# **Regulations Compliance Report**

Approved Document Printed on 28 Octobe		, England assessed by Stroma FS	AP 2012 program, Ve	rsion: 1.0.5.9	
Project Information:					
Assessed By: 2	Zahid Ashraf (STR	O001082)	Building Type:	Flat	
Dwelling Details:					
NEW DWELLING DE	SIGN STAGE		Total Floor Area: 7	70.86m²	
Site Reference :	Hermitage Lane		Plot Reference:	Plot 32	
Address :	Ū				
Client Details:					
Name: Address :					
This report covers in It is not a complete		thin the SAP calculations. ons compliance.			
1a TER and DER					
Fuel for main heating		s (c)			
Fuel factor: 1.00 (mai	0 ( ) /				
Target Carbon Dioxic	,		15.98 kg/m <sup>2</sup>		01/
Dwelling Carbon Diox 1b TFEE and DFEE		(DER)	9.43 kg/m <sup>2</sup>		OK
Target Fabric Energy			37.9 kWh/m <sup>2</sup>		
Dwelling Fabric Energy	• • •		31.8 kWh/m <sup>2</sup>		
Dweining Fabrie Erier		_)			ОК
2 Fabric U-values					
Element		Average	Highest		
External wal	I	0.14 (max. 0.30)	0.15 (max. 0.70)		OK
Floor		(no floor)			
Roof		(no roof)			
Openings		1.40 (max. 2.00)	1.40 (max. 3.30)		OK
2a Thermal bridgin	g				
	lging calculated fro	om linear thermal transmittances f	or each junction		
3 Air permeability					
	ty at 50 pascals		3.00 (design val	ue)	
Maximum			10.0		OK
4 Heating efficienc	У				
Main Heating	system:	Community heating schemes - n	nains gas		
Secondary hea	ating system:	None			
5 Cylinder insulation	on				
Hot water Stor		No cylinder			
6 Controls					
Space heating	controls	Charging system linked to use o	f community beating		
opulo notaling		programmer and at least two roc			ОК
Hot water cont	trols:	No cylinder thermostat			
		No cylinder			

# **Regulations Compliance Report**

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.91	
Maximum	1.5	OK
MVHR efficiency:	93%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	ОК
Based on:		
Overshading:	Average or unknown	
Windows facing: South East	6.1m <sup>2</sup>	
Windows facing: North West	5.11m <sup>2</sup>	
Ventilation rate:	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
External Walls U-value	0.13 W/m²K	
Community heating, heat from boilers – mains gas		
Photovoltaic array		

