga	0.94 iins, mGm	0.89 n,W	0.85	0.77	0.67	0.52	0.37	0.41	0.6	0.79	0.89	0.93		(94)
Monthly	694.9 average e	765.65 external t	788.01 emperat	771.19 ure from	685.01 Table U1	516.47	359.19	372.77	528	633.88	652.43	659.54		(95)
Heat loss	4.3 rate for	4.9 mean int	6.5 ernal tem	8.9 nperature	11.7 e	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Space he	1624.09 ating req	1432 uirement	1308.46 for each	1098.63 month	852.88	571.18	374.71	392.86	617.02	925.31	1208.45	1492.53		(97)
Solar spa	691.32 ce heatin	447.79 g calcula	387.22 ted using	235.76 Appendi	124.9 ix H (nega	0 ative qua	0 ntity)	0	0	216.83	400.34	619.75		(98a)
Space he	0 ating req	0 uirement	0 for each	0 month a	0 Ifter solar	0 r contribu	0 ution	0	0	0	0	0		(98b)
Space he	691.32 ating req	447.79 uirement	387.22 : in kWh/	235.76 m²/year	124.9	0	0	0	0	216.83	400.34	619.75	29.56	(98c) (99)

8c. Spa	ace Co	oling rec	uiremen	it										
Heat loss	rate,													
Utilisatio	0 n facto	0 r for loss	0	0	0	0	0	0	0	0	0	0		(100)
Useful los	0 ss, mLn	0 n (watts)	0	0	0	0	0	0	0	0	0	0		(101)
Gains	0	0	0	0	0	0	0	0	0	0	0	0		(102)
Space coo	0 oling re	0 quiremer	0 nt for mor	0 1th, whol	0 e dwellin	0 g, contin	0 uous (kW	0 ′h)	0	0	0	0		(103) (104)
Cooled fra Intermitte	0 action ency fa	0 ctor	0	0	0	0	0	0	0	0	0	0	0	(104) (105)
Space coo	0 oling re	0 quiremer	0 nt for mor	0 1th	0	0	0	0	0	0	0	0	0	(106)
Space coo	0 oling re	0 quiremer	0 ាt in kWh/	0 /m²/year	0	0	0	0	0	0	0	0	0	(107) (108)
8f. Spa	ace he	ating req	luiremen	t										

Fabric Energy Efficiency,	0	0	(109)

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





Fraction	of space h	neat fron	n second	ary/supp	lementar	y system	,		0					0	(201)
Fraction	of space h	neat fron	n main sy	/stem(s),										1	(202)
Fraction	of main h	eating fr	om main	system 2	2,									0	(203)
Fraction	of total sp	bace hea	t from m	ain syste	m 1,									1	(204)
Fraction	of total sp	bace hea	t from m	ain syste	m 2,									0	(205)
Efficiency	y of main	space he	eating sys	stem 1 (ir	n %) <i>,</i>									192.19	(206)
Efficiency	y of main	space he	eating sys	stem 2 (ir	n %) <i>,</i>									0	(207)
Efficiency	y of secon	ndary/su	pplement	tary heat	ing syste	m, %,								0	(208)
Cooling S	System Se	asonal E	nergy Eff	iciency R	atio,				0					0	(209)
Space he	ating req	uirement	t (calcula	ted abov	e),										
	0	0	0	0	0	0	0	0		0	0	0	0		(210)
Space he	ating fuel	l (main h	eating sy	stem 1),	kWh/mo	nth			0					0	
	359.7	232.99	201.47	122.67	64.98	0	0	0		0	112.82	208.3	322.46		(211)
Space he	ating fuel	l (main h	eating sy	stem 2),	kWh/mo	nth			0					0	
	0	0	0	0	0	0	0	0		0	0	0	0		(213)
Space he	ating fuel	l (second	lary), kW	h/month					0					0	
	0	0	0	0	0	0	0	0		0	0	0	0		(215)
Output f	rom wate	r heater)	),						0					269.13	(216)
Efficienc	y of water	r heater													
	269.13	269.13	269.13	269.13	269.13	269.13	269.13	26	9.13	269.13	269.13	269.13	269.13		(217)
Fuel for v	water hea	iting													
Space Co	112.02 ooling	98.92	104.56	90.52	86.82	77.21	75.38	78	.9	80.36	90.85	98.14	110.59	1104.25	(219)
Annual t	0 otals	0	0	0	0	0	0	0 kW	h/vea	0 Ir kW	0 /h/vear	0	0		(221)
Space he	ating fuel	l used, m	ain syste	m 1					, ,		11			1625.38	(211)
Space he	ating fuel	l used, m	ain syste	m 2										0	(213)
Space he	ating fuel	l used, se	econdary											0	(215)
Water he	eating fue	lused												1104.25	(219)
Electricit	y for insta	antaneou	us electrio	shower	(s)									0	(64a)
Space co	oling fuel	used												0	(221)
Electricit	y for pum	ips, fans	and elect	tric keep-	hot										
Mechani	cal vent fa	ans - bala	anced, ex	tract or p	oositive in	nput from	n outside		0		0			367.29	(230a)
warm air	heating s	system fa	ans											0	(230b)
Heating	circulatior	n pump c	or water p	pump wit	hin warn:	n air heat	ing unit							0	(230c)
Oil boile	r auxiliary	(oil pum	ip, flue fa	in, etc; ex	kcludes ci	rculation	pump)							0	(230d)
Gas boile	er auxiliar	y (flue fa	n, etc; ex	cludes ci	rculation	pump)								0	(230e)
Maintain	ing electr	ic keep-ł	not facilit	y for gas	combi bo	oiler								0	(230f)
Pump fo	r solar wa	ter heati	ing											0	(230g)
Pump fo	r storage	WWHRS												0	(230h)
Total ele	ctricity fo	r the abo	ove											367.29	(231)
Electricity for lighting									235.84	(232)					





Energy s	saving/g	eneratio	on techno	ologies (A	ppendice	es M, N) -	Energy ι	used in dw	elling					
Electrici	ty gene	rated by	PVs (App	pendix M)	(negativ	ve quantit	ty)							
	0	0	0	0	0	0	0	0	0	0	0	0	0	(233a)
Electrici	ty gene	rated by	wind tur	rbines (Ap	pendix N	И) (negati	ive quan	tity)						
	0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)
Electrici	ty gene	rated by	hydro-e	lectric ger	nerators									
Electrici	0 ty used	0 or net e	0 lectricity	0 generate	0 d by mic	0 ro-CHP	0	0	0	0	0	0	0	(235a)
	0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)
Energy s	saving/g	eneratio	on techno	ologies (A	ppendice	es M, N) -	Energy e	exported						
Electrici	ty gene	rated by	PVs (Ap	pendix M)	(negativ	ve quantit	ty)							
	0	0	0	0	0	0	0	0	0	0	0	0	0	(233b)
Electrici	ty gene	rated by	wind tur	rbines (Ap	pendix N	И) (negati	ive quan	tity)						
	0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)
Electrici	ty gene	rated by	hydro-e	lectric ger	nerators									
	0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)
Electrici	ty used	or net e	lectricity	generate	d by mic	ro-CHP								
	0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)
Append	ix Q iter	ns: annu	ial energ	У										
Append	ix Q, <it< td=""><td>em 1 de</td><td>scription</td><td>&gt;</td><td></td><td></td><td></td><td>Fue</td><td>I</td><td>kWh/year</td><td></td><td></td><td></td><td></td></it<>	em 1 de	scription	>				Fue	I	kWh/year				
energy s	saved												0	(236a)
energy ເ	used												0	(237a)
Total de	livered	energy f	or all use	25									3332.76	

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

Fuel required	kWh/year	Fuel price	Fuel cost £/yea	ır
Space heating - main system 1 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		268.03	(240a)
Low-rate fraction	0		268.03	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		268.03	(241a)
Low-rate fraction	0		268.03	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		268.03	(242a)





Low-rate fraction	0		268.03	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		182.09	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247)	)			
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		60.57	(249)
Energy For lighting	0		38.89	(250)
Additional standing charges	0		0	(251)
Energy saving/generation technologies	0		0	(252)
Appendix Q, <item 1="" description=""></item>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		549.57	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP		
Energy cost deflator	0.36	(256)
Energy cost factor (ECF)	1.31	(257)
SAP rating	78.72	(258)
12a. CO2 emissions – Individual heating systems including micro-CHP		

Energy	Emission factor	Emissions	
KWh/year	kg	kg CO2/year	
Space heating - main system 1		252.21	(261)
Space heating - main system 2		0	(262)
Space heating - secondary		0	(263)
Energy for water heating		155.96	(264)
Energy for instantaneous electric shower(s)		0	(264a)





Space and water heating		0	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		50.95	(267)
Electricity for lighting		34.04	(268)
energy saved or generated	0	0	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		493.16	(272)
Dwelling CO2 Emission Rate		4.67	(273)
El rating		96	(274)

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

	Energy	Emission factor	Emissionsr	
	KWb/year	ka	kg CO2/year	
Space heating - main system 1	Kvvii/year	Ng	2559.04	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			1680.96	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			0	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			555.63	(281)
Electricity for lighting			361.73	(282)
energy saved or generated	0		0	( )
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			5157.36	(286)
Dwelling PE Rate			48.8	(287)





#### Dwelling Reference: Dwelling Type: Redhorn Close Poole BH16 5BE

15690 RHC New Dwelling Design Stage

1. Overall dwelling dimensions						
	Area(m²)	А	w. Height(m)		Volume(m³)	
Basement Ground Floor Total floor area TFA Dwelling volume	46.11 ( 1a) 46.11 ( 1b)	x x	2.5 2.8	(2a) = (2b) =	115.28 129.11 92.22 244.38	( 3a) ( 3b) ( 4) ( 5)
2. Ventilation Rate						
Chimneys /Elues	0					$\langle C_{-} \rangle$
Onen chimneys	0	X	80 =		0	(0d) (Ch)
Chimneys / flues attached to closed fire	0	X	20 =		0	(ua)
Elues attached to solid fuel boiler	0	х	10 =		0	(60)
Flues attached to other beater	0	х	20 =		0	(60)
Number of blocked chimpour	0	Х	35 =		0	(66)
Number of blocked childreys	0	Х	20 =		0	(6f)
Number of massive vents	0	х	10 =		0	(7a)
Number of passive vents	0	Х	10 =		0	(7b)
Number of flueless gas fires	0	х	40 =		0	(7c)
		А	Air changes per r	nour		
Number of storeys in the dwelling (ns)				0	0	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc				0	0	(9)
Additional infiltration				0	0	(10)
Structural infiltration				0	0	(11)
Suspended wooden ground floor				0	0	(12)
No draught lobby				0	0	(13)
Window infiltration				0	0	(14)
Infiltration rate				0	0	(15)
Air permeability value, AP50, (m <sup>3</sup> /h/m <sup>2</sup> )				4	4	(17) (17)
Air permeability value, AP4, (m³/h/m²)				0	0	(17a)
Air permeability value)			(	).2	0.2	(18)
Number of sides on which dwelling is sheltered				1	1	(19)





Shelter fa Infiltratio Infiltratio	actor on rate inc on rate m	corporati odified fo	ing shelte or month	er factor ly wind sp	peed								0.92 0.19	(20) (21)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	(22)
Monthly	average	wind spe	ed from 1	Table U2										
Wind Fac	5.1 ctor	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Adjusted	1.28 infiltratio	1.25 on rate (a	1.23 allowing f	1.1 or shelte	1.08 r and win	0.95 nd speed)	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Calculate	0.24 e effective	0.23 e air chan	0.23 Ige rate fo	0.2 or the ap	0.2 plicable c	0.18 ase:	0.18	0.17	0.19	0.2	0.21	0.22	2.43	(22b)
a) If bala	If balanced mechanical ventilation with heat recovery (MVHR)													(23a) (23b) (23c)
b) If bala	0.52 nced med	0.52 chanical v	0.51 /entilatio	0.49 n without	0.49 t heat red	0.46 covery (N	0.46 1V)	0.46	0.47	0.49	0.5	0.5		(24a)
c) lf who	0 le house e	0 extract ve	0 entilation	0 or positi	0 ve input	0 ventilatio	0 on from c	0 outside	0	0	0	0		(24b)
d) lf natu	0 Iral ventil	0 ation or v	0 whole ho	0 use posit	0 ive input	0 ventilatio	0 on from l	0 oft	0	0	0	0		(24c)
Effective	0 air chang	0 ge rate	0	0	0	0	0	0	0	0	0	0		(24d)
Effective	0.52 air chang	0.52 ge rate fro	0.51 om PCDB	0.49 :	0.49	0.46	0.46	0.46	0.47	0.49	0.5	0.5		(25)
	0.52	0.52	0.51	0.49	0.49	0.46	0.46	0.46	0.47	0.49	0.5	0.5		(25)

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

#### Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

			•			• • • •		
ELEMENT Solid door	Gross area (m²)	Openings m²	Net Area A ,m²	U-value W/m2K	A X U (W/K)	k-value kJ/m²·K	2.6	A X k kJ/K <sub>(26)</sub>
Semi-glazed door							2.6	(26a)
Window							16.16	(27)
Roof window							0	(27a)
Basement floor				0			0	(28)
Ground floor				3458.25			6.46	(28a)
Exposed floor				0			0	(28b)
Basement wall				0			0	(29)
External wall				775.62			15.51	(29a)





Roof								414.99	)				5.99	(30)
Total are	ea of exte	rnal elen	nents ∑A,	m²									194.51	(31)
Party Wa	all												0	(32)
Party flo	or												0	(32a)
Party cei	ling												0	(32b)
Internal	wall **												0	(33c)
Internal	floor												0	(32d)
Internal	ceiling flo	oor											0	(32e)
Fabric he	eat loss, N	N/K = ∑ (	A x U)										46.72	(33)
Heat cap	acity Cm	= ∑(A x k	< )										6723.81	(34)
Thermal	mass par	rameter (	(TMP = Cr	m ÷ TFA)	in kJ/m²k	(							100	(35)
Linear Th	nermal br	ridges: ∑	(L x Ψ) ca	lculated	using Ap	oendix K							8.07	(36)
Point Th	ermal bri	dges: ∑χ	(W/K) if s	significan	t point th	ermal br	idge pres	ent and	values av	ailable			8.07	(36a)
Total fab	oric heat l	oss H = ∑	(A × U) +	$\Sigma(L \times \Psi)$	+∑χ								54.79	(37)
Ventilati	on heat l	oss calcu	lated mo	nthly										
Heat trai	42.21 nsfer coe	41.84 fficient, \	41.46 W/K	39.6	39.22	37.36	37.36	36.99	38.11	39.22	39.97	40.72		(38)
Heat los	97 96.62 96.25 94.39 94.01 92.15 92.15 91.78 92.89 94.01 94.76 95.51 t loss parameter (HLP) W/m <sup>2</sup> K													
ficat ios.		1.05	1.04	1.02	1.02	1	1	1	1.01	1.02	1.02	1.04		(40)
Number	of days in	n month	T.04 (Table 1a	1.02 I)	1.02	T	1	1	1.01	1.02	1.03	1.04		(40)
	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	iter heat	ing enei	rgy requi	irement										
Assumed	d occupar	ncv. N											2 65	(42)
Hot wate	er usage i	n litres p	er day fo	r mixer sl	howers, \	/d,showe	er (from A	Appendix	1)				2.05	(72)
	9/ 51	03 00	91 02	87.06	8/1 1/1	80.88	, 79 03	81 NR	, 83.33	86.83	90 88	9/ 15		(42a)
Hot wate	er usage i	n litres p	per day fo	r baths, \	/d,bath (1	from App	endix J)	01.00	05.55	00.05	50.00	54.15		(124)
Hot wate	29.68 er usage i	29.24 n litres p	28.62 er day fo	27.47 r other u	26.62 ses, Vd,o	25.67 ther (fror	25.15 m Appen	25.77 dix J)	26.44	27.46	28.63	29.58		(42b)
	41.82	40.3	38.78	37.26	35.74	34.22	34.22	35.74	37.26	38.78	40.3	41.82		(42c)
Annual a Hot wate	iverage h er usage i	ot water in litres p	usage in er day fo	litres per r each me	<sup>·</sup> day Vd,a onth Vd,i	iverage (i n = (42a)	from App + (42b) -	endix J) + (42c)					152.92	(43)
	166.01	162.63	158.42	151.79	146.49	140.76	138.4	142.59	147.03	153.07	159.8	165.55	1832.52	(44)