Assessor Name:       Zahid Ashraf       Stroma Number:       STRO01082         Software Version:       Version: 1.0.5.9         Property Address:       Process: Plot32         Address :       Image: Comparison of the stress of the				User D	etails:						
Software Name:       Stoma FSAP 2012       Software Version:       Version: 1.0.5.9         Property Address:       Ploates:       Ploates:         Address:       Control downing dimensions:       Area(m <sup>2</sup> )       Av. Height(m)       Version:       Volume(m <sup>2</sup> )         Ground floor       Area(m <sup>2</sup> )       (a)       Av. Height(m)       Volume(m <sup>2</sup> )       Volume(m <sup>2</sup> )         Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)       Total       Av. Height(m)       Volume(m <sup>2</sup> )         Durbling volume       Secondary       Other       total       Av. Height(m)       Volume(m <sup>2</sup> )         Number of chinneys       D       +       D       =       D       × 40 =       D       0       <	Assessor Name:	Zahid Ashraf			Strom	a Num	ber:		STRO	001082	
Adverse :1. Cvarial dwelling dimensions:Area(m?)Av. Height(m)Volume(m?)Ground floor70.85(a)(a)(77.14(a)Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)70.86(a)Volume(m?)Output(a)+(2a)+(3c)+(3c)+(3c)+(3c)+(3c)+(3c)+(3c)+(3c	Software Name:	Stroma FSAP 2	012		Softwa	are Ver	sion:		Versio	on: 1.0.5.9	
Area(m <sup>2</sup> )Av. Height(m)Volume(m <sup>3</sup> )Ground floor $70.86$ (ta) x $2.5$ (2a) = $177.14$ (3a)Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) $70.86$ (ta) x $2.5$ (2a) = $177.14$ (5)Dwelling volume(3a)+(3b)+(3b)+(3b)+(3b)+(3b)+(3b)+(3b)+(3b			Р	roperty <i>i</i>	Address:	Plot 32					
Area(m <sup>2</sup> )Av. Height(m)Volume(m <sup>2</sup> )Ground floor70.86(1a) ×2.5(2a) =117.14(3a)Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)70.86(4)177.14(5)Dwelly volume(3a)+(3b)+(3c)+(3d)+(3e)+(3n) =(177.14(5)2. Ventilation rate:mainsecondaryothertotalm <sup>3</sup> per hourNumber of chimneys0+0=0(6a)Number of passive vents0×10 =0(7a)Number of flueless gas fires0×10 =0(7b)Number of storeys in the dwelling (ns)0×40 =0(6b)Additional infitration((9)-1(b)-1)0(1b)(1b)Number of storeys in the dwelling (ns)(1b)0(1b)(1b)Additional infitration((9)-1(b)-1)0(1b)(1b)Structural infitration((9)-1(b)-1)0(1b)(1b)If a unsauriation inst has been carined out or is interaded, proceed to (17), otherwise continue from (9) to (16)0(1b)Additional infitration((9)-1(b)-1)0(1b)(1b)(1b)(1b)(1b)If but speed dwooden floor, enter 0.2 (unscaled) or 0.1 (sealed), else enter 00(12)If no draught biby, enter 0.20, else enter 00(15)(1b)Percentage of windows and doors draught stripped0.15(1b)(1b)Window infitration0.25-(0.2 x (14) + 100) =(15)(15)											
Ground floorT0.86(1a) x2.5(2a) =177.14(3a)Total floor area TFA = (1a)+(1b)+(1c)+(1c)+(1c)+(1c)+(1n)T0.86(4)T0.86(1a) x2.5(2a) =177.14(3a)Dwelling volume(3a)+(2b)+(3c)+(3c)+(3c)+(3c)+(3c)+(3c)+(3c)+(3c	1. Overall dwelling dimer	nsions:									
Develing volume(3a)+(3b)+(3c)+(3d)+(3b)+(3c)+(3d)+(3d)+(3d)+(3d)+(3d)+(3d)+(3d)+(3d	Ground floor				· ·	(1a) x			(2a) =		_
2. Ventilition rate:main heatingsecondary heatingothertotalm³ per hourNumber of chimneys $0$ $0$ $+$ $0$ $=$ $0$ $x40$ $=$ $0$ $(6a)$ Number of open flues $0$ $+$ $0$ $=$ $0$ $x20$ $0$ $(6b)$ Number of open flues $0$ $+$ $0$ $=$ $0$ $x20$ $0$ $(6b)$ Number of number of numbers of passive vents $0$ $x10$ $0$ $(7a)$ Number of flueless gas fires $0$ $x40$ $0$ $(7c)$ Number of storeys in the dwelling (ns) $x40$ $0$ $(7c)$ Additional infiltration $(16)$ $(17)$ , otherwise continue from (9) to (16)Number of storeys in the dwelling (ns) $(19)$ $(19)$ $0$ Additional infiltration $(19)$ $10$ $0$ $(11)$ Structural infiltration $0$ $0$ $1$ $0$ Structural infiltration $0$ $0$ $1$ $0$ $(12)$ If no draught lobby, enter 0.05, else enter 0 $0$ $0$ $0$ $0$ Percentage of windows and doors draught stripped $0$ $0$ $0$ $0$ Window infiltration $0.25$ $0.2$ $(10)$ $1$ $0$ Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area $3$ $0$ $1$ Air permeability value, applies if a pressurisation test has been done or a degree air permeability is being used $0$ $1$ $0$ $1$ <	Total floor area TFA = (1a	n)+(1b)+(1c)+(1d)+(	1e)+(1r	1) 7	0.86	(4)					
main heating heatingsecondary heatingothertotalm³ per hourNumber of chimneys0+0=0x40 =0(les)Number of open flues0+0=0x20 =0(les)Number of open flues0+0=0x20 =0(les)Number of intermittent fans0x10 =0(?a)0(?b)Number of passive vents0x10 =0(?b)0(?c)Number of flueless gas fires0x40 =0(?c)Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7c) =0++00(?b)Infiltration test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)0(li)0(li)Number of storeys in the dwelling (ns)(g)+1bac.1 =0(li)0(li)Additional infiltration(g)+1bac.1 =0(li)0(li)Structural infiltration .25 for steel or timber frame or 0.35 for masonry construction if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of apointigs); if aqual user 0.3300(li)0(li)If suspended wooden floor, enter 0.2(unsealed) or 0.1 (sealed), else enter 00(li)(li)Percentage of windows and doors draught stripped0(li)0(li)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope ar	Dwelling volume					(3a)+(3b)	+(3c)+(3d	)+(3e)+	.(3n) =	177.14	(5)
Number of chimneysheating 0+heating 0+0=0x40 =0(6a)Number of open flues0+0=0x20 =0(6b)Number of intermittent flans0x 10 =0(7a)Number of passive vents0x 10 =0(7a)Number of flueless gas fires0x 40 =0(7c)Number of flueless gas fires0x 40 =0(7c)Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7c) =0+ (5) =0(9)Additional infiltration(9)additional infiltration09)Number of storeys in the dwelling (ns)00.1 (sealed), else enter 00(11) <i>if both types of wall are present, use the value corresponding to the greater wall area (after doducting areas of opening); if equal user 0.350(10)(10)If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 00(12)(13)Percentage of windows and doors draught stripped0(14)0(15)0(16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area3&lt;(17)</i>	2. Ventilation rate:									<u> </u>	
Number of intermittent fans $0$ $x10 =$ $0$ $(7a)$ Number of passive vents $0$ $x10 =$ $0$ $(7b)$ Number of flueless gas fires $0$ $x40 =$ $0$ $(7c)$ Air changes per hourInfiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ $0$ $+(6) =$ $0$ $(6)$ <i>It a pressurisation test has been carried out or is intended, proceed to <math>(17)</math>, otherwise continue from <math>(9)</math> to <math>(16)</math><math>0</math><math>(9)</math>Number of storeys in the dwelling (ns)Additional infiltration<math>(9)-1]x0.1 =</math><math>0</math>O<math>(10)</math>Structural infiltration:<math>0.25</math> for steel or timber frame or 0.35 for masonry constructionif both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0If or draught lobby, enter 0.05, else enter 0If no draught lobby, enter 0.05, else enter 0If no draught lobby, enter 0.05, else enter 0If floated on air permeability value, q50, expressed in cubic metres per hour per square metre of envelope areaAir permeability value, q50, expressed in cubic metres per hour per square metre of envelope areaAir permeability value, q50, expressed in cubic metres per hour per square metre of envelope areaAir permeability value, q50, expressed in cubic metres per hour per square metre of envelope area&lt;</i>	-	heating 0 +	heating 0		0		0			0	(6a)
Number of passive vents $10^{\circ}$	·	0	0		0	」⁻└	0			0	
Number of flueless gas fires $0  \times 40 = 0  (7c)$ Air changes per hour Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = 0 + (5) = 0 (6) If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) Additional infiltration (9)-1x0.1 = 0 (9) Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 If no draught lobby, enter 0.05, else enter 0 Percentage of windows and doors draught stripped Window infiltration rate (8) + (10) + (11) + (12) + (13) + (15) = Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area If based on air permeability value, then (16) = [(17) + 20]+(8), otherwise (18) = (16) Air permeability value, applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Infiltration rate incorporating shelter factor (20) = 1 - [0.075 x (19)] = D.15 (20) Infiltration rate incorporating shelter factor (20) = 1 - [0.075 x (19)] = D.15 (20) Infiltration rate modified for monthly wind speed Infiltration rate incorporating shelter factor (20) = 1 - [0.075 x (19)] = D.15 (21) Infiltration rate modified for monthly wind speed (22) = 0.13 (21) Infiltration rate modified for monthly wind speed (22) = 0.13 (21) Infiltration rate incorporating shelter factor (22) = 1 - [0.075 x (19)] = D.15 (22) = D.1	Number of intermittent far	IS				L	0	x 1	10 =	0	(7a)
Air changes per hourInfiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =0+ (6) =0(8)If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)(9)(10)Number of storeys in the dwelling (ns)0(9)-1)x0.1 =0(10)Additional infiltration(9)-1)x0.1 =0(10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction0(11)if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.350(12)If no draught lobby, enter 0.05, else enter 00(12)(13)Percentage of windows and doors draught stripped0(14)Window infiltration0.25 · (0.2 x (14) ÷ 100) =(15)Infiltration rate(8) + (10) + (11) + (12) + (13) + (15) =0Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area3If based on air permeability value, then (16) = [(17) ÷ 20]+(8), otherwise (18) = (16)0.15Air permeability value, applies if a pressurisation test has been done or a degree air permeability is being used(19)Number of sides sheltered2(19)Shelter factor(20) = 1 - [0.075 x (19)] =0.15Infiltration rate incorporating shelter factor(21) = (18) x (20) =Infiltration rate incorporating shelter factor(21) = (18) x (20) =Infiltration rate incorporating shelter factor(21) = (18) x (20) = <td>Number of passive vents</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>0</td> <td><b>x</b> 1</td> <td>10 =</td> <td>0</td> <td>(7b)</td>	Number of passive vents						0	<b>x</b> 1	10 =	0	(7b)
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 0 + (5) = 0$ (6) If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) Additional infiltration (9)-1 x0.1 = 0 (10) Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 If no draught lobby, enter 0.05, else enter 0 Percentage of windows and doors draught stripped Window infiltration rate (b) + (10) + (11) + (12) + (13) + (15) = 0 (16) Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area 3 (17) If based on air permeability value, then (18) = (17) + 20]+(8), otherwise (18) = (16) Air permeability value applies if a presurisation test has been done or a degree air permeability is being used Number of sides sheltered Shelter factor (20) = 1 - [0.075 x (19)] = 0.13 (21) Infiltration rate modified for monthly wind speed Infiltration rate modified for monthly wind speed Infiltration rate modified for monthly wind speed Monthly average wind speed from Table 7 (22)me <u>5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7</u>	Number of flueless gas fir	es					0	x 4	40 =	0	(7c)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns) Additional infiltration $(9)$ Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction $(9)$ -1)x0.1 = 0 (10) Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction $(11)$ if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 0 (12) If no draught lobby, enter 0.05, else enter 0 0 (13) Percentage of windows and doors draught stripped Window infiltration $0.25 \cdot [0.2 \times (14) \pm 100] = 0$ (15) Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) = 0$ (16) Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area If based on air permeability value, then $(18) = [(17) \pm 20] + (8)$ , otherwise $(18) = (16)$ Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Shelter factor $(20) = 1 - [0.075 \times (19)] = 0.35$ (20) Infiltration rate incorporating shelter factor $(21) = (18) \times (20) = 0.13$ (21) Infiltration rate modified for monthly wind speed <u>Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec</u> Monthly average wind speed from Table 7 (22)me <u>5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7</u>									Air ch	anges per ho	ur
Number of storeys in the dwelling (ns) $0$ Additional infiltration $((9)-1)x0.1 =$ Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction $0$ if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 $0$ If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 $0$ Percentage of windows and doors draught stripped $0$ Window infiltration $0.25 \cdot [0.2 \times (14) + 100] =$ Infiltration rate $(B) + (10) + (11) + (12) + (13) + (15) =$ Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope areaAir permeability value, applies if a pressurisation test has been done or a degree air permeability is being usedNumber of sides shelteredNumber of sides shelteredShelter factorInfiltration rate incorporating shelter factor(20) = 1 - [0.075 x (19)] =Infiltration rate modified for monthly wind speedInfiltration rate for table 7(22)meInfiltration rateInfiltration rateInfiltration rate for Table 7(22)meInfiltration rate for Table 7(22)meInfiltration rateInfiltration rate for Table 7(22)meInfiltration rate for Table 7(22)meInfiltration rateInfiltration rate f							-		÷ (5) =	0	(8)
Additional infiltration $(9)-1\times0.1 =$ 0(10)Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction0(11)if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.350(11)If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 00(12)If no draught lobby, enter 0.05, else enter 00(13)Percentage of windows and doors draught stripped0(14)Window infiltration0.25 - [0.2 x (14) + 100] =0Infiltration rate(8) + (10) + (11) + (12) + (13) + (15) =0Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area3If based on air permeability value, then (18) = [(17) + 20]+(8), otherwise (18) = (16)0.15Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used2Number of sides sheltered2(20)Number of sides sheltered(20) = 1 - [0.075 x (19)] =0.13Infiltration rate incorporating shelter factor(21) = (18) x (20) =0.13Infiltration rate modified for monthly wind speed1011Infiltration rate modified for monthly wind speed1011Infiltration rate speed from Table 71011(22)me5.154.94.43.83.83.744.34.54.7			nded, procee	d to (17), c	otherwise o	continue fro	om (9) to (	(16)			
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry constructionif both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.350If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 00If no draught lobby, enter 0.05, else enter 00Percentage of windows and doors draught stripped0Window infiltration0.25 - [0.2 x (14) ÷ 100] =Infiltration rate(B) + (10) + (11) + (12) + (13) + (15) =Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope areaIf based on air permeability value, then (18) = [(17) ÷ 20]+(8), otherwise (18) = (16)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being usedNumber of sides shelteredShelter factorInfiltration rate incorporating shelter factorInfiltration rate modified for monthly wind speedInfiltration rate modified for Table 7(22)meImplies to the speed from Table 7	•	e dweiling (ns)						[(0)]	11v0 1 -		
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0 If no draught lobby, enter 0.05, else enter 0 $0$ (12) If no draught lobby, enter 0.05, else enter 0 $0$ (13) Percentage of windows and doors draught stripped $0$ (14) Window infiltration $0.25 \cdot [0.2 \times (14) \div 100] =$ 0 (15) Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$ 0 (16) Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area If based on air permeability value, then $(18) = [(17) \div 20] + (8)$ , otherwise $(18) = (16)$ Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Shelter factor $(20) = 1 - [0.075 \times (19)] =$ $0.13$ (21) Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ $0.13$ (21) Infiltration rate modified for monthly wind speed Monthly average wind speed from Table 7 (22)m= $5.1$ $5$ $4.9$ $4.4$ $4.3$ $3.8$ $3.8$ $3.7$ $4$ $4.3$ $4.5$ $4.7$		25 for steel or timb	er frame or	0.35 for	masonr	v constr	uction	[(0)	110.1 -		=
If no draught lobby, enter 0.05, else enter 00Percentage of windows and doors draught stripped0Window infiltration $0.25 \cdot [0.2 \times (14) \div 100] =$ Infiltration rate(8) + (10) + (11) + (12) + (13) + (15) =Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope areaIf based on air permeability value, then $(18) = [(17) \div 20] + (8)$ , otherwise $(18) = (16)$ Air permeability value applies if a pressurisation test has been done or a degree air permeability is being usedNumber of sides shelteredShelter factor(20) = 1 - [0.075 x (19)] =Infiltration rate modified for monthly wind speedJanFebMarAprMayJunJunAugSepOctNovDecMonthly average wind speed from Table 7(22)m=5.154.94.44.33.83.744.34.54.7	if both types of wall are pre	esent, use the value cor				•				0	
Percentage of windows and doors draught stripped0Window infiltration $0.25 \cdot [0.2 \times (14) \div 100] =$ 0Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$ 0Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area3If based on air permeability value, then $(18) = [(17) \div 20] + (8)$ , otherwise $(18) = (16)$ 0.15Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used0Number of sides sheltered2(19)Shelter factor $(20) = 1 - [0.075 \times (19)] =$ 0.13Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ 0.13Infiltration rate modified for monthly wind speed01.13Monthly average wind speed from Table 72.154.9(22) m=5.154.94.44.33.83.744.34.5(22) m=5.154.94.44.33.83.744.34.54.7	•		,	1 (seale	ed), else	enter 0				0	(12)
Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ $0$ (15)Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$ $0$ (16)Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area $3$ (17)If based on air permeability value, then $(18) = [(17) \div 20] + (8)$ , otherwise $(18) = (16)$ $0.15$ (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used $0.15$ (18)Number of sides sheltered $2$ (19)Shelter factor $(20) = 1 - [0.075 \times (19)] =$ Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ Infiltration rate modified for monthly wind speedMonthly average wind speed from Table 7 $(22)m =$ $5.1$ $5$ $4.9$ $4.4$ $4.3$ $3.8$ $3.7$ $4$ $4.3$ $4.3$ $4.5$ $4.7$										0	(13)
InfibutionInfibutionImage: Constraint of the cons	0	and doors draught	stripped		0.05 10.0		0.01			0	=
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area $3$ (17)If based on air permeability value, then $(18) = [(17) \div 20]+(8)$ , otherwise $(18) = (16)$ $0.15$ (18)Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used $0.15$ (18)Number of sides sheltered $2$ (19)Shelter factor $(20) = 1 - [0.075 \times (19)] =$ Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ Infiltration rate modified for monthly wind speed $0.13$ (21)Infiltration rate modified for monthly wind speed $0.13$ (21)Monthly average wind speed from Table 7 $0.13$ (22)m= $(22)m=$ $5.1$ $5$ $4.9$ $4.4$ $4.3$ $3.8$ $3.8$ $3.7$ $4$ $4.3$ $4.5$ $4.7$							- 1	(45)		0	=
If based on air permeability value, then $(18) = [(17) \div 20]+(8)$ , otherwise $(18) = (16)$ Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used Number of sides sheltered Shelter factor $(20) = 1 - [0.075 \times (19)] =$ Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ Infiltration rate modified for monthly wind speed Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Monthly average wind speed from Table 7 (22)m= 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7							<i>·</i> · · <i>·</i>				=
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being usedNumber of sides sheltered $2$ (19)Shelter factor $(20) = 1 - [0.075 \times (19)] =$ Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ Infiltration rate modified for monthly wind speed $0.13$ (21)Infiltration rate modified for monthly wind speed $0.13$ (21)Monthly average wind speed from Table 7 $0.21 + 0.075 \times (19) =$ (22)m= $5.1$ $5$ $4.9$ $4.4$ $4.3$ $3.8$ $3.7$ $4$ $4.3$ $4.5$ $4.7$		• •		•	•	•	etre of e	nvelope	area		=
Number of sides sheltered $(20) = 1 - [0.075 \times (19)] =$ $2$ (19)Shelter factor $(20) = 1 - [0.075 \times (19)] =$ $0.85$ (20)Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ $0.13$ (21)Infiltration rate modified for monthly wind speed $0.13$ (21)Infiltration rate modified for monthly wind speed $0.13$ (21)Monthly average wind speed from Table 7 $0.13$ (22)m= $5.1$ $5$ $4.9$ $4.4$ $4.3$ $3.8$ $3.7$ $4$ $4.3$ $4.3$ $4.5$ $4.5$ $4.7$	•	•					is beina us	sed		0.15	
Infiltration rate incorporating shelter factor(21) = (18) x (20) =Infiltration rate modified for monthly wind speed $0.13$ (21)Infiltration rate modified for monthly wind speedJanFebMarAprMayJunJulAugSepOctNovDecMonthly average wind speed from Table 7(22)m= $5.1$ $5$ $4.9$ $4.4$ $4.3$ $3.8$ $3.7$ $4$ $4.3$ $4.5$ $4.7$					,	,	9			2	(19)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec         Monthly average wind speed from Table 7         (22)m=       5.1       5       4.9       4.4       4.3       3.8       3.7       4       4.3       4.5       4.7	Shelter factor				(20) = 1 -	[0.075 x (1	9)] =			0.85	(20)
JanFebMarAprMayJunJulAugSepOctNovDecMonthly average wind speed from Table 7(22)m=5.154.94.44.33.83.744.34.54.7	Infiltration rate incorporati	ng shelter factor			(21) = (18)	) x (20) =				0.13	(21)
Monthly average wind speed from Table 7         (22)m=       5.1       5       4.9       4.4       4.3       3.8       3.7       4       4.3       4.5       4.7	Infiltration rate modified for	or monthly wind spe	ed					-			
(22)m= 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7	Jan Feb	Mar Apr Ma	y Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	Monthly average wind spe	ed from Table 7									
Wind Factor (22a)m = (22)m $\div$ 4	(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
	Wind Factor (22a)m = (22	)m ÷ 4									
(22a)m= 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18	(22a)m= 1.27 1.25 1	.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18	]	

Adjust	ed infiltr	ation rat	e (allowi	ng for sł	nelter an	d wind s	peed) =	(21a) x	(22a)m		-			
	0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15		
		ctive air al ventila	change i	rate for t	he appli	cable ca	se						0.5	(220)
			using Appe	andix N (2	3h) - (23a	) v Emv (e	auation (N	(5)) other	nwise (23h	) – (23a)			0.5	(23a)
			overy: effici							) = (200)			0.5	(23b)
			-	-	-					) b) m i ('	226) v [	1 (22a)	79.05	(23c)
(24a)m=		0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	1 – (23c) 0.25	÷ 100]	(24a)
			anical ve									0.20		(_ · · · )
(24b)m=				0				0	0 = (22)	0	230)	0		(24b)
	-		tract ven	-	-	-	-	-	-	•	Ů	Ŭ		()
			(23b), t		-	-				5 × (23b	))			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,			on or wh en (24d)							0.51		•		
(24d)m=	, <i>,</i>	0	0	0	0	0	0	0	0	0	0	0		(24d)
		change	rate - er	ter (24a	) or (24t	) or (24	L c) or (24	d) in boy	(25)					
(25)m=	0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(25)
3 Ho	atlosso	s and he	eat loss p	aramot	or.									
ELEN		Gros		Openin		Net Ar	00	U-valı		AXU		k-value	2	AXk
		area		r		A,r		W/m2		(W/I	<b>&lt;</b> )	kJ/m²·ł		kJ/K
Doors						2	x	1.4	=	2.8				(26)
Windo	ws Type	e 1				6.097	· x1,	/[1/( 1.4 )+	0.04] =	8.08				(27)
Windo	ws Type	e 2				5.107	y x1,	/[1/( 1.4 )+	0.04] =	6.77				(27)
Walls -	Type1	35.7	2	11.2	2	24.51	x	0.15	] = [	3.68				(29)
Walls <sup>-</sup>	Гуре2	11.	7	2		9.7	x	0.14	=	1.37			$\neg$	(29)
Walls -	ГуреЗ	16.7	76	0		16.76	3 X	0.13		2.22	īĒ		$\exists \square$	(29)
Total a	rea of e	lements	, m²			64.18	3							(31)
			ows, use e sides of in				ated using	formula 1,	/[(1/U-valu	e)+0.04] a	ns given in	paragraph	3.2	
Fabric	heat los	s, W/K	= S (A x	U)				(26)(30)	+ (32) =				24.92	(33)
Heat c	apacity	Cm = S(	(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	713.73	(34)
Therm	al mass	parame	ter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value:	: Low		100	(35)
	-		ere the de tailed calcu		constructi	ion are not	t known pr	ecisely the	e indicative	values of	TMP in T	able 1f		
Therm	al bridge	es : S (L	x Y) cal	culated	using Ap	pendix ł	<						6.81	(36)
if details	of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)								
Total fa	abric he	at loss							(33) +	(36) =			31.73	(37)
Ventila	tion hea	at loss ca	alculated	monthl					(38)m	= 0.33 × (	25)m x (5	)	I	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		( <b>)</b>
(38)m=	15.63	15.44	15.25	14.32	14.14	13.2	13.2	13.02	13.58	14.14	14.51	14.88		(38)
Heat tr	ansfer o	coefficie	nt, W/K					r	(39)m	= (37) + (3	38)m		I	
(39)m=	47.35	47.17	46.98	46.05	45.86	44.93	44.93	44.75	45.3	45.86	46.24	46.61		<b></b> .
									/	Average =	Sum(39)1	12 /12=	46	(39)

Heat lo	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	0.67	0.67	0.66	0.65	0.65	0.63	0.63	0.63	0.64	0.65	0.65	0.66		
Numb	er of day		nth (Tab	L					,	Average =	Sum(40)1.	.12 /12=	0.65	(40)
Numbe	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
. ,														
4. Wa	ater heat	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF				: [1 - exp	0(-0.0003	849 x (TF	FA -13.9	)2)] + 0.(	0013 x ( <sup>-</sup>	TFA -13		27		(42)
Reduce	the annua	al average	hot water	usage by	es per da 5% if the a vater use, l	welling is	designed			se target o		.67		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat	er usage il	n litres pei	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m=	101.93	98.23	94.52	90.81	87.11	83.4	83.4	87.11	90.81	94.52	98.23	101.93		<b>-</b>
Energy	content of	hot water	used - cal	culated m	onthly $= 4$ .	190 x Vd,r	m x nm x [	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1		1112.02	(44)
(45)m=	151.17	132.21	136.43	118.94	114.13	98.48	91.26	104.72	105.97	123.5	134.81	146.4		
lf instan	taneous w	ater heati	na at point	t of use (no	o hot water	storage).	enter 0 in	boxes (46		Total = Su	m(45) <sub>112</sub> =		1458.03	(45)
(46)m=	22.67	19.83	20.46	17.84	17.12	14.77	13.69	15.71	15.9	18.53	20.22	21.96		(46)
· · ·	storage			_										
Storag	e volum	e (litres)	) includir	ng any se	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
	•	•			velling, e			```	ora) ont	or (0) in (	(47)			
	storage		not wate	er (uns n	ncludes i	instantial			ers) erne		(47)			
	•		eclared I	oss facto	or is kno	wn (kWł	n/day):					C		(48)
Tempe	erature f	actor fro	m Table	2b								C		(49)
			-	, kWh/y				(48) x (49)	) =		1	10		(50)
,					loss fact le 2 (kWl						0.	02		(51)
		-	ee secti			1, nu o, uo	· <b>J</b> /				0.	02		(01)
Volum	e factor	from Ta	ble 2a								1.	03		(52)
Tempe	erature f	actor fro	m Table	2b							0	.6		(53)
			-	e, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		03		(54)
	. ,	(54) in (5		faraab				((50)			1.	03		(55)
			<b></b>	for each			1	((56)m = (						(50)
(56)m= If cylinde	32.01 er contains	28.92 s dedicate	32.01 d solar sto	30.98 rage, (57)	32.01 m = (56)m	30.98 x [(50) – (	32.01 H11)] ÷ (5	32.01 0), else (5	30.98 7)m = (56)	32.01 m where (	30.98 H11) is fro	32.01 m Append	ix H	(56)
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primar	v circuit	loss (ar	nual) fro	om Table	• 3							)		(58)
Primar	y circuit	loss cal	culated	for each	month (		. ,	. ,						
•		-	r	r	here is s		· · · · · · · · · · · · · · · · · · ·	- <u>-</u>	· ·	1	, 	00.00		(50)
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi	loss ca	lculated	for ea	ch	month (	(61)m =	(60	)) ÷ 36	65 × (41)	m								
(61)m=	0	0	0		0	0		0	0	0		0	0	0		0		(61)
Total h	eat req	uired for	water	he	ating ca	alculated	l fo	r each	n month	(62)n	า =	0.85 × (	(45)m -	+ (46)n	า + (ร	57)m +	(59)m + (61)m	
(62)m=	206.44	182.14	191.7	'1	172.44	169.41	1	51.98	146.54	160		159.47	178.7	3 188.	31	201.67		(62)
Solar DH	W input	calculated	using A	.ppe	ndix G or	Appendix	Η (	(negativ	ve quantity	) (ente	r '0'	if no sola	r contrib	ution to v	water	heating)		
(add a	dditiona	al lines if	FGHF	RS a	and/or V	WWHRS	s ap	oplies,	, see Ap	pendi	x G	6)						
(63)m=	0	0	0		0	0		0	0	0		0	0	0		0		(63)
Output	from w	vater hea	ter				-											
(64)m=	206.44	182.14	191.7	1	172.44	169.41	1	51.98	146.54	160		159.47	178.7	3 188.	31	201.67		
		1	1							C	Dutp	ut from wa	ater hea	ter (annu	ual)11	2	2108.87	(64)
Heat q	ains fro	m water	heatir	na.	kWh/mo	onth 0.2	5 ´	[0.85	× (45)m	+ (61	l)m	]+0.8×	((46)r	n + (57	')m +	· (59)m	1	_
(65)m=	94.48	83.9	89.58	<u> </u>	82.34	82.17	<u> </u>	'5.54	74.57	79.0	<u> </u>	78.03	85.29	`	<u>,</u>	92.9	ĺ	(65)
inclu	ude (57)	m in calo	ulatio	n o	f (65)m	only if c	ı vlir	nder is	s in the c	lwelli	na (	or hot w	ater is	from c	omm	unity h	ı Deating	
	. ,	ains (see			、 ,	-	y m				·g·			nomo	Unit in the second seco	i ann y i	loating	
						)•												
Metabo		ns (Table				Mov	<u> </u>	lun	11	۸.	~	Son				Dee	1	
(66)m	Jan 113.34	Feb	Ma	-	Apr 113.34	May 113.34	-	Jun	Jul 113.34	Au 113.3	Ť	Sep	Oct			Dec		(66)
(66)m=		113.34	113.3					13.34				113.34	113.3	+   113.	34	113.34		(00)
-		(calcula	I	<u> </u>		· · ·	<u> </u>		, 		- 1						1	(07)
(67)m=	18.58	16.5	13.42	2	10.16	7.59	(	6.41	6.93	9.01		12.09	15.35	17.9	91	19.1		(67)
Applia	nces ga	ins (calc	ulatec	l in	Append	dix L, eq	uat	tion L'	13 or L1	3a), a	lso	see Ta	ble 5					
(68)m=	199.29	201.35	196.1	4	185.05	171.05	1:	57.88	149.09	147.0	)2	152.23	163.3	3 177.	33	190.49		(68)
Cookin	ig gains	calcula	ated in	Ар	pendix	L, equa	tior	L15 ו	or L15a)	, also	se	e Table	5				_	
(69)m=	34.33	34.33	34.33	3	34.33	34.33	3	34.33	34.33	34.3	3	34.33	34.33	34.3	33	34.33		(69)
Pumps	and fa	ns gains	(Tabl	e 5	a)													
(70)m=	0	0	0		0	0		0	0	0		0	0	0		0		(70)
Losses	s e.g. ev	/aporatic	n (neg	gati	ve valu	es) (Tab	le	5)										
(71)m=	-90.67	-90.67	-90.6	7	-90.67	-90.67	-9	90.67	-90.67	-90.6	67	-90.67	-90.67	· -90.	67	-90.67		(71)
Water	heating	gains (T	r able {	5)			I						1				1	
(72)m=	127	124.85	120.4	ŕ	114.37	110.44	1	04.92	100.22	106.2	24	108.38	114.6	3 121.	69	124.86		(72)
	nternal	l gains =							m + (67)m	+ (68)	 m +	(69)m + (				1	1	
(73)m=	401.86	399.71	386.9	7	366.58	346.08	3	26.21	313.24	319.2		329.7	350.3	<u> </u>	· /	391.45	]	(73)
· · /	ar gain		000.0	<u>'</u>	000.00	010.00		20.21	010.21	010.	-' ]	02011	000.0			001110		( - )
	Ŭ	calculated	usina s	olar	flux from	Table 6a	and	associ	ated equa	tions to		nvert to th	e applic	able orie	ntatio	n.		
		Access F	0		Area			Flu				g_		FF			Gains	
onona		Table 6d			m²				ole 6a			able 6b		Table (			(W)	
Southe	ast <u>o 9x</u> [	0.77		x	6.	1	x	3	6.79	x [		0.63	×	0.	7		68.56	(77)
Southe		0.77		x	6.		x		2.67	x [		0.63	٦^ ×	0.		$\exists $	116.78	(77)
Southe	Ļ												4			=		]( <i>77</i> )
Southe	L	0.77		x	6.		x		5.75			0.63		0.			159.78	-
		0.77		x	6.		X		06.25	X		0.63	×		.7	=	197.98	(77)
Southe	asi ().9x	0.77		Х	6.	1	x	1'	19.01	X		0.63	x	0.	.7	=	221.76	(77)