Energy content of hot water used =  $4.18 \times Vd$ ,m x nm x DTm / 3600 kWh/month (from Appendix J) 262.92 231.58 243.48 207.79 197.2 173.08 167.38 176.55 181.3 207.71 227.66 259.21 2535.87 (45) Distribution loss (46) =  $0.15 \times (45)$ 39.44 34.74 36.52 31.17 29.58 25.96 25.11 26.48 27.2 31.16 34.15 38.88 (46)

 33.44
 34.14
 30.32
 31.17
 23.30
 23.11
 20.48
 27.2
 31.10
 34.15
 38.88
 (40)

 Storage volume (litres) including any solar or WWHRS storage within same vessel
 0
 (47)

 Water storage loss (or HIU loss)
 0
 (47)





a) If manufacturer's declared loss factor is known (kWh/day): Temperature factor from Table 2b	1.8 0.54	(48) (49)
Energy lost from water storage, kWh/day (48) x (49) =	0	(50)
b) It manufacturer's declared loss factor is not known :		
Hot water storage loss factor from Table 2 (kWh/litre/day)	0	(51)
Volume factor from Table 2a	0	(52)
Temperature factor from Table 2b	0	(53)
Energy lost from water storage, kWh/day	0	(54)
Enter (50) or (54) in (55)	0.97	(55)
Water storage (or HIU) loss calculated for each month $(56) = (55) \times (41)$		
30.13 27.22 30.13 29.16 30.13 29.16 30.13 30.13 29.16 30.13 29.16 30.13 If the vessel contains dedicated solar storage or dedicated WWHRS storage,		(56)
(57)m = (56)m 🛛 [(47) − Vs] ÷ (47), else (57)m = (56)m		
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable).		
30.13 27.22 30.13 29.16 30.13 29.16 30.13 30.13 29.16 30.13 29.16 30.13 Primary circuit loss for each month from Table 3		(57)
modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only	heat networ	rks)
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		(59)
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		(61)
293.05 258.79 273.61 236.95 227.34 202.24 197.51 206.68 210.46 237.84 256.82 289.34 CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water her	2890.65 ating)	(62)
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		(63a)
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		(63b)
0 $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$		(63c)
FGHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no FGHRS contribution to water neating	ł	
0 $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$		(63d)
293.05 258.79 273.61 236.95 227.34 202.24 197.51 206.68 210.46 237.84 256.82 289.34 Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)	2890.65	(64)
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		(64a)
87.42 77 80.96 69.09 65.57 57.55 55.65 58.7 60.28 69.06 75.7 86.19 include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network		(65)

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

Metabolic gains (Table 5), watts

132.75 132.75 132.75 132.75 132.75 132.75 132.75 132.75 132.75 132.75 132.75 132.75

(66)





Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

Appliance	129.09 es gains (	142.92 calculate	129.09 d in Appe	133.39 endix L, e	129.09 quation l	133.39 .16 or L10	129.09 6a), also s	129.09 see Table	133.39 • <b>5</b>	129.09	133.39	129.09	(67)
Cooking §	243.1 gains (cal	245.63 culated in	239.27 n Append	225.74 lix L, equ	208.65 ation L18	192.6 or L18a)	181.87 , also see	179.35 Table 5	185.7	199.24	216.32	232.38	(68)
Pumps ar	36.27 nd fans ga	36.27 ains (Tabl	36.27 le 5a)	36.27	36.27	36.27	36.27	36.27	36.27	36.27	36.27	36.27	(69)
Losses e.	0 g. evapor	0 ation (ne	0 egative va	0 alues) (Ta	0 ble 5	0	0	0	0	0	0	0	(70)
Water he	-106.2 ating gai	-106.2 ns (Table	-106.2 5)	-106.2	-106.2	-106.2	-106.2	-106.2	-106.2	-106.2	-106.2	-106.2	(71)
Total inte	117.5 ernal gain	114.58 IS	108.81	95.96	88.13	79.93	74.8	78.9	83.73	92.83	105.14	115.84	(72)
	552.51	565.95	539.99	517.91	488.69	468.74	448.58	450.16	465.64	483.97	517.67	540.13	(73)

6. Solar gains

Solar gains in watts, calculated for each month													
	100.05	172.03	243.44	321.36	382.44	390.77	372.04	323.98	269.62	191.94	120.04	85.54	(83)
Total gain	is – inter	nal and s	olar (wat	ts)									
	652.56	737.98	783.43	839.27	871.14	859.51	820.62	774.14	735.26	675.91	637.71	625.67	(84)

7. Me	ean intei	mal tem	perature	e (heatin	ig seasoi	n)								
Temper Utilisatio	ature dur on factor	ing heati for gains	ng perioo for living	ds in the garea, 🛙	living are L,m (see T	a from Ta Fable 9a)	able 9, Th	1 (°C)					21	(85)
Mean in	0.95 0.93 0.9 0.84 0.74 0.59 0.46 0.5 0.69 0.86 0.93 0.95 internal temperature in living area T1 (follow steps 3 and 4 in Table 9c) 19.83 19.01 19.42 19.99 20.47 20.81 20.93 20.91 20.68 20.07 19.32 19.01													(86)
Temper	19.83 ature dur	19.01 ing heati	19.42 ng period	19.99 ds in rest	20.47 of dwelli	20.81 ng from <sup>-</sup>	20.93 Table 9, T	20.91 h2 (°C)	20.68	20.07	19.32	19.01		(87)
Roof	20.04 20.04 20.05 20.06 20.07 20.08 20.08 20.09 20.08 20.07 20.06 20.05 Utilisation factor for gains for rest of dwelling, 22,m (see Table 9a)													(88)
Roof	0.94	0.92	0.89	0.81	0.7 Me	0.53 ean inter	0.37 nal temp	0.41 erature in	0.63 n the rest	0.83 of dwell	0.92 ing T2	0.95		(89)
Living a	18.97 rea fractio	17.74 on	18.25	18.97	19.54	19.93	20.04	20.03	19.8	19.09	18.15	17.82	0.16	(90) (91)
Mean in	ternal te	mperatu	re (for th	e whole o	dwelling)									
Adjuste	19.11 d mean ir	17.93 nternal te	18.43 mperatu	19.13 re:	19.69	20.06	20.18	20.17	19.94	19.24	18.34	18.01		(92)
	19.11	17.93	18.43	19.13	19.69	20.06	20.18	20.17	19.94	19.24	18.34	18.01		(93)

8. Space heating requirement





Utilisation factor for gains,

Useful ga	0.93 ins, mGm	0.89 n, W	0.86	0.79	0.68	0.53	0.38	0.42	0.62	0.8	0.89	0.93		(94)
Monthly	610.04 average e	657.65 external t	670.67 emperat	660.21 ure from	593.18 Table U1	451.6	314.96	325.98	455.31	541.85	566.81	581.96		(95)
Heat loss	4.3 rate for	4.9 mean inte	6.5 ernal tem	8.9 nperature	11.7 e	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Space hea	1436.27 ating req	1259.45 uirement	1148.66 for each	965.21 month	750.72	503.59	330.09	345.98	542.39	812.58	1064.81	1318.83		(97)
Solar spa	614.72 ce heatin	404.41 g calculat	355.62 ted using	219.6 ; Appendi	117.21 ix H (nega	0 ative qua	0 ntity)	0	0	201.43	358.57	548.23		(98a)
Space hea	0 ating req	0 uirement	0 for each	0 month a	0 fter solar	0 contribu	0 Ition	0	0	0	0	0		(98b)
Space hea	614.72 ating req	404.41 uirement	355.62 in kWh/	219.6 m²/year	117.21	0	0	0	0	201.43	358.57	548.23	30.58	(98c) (99)

8c. 9	Space C	cooling re	equirem	ent										
Heat lo	ss rate,													
Utilisat	0 ion fact	0 or for los	0 s	0	0	0	0	0	0	0	0	0		(100)
Useful	0 loss, mL	0 .m (watts	0	0	0	0	0	0	0	0	0	0		(101)
Gains	0	0	0	0	0	0	0	0	0	0	0	0		(102)
Space (	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0													
Cooled Interm	0 fractior ittency f	0 n factor	0	0	0	0	0	0	0	0	0	0	0	(104) (105)
Space (	0 cooling r	0 requirem	0 ent for m	0 Ionth	0	0	0	0	0	0	0	0	0	(106)
Space o	0 cooling r	0 requirem	0 ent in kW	0 /h/m²/ye	0 ar	0	0	0	0	0	0	0	0	(107) (108)
8f. S	pace h	eating re	equirem	ent		_			_		_			

Fabric Energy Efficiency,

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



0

(109)

DER WORKSHEET

0



Fraction of s	action of space heat from secondary/supplementary system, 0													0	(201)
Fraction of s	space h	eat from	n main sy	vstem(s),										1	(202)
Fraction of	main he	eating fro	om main	system 2	<u>,</u>									0	(203)
Fraction of	total sp	ace heat	t from ma	ain syste	m 1,									1	(204)
Fraction of	total sp	ace heat	t from ma	ain syste	m 2,									0	(205)
Efficiency of	f main s	space he	ating sys	tem 1 (in	ı %),									193.54	(206)
Efficiency of	f main s	space he	ating sys	tem 2 (in	ı %),									0	(207)
Efficiency of	f secon	dary/sup	plement	tary heat	ing syster	n <i>,</i> %,								0	(208)
Cooling Syst	tem Sea	asonal Er	nergy Effi	iciency R	atio,				0					0	(209)
Space heati	ng requ	irement	: (calculat	ted abov	e),										
0		0	0	0	0	0	0	0		0	0	0	0		(210)
Space heati	ng fuel	(main he	eating sys	stem 1),	kWh/moi	nth			0					0	
31	17.61	208.95	183.74	113.46	60.56	0	0	0		0	104.07	185.26	283.26		(211)
Space heati	ng fuel	(main he	eating sys	stem 2),	kWh/moi	nth			0					0	
0		0	0	0	0	0	0	0		0	0	0	0		(213)
Space heati	ace heating fuel (secondary), kWh/month 0														
0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0														(215)
Output fron	Itput from water heater), 0														(216)
Efficiency of	f water	heater													
26 Fuel for wat	58.94 er heat	268.94 ting	268.94	268.94	268.94	268.94	268.94	26	8.94	268.94	268.94	268.94	268.94		(217)
1(	18 96	96.23	101 74	88 11	84 53	75.2	73 44	76	85	78 26	88 44	95 5	107 58	1074 83	(219)
Space Cooli	ng	50.25	101.74	00.11	04.55	75.2	73.77	70	.05	70.20	00.44	55.5	107.50	1074.05	(===)
0 Annual tota	ls	0	0	0	0	0	0	0 kW	h/vea	0 ur kM	0 /h/vear	0	0		(221)
Space heati	ng fuel	used, m	ain syste	m 1					, y c c		, in year			1456.94	(211)
Space heati	ng fuel	used, m	ain syste	m 2										0	(213)
Space heati	ng fuel	used, se	condary											0	(215)
Water heati	ing fuel	used												1074.83	(219)
Electricity fo	or insta	ntaneou	s electric	shower	(s)									0	(64a)
Space coolir	ng fuel	used												0	(221)
Electricity fo	or pum	ps, fans a	and elect	ric keep-	hot										
Mechanical	vent fa	ns - bala	nced, ex	tract or p	ositive ir	nput from	n outside		0		0			320.51	(230a)
warm air he	eating s	ystem fa	ns											0	(230b)
Heating circ	ulation	pump o	r water p	oump wit	hin warm	n air heat	ing unit							0	(230c)
Oil boiler au	ıxiliary	(oil pum	p, flue fa	n, etc; ex	cludes ci	rculation	pump)							0	(230d)
Gas boiler a	uxiliary	(flue fai	n, etc; ex	cludes ci	rculation	pump)								0	(230e)
Maintaining	g electri	c keep-h	not facilit	y for gas	combi bo	oiler								0	(230f)
Pump for sc	olar wat	er heati	ng											0	(230g)
Pump for st	orage V	WWHRS												0	(230h)
Total electri	icity for	the abo	ve											320.51	(231)
Electricity fo	or lighti	ng												216.46	(232)





Energy s	saving/g	eneratio	on techno	ologies (A	ppendice	es M, N) -	Energy ι	ised in dw	elling					
Electrici	ty gene	rated by	PVs (App	pendix M)	(negativ	ve quantit	ty)							
	0	0	0	0	0	0	0	0	0	0	0	0	0	(233a)
Electrici	ty gene	rated by	wind tur	rbines (Ap	pendix <b>N</b>	M) (negat	ive quan	tity)						
	0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)
Electrici	ty gene	rated by	hydro-e	lectric ger	nerators									
Electrici	0 ty used	0 or net e	0 lectricity	0 generate	0 d by mic	0 ro-CHP	0	0	0	0	0	0	0	(235a)
	0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)
Energy s	saving/g	eneratio	on techno	ologies (A	ppendice	es M, N) -	Energy e	exported						
Electrici	ty gene	rated by	PVs (Ap	pendix M)	(negativ	ve quantit	ty)							
	0	0	0	0	0	0	0	0	0	0	0	0	0	(233b)
Electrici	ty gene	rated by	wind tur	rbines (Ap	pendix <b>N</b>	M) (negat	ive quan	tity)						
	0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)
Electrici	ty gene	rated by	hydro-e	lectric ger	nerators									
	0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)
Electrici	ty used	or net e	lectricity	generate	d by mic	ro-CHP								
	0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)
Append	ix Q iter	ns: annı	ual energ	У										
Append	ix Q, <it< td=""><td>em 1 de</td><td>scription</td><td>&gt;</td><td></td><td></td><td></td><td>Fue</td><td>1</td><td>kWh/year</td><td></td><td></td><td></td><td></td></it<>	em 1 de	scription	>				Fue	1	kWh/year				
energy s	saved												0	(236a)
energy ι	used												0	(237a)
Total de	livered	energy f	or all use	25									3068.74	

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

Fuel required	kWh/vear	Fuel price	Fuel cost f/vea	ar
Space heating - main system 1 (electric off-peak tariff	kwn, ycar	r del price		
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		240.25	(240a)
Low-rate fraction	0		240.25	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		240.25	(241a)
Low-rate fraction	0		240.25	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		240.25	(242a)





Low-rate fraction	0		240.25	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		177.24	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247	')			
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		52.85	(249)
Energy For lighting	0		35.69	(250)
Additional standing charges	0		0	(251)
Energy saving/generation technologies	0		0	(252)
Appendix Q, <item 1="" description=""></item>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		506.04	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP		
Energy cost deflator	0.36	(256)
Energy cost factor (ECF)	1.33	(257)
SAP rating	78.48	(258)
12a. CO2 emissions – Individual heating systems including micro-CHP		

Energy	Emission factor	Emissions	
KWh/year	kg	kg CO2/year	
Space heating - main system 1		225.84	(261)
Space heating - main system 2		0	(262)
Space heating - secondary		0	(263)
Energy for water heating		151.79	(264)
Energy for instantaneous electric shower(s)		0	(264a)