Southea	ast <mark>0.9x</mark>	0.77	x	6.	1	x	118.15	x	0.63	x	0.7	=	220.15	(77)
Southea	ast <mark>0.9x</mark>	0.77	X	6.	1	x	113.91	x	0.63	x	0.7	=	212.25	(77)
Southea	ast <mark>0.9x</mark>	0.77	X	6.	1	x	104.39	x	0.63	x	0.7	=	194.51	(77)
Southea	ast <mark>0.9x</mark>	0.77	x	6.	1	x	92.85	x	0.63	x	0.7	=	173.01	(77)
Southea	ast <mark>0.9x</mark>	0.77	x	6.	1	x	69.27	x	0.63	x	0.7	=	129.07	(77)
Southea	ast <mark>0.9x</mark>	0.77	x	6.	1	x	44.07	x	0.63	x	0.7	=	82.12	(77)
Southea	ast <mark>0.9x</mark>	0.77	x	6.	1	x	31.49	x	0.63	x	0.7	=	58.67	(77)
Northwe	est <mark>0.9x</mark>	0.77	x	5.1	1	x	11.28	x	0.63	x	0.7	=	17.61	(81)
Northwe	est <mark>0.9x</mark>	0.77	x	5.1	1	x	22.97	x	0.63	x	0.7	=	35.85	(81)
Northwe	est <mark>0.9x</mark>	0.77	x	5.1	1	x	41.38	x	0.63	x	0.7	=	64.58	(81)
Northwe	est <mark>0.9x</mark>	0.77	x	5.1	1	x	67.96	x	0.63	x	0.7	=	106.06	(81)
Northwe	est <mark>0.9x</mark>	0.77	x	5.1	1	x	91.35	x	0.63	x	0.7	=	142.57	(81)
Northwe	est <mark>0.9x</mark>	0.77	x	5.1	1	x	97.38	x	0.63	x	0.7	=	151.99	(81)
Northwe	est <mark>0.9x</mark>	0.77	x	5.1	1	x	91.1	x	0.63	x	0.7	=	142.19	(81)
Northwe	est <mark>0.9x</mark>	0.77	x	5.1	1	x	72.63	x	0.63	x	0.7	=	113.35	(81)
Northwe	est <mark>0.9x</mark>	0.77	x	5.1	1	x	50.42	x	0.63	x	0.7	=	78.69	(81)
Northwe	est <mark>0.9x</mark>	0.77	x	5.1	1	x	28.07	x	0.63	x	0.7	=	43.81	(81)
Northwe	est <mark>0.9x</mark>	0.77	x	5.1	1	x	14.2	x	0.63	x	0.7	=	22.16	(81)
Northwe	est <mark>0.9x</mark>	0.77	x	5.1	1	x	9.21	x	0.63	x	0.7	=	14.38	(81)
	_							_						
Solar g	ains in	watts, ca	alculated	for eac	h month	_		(83)m	n = Sum(74)n	n(82)m			_	
(83)m=	86.17	152.63	224.37	304.04	364.32	372.15	354.44	307	.87 251.7	1 172.8	7 104.28	73.05		(83)
Total g	ains – i	nternal a	nd sola	: (84)m =	= (73)m	+ (83)m	, watts							
(84)m=	488.03	552.34	611.34	670.62	710.41	698.36	667.68	627	.13 581.4	1 523.1	8 478.21	464.51		(84)
7. Me	an inter	nal temp	oerature	(heating	season	)								
				` U		, 	from Tal	ble 9	, Th1 (°C)				21	(85)
		tor for g	• •			-								
	Jan	Feb	Mar	Apr	May	Jun	Jul	A	ug Sep	) Oc	Nov	Dec		
(86)m=	0.93	0.9	0.83	0.71	0.56	0.4	0.29	0.3		0.76	0.89	0.94		(86)
Mean	interna	l temper	ature in	living ar		u Mow st	eps 3 to 7		ahle 9c)				1	
(87)m=	19.98	20.2	20.48	20.76	20.92	20.98	21	20.		20.75	20.34	19.95		(87)
						ļ						I	I	
(88)m=	20.37	20.37	20.37	20.39	20.39	20.4	20.4	20	9, Th2 (°C)		20.38	20.38	]	(88)
(00)11-	20.01	20.57	20.57	20.03	20.03	20.4	20.4	20	20.39	20.3	20.30	20.00	l	(30)

Utilisa	ation fac	tor for g	ains for	rest of d	welling, l	n2,m (se	e Table	9a)					_
(89)m=	0.92	0.88	0.82	0.69	0.53	0.37	0.25	0.28	0.47	0.73	0.88	0.93	(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (fe	ollow ste	ps 3 to 7	7 in Tabl	e 9c)			1

(90)m=	18.99	19.3	19.69	20.09	20.3	20.38	20.4	20.4	20.35	20.09	19.52	18.95		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.41	(91)

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

(92)m=	19.4	19.67	20.02	20.37	20.56	20.63	20.65	20.65	20.6	20.36	19.86	19.36	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

					1	1	1	1		1		1	I	(00)
(93)m=	19.4	19.67	20.02	20.37	20.56	20.63	20.65	20.65	20.6	20.36	19.86	19.36		(93)
			uirement		ra abtair		on 11 of			tTim (	76)m.on	d ro oolo	vulata	
				using Ta		ieu al sie	эрттог	Table 9	), so ina	u 11,m=(	70)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	:										
(94)m=	0.91	0.87	0.81	0.69	0.54	0.38	0.27	0.3	0.49	0.73	0.87	0.92		(94)
Usefu	ıl gains,	-	, W = (94	4)m x (84	4)m	i	r	1		i	1	i	I	
(95)m=	444.29	481.44	492.85	462.95	384.68	266.96	180.96	188.74	283.99	381.08	414.8	427.5		(95)
	<u> </u>		i	perature	i	r					1		I	(22)
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
			ì	· · ·	i	1		x [(93)m	· ,	r <del>ī</del>	E90.07	706 76	l	(07)
(97)m=	715.23	696.82	635.12	528.21	406.19	271.06	181.77	189.95	294.66	447.75	589.97	706.76		(97)
(98)m=	201.58	144.74	105.85	46.99	16.01		n = 0.02	24 x [(97) 0	0 0	49.6	126.13	207.77		
(30)11-	201.30	144.74	103.05	40.99	10.01	0	0		-		r) = Sum(9		898.66	(98)
•								TULA	i per year	(KVVII/yeal	r) = 3um(9	0)15,912 =		
Space	e heatin	g require	ement in	kWh/m <sup>2</sup>	/year								12.68	(99)
		-				scheme								
•		•				-		ting prov (Table 1 <sup>-</sup>	-		unity scł	neme.	0	(301)
	•					1 – (30 <sup>2</sup>	•		,	0110				(302)
	•												1	(302)
	-							allows for See Appel		up to four	other heat	sources; ti	he latter	
			-	ity boiler		,							1	(303a)
Fractic	on of tota	al space	heat fro	m Comn	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor	for cont	rol and o	charging	method	(Table	4c(3)) fo	r comm	unity hea	ting sys	tem			1	(305)
Distrib	ution los	s factor	(Table 1	2c) for c	commun	ity heatii	ng syste	m					1.05	(306)
Space	heating	9											kWh/ye	ar
Annua	l space	heating	requiren	nent									898.66	
Space	heat fro	om Comr	munity b	oilers					(98) x (30	04a) x (30	5) x (306)	=	943.59	(307a)
Efficie	ncy of se	econdar	y/supple	mentary	heating	system	in % (fro	om Table	4a or A	ppendix	: E)		0	(308
Space	heating	require	ment fro	m secon	dary/su	oplemen	tary sys	tem	(98) x (30	01) x 100 ·	÷ (308) =		0	(309)
Water	heating	1												
			equirem	ent									2108.87	
			ty schen nunity bo						(64) x (30	03a) x (30	5) x (306) :	=	2214.31	(310a)
Electri	city used	d for hea	at distribu	ution				0.01	× [(307a).	(307e) +	- (310a)(	(310e)] =	31.58	(313)
Coolin	g Syster	n Energ	y Efficie	ncy Rati	0								0	(314)
Space	cooling	(if there	is a fixe	d cooling	g systen	n, if not e	enter 0)		= (107) ÷	- (314) =			0	(315)
Electri	city for p	oumps a	nd fans v	within dv	vellina (1	Table 4f)	:							
								outside					245.83	(330a)
mecna	nical ve	ntilation	- balanc	eu, exilă	act of pc		put nom	outside					245.65	(330a)

					_
warm air heating system fans				0	(330b)
pump for solar water heating				0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	b) + (330g) =		245.83	(331)
Energy for lighting (calculated in Appendix L)				328.11	(332)
Electricity generated by PVs (Appendix M) (neg	gative quantity)			-716.31	(333)
Electricity generated by wind turbine (Appendix	M) (negative quantity)			0	(334)
12b. CO2 Emissions – Community heating sch	eme				
	CINC				
	Energy kWh/year	Emission fac kg CO2/kWh		nissions J CO2/year	
CO2 from other sources of space and water he Efficiency of heat source 1 (%)	Energy kWh/year	kg CO2/kWh	kg		](367a)
CO2 from other sources of space and water he	Energy kWh/year ating (not CHP)	kg CO2/kWh	kg	CO2/year	)(367a) )(367)
CO2 from other sources of space and water he Efficiency of heat source 1 (%)	Energy kWh/year ating (not CHP) If there is CHP using two fuels repeat (363) to	kg CO2/kWh (366) for the secon	kg Id fuel	94	- - -
CO2 from other sources of space and water he Efficiency of heat source 1 (%) CO2 associated with heat source 1	Energy kWh/year ating (not CHP) If there is CHP using two fuels repeat (363) to [(307b)+(310b)] x 100 ÷ (367b) x [(313) x	kg CO2/kWh (366) for the secon 0.22 0.52	kç Id fuel =	94 725.65	](367)

(373) + (374) + (375) =

(332))) x

CO2 associated with water from immersion heater or instantaneous heater (312) x

sum of (376)...(382) =

(383) ÷ (4) =

CO2 associated with electricity for pumps and fans within dwelling (331)) x

Energy saving/generation technologies (333) to (334) as applicable

Total CO2 associated with space and water heating

CO2 associated with electricity for lighting

**Dwelling CO2 Emission Rate** 

Item 1

Total CO2, kg/year

El rating (section 14)

=

=

=

x 0.01 =

0.22

0.52

0.52

0.52

(375)

(376)

(378)

(379)

(380)

(383)

(384)

(385)

0

742.04

127.58

170.29

-371.77

668.14

9.43

92.27

# SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 28 October 2020

Property Details: Plot 32

Dwelling type: Located in: Region: Cross ventilation pos Number of storeys: Front of dwelling face Overshading: Overhangs: Thermal mass parame Night ventilation: Blinds, curtains, shut Ventilation rate during Overheating Details: Summer ventilation h Transmission heat loss con Overhangs:	es: eter: ters: g hot we eat loss ss coeffi	coeffici		Yes 1 South Averag None Indicat False	es valley West je or unknown tive Value Low ndows fully open)			(P1) (P2)
Orientation: South East (SE) North West (NW) Solar shading: Orientation: South East (SE)	Ratio: 0 0 Z blind	ls:	Z_overhangs: 1 1 Solar access: 0.9	<b>C</b>	Overhangs:	<b>Z summer:</b> 0.9		(P8)
North West (NW)	1		0.9	1		0.9 0.9		(P8)
OrientationSouth East (SE)North West (NW)Internal gains:	0.9 x 0.9 x	<b>Area</b> 6.1 5.11	<b>Flux</b> 119.92 98.85	<b>g_</b> 0.63 0.63	<b>FF</b> 0.7 0.7	Shading 0.9 0.9 Total	<b>Gains</b> 261.18 180.32 441.5	(P3/P4)
Internal gains Total summer gains Summer gain/loss ratio Mean summer external Thermal mass tempera Threshold temperature Likelihood of high int Assessment of likelih	tempera ture incre ernal ten	ement n <b>peratu</b>	re	re:	June 452.8 921.64 2.41 16 1.3 19.71 Not significant Slight	July 436.27 877.77 2.3 17.9 1.3 21.5 Slight	August 444.39 835.56 2.18 17.8 1.3 21.28 Slight	(P5) (P6) (P7)