Space and water heating		0	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		44.46	(267)
Electricity for lighting		31.24	(268)
energy saved or generated	0	0	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		453.33	(272)
Dwelling CO2 Emission Rate		4.92	(273)
El rating		96	(274)

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

KWh/yearkgkg CO2/yearSpace heating - main system 12292.97(275)Space heating - main system 20(276)Space heating - secondary0(277)Energy for water heating1636.13(278)Energy for instantaneous electric shower(s)0(278a)Space and water heating0(279)Space cooling0(280)Electricity for pumps, fans and electric keep484.86(281)Electricity for lighting332.02(282)energy saved or generated00(282)energy saved00(284b)energy saved00(284b)energy saved00(284b)energy saved00(284b)energy used00(284b)energy used00(285b)		Energy	Emission factor	Emissionsr	
Space heating - main system 1         2292.97         (275)           Space heating - main system 2         0         (276)           Space heating - secondary         0         (277)           Energy for water heating         1636.13         (278)           Energy for instantaneous electric shower(s)         0         (278a)           Space cooling         0         (280)           Electricity for pumps, fans and electric keep         484.86         (281)           Electricity for lighting         332.02         (282)           energy saved or generated         0         0         (282)           energy used         0         0         (282)           energy saved         0         0         (282)           energy saved or generated         0         0         (282)           energy saved or generated         0         0         (282)           energy used         0         0         (284b)           energy used         0         0         (284b)           energy used         0         (284b)         (284b)		KWh/year	kσ	kg CO2/year	
Space heating - main system 2       0       (276)         Space heating - secondary       0       (277)         Energy for water heating       1636.13       (278)         Energy for instantaneous electric shower(s)       0       (278a)         Space and water heating       0       (279)         Space cooling       0       (280)         Electricity for pumps, fans and electric keep       484.86       (281)         Electricity for lighting       332.02       (282)         energy saved or generated       0       0       (282)         energy saved       0       0       (282)         energy used       0       0       (284)         energy used       0       0       (284b)         energy used       0       (284b)       (284b)         energy used       0       (284b)       (285b)	Space heating - main system 1	it will year	<b>'</b> 6	2292.97	(275)
Space heating - secondary       0       (277)         Energy for water heating       1636.13       (278)         Energy for instantaneous electric shower(s)       0       (278a)         Space and water heating       0       (279)         Space cooling       0       (280)         Electricity for pumps, fans and electric keep       484.86       (281)         Electricity for lighting       332.02       (282)         energy saved or generated       0       0       (282)         energy saved or generated       0       0       (282)         energy saved       0       0       (284b)         energy saved       0       (284b)       (285b)	Space heating - main system 2			0	(276)
Energy for water heating       1636.13       (278)         Energy for instantaneous electric shower(s)       0       (279a)         Space and water heating       0       (279)         Space cooling       0       (280)         Electricity for pumps, fans and electric keep       484.86       (281)         Electricity for lighting       332.02       (282)         energy saved or generated       0       0         Appendix Q items       0       0         energy used       0       0         energy saved       0       0         energy used       0       0         energy used       0       (284b)         energy used       0       (284b)         energy used       0       (284b)	Space heating - secondary			0	(277)
Energy for instantaneous electric shower(s)       0       (278a)         Space and water heating       0       (279)         Space cooling       0       (280)         Electricity for pumps, fans and electric keep       484.86       (281)         Electricity for lighting       332.02       (282)         energy saved or generated       0       0       (282)         Appendix Q items       0       0       (282)         energy used       0       0       (282)         energy saved or generated       0       0       (282)         energy saved or generated       0       0       (282)         energy saved       0       0       (282)         energy saved       0       0       (284b)         energy used       0       (284b)       (284b)         energy used       0       (285b)       (285b)	Energy for water heating			1636.13	(278)
Space and water heating       0       (279)         Space cooling       0       (280)         Electricity for pumps, fans and electric keep       484.86       (281)         Electricity for lighting       332.02       (282)         energy saved or generated       0       0       (279)         Appendix Q items       0       0       (282)         energy saved       0       0       (282)         energy saved       0       0       (282)         energy saved or generated       0       0       (282)         energy saved       0       0       (282)         energy saved       0       0       (282)         energy used       0       0       (284b)         energy used       0       (284b)       (284b)	Energy for instantaneous electric shower(s)			0	(278a)
Space cooling0(280)Electricity for pumps, fans and electric keep484.86(281)Electricity for lighting332.02(282)energy saved or generated00(280)Appendix Q items00(282)energy saved00(280)energy used00(284b)energy used00(284b)energy used00(285b)	Space and water heating			0	(279)
Electricity for pumps, fans and electric keep484.86(281)Electricity for lighting332.02(282)energy saved or generated00Appendix Q items00energy saved00energy used00energy saved00energy saved00energy used00energy used00energy used00energy used0(284b)energy used0(285b)	Space cooling			0	(280)
Electricity for lighting332.02(282)energy saved or generated00Appendix Q items00energy saved00energy used00energy saved00energy used00energy used00energy used00energy used00energy used00energy used00energy used00energy used0(284b)energy used0(285b)	Electricity for pumps, fans and electric keep			484.86	(281)
energy saved or generated00Appendix Q items00energy saved00energy used00energy saved00energy used00energy used00energy used00(284b)0(285b)	Electricity for lighting			332.02	(282)
Appendix Q items0energy saved00energy used00energy saved00energy used00energy used00	energy saved or generated	0		0	· · ·
energy saved         0         0           energy used         0         0         284b)           energy used         0         (284b)         285b)	Appendix Q items				
energy used     0     0       energy saved     0     0     (284b)       energy used     0     (285b)	energy saved	0		0	
energy saved         0         (284b)           energy used         0         (285b)	energy used	0		0	
energy used 0 (285b)	energy saved	0		0	(284b)
	energy used			0	(285b)
Total PE, kWh/year 4745.98 (286)	Total PE, kWh/year			4745.98	(286)
Dwelling PE Rate 51.46 (287)	Dwelling PE Rate			51.46	(287)





#### Dwelling Reference: Dwelling Type: Redhorn Close Poole BH16 5BE

15690 RHCM New Dwelling Design Stage

1. Overall dwelling dimensions						
	Area(m²)	ß	Av. Height(m)		Volume(m³)	
Basement Ground Floor Total floor area TFA Dwelling volume	46.11 ( 1a) 46.11 ( 1b)	x x	2.5 2.8	(2a) = (2b) =	115.28 129.11 92.22 244.38	( 3a) ( 3b) ( 4) ( 5)
2. Ventilation Rate						
Chimnevs/Flues	0	v	80 -		0	(62)
Open chimneys	0	Ŷ	20 =		0	(66)
Chimneys / flues attached to closed fire	0	x	10 =		0	(6c)
Flues attached to solid fuel boiler	0	x	20 =		0	(6d)
Flues attached to other heater	0	×	35 =		0	(6e)
Number of blocked chimneys	0	x	20 =		0	(6c)
Number of intermittent extract fans	0	×	10 =		0	(01)
Number of passive vents	0	Ŷ	10 =		0	(7a) (7h)
Number of flueless gas fires	0	×	40 =		0	(7c)
	0	4	Air changes per	hour	0	(70)
Number of storeys in the dwelling (ns)				0	0	(8)
Infiltration due to chimneys, flues, fans, PSVs, etc				0	0	(9)
Additional infiltration				0	0	(10)
Structural infiltration				0	0	(11)
Suspended wooden ground floor				0	0	(12)
NO Uraught 10009 Percentage of windows and doors draught proofed				0	0	(13)
Window infiltration				0	0	(14)
Infiltration rate				0	0	(15)
Air permeability value, AP50, (m³/h/m²)				4	4	(10)
Air permeability value, AP4, (m³/h/m²)				0	0	(17a)
Air permeability value)				0.2	0.2	(18)
Number of sides on which dwelling is sheltered				2	2	(19)