			User D	etails:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2	012		Stroma Softwa					001082 m: 1.0.5.9	
Software Name.	Stroma POAL 2	-		Address:		51011.		V CI 310	1. 1.0.0.3	
Address :			operty /	luuress.	1 101 02					
1. Overall dwelling dime	nsions:									
Ŭ			Area	ı(m²)		Av. He	ight(m)		Volume(m <sup>3</sup> )	)
Ground floor			70	0.86	(1a) x	2	2.5	(2a) =	177.14	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(	(1e)+(1n)	) 70	0.86	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	177.14	(5)
2. Ventilation rate:										
	main heating	secondary heating	/	other		total			m <sup>3</sup> per hou	ŕ
Number of chimneys		0	+ [	0	] = [	0	x 4	40 =	0	(6a)
Number of open flues	0 +	0	] + [	0	] = [	0	x 2	20 =	0	(6b)
Number of intermittent fa	ns				Γ	3	x ′	10 =	30	(7a)
Number of passive vents					Γ	0	x ^	10 =	0	(7b)
Number of flueless gas fi	res				Г	0	x 4	40 =	0	(7c)
								Air ch	anges per ho	ur
Infiltration due to chimney	, fluon and fana -	(6a)+(6b)+(7	a)+(7b)+(7	7c) -	Г					_
Infiltration due to chimney If a pressurisation test has b	-				ontinue fro	30 0 <i>m (9) to (</i>		÷ (5) =	0.17	(8)
Number of storeys in th		11000, proceed	10 (11), 0			, (0) 10 (	10)		0	(9)
Additional infiltration							[(9)-	-1]x0.1 =	0	(10)
Structural infiltration: 0.	25 for steel or timbe	er frame or	0.35 for	masonr	y constru	uction			0	(11)
if both types of wall are pr deducting areas of openir		responding to	the greate	er wall area	a (after					—
If suspended wooden f	• · ·	ealed) or 0. <sup>-</sup>	1 (seale	d), else	enter 0				0	(12)
If no draught lobby, ent	er 0.05, else enter	0							0	(13)
Percentage of windows	and doors draught	stripped							0	(14)
Window infiltration			(	0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)
Infiltration rate				(8) + (10) ·	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)
Air permeability value,	• • •		•	•	•	etre of e	nvelope	area	3	(17)
If based on air permeabil	•								0.32	(18)
Air permeability value applie. Number of sides sheltere		has been done	e or a deg	ree air pei	meability i	s being us	sed			
Shelter factor	u			(20) = 1 - [	0.075 x (1	9)] =			2 0.85	(19) (20)
Infiltration rate incorporat	ing shelter factor			(21) = (18)	x (20) =				0.27	(21)
Infiltration rate modified for	-	ed							0.21	` ′
	Mar Apr Ma		Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Table 7									
· · · · · · · · · · · · · · · · · · ·	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor $(22a)m = (22a)m$	2)m ÷ 4	· ·								
	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjust	ed infiltr	ation rat	e (allowi	ng for sł	nelter an	d wind s	speed) =	(21a) x	(22a)m				_		
	0.35	0.34	0.33	0.3	0.29	0.26	0.26	0.25	0.27	0.29	0.31	0.32			
	ate effec echanica		change i	rate for t	he appli	cable ca	se								
				andix N (2	(25) = (23)	a) v Emv (a	acuation (I	N5)) , othei	nwise (23b	) - (23a)			0		(23a)
										) = (23a)			0		(23b)
			-	-	-			n Table 4h)		<b>)</b>	006)	4 (00-)	0		(23c)
,			<b></b>			at recove		HR) (242	m = (22)	2b)m + ( 0	23b) × [ 0	1 – (23c)	÷100]		(24a)
(24a)m=		-	0	-	-	-		-	-	-	Ů	0			(24a)
		1			1	1	<b></b>	ИV) (24b	,	r , ,	· · · · · · · · · · · · · · · · · · ·		l		(0.4b)
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24b)
,					•	•		on from c c) = (22b		5 × (23b	<b>)</b> )		_		
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24c)
,								on from l 0.5 + [(2		0.5]					
(24d)m=	0.56	0.56	0.56	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55			(24d)
Effe	ctive air	change	rate - er	nter (24a	) or (24b	o) or (24	c) or (24	d) in box	x (25)		-	-			
(25)m=	0.56	0.56	0.56	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55			(25)
3 Ho	at losse	s and he	eat loss p	haramet	≏r.								-		
	/IENT	Gros		Openin		Net Ar	ea	U-valı	IE	AXU		k-value	2	АX	k
		area		n		A ,r		W/m2		(W/I	K)	kJ/m²·l		kJ/ł	
Doors						2	x	1.4	=	2.8					(26)
Windo	ws Type	e 1				6.097	7 x1	/[1/( 1.4 )+	0.04] =	8.08					(27)
Windo	ws Type	2				5.107	7 x1	/[1/( 1.4 )+	0.04] =	6.77					(27)
Walls -	Type1	35.7	2	11.2	2	24.51	ı x	0.15	] = [	3.68	Ξ r				(29)
Walls -	Type2	11.	7	2		9.7	x	0.14		1.37	i F				(29)
Walls	Type3	16.7	76	0		16.76		0.13		2.22	= i		$\dashv$		(29)
	area of e					64.18			[		L				(31)
				ffective wi	ndow U-va			, formula 1	/[(1/U-valu	ie)+0.04] a	as given in	paragraph	3.2		(- )
			sides of in				Ū			, <u>-</u>	0	, ,			
Fabric	heat los	s, W/K	= S (A x	U)				(26)(30)	+ (32) =				24.9	12	(33)
Heat c	apacity	Cm = S(	(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	713.	73	(34)
Therm	al mass	parame	ter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	: Low		100	)	(35)
	-		ere the de tailed calcu		construct	ion are noi	t known pr	ecisely the	e indicative	values of	TMP in T	able 1f			
Therm	al bridge	es : S (L	x Y) cal	culated	using Ap	pendix I	K						6.8	1	(36)
			are not kn	own (36) =	= 0.05 x (3	1)									_
Total f	abric he	at loss							(33) +	(36) =			31.7	'3	(37)
Ventila	ation hea	at loss ca	alculated	monthl	y		1		(38)m	= 0.33 × (	25)m x (5	)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
(38)m=	32.73	32.59	32.46	31.83	31.72	31.17	31.17	31.07	31.38	31.72	31.95	32.2			(38)
Heat ti	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m				
(39)m=	64.46	64.32	64.19	63.56	63.45	62.9	62.9	62.8	63.11	63.45	63.68	63.93			_
										Average =	Sum(39)1	12 /12=	63.5	6	(39)

Heat lo	oss para	meter (I	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	0.91	0.91	0.91	0.9	0.9	0.89	0.89	0.89	0.89	0.9	0.9	0.9		
Numbe	er of dav	vs in mo	nth (Tab	le 1a)				-		Average =	Sum(40)1.	<sub>12</sub> /12=	0.9	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ter heat	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF				: [1 - exp	(-0.0003	849 x (TF	FA -13.9	9)2)] + 0.0	0013 x ( <sup>-</sup>	TFA -13		27		(42)
Reduce	the annua	al average	hot water	usage by		lwelling is	designed	(25 x N) to achieve		se target o		67		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage il	n litres pei	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)	· · · · ·					
(44)m=	101.93	98.23	94.52	90.81	87.11	83.4	83.4	87.11	90.81	94.52	98.23	101.93		
Enorm	contant of	hot water	unad an	loulotod m	onthly _ 1	100 v Vd r		Tm / 2600			m(44) <sub>112</sub> =		1112.02	(44)
			. <u> </u>	. <u> </u>		i	. <u> </u>	DTm / 3600		·	. <u> </u>		l	
(45)m=	151.17	132.21	136.43	118.94	114.13	98.48	91.26	104.72	105.97	123.5	134.81 m(45) <sub>112</sub> =	146.4	1458.03	(45)
lf instant	taneous w	ater heati	ng at point	t of use (no	o hot water	r storage),	enter 0 in	boxes (46		10tal = Su	III(43) <sub>112</sub> =	-	1456.05	(+0)
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0		(46)
	storage								1		·			
-		. ,		• •			-	within sa	ame ves	sel		0		(47)
	•	-			/elling, e			ı (47) ombi boil	ars) ante	ar '∩' in <i>(</i>	(47)			
	storage		not wate	51 (1113 11	iciuues i	nstantai			ers) erite					
	-		eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature fa	actor fro	m Table	2b								0		(49)
•••			-	e, kWh/ye				(48) x (49)	) =			0		(50)
				•	loss fact le 2 (kWl							0		(51)
		•	see secti			n/ntre/ue	ay)					0		(51)
Volum	e factor	from Ta	ble 2a									0		(52)
Tempe	erature fa	actor fro	m Table	2b								0		(53)
0.			•	e, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(54)
		(54) in (5			_							0		(55)
Water	storage	loss cal	culated	for each	month		1	((56)m = (	55) × (41)ı	m	1		1	
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0	5	(56)
If cylinde	er contains		a solar sto	rage, (57)				50), else (5		m wnere ( r			IX H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
	•	•	,	om Table								0		(58)
	•					,	. ,	65 × (41)		r th a r	atat)			
	0 0	o factor f	rom Tab			olar wat	ter heati	ng and a	cylinde	r thermo	ostat)	0		(59)
(59)m=	U	U										0		(00)

Combi	loss ca	alculated	for eac	ch	month (	(61)m =	(60	0) ÷ 36	65 × (41)	)m								
(61)m=	0	0	0		0	0		0	0	0		0	0	0	0			(61)
Total h	eat req	uired for	water	he	ating ca	alculated	d fo	r eacl	h month	(62)	m =	0.85 × (	(45)m +	- (46)m +	(57)m	n +	(59)m + (61)m	
(62)m=	128.49	112.38	115.9	7	101.1	97.01	8	3.71	77.57	89.	01	90.08	104.98	114.59	124.4	44		(62)
Solar DH	- W input	calculated	using A	ppe	ndix G or	Appendi	(H)	(negati	ve quantity	/) (ent	er '0	' if no sola	r contribu	ution to wat	er heati	ing)	I	
(add a	dditiona	al lines if	FGHR	Sa	and/or V	WWHRS	s ap	oplies	, see Ap	penc	lix C	G)						
(63)m=	0	0	0		0	0		0	0	0		0	0	0	0			(63)
Output	from w	ater hea	ter															
(64)m=	128.49	112.38	115.9	7	101.1	97.01	8	3.71	77.57	89.	01	90.08	104.98	114.59	124.4	44		
											Outp	out from w	ater heat	er (annual)	112		1239.33	(64)
Heat g	ains fro	m water	heatin	g,	kWh/ma	onth 0.2	5 ´	[0.85	× (45)m	+ (6	1)m	n] + 0.8 x	۲ ((46) «	n + (57)m	n + (59	)m	]	
(65)m=	32.12	28.09	28.99		25.28	24.25	2	20.93	19.39	22.	25	22.52	26.24	28.65	31.1	1		(65)
inclu	de (57)	m in cal	culation	n o	f (65)m	only if c	: ylir	nder i	s in the o	dwell	ing	or hot w	ater is	from corr	nmunit	ty h	eating	
5. Int	ernal g	ains (see	e Table	e 5	and 5a)	):												
Metab	olic daii	ns (Table	e 5). W	att	s													
	Jan	Feb	Mai		Apr	May		Jun	Jul	A	ug	Sep	Oct	Nov	De	ес		
(66)m=	113.34	113.34	113.34	4	113.34	113.34	1	13.34	113.34	113	.34	113.34	113.34	113.34	113.3	34		(66)
Lightin	g gains	(calcula	ted in <i>i</i>	Ap	pendix l	L, equat	ion	L9 oi	r L9a), a	lso s	ee <sup>-</sup>	Table 5		•	·		I	
(67)m=	18.58	16.5	13.42	:	10.16	7.59	(	6.41	6.93	9.0	)1	12.09	15.35	17.91	19.1	1		(67)
Applia	nces ga	ins (calc	ulated	in	Append	dix L, eq	uat	tion L	13 or L1	3a), a	alsc	see Ta	ble 5	- <b>!</b>			]	
(68)m=	199.29	201.35	196.14	- T	185.05	171.05	r	57.88	149.09	147		152.23	163.33	177.33	190.4	49		(68)
Cookir	ig gains	s (calcula	ted in	Ap	pendix	L, equa	tior	า L15	or L15a)	), als	o se	e Table	5				]	
(69)m=	34.33	34.33	34.33	-i	34.33	34.33	-	34.33	34.33	34.		34.33	34.33	34.33	34.3	3		(69)
Pumps	and fa	ins gains	i (Table	 2 5	a)		-								-		1	
(70)m=	0	0	0		0	0		0	0	0		0	0	0	0			(70)
Losses	s e.a. e	vaporatio	n (nec	ati	ve valu	es) (Tab	ble	5)	Į			1	1		Į		1	
(71)m=	-90.67	<u> </u>	-90.67		-90.67	-90.67	r –	, 90.67	-90.67	-90.	67	-90.67	-90.67	-90.67	-90.6	67		(71)
Water	heating	ı gains (1	rable 5				I							-	<u> </u>		1	
(72)m=	43.18	41.81	38.97	ŕ	35.1	32.6	2	9.07	26.07	29.	91	31.28	35.27	39.79	41.8	1	1	(72)
Total i	nterna	l gains =					I	(66)	I )m + (67)m	L 1 + (68	3)m -	L ⊦ (69)m + I	I (70)m + (	 71)m + (72	!)m		1	
(73)m=	318.04	316.67	305.5	3	287.31	268.24	2	50.36	239.08	242	.94	252.6	270.95	292.03	308.	.4	1	(73)
6. So	lar gain	s:																
			using sc	olar	flux from	Table 6a	and	associ	iated equa	tions	to co	onvert to th	e applica	able orienta	tion.			
Orienta		Access F			Area			Flu				g_		FF			Gains	
		Table 6d			m²			Tal	ble 6a		Т	able 6b	-	Table 6c			(W)	
Southe	ast <mark>0.9x</mark>	0.77		x	6.1	1	x	3	36.79	x		0.63	x [	0.7		=	68.56	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	6.	1	x	6	62.67	x		0.63	x	0.7		=	116.78	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	6.	1	x	8	35.75	x		0.63	x	0.7		=	159.78	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	6.	1	x	10	06.25	×		0.63	_ x [	0.7		=	197.98	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	6.	1	x	1	19.01	x		0.63	× [	0.7		=	221.76	(77)