Shelter fa Infiltratio Infiltratio	actor on rate in on rate m	corporati odified fo	ing shelte or month	er factor ly wind sp	beed								0.85 0.17	(20) (21)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	(22)
Monthly	average	wind spe	ed from 1	Table U2										
Wind Fac	5.1 ctor	5	4.9	4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7	52.5	(22)
Adjusted	1.28 I infiltratio	1.25 on rate (a	1.23 allowing f	1.1 or shelte	1.08 r and win	0.95 nd speed)	0.95	0.93	1	1.08	1.13	1.18	13.13	(22a)
Calculate	0.22 e effective	0.21 e air chan	0.21 Ige rate fo	0.19 or the app	0.18 olicable c	0.16 ase:	0.16	0.16	0.17	0.18	0.19	0.2	2.23	(22b)
a) If bala	nced med	chanical v	ventilatio	n with he	at recove	ery (MVH	R)						0.5 0.5 42.5	(23a) (23b) (23c)
b) If bala	0.5 nced med	0.5 chanical v	0.5 ventilatio	0.47 n without	0.47 t heat red	0.45 covery (N	0.45 1V)	0.44	0.46	0.47	0.48	0.49		(24a)
c) lf who	0 le house (	0 extract ve	0 entilation	0 or positi	0 ve input	0 ventilatio	0 on from o	0 outside	0	0	0	0		(24b)
d) lf natu	0 Iral ventil	0 ation or v	0 whole ho	0 use positi	0 ive input	0 ventilati	0 on from l	0 oft	0	0	0	0		(24c)
Effective	0 air chang	0 ge rate	0	0	0	0	0	0	0	0	0	0		(24d)
Effective	0.5 air chang	0.5 ge rate fro	0.5 om PCDB	0.47 :	0.47	0.45	0.45	0.44	0.46	0.47	0.48	0.49		(25)
	0.5	0.5	0.5	0.47	0.47	0.45	0.45	0.44	0.46	0.47	0.48	0.49		(25)

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

#### Items in the table below are to be expanded as necessary to allow for all different types of element e.g. 4 wall types. The k -value

			•			• • • •		
ELEMENT Solid door	Gross area (m²)	Openings m²	Net Area A ,m²	U-value W/m2K	A X U (W/K)	k-value kJ/m²·K	2.6	A X k kJ/K <sub>(26)</sub>
Semi-glazed door							2.6	(26a)
Window							16.16	(27)
Roof window							0	(27a)
Basement floor				0			0	(28)
Ground floor				3458.25			6.46	(28a)
Exposed floor				0			0	(28b)
Basement wall				0			0	(29)
External wall				775.62			15.51	(29a)





Roof								414.99	9				5.99	(30)
Total ar	ea of exte	ernal eler	ments ∑A	, m²									194.51	(31)
Party W	/all												0	(32)
Party fl	oor												0	(32a)
Party ce	eiling												0	(32b)
Interna	l wall **												0	(33c)
Interna	l floor												0	(32d)
Interna	l ceiling fl	oor											0	(32e)
Fabric h	neat loss,	W/K = ∑	(A x U)										46.72	(33)
Heat ca	pacity Cm	n = ∑(A x	k)										6723.81	(34)
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m <sup>2</sup> K													100	(35)
Linear 1	-inear Thermal bridges: Σ (L x $\Psi$ ) calculated using Appendix K													(36)
Point Thermal bridges: $\Sigma\chi$ (W/K) if significant point thermal bridge present and values available													8.07	(36a)
Total fa	bric heat	loss H = 2	∑(A × U) +	- <u>Σ</u> (L × Ψ)	+∑χ								54.79	(37)
Ventilat	tion heat	loss calcu	ulated mo	onthly										<b>、</b> ,
Heat tra	40.67 ansfer coe	40.32 efficient,	39.98 W/K	38.27	37.92	36.21	36.21	35.87	36.9	37.92	38.61	39.29		(38)
Heat lo	95.45 ss parame	95.11 eter (HLP	94.77 ), W/m²K	93.06	92.71	91	91	90.66	91.68	92.71	93.4	94.08		(39)
Numbe	1.04 r of days i	1.03 in month	1.03 (Table 1a	1.01 a)	1.01	0.99	0.99	0.98	0.99	1.01	1.01	1.02		(40)
	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. W	ater hea	ting ene	ergy requ	irement	:									
Assume	ed occupa	ncy, N											2.65	(42)
Hot wa	ter usage	in litres p	per day fo	or mixer s	howers,	Vd,show	er (from /	Appendix	J)					
Hot wa	94.51 ter usage	93.09 in litres p	91.02 per day fo	87.06 or baths,	84.14 Vd,bath (	80.88 from App	79.03 Dendix J)	81.08	83.33	86.83	90.88	94.15		(42a)
Hot wa	29.68 ter usage	29.24 in litres p	28.62 per day fo	27.47 or other u	26.62 Ises, Vd,c	25.67 other (fro	25.15 m Appen	25.77 dix J)	26.44	27.46	28.63	29.58		(42b)
Annual Hot wa <sup>:</sup>	41.82 average h ter usage	40.3 not water in litres p	38.78 r usage in per day fo	37.26 litres pe or each m	35.74 r day Vd, ionth Vd,	34.22 average ( m = (42a	34.22 from App ) + (42b)	35.74 pendix J) + (42c)	37.26	38.78	40.3	41.82	152.92	(42c) (43)
														( )

 166.01
 162.63
 158.42
 151.79
 146.49
 140.76
 138.4
 142.59
 147.03
 153.07
 159.8
 165.55
 1832.52 (44)

 Energy content of hot water used = 4.18 x Vd,m x nm x DTm / 3600 kWh/month (from Appendix J)
 262.92
 231.58
 243.48
 207.79
 197.2
 173.08
 167.38
 176.55
 181.3
 207.71
 227.66
 259.21
 2535.87 (45)

 39.44
 34.74
 36.52
 31.17
 29.58
 25.96
 25.11
 26.48
 27.2
 31.16
 34.15
 38.88
 (46)

 Storage volume (litres) including any solar or WWHRS storage within same vessel
 0
 (47)

 Water storage loss (or HIU loss)
 0
 (47)





a) If manufacturer's declared loss factor is known (kWh/day): Temperature factor from Table 2b Energy lost from water storage, kWh/day (48) x (49) = b) If manufacturer's declared loss factor is not known :											
Hot water storage loss factor from Table 2 (kWh/litre/day) Volume factor from Table 2a Temperature factor from Table 2b Energy lost from water storage, kWh/day Enter (50) or (54) in (55)	0 0 0 0 0.97	(51) (52) (53) (54) (55)									
Water storage (or HIU) loss calculated for each month (56) = (55) × (41) 30.13 27.22 30.13 29.16 30.13 29.16 30.13 30.13 29.16 30.13 29.16 30.13 If the vessel contains dedicated solar storage or dedicated WWHRS storage, (57)m = (56)m ☑ [(47) - Vs] ÷ (47), else (57)m = (56)m		(56)									
where Vs is Vww from Appendix G3 or (H12) from Appendix H (as applicable). 30.13 27.22 30.13 29.16 30.13 29.16 30.13 29.16 30.13 29.16 30.13 29.16 30.13 Primary circuit loss for each month from Table 3 modified by factor from Table H4 if there is solar water heating and a cylinder thermostat, although not for DHW-only h	neat networ	(57) <sup>r</sup> ks)									
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		(59)									
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		(61)									
293.05 258.79 273.61 236.95 227.34 202.24 197.51 206.68 210.46 237.84 256.82 289.34 CWWHRS DHW input calculated using Appendix G (negative quantity) (enter 0 if no WWHRS contribution to water heat	2890.65 ing)	(62)									
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		(63a)									
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		(63b)									
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		(63c)									
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		(63d)									
293.05 258.79 273.61 236.95 227.34 202.24 197.51 206.68 210.46 237.84 256.82 289.34 Output from water heater for each month, kWh/month (64) = (62) + (63a) + (63b) + (63c) + (63d)	2890.65	(64)									
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		(64a)									
87.42 77 80.96 69.09 65.57 57.55 55.65 58.7 60.28 69.06 75.7 86.19 include (57) m in calculation of (65) m only if hot water store is in the dwelling or hot water is from heat network		(65)									