Southe	ast <mark>0.9x</mark>	0.77		x	6.1		x	1	18.15	x	(	0.63	x	0.7		=	220.15	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	6.1		x	1	13.91	x	(	0.63	x	0.7		=	212.25	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	6.1	I	x	1	04.39	x	(	0.63	x	0.7		=	194.51	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	6.1	I	x	g	2.85	x	(	0.63	x	0.7		=	173.01	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	6.1	I	x	6	9.27	x	(	0.63	x	0.7		=	129.07	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	6.1	I	x	4	4.07	x	(	0.63	x	0.7		=	82.12	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	6.1	l	x	3	1.49	x	(	0.63	x	0.7		=	58.67	(77)
Northwe	est <mark>0.9x</mark>	0.77		x	5.1	1	x	1	1.28	x	(	0.63	x	0.7		=	17.61	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	5.1	1	x	2	2.97	x	(	0.63	x	0.7		=	35.85	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	5.1	1	x	4	1.38	x	(	0.63	x	0.7		=	64.58	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	5.1	1	x	6	7.96	x	(	0.63	x	0.7		=	106.06	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	5.1	1	x	g	1.35	×	(	0.63	x	0.7		=	142.57	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	5.1	1	x	g	7.38	x	(	0.63	x	0.7		=	151.99	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	5.1	1	x		91.1	x	(	0.63	x	0.7		=	142.19	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	5.1	1	x	7	2.63	x	(	0.63	x	0.7		=	113.35	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	5.1	1	x	5	0.42	x	(	0.63	x	0.7		=	78.69	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	5.1	1	x	2	8.07	x	(	0.63	x	0.7		=	43.81	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	5.1	1	x		14.2	×	(	0.63	x	0.7		=	22.16	(81)
Northwe	est <mark>0.9x</mark>	0.77		x	5.1	1	x		9.21	x	(	0.63	x	0.7		=	14.38	(81)
										-			_					_
Solar g	ains in	watts, ca	alculate	d	for each	n montl	h			(83)m	i = Sum	n(74)m	(82)m					
(83)m=	86.17	152.63	224.37	·	304.04	364.32	3	72.15	354.44	307	.87 2	251.71	172.8	7 104.28	73.0	)5		(83)
Total g	ains – ir	nternal a	ind sola	ar		: (73)m	+ (	83)m	, watts									
(84)m=	404.21	469.29	529.9	Т	591.36	632.56	6	22.51	593.52	550	.81 5	504.31	443.8	2 396.31	381.4	46		(84)
7 Me	an inter	nal temp	eratur	- (	heating	seaso	n)			<b>,</b>	•				•			
		during h		Ì	Ŭ		<i>.</i>	area	from Tab	ole 9.	. Th1	(°C)					21	(85)
		tor for g	-				-				,	( - )						
Ounse		Feb		-			T		Jul			Sep	Oct	Nov		2	l	
(86)m=																		
							_			I			0.88	0.93	0.97	/		(00)
		l temper		۱ li	<u> </u>	,	-			r —				-	-		I	
(87)m=	19.11	19.37	19.77		20.25	20.64	2	20.88	20.96	20.	94	20.77	20.25	19.6	19.0	6		(87)
Temp	erature	during h	eating	pe	eriods in	rest o	f dv	velling	from Ta	able 9	9, Th2	2 (°C)						

20.2 Apply adjustment to the mean internal temperature from Table 4e, where appropriate

20.17

0.69

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

19.89

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

20.18

0.52

20.1

20.42

20.18

0.37

20.16

20.49

20.18

0.41

20.15

20.48

20.18

0.64

20.01

20.33

20.17

0.86

19.54

19.84

20.17

0.94

18.9  $fLA = Living area \div (4) =$ 

19.19

20.17

0.97

18.37

18.66

20.16

0.96

18.42

18.71

20.16

0.94

18.68

18.97

20.16

0.9

19.06

19.36

20.17

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

0.82

19.53

19.83

(88)m=

(89)m=

(90)m=

(92)m=

(88)

(89)

(90)

(91)

(92)

0.41

(93)m=	18.71	18.97	19.36	19.83	20.2	20.42	20.49	20.48	20.33	19.84	19.19	18.66		(93)
8. Spa	ace hea	ting requ	uirement	t										
				mperatur using Ta		ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	culate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	tion fac	tor for g	ains, hm	1. 1:										
(94)m=	0.95	0.93	0.89	0.81	0.69	0.53	0.4	0.44	0.65	0.85	0.93	0.96		(94)
Usefu	l gains,	hmGm	W = (9	4)m x (84	4)m									
(95)m=	385.28	436.25	470.81	479.58	437.26	333.04	235.11	242.73	329.9	376.06	369.29	365.99		(95)
Month	nly avera	age exte	rnal tem	perature	e from Ta	able 8					•	•		
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat I	oss rate	e for mea	an interr	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m	]				
(97)m=	928.65	904.72	825.23	694.76	539.43	366.13	244.71	256.19	392.9	586.15	769.92	924.17		(97)
Space	e heatin	g require	ement fo	r each m	nonth, k	Nh/mon	h = 0.02	24 x [(97)	)m – (95	)m] x (4	1)m			
(98)m=	404.27	314.81	263.68	154.93	76.01	0	0	0	0	156.3	288.46	415.28		
				•				Tota	l per year	(kWh/yeai	.) = Sum(9	8)15,912 =	2073.75	(98)
Space	e heatin	g require	ement in	kWh/m²	/year								29.27	(99)
8c. Sr	bace co	oling rec	uiremer	nt										
				August.	See Tal	ole 10b								
Calca	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat I	oss rate	e Lm (ca	lculated	using 25	5°C inter	nal temp	berature	-	ernal ten	nperatur	e from T	able 10)		
(100)m=	0	0	0	0	0	591.26	465.46	477.28	0	0	0	0		(100)
Utilisa	tion fac	tor for lo	ss hm			1								
(101)m=	0	0	0	0	0	0.86	0.91	0.89	0	0	0	0		(101)
Usefu	l loss, h	mLm (V	/atts) =	(100)m x	(101)m									
(102)m=	0	0	0	0	0	508.13	421.6	423.01	0	0	0	0		(102)
Gains	(solar (	gains ca	culated	for appli	cable we	eather re	gion, se	e Table	10)		•	•		
(103)m=	0	0	0	0	0	811.92	776.39	727.91	0	0	0	0		(103)
				r month, < 3 × (98)		lwelling,	continue	ous ( kW	h) = 0.0	24 x [(10	03)m – (	102)m]:	x (41)m	
(104)m=	0	0	0	0	0	218.73	263.96	226.84	0	0	0	0		
									Total	= Sum(	104)	=	709.53	(104)
Cooled	I fraction	า							f C =	cooled	area ÷ (4	4) =	1	(105)
Intermi	ttency f	actor (Ta	able 10b	)		-			-					_
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		
									Tota	l = Sum(	(104)	=	0	(106)
Space	cooling	requirer	nent for	month =	(104)m	× (105)	<u> </u>	n						_
(107)m=	0	0	0	0	0	54.68	65.99	56.71	0	0	0	0		_
									Total	= Sum(	107)	=	177.38	(107)
Space	cooling	requirer	nent in l	wh/m²/y	/ear				(107)	) ÷ (4) =			2.5	(108)
8f. Fab	ric Enei	rgy Effici	ency (ca	alculated	l only un	der spec	cial cond	litions, s	ee sectio	on 11)				
Fabric	Energ	y Efficier	псу						(99)	+ (108) =	=		31.77	(109)

# SAP Input

Property Details: Pl	ot 32						
Address: Located in: Region: UPRN: Date of assessm Date of certifica Assessment type Transaction type Tenure type: Related party dis Thermal Mass Pa Water use <= 12 PCDF Version:	te: e: e: sclosure: arameter:	08 Ju 28 Oo New New Unkn No re Indica	ies valley ly 2020 ctober 2020 dwelling design sta dwelling	ige			
Property description	ו:						
Dwelling type: Detachment: Year Completed: Floor Location: Floor 0 Living area: Front of dwelling fa	aces:	70.85 29.38	r area: 6 m² 4 m² (fraction 0.4 9 West		Storey height 2.5 m	:	
Opening types:							
Name: SW SE NW	Source: Manufacturer Manufacturer Manufacturer		Type: Solid Windows Windows	Glazing: double-glaze double-glaze		Argon: Yes Yes	Frame:
Name:	Gap:		Frame Fact	or: q-value:	U-value:	Area:	No. of Openings:
SW	mm		0	0	1.4	2	1
SE NW	16mm or 16mm or		0.7 0.7	0.63 0.63	1.4 1.4	6.097 5.107	1 1
Name: sw SE NW	Type-Name	:	Location: Corridor Wall External Wall External Wall	Orient: South West South East North West		Width: 0 0 0	Height: 0 0 0
Overshading:		Avera	ige or unknown				
Opaque Elements:							
Type: <u>External Elements</u> External Wall Corridor Wall Stairwell Wall <u>Internal Elements</u> <u>Party Elements</u>	Gross area: 35.717 11.704 16.764	Openings: 11.2 2 0	Net area: 24.51 9.7 16.76	U-value: 0.15 0.15 0.15	Ru value: 0 0.4 0.9	Curtain False False False	wall: Kappa: N/A N/A N/A
Thermal bridges: Thermal bridges:		User- <b>Leng</b> 5.93			ie = 0.1061 · lintels (including (	other steel linte	ls)

# **SAP Input**

17.7 47.7	08 0	0.064	E7	Jamb Party floor between dwellings (in blocks of flats)
2.72 5.45			2.0	Corner (normal) Corner (inverted internal area greater than external area)
8.52				Party wall between dwellings
8.17 43.9				Staggered party wall between dwellings Intermediate floor between dwellings (in blocks of flats)

Ventilation:	
Pressure test: Ventilation:	Yes (As designed) Balanced with heat recovery Number of wet rooms: Kitchen + 1 Ductwork: Insulation, rigid Approved Installation Scheme: True
Number of chimneys: Number of open flues: Number of fans: Number of passive stacks: Number of sides sheltered: Pressure test:	0 0 0 0 2 3
Main heating system:	
Main heating system:	Community heating schemes Heat source: Community boilers heat from boilers – mains gas, heat fraction 1, efficiency 94 Piping>=1991, pre-insulated, low temp, variable flow Central heating pump : 2013 or later Design flow temperature: Unknown Boiler interlock: Yes
Main heating Control:	
Main heating Control:	Charging system linked to use of community heating, programmer and at least two room thermostats Control code: 2312
Secondary heating system:	
Secondary heating system: Water heating:	None
Water heating:	From main heating system Water code: 901 Fuel :mains gas No hot water cylinder Solar panel: False
Others:	
Electricity tariff: In Smoke Control Area: Conservatory: Low energy lights: Terrain type: EPC language: Wind turbine: Photovoltaics:	Standard Tariff Unknown No conservatory 100% Low rise urban / suburban English No <u>Photovoltaic 1</u> Installed Peak power: 0.87 Tilt of collector: 30° Overshading: None or very little Collector Orientation: South West
Assess Zero Carbon Home:	No

		Us	er Details:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 20 <sup>-</sup>	12	Stroma Softwa					001082 n: 1.0.5.9	
		Prope	erty Address:	Plot 32					
Address :									
1. Overall dwelling dimer	nsions:								
Ground floor			Area(m²) 70.86	(1a) x	<b>Av. Hei</b>	<b>ght(m)</b> .5	(2a) =	Volume(m <sup>3</sup> ) 177.14	(3a)
Total floor area TFA = (1a	)+(1b)+(1c)+(1d)+(1	e)+(1n)	70.86	(4)					
Dwelling volume		L		(3a)+(3b)∙	+(3c)+(3d)	)+(3e)+	.(3n) =	177.14	(5)
2. Ventilation rate:	-								
Number of chimneys		econdary heating 0 +	other 0	] = [	total 0	x 4	40 =	m <sup>3</sup> per hour	(6a)
Number of open flues	0 +	0 +	- 0	] = [	0	x 2	20 =	0	(6b)
Number of intermittent fan	IS		L		3	x 1	0 =	30	(7a)
Number of passive vents					0	x 1	0 =	0	(7b)
Number of flueless gas fire	es				0	× 4	40 =	0	(7c)
							Air ch	anges per ho	ur
Infiltration due to chimney	s. flues and fans = $($	6a)+(6b)+(7a)+(7	7b)+(7c) =		30		÷ (5) =	0.17	(8)
If a pressurisation test has be				ontinue fro				0.11	
Number of storeys in the	e dwelling (ns)						[	0	(9)
Additional infiltration						[(9)-	1]x0.1 =	0	(10)
Structural infiltration: 0.2 if both types of wall are pre- deducting areas of opening	esent, use the value corre			•	uction		l	0	(11)
If suspended wooden flo	oor, enter 0.2 (unsea	led) or 0.1 (s	ealed), else	enter 0			[	0	(12)
If no draught lobby, ente	er 0.05, else enter 0							0	(13)
Percentage of windows	and doors draught s	tripped						0	(14)
Window infiltration			0.25 - [0.2			(4.5)		0	(15)
Infiltration rate	50		(8) + (10) -					0	(16)
Air permeability value, o If based on air permeabilit		•	•		etre of e	nvelope	area	5	(17)
Air permeability value applies	-				s heina us	ed		0.42	(18)
Number of sides sheltered			a aogroo an por	incubinty k	o bonng uo		[	2	(19)
Shelter factor			(20) = 1 - [	0.075 x (19	9)] =			0.85	(20)
Infiltration rate incorporation	ng shelter factor		(21) = (18)	x (20) =				0.36	(21)
Infiltration rate modified fo	r monthly wind spee	d					•		
Jan Feb I	Mar Apr May	Jun J	ul Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table 7								
(22)m= 5.1 5	4.9 4.4 4.3	3.8 3.	.8 3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22	)m ÷ 4								
(22a)m= 1.27 1.25 1	.23 1.1 1.08	0.95 0.9	95 0.92	1	1.08	1.12	1.18		

Adjust	ed infiltr	ation rat	e (allowi	ng for sł	nelter an	d wind s	speed) =	(21a) x	(22a)m				_		
	0.45	0.45	0.44	0.39	0.38	0.34	0.34	0.33	0.36	0.38	0.4	0.42			
	<i>ate effec</i> echanica		change i	rate for t	he appli	cable ca	se						- 		
			using Appe	ondix N (2	(2b) = (22c)		ocuption (N	(5)) othou	nuico (22h	) = (22a)			0		(23a)
										) = (23a)			0		(23b)
			overy: effici	-	_						001-)	<b>1</b> (00 s)	0		(23c)
			anical ve					HR) (24a	a)m = (22)	20)m + (. 0	23b) × [	1 – (23c) 0	) ÷ 100] ]		(24a)
(24a)m=		-	-	-		-			-	-	Ů	0	J		(24a)
,			anical ve		1		<u> </u>	r , ,	ŕ	, ,	<u>,</u>		1		(24b)
(24b)m=		0	0	0	0	0	0	0	0	0	0	0	J		(240)
,			tract ven (23b), t		•	•				5 × (23b	)		_		
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24c)
,			on or when (24d)		•					0.5]					
(24d)m=	0.6	0.6	0.6	0.58	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59			(24d)
Effe	ctive air	change	rate - en	iter (24a	) or (24b	o) or (24	c) or (24	d) in boy	(25)		-		-		
(25)m=	0.6	0.6	0.6	0.58	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59			(25)
3 He	at losse	s and he	eat loss p	haramet	≏r.								-		
	IENT	Gros		Openin		Net Ar	ea	U-valı	le	AXU		k-value	j.	АX	k
		area	-	n		A ,r		W/m2		(W/I	K)	kJ/m²·l		kJ/k	
Doors						2	x	1	=	2					(26)
Windo	ws Type	91				6.097	7 x1	/[1/( 1.4 )+	0.04] =	8.08					(27)
Windo	ws Type	2				5.107	7 x1	/[1/( 1.4 )+	0.04] =	6.77					(27)
Walls	Type1	35.7	2	11.2	2	24.51	x	0.18	=	4.41					(29)
Walls	Type2	11.	7	2		9.7	x	0.18	=	1.75			$\neg$		(29)
Walls	Туре3	16.7	6	0		16.76	3 x	0.18	 ] = [	3.02	i F		7 7		(29)
Total a	area of e	lements	, m²			64.18	3		·						(31)
			ows, use e sides of in				ated using	formula 1	/[(1/U-valu	e)+0.04] a	as given in	paragraph	ז 3.2		
Fabric	heat los	s, W/K :	= S (A x	U)				(26)(30)	) + (32) =				26.0	3	(33)
Heat c	apacity	Cm = S(	(Axk)						((28)	.(30) + (32	2) + (32a)	(32e) =	713.	73	(34)
Therm	al mass	parame	ter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value:	: Medium		250	)	(35)
	-		ere the de tailed calcu		construct	ion are noi	t known pr	ecisely the	e indicative	values of	TMP in T	able 1f			-
Therm	al bridge	es : S (L	x Y) cale	culated	using Ap	pendix I	<						5.24	4	(36)
if details	s of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)									_
Total f	abric he	at loss							(33) +	(36) =			31.2	27	(37)
Ventila	ation hea	at loss ca	alculated	monthl	y				(38)m	= 0.33 × (	25)m x (5	· · · · · ·	1		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
(38)m=	35.27	35.03	34.8	33.72	33.52	32.58	32.58	32.41	32.94	33.52	33.93	34.36	J		(38)
Heat t	ransfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m				
(39)m=	66.53	66.3	66.07	64.99	64.79	63.85	63.85	63.67	64.21	64.79	65.19	65.62			-
									/	Average =	Sum(39)	12 /12=	64.9	9	(39)

Heat lo	oss para	ameter (H	HLP), W	/m²K					(40)m	= (39)m ÷	· (4)			
(40)m=	0.94	0.94	0.93	0.92	0.91	0.9	0.9	0.9	0.91	0.91	0.92	0.93		
Numbe	er of day	/s in mo	nth (Tab	le 1a)	•		•	•		Average =	Sum(40) <sub>1</sub> .	12 /12=	0.92	(40)
Numbe	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	iter hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF	A > 13.	upancy, 9, N = 1 9, N = 1		([1 - exp	0(-0.0003	849 x (TF	FA -13.9	9)2)] + 0.0	0013 x ( <sup>-</sup>	TFA -13	2. .9)	27		(42)
Reduce	the annua	al average	hot water	usage by		lwelling is	designed	(25 x N) to achieve		se target o		.03		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage i	n litres pei	r day for e	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m=	96.84	93.32	89.8	86.27	82.75	79.23	79.23	82.75	86.27	89.8	93.32	96.84		
_						100					m(44) <sub>112</sub> =		1056.42	(44)
		. <u> </u>	·		· ·			DTm / 3600		· ·			I	
(45)m=	143.61	125.6	129.61	113	108.42	93.56	86.7	99.49	100.67	117.33	128.07	139.08		
lf instant	aneous v	vater heati	ng at poin	t of use (no	o hot water	<sup>r</sup> storage),	enter 0 in	boxes (46		Total = Su	m(45) <sub>112</sub> =	-	1385.13	(45)
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0		(46)
Water	storage	loss:												
Storag	e volum	ne (litres)	) includir	ng any s	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
		-			velling, e			. ,	<b>`</b>	(0) : (	47			
	/ise if no storage		not wate	er (this ir	iciudes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (	47)			
	-		eclared l	loss fact	or is kno	wn (kWł	n/day):					0		(48)
,		actor fro				,						0		(49)
Energy	lost fro	om water	r storage	e, kWh/y	ear			(48) x (49)	) =			0		(50)
•				•	loss fact									
		age loss neating s			le 2 (kW	h/litre/da	ay)					0		(51)
		from Ta		011 4.5								0		(52)
Tempe	rature f	actor fro	m Table	e 2b								0		(53)
Energy	lost fro	om watei	r storage	e, kWh/y	ear			(47) x (51)	) x (52) x (	53) =		0		(54)
Enter	(50) or	(54) in ( <del>5</del>	55)									0		(55)
Water	storage	loss cal	culated	for each	month			((56)m = (	55) × (41)	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contain	s dedicate	d solar sto	orage, (57)	m = (56)m	x [(50) – (	[H11)] ÷ (5	50), else (5	7)m = (56)	m where (	H11) is fro	m Append	lix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	y circuit	loss (ar	nnual) fro	om Table	e 3							0		(58)
Primar	y circuit	loss cal	lculated	for each	month (			65 × (41)					-	
· .	-		1	1		1	r	ng and a	· ·	· · · · · ·	, 		I	<i>i</i> = .
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)