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

Metabolic gains (Table 5), watts

132.75 132.75 132.75 132.75 132.75 132.75 132.75 132.75 132.75 132.75 132.75 132.75

(66)



Page 4



Lighting gains (calculated in Appendix L, equation L12 or L12a), also see Table 5

Appliance	129.09 es gains (	142.92 calculate	129.09 d in Appe	133.39 endix L, e	129.09 quation l	133.39 .16 or L16	129.09 6a), also s	129.09 see Table	133.39 9 5	129.09	133.39	129.09	(67)
Cooking §	243.1 gains (cal	245.63 culated in	239.27 n Append	225.74 lix L, equ	208.65 ation L18	192.6 or L18a)	181.87 , also see	179.35 Table 5	185.7	199.24	216.32	232.38	(68)
Pumps ar	36.27 nd fans ga	36.27 ains (Tabl	36.27 le 5a)	36.27	36.27	36.27	36.27	36.27	36.27	36.27	36.27	36.27	(69)
Losses e.;	0 g. evapor	0 ation (ne	0 gative va	0 alues) (Ta	0 ble 5	0	0	0	0	0	0	0	(70)
Water he	-106.2 ating gai	-106.2 ns (Table	-106.2 5)	-106.2	-106.2	-106.2	-106.2	-106.2	-106.2	-106.2	-106.2	-106.2	(71)
Total inte	117.5 ernal gain	114.58 s	108.81	95.96	88.13	79.93	74.8	78.9	83.73	92.83	105.14	115.84	(72)
	552.51	565.95	539.99	517.91	488.69	468.74	448.58	450.16	465.64	483.97	517.67	540.13	(73)

6. Solar gains

Solar gains in watts, calculated for each month													
	100.05	172.03	243.44	321.36	382.44	390.77	372.04	323.98	269.62	191.94	120.04	85.54	(83)
Total gains – internal and solar (watts)													
	652.56	737.98	783.43	839.27	871.14	859.51	820.62	774.14	735.26	675.91	637.71	625.67	(84)

7. Me	an inter	nal tem	perature	e (heatin	g seasor	1)								
Tempera Utilisatic	ature dur on factor	ing heatiı for gains	ng perioc for living	ls in the l ; area, ⊡1	iving area .,m (see T	a from Ta able 9a)	able 9, Th	1 (°C)					21	(85)
Mean in	0.95 ternal ter	0.93 nperatur	0.9 e in living	0.84 g area T1	0.74 (follow s	0.59 teps 3 ar	0.45 nd 4 in Ta	0.49 ble 9c)	0.68	0.85	0.93	0.95		(86)
Tempera	19.85 ature duri	19.05 ing heati	19.45 ng perioc	20.01 Is in rest	20.49 of dwelli	20.82 ng from 1	20.93 Fable 9, T	20.92 h2 (°C)	20.7	20.1	19.36	19.04		(87)
Roof	20.05	20.06	20.06	20.08 I	20.08 Jtilisatior	20.09 n factor f	20.09 or gains f	20.1 For rest o	20.09 f dwelling	20.08 g,	20.07 see Table	20.07 9a)		(88)
Roof	0.94	0.92	0.88	0.81	0.7 Me	0.52 an interi	0.37 nal tempe	0.41 erature ir	0.63 In the rest	0.83 of dwell	0.92 ing T2	0.95		(89)
Living ar	19.01 ea fractic	17.8 on	18.31	19.01	19.57	19.94	20.06	20.04	19.82	19.12	18.2	17.88	0.16	(90) (91)
Mean in	ternal ter	nperatur	e (for the	e whole c	welling)									
Adjustec	19.14 I mean in	17.99 ternal te	18.49 mperatu	19.17 re:	19.71	20.08	20.19	20.18	19.96	19.28	18.38	18.06		(92)
	19.14	17.99	18.49	19.17	19.71	20.08	20.19	20.18	19.96	19.28	18.38	18.06		(93)

8. Space heating requirement





Utilisation factor for gains,

Useful ga	0.93 iins, mGn	0.89 n, W	0.86	0.79	0.68	0.52	0.38	0.42	0.62	0.8	0.89	0.93		(94)
Monthly	609.78 average e	657.27 external t	669.97 emperat	658.87 ure from	590.93 Table U1	448.95	312.64	323.75	453.27	540.92	566.49	581.82		(95)
Heat loss	4.3 rate for	4.9 mean inte	6.5 ernal tem	8.9 operature	11.7 e	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Space he	1416.52 ating req	1245.35 uirement	1135.98 for each	955.29 month	742.93	498.72	326.98	342.79	537.11	804.53	1053.93	1303.83		(97)
Solar spa	600.22 ce heatin	395.19 g calcula	346.71 ted using	213.42 Appendi	113.09 ix H (nega	0 ative qua	0 ntity)	0	0	196.13	350.95	537.18		(98a)
Space he	0 ating req	0 uirement	0 for each	0 month a	0 fter solar	0 <sup>.</sup> contribu	0 Ition	0	0	0	0	0		(98b)
Space he	600.22 ating req	395.19 uirement	346.71 : in kWh/	213.42 m²/year	113.09	0	0	0	0	196.13	350.95	537.18	29.85	(98c) (99)

8c. Spa	ace Coo	oling req	uirement	Ċ										
Heat loss	rate,													
Utilisatior	0 n factor	0 for loss	0	0	0	0	0	0	0	0	0	0		(100)
Useful los	0 s, mLm	0 (watts)	0	0	0	0	0	0	0	0	0	0		(101)
Gains	0	0	0	0	0	0	0	0	0	0	0	0		(102)
Space coo	0         0         0         0         0         0         0         0         0         0         (103)           Space cooling requirement for month, whole dwelling, continuous (kWh)         (104)         (104)         (104)													
Cooled fra	0 action ency fac	0 ctor	0	0	0	0	0	0	0	0	0	0	0	(104) (105)
Space coo	0 oling rea	0 quiremen	0 t for mon	0 th	0	0	0	0 0	0	0	0	0	0	(106)
Space coc	0 oling rea	0 quiremen	0 t in kWh/r	0 m²/year	0	0	0	0	0	0	0	0	0	(107) (108)
8f. Spa	ice hea	iting real	uirement											

Fabric Energy Efficiency, 0

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



0

(109)



Fraction of space heat from secondary/supplementary system, 0													0	(201)	
Fraction o	tion of space heat from main system(s), tion of main heating from main system 2, tion of total space heat from main system 1, tion of total space heat from main system 2														(202)
Fraction o	of main h	eating fr	om main	system 2	<u>,</u>									0	(203)
Fraction o	of total sp	ace heat	t from m	ain syste	m 1,									1	(204)
Fraction o	of total sp	ace heat	t from m	ain syste	m 2,									0	(205)
Efficiency	of main	space he	ating sys	tem 1 (ir	ı %),									193.71	(206)
Efficiency	of main	space he	ating sys	tem 2 (ir	ı %),									0	(207)
Efficiency	of secon	dary/sup	oplement	tary heat	ing systei	n, %,								0	(208)
Cooling Sy	stem Sea	asonal Ei	nergy Eff	iciency R	atio,				0					0	(209)
Space hea	iting requ	uirement	t (calcula	ted abov	e) <i>,</i>										
	0	0	0	0	0	0	0	0		0	0	0	0		(210)
Space hea	iting fuel	(main h	eating sy	stem 1),	kWh/mo	nth			0					0	
	309.85	204.01	178.98	110.17	58.38	0	0	0		0	101.25	181.17	277.3		(211)
Space hea	iting fuel	(main h	eating sy	stem 2),	kWh/mo	nth			0					0	
	0	0	0	0	0	0	0	0		0	0	0	0		(213)
Space hea	iting fuel	(second	ary), kWl	h/month					0					0	
-	0	0	0	0	0	0	0	0		0	0	0	0		(215)
Output fro	om wate	r heater)	,						0					268.92	(216)
Efficiency	of water	heater													
Fuel for w	268.92 ater hea	268.92 ting	268.92	268.92	268.92	268.92	268.92	26	8.92	268.92	268.92	268.92	268.92		(217)
	108.97	96.24	101.75	88.11	84.54	75.21	73.45	76	.86	78.26	88.44	95.5	107.59	1074.93	(219)
Space Coc	oling														, , , , , , , , , , , , , , , , , , ,
Annual to	0 tals	0	0	0	0	0	0	0	hluos	0	0	0	0		(221)
Space hea	iting fuel	used. m	ain syste	m 1				KVV	II/ yea		/ii/yeai			1/101 11	(211)
Space hea	iting fuel	used. m	ain syste	m 2										0	(211)
Space hea	ting fuel	used. se	condarv											0	(213) (215)
Water hea	ating fue	l used	,											1074 93	(219)
Electricity	for insta	intaneou	is electric	shower	s)									0	(213)
Space coo	ling fuel	used			. ,									0	(221)
Electricity	for pum	ps, fans a	and elect	ric keep-	hot									0	()
Mechanic	al vent fa	ans - bala	anced, ex	tract or p	ositive ir	nput from	n outside		0		0			320.51	(230a)
warm air l	heating s	ystem fa	ins						0		U U			0	(230b)
Heating ci	rculation	n pump o	or water p	oump wit	hin warn	n air heat	ing unit							0	(230c)
Oil boiler a	auxiliary	(oil pum	p, flue fa	n, etc; ex	cludes ci	rculation	pump)							0	(230d)
Gas boiler	auxiliary	/ (flue fa	n, etc; ex	cludes ci	rculation	pump)								0	(230e)
Maintainii	ng electr	ic keep-ł	not facilit	y for gas	combi bo	oiler								0	(230f)
Pump for	solar wa	ter heati	ng											0	(230g)
Pump for	storage \	WWHRS												0	(230h)
Total elect	tricity fo	r the abo	ove											320.51	(231)
Electricity	for light	ing												216.46	(232)





Energy s	saving/g	eneratio	on techno	ologies (A	ppendice	es M, N) -	Energy ι	ised in dw	elling					
Electrici	ty gene	rated by	PVs (Ap	pendix M)	(negativ	ve quantit	:y)							
	0	0	0	0	0	0	0	0	0	0	0	0	0	(233a)
Electrici	ty gene	rated by	wind tur	rbines (Ap	pendix <b>N</b>	И) (negati	ve quant	tity)						
	0	0	0	0	0	0	0	0	0	0	0	0	0	(234a)
Electrici	ty gene	rated by	hydro-e	lectric ger	nerators									
Electrici	0 ty used	0 or net e	0 lectricity	0 generate	0 d by mic	0 ro-CHP	0	0	0	0	0	0	0	(235a)
	0	0	0	0	0	0	0	0	0	0	0	0	0	(235c)
Energy s	saving/g	eneratio	on techno	ologies (A	ppendice	es M, N) -	Energy e	exported						
Electrici	ty gene	rated by	PVs (Ap	pendix M)	(negativ	ve quantit	:y)							
	0	0	0	0	0	0	0	0	0	0	0	0	0	(233b)
Electrici	ty gene	rated by	wind tur	bines (Ap	pendix <b>N</b>	И) (negati	ve quant	tity)						
	0	0	0	0	0	0	0	0	0	0	0	0	0	(234b)
Electrici	ty gene	rated by	hydro-e	lectric ger	nerators									
	0	0	0	0	0	0	0	0	0	0	0	0	0	(235b)
Electrici	ty used	or net e	lectricity	generate	d by mic	ro-CHP								
	0	0	0	0	0	0	0	0	0	0	0	0	0	(235d)
Append	ix Q iter	ns: annu	ial energ	У										
Append	ix Q, <it< td=""><td>em 1 de</td><td>scription</td><td>&gt;</td><td></td><td></td><td></td><td>Fue</td><td>l –</td><td>kWh/year</td><td></td><td></td><td></td><td></td></it<>	em 1 de	scription	>				Fue	l –	kWh/year				
energy s	saved												0	(236a)
energy ເ	used												0	(237a)
Total de	livered	energy f	or all use	es									3033.01	

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

Fuel required	kWh/vear	Euel price	Fuel cost f/yea	r
Space heating - main system 1 (electric off-peak tariff	,,,			
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		234.34	(240a)
Low-rate fraction	0		234.34	(240b)
High-rate cost	0		0	(240c)
Low-rate cost	0		0	(240d)
Space heating - main system 1 cost (other fuel)	0		0	(240e)
Space heating - main system 2 (electric off-peak tariff				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		234.34	(241a)
Low-rate fraction	0		234.34	(241b)
High-rate cost	0		0	(241c)
Low-rate cost	0		0	(241d)
Space heating - main system 2 cost (other fuel)	0		0	(241e)
Space heating - secondary (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		234.34	(242a)





Low-rate fraction	0		234.34	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Space heating - secondary cost (other fuel)	0		0	(242e)
Water heating (electric off-peak tariff)				
High-rate fraction (Table 12a, or Appendix F for electric CPSU)	0		0	(243)
Low-rate fraction	0		0	(242b)
High-rate cost	0		0	(242c)
Low-rate cost	0		0	(242d)
Water heating cost (other fuel)	0		177.26	(247)
(for a DHW-only heat network use (342a) or (342b) instead of (247	)			
Energy For instantaneous electric shower(s)	0		0	(247a)
Space cooling	0		0	(248)
Pumps, fans And electric keep-hot	0		52.85	(249)
Energy For lighting	0		35.69	(250)
Additional standing charges	0		0	(251)
Energy saving/generation technologies	0		0	(252)
Appendix Q, <item 1="" description=""></item>	Fuel	kWh/year		
energy saved Or generated	0		0	(253)
energy used	0		0	(254)
Total energy cost	0		500.14	(255)
11a. SAP rating – Individual heating systems including micro-CHP				
Energy cost deflator	0		0	(256)
Energy cost factor (ECF)	0		0	(257)
SAP rating	0		0	(258)

11a. SAP rating – Individual heating systems including micro-CHP		
Energy cost deflator	0.36	(256)
Energy cost factor (ECF)	1.31	(257)
SAP rating	78.73	(258)
122 CO2 emissions - Individual beating systems including micro-CHP		

**Emission factor** Emissions Energy KWh/year kg kg CO2/year Space heating - main system 1 220.32 (261) Space heating - main system 2 0 (262) Space heating - secondary 0 (263) Energy for water heating 151.81 (264) Energy for instantaneous electric shower(s) 0 (264a)





Space and water heating		0	(265)
Space cooling		0	(266)
Electricity for pumps, fans and electric keep		44.46	(267)
Electricity for lighting		31.24	(268)
energy saved or generated	0	0	(269b)
Appendix Q items			
energy saved	0	0	
energy used	0	0	
energy saved	0	0	(270b)
energy used		0	(271b)
Total CO2, kg/year		447.83	(272)
Dwelling CO2 Emission Rate		4.86	(273)
El rating		96	(274)

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

	Energy	Emission factor	Emissionsr	
	KWh/year	kg	kg CO2/year	
Space heating - main system 1		U U	2236.72	(275)
Space heating - main system 2			0	(276)
Space heating - secondary			0	(277)
Energy for water heating			1636.28	(278)
Energy for instantaneous electric shower(s)			0	(278a)
Space and water heating			0	(279)
Space cooling			0	(280)
Electricity for pumps, fans and electric keep			484.86	(281)
Electricity for lighting			332.02	(282)
energy saved or generated	0		0	
Appendix Q items				
energy saved	0		0	
energy used	0		0	
energy saved	0		0	(284b)
energy used			0	(285b)
Total PE, kWh/year			4689.88	(286)
Dwelling PE Rate			50.86	(287)