Combi	loss ca	lculated	for ea	ch	month (	(61)m =	(60	)) ÷ 36	65 × (41)	)m								
(61)m=	0	0	0		0	0		0	0	0		0	0	0		0		(61)
Total h	eat req	uired for	water	he	ating ca	alculated	l fo	r eacl	n month	(62)m	า =	0.85 × (	(45)m ·	+ (46)m +	+ (57)	)m +	(59)m + (61)m	
(62)m=	122.07	106.76	110.1	7	96.05	92.16	7	'9.53	73.69	84.5	6	85.57	99.73	108.86	118	8.22		(62)
Solar DH	- W input	calculated	using A	hppe	endix G or	Appendix	(H)	(negativ	ve quantity	/) (ente	r '0'	if no sola	r contrib	ution to wa	ter hea	ating)		
(add a	dditiona	al lines if	FGHF	RS a	and/or V	WWHRS	ap	plies,	, see Ap	pendi	x G	6)					_	
(63)m=	0	0	0		0	0		0	0	0		0	0	0		0		(63)
Output	from w	ater hea	ter															
(64)m=	122.07	106.76	110.1	7	96.05	92.16	7	'9.53	73.69	84.5	6	85.57	99.73	108.86	118	8.22		
			•	-						C	Outp	ut from wa	ater hea	ter (annual)	112		1177.36	(64)
Heat g	ains fro	m water	heatir	ng,	kWh/mo	onth 0.2	5 ′	[0.85	× (45)m	+ (61	)m	] + 0.8 ×	(46)r	n + (57)n	n + (5	59)m	1]	
(65)m=	30.52	26.69	27.5	4	24.01	23.04	1	9.88	18.42	21.1	4	21.39	24.93	27.22	29	.55	1	(65)
inclu	de (57)	m in calo	ulatio	n o	f (65)m	only if c	ylir	nder is	s in the c	dwellir	ngo	or hot w	ater is	from con	nmur	nity h	eating	
	. ,	ains (see			. ,	-					Ū							
		ns (Table																
Melabi	Jan Jan	Feb	, <u>5), w</u> Ma		Apr	May	Γ	Jun	Jul	Au	a	Sep	Oct	Nov	Тг	Dec	1	
(66)m=	113.34	113.34	113.3	-	113.34	113.34	-	13.34	113.34	113.3		113.34	113.34		-	3.34		(66)
		(calcula															I	
(67)m=	9 9ans 18.58	16.5	13.4	<u> </u>	10.16	2, equal 7.59	<u> </u>	6.41	6.93	9.01	- 1	12.09	15.35	17.91	10	9.1	1	(67)
														17.51		5.1	J	(0.)
		tins (calc	r	- T			<b></b>				- 1			477.00		2 40	1	(69)
(68)m=	199.29	201.35	196.1		185.05	171.05		57.88	149.09	147.0		152.23	163.33	3 177.33	190	0.49	J	(68)
		s (calcula		<u> </u>		· ·	<u> </u>				-		· · · · ·				1	(00)
(69)m=	34.33	34.33	34.3		34.33	34.33	3	34.33	34.33	34.3	3	34.33	34.33	34.33	34	.33	J	(69)
Pumps	and fa	ns gains	(Tabl	e 5	a)		-										1	
(70)m=	0	0	0		0	0		0	0	0		0	0	0		0	J	(70)
Losses	s e.g. ev	vaporatic	on (ne	gati	ve valu	es) (Tab	le	5)										
(71)m=	-90.67	-90.67	-90.6	7	-90.67	-90.67	-9	90.67	-90.67	-90.6	67	-90.67	-90.67	-90.67	-90	).67		(71)
Water	heating	gains (T	able \$	5)									-				_	
(72)m=	41.02	39.72	37.0	2	33.35	30.97	2	27.61	24.76	28.4	2	29.71	33.51	37.8	39	.72		(72)
Total i	nterna	gains =	:					(66)	m + (67)m	ı + (68)	m +	(69)m + (	(70)m +	(71)m + (72	2)m			
(73)m=	315.88	314.57	303.5	8	285.56	266.61	2	48.91	237.78	241.4	14	251.03	269.19	9 290.04	306	6.31		(73)
6. Sol	lar gain	s:																
Solar g	ains are	calculated	using s	olar	flux from	Table 6a	and	associ	ated equa	tions to	0 00	nvert to th	e applic	able orienta	ation.			
Orienta		Access F			Area			Flu				g_		FF			Gains	
	-	Table 6d			m²			Tat	ole 6a		Та	able 6b		Table 6c			(W)	
Southe	ast <mark>0.9x</mark>	0.77		x	6.	1	x	3	6.79	x		0.63	x	0.7		=	68.56	(77)
Southe	ast <mark>0.9</mark> x	0.77		x	6.	1	x	6	2.67	x		0.63	x	0.7		=	116.78	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	6.	1	x	8	5.75	x		0.63	x	0.7		=	159.78	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	6.	1	x	1(	06.25	×		0.63	x	0.7		=	197.98	(77)
Southe	ast <mark>0.9x</mark>	0.77		x	6.	1	x	1	19.01	x		0.63	×	0.7		=	221.76	(77)

Southea	ast <mark>0.9x</mark>	0.77	>		6.1		x	1	18.15	x		0.63	x	0.7	=	220.15	(77)
Southea	ast <mark>0.9x</mark>	0.77	)		6.1		x	1	13.91	x		0.63	×	0.7	=	212.25	(77)
Southea	ast <mark>0.9x</mark>	0.77			6.1		x	1	04.39	x		0.63	×	0.7	=	194.51	(77)
Southea	ast <mark>0.9x</mark>	0.77			6.1		x	9	2.85	] x		0.63	× ٦	0.7	= =	173.01	(77)
Southea	ast <mark>0.9x</mark>	0.77	,		6.1		x	6	9.27	] ×		0.63	× ٦	0.7	=	129.07	(77)
Southea	ast <mark>0.9x</mark>	0.77	,		6.1		x	4	4.07	x		0.63	×	0.7	=	82.12	(77)
Southea	ast <mark>0.9x</mark>	0.77	,	Γ	6.1		x	3	1.49	x		0.63	×	0.7	=	58.67	(77)
Northwe	est 0.9x	0.77	)		5.11		x	1	1.28	x		0.63	×	0.7	=	17.61	(81)
Northwe	est 0.9x	0.77	)	Γ	5.11		x	2	2.97	x		0.63	×	0.7	=	35.85	(81)
Northwe	est 0.9x	0.77	,	Γ	5.11		x	4	1.38	x		0.63	×	0.7	=	64.58	(81)
Northwe	est 0.9x	0.77	,	Γ	5.11		x	6	7.96	x		0.63	×	0.7	=	106.06	(81)
Northwe	est 0.9x	0.77	>	Γ	5.11		x	9	1.35	x		0.63	×	0.7	=	142.57	(81)
Northwe	est 0.9x	0.77	)		5.11		x	9	7.38	x		0.63	×	0.7	=	151.99	(81)
Northwe	est 0.9x	0.77	)		5.11		x	9	91.1	x		0.63	×	0.7	=	142.19	(81)
Northwe	est 0.9x	0.77	)	Γ	5.11		x	7	2.63	x		0.63	×	0.7	=	113.35	(81)
Northwe	est 0.9x	0.77	)		5.11		x	5	0.42	x		0.63	×	0.7	=	78.69	(81)
Northwe	est 0.9x	0.77	>	Γ	5.11		x	2	8.07	x		0.63	×	0.7	=	43.81	(81)
Northwe	est 0.9x	0.77	>	Γ	5.11		x		14.2	x		0.63	×	0.7	=	22.16	(81)
Northwe	est 0.9x	0.77	>		5.11		x	9	9.21	x		0.63	×	0.7	=	14.38	(81)
	_			_						-							
Solar c	ains in v	watts, ca	alculate	d fo	or each	mont	h			(83)m	n = Sur	m(74)m	(82)m				
(83)m=	86.17	152.63	224.37	30	04.04	364.32	3	72.15	354.44	307	.87	251.71	172.8	7 104.28	73.05	]	(83)
Total g	ains – ir	nternal a	nd sola	r (8	 34)m =	(73)m	+ (	83)m	, watts	I		I		ļ		1	
(84)m=	402.05	467.2	527.95	5	589.6	630.93	6	21.05	592.22	549	.31	502.74	442.0	6 394.32	379.37	]	(84)
7. Me	an inter	nal temp	berature	(he	eating s	seaso	n)				•					-	
		during h						area	from Tal	ole 9	Th1	(°C)				21	(85)
-		tor for g	_				-				,	( -)					
Cunoc	Jan	Feb	Mar	-	<u> </u>		ТÒ	Jun	Jul			Son	Oct	Nov	Dec	1	
(00)			0.99	-	Apr 0.95	May	_	Jun 0.64	0 47	0.5	ug	Sep	0.97	-		-	(86)
(86)m =	1	1	0.99	1 (	0.95	0.84	1 (	1.04	0.47	1 0.5	0.5 I	0.8	0.97	1 1	1	1	(00)

Total g	ains – ir	nternal a	and solar	<sup>-</sup> (84)m =	- (73)m -	+ (83)m	, watts						1	
(84)m=	402.05	467.2	527.95	589.6	630.93	621.05	592.22	549.31	502.74	442.06	394.32	379.37		(84)
7. Me	an inter	nal temp	perature	(heating	season	)								
Temp	erature	during h	neating p	eriods ir	n the livir	ng area f	from Tab	ole 9, Th	1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for l	iving are	ea, h1,m	(see Ta	ble 9a)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	1	1	0.99	0.95	0.84	0.64	0.47	0.53	0.8	0.97	1	1		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	in Tabl	e 9c)					
(87)m=	20.02	20.17	20.4	20.69	20.9	20.98	21	21	20.94	20.66	20.29	20	ĺ	(87)
Temp	erature	during h	neating p	eriods ir	n rest of	dwelling	from Ta	ble 9, Tl	h2 (°C)				_	
(88)m=	20.13	20.14	20.14	20.15	20.16	20.17	20.17	20.17	20.16	20.16	20.15	20.15		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling, I	h2,m (se	e Table	9a)						
(89)m=	1	0.99	0.98	0.93	0.79	0.56	0.38	0.44	0.73	0.96	0.99	1		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (fo	ollow ste	eps 3 to 7	7 in Tabl	e 9c)				
(90)m=	19.24	19.38	19.61	19.9	20.09	20.16	20.17	20.17	20.13	19.89	19.52	19.22		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.41	(91)
Mean	interna	l temper	ature (fo	r the wh	ole dwe	lling) = fl	_A × T1	+ (1 – fL	.A) × T2					—

								. (	,				_
(92)m=	19.56	19.71	19.94	20.23	20.42	20.5	20.51	20.51	20.47	20.21	19.84	19.55	(92)
													-

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

(93)m=	19.56	19.71	19.94	20.23	20.42	20.5	20.51	20.51	20.47	20.21	19.84	19.55		(93)
8. Spa	ace hea	ting requ	uiremen	t										
				mperatu using Ta		ied at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hr	<u>ו י</u> ו:				<u> </u>	·					
(94)m=	1	0.99	0.98	0.93	0.81	0.6	0.42	0.47	0.76	0.96	0.99	1		(94)
Usefu	l gains,	hmGm	, W = (9	4)m x (84	4)m									
(95)m=	401.05	464.23	518.05	550.83	509.26	369.7	248.98	260.32	380.83	424.4	391.99	378.69		(95)
Month	nly aver	age exte	rnal ter	nperature	e from Ta	able 8					!			
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat I	oss rate	e for mea	an interr	nal tempe	erature,	Lm,W =	- =[(39)m :	x [(93)m	– (96)m	1				
(97)m=	1015.37		887.79	736.13	565.18	376.79	249.7	261.76	408.89	622.42	830.38	1006.98		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k	Nh/mon	h = 0.02	24 x [(97]	)m – (95	)m] x (4	1)m	1		
(98)m=	457.05	347.86	275.09	133.41	41.61	0	0	0	0	147.33	315.64	467.45		
I				1		<u> </u>		Tota	l per year	(kWh/yeai	r) = Sum(9	8)15,912 =	2185.44	(98)
Space	e heatin	g require	ement ir	n kWh/m²	²/year								30.84	(99)
8c Sr	bace co	oling rec	uiremer	nt								L. L		
				August.	See Tal	ole 10b								
Culou	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat I								-	· ·			able 10)		
(100)m=	0	0	0	0	0	600.15	472.46	483.91	0	0	0	0		(100)
Utilisa	ation fac	tor for lo	u Diss hm											
(101)m=	0	0	0	0	0	0.95	0.98	0.97	0	0	0	0		(101)
Usefu	l loss. h	i mLm (V	vatts) =	ı (100)m x	(101)m	I	I	1						
(102)m=	0	0	0	0	0	572.25	463.36	469.86	0	0	0	0		(102)
Gains	(solar (	u aains ca	L Iculated	for appli	cable w	eather re	eaion. se	e Table	L 10)					
(103)m=	0	0	0	0	0	810.47	775.08	726.41	0	0	0	0		(103)
•						lwelling,	continue	ous ( kW	(h) = 0.0	24 x [(10	) 03)m – (	102)m]>	(41)m	
set (1 (104)m=	04)11110		0	< 3 × (98	0	171.52	231.93	190.87	0	0	0	0		
(104)11=	0	0	0	0	0	171.52	231.93	190.87				L		
Cooled	l fractio	0								= Sum(	area ÷ (4	=	594.31	(104) (105)
		actor (Ta	ahle 10h						10 -	cooleu	aiea <del>-</del> (-	+) -	1	(103)
(106)m=	0			0	0	0.25	0.25	0.25	0	0	0	0		
(,	-	-								' = Sum(		=	0	(106)
Space	coolina	requirer	nent for	month =	= (104)m	× (105)	× (106)r	n	10101	- Ourri	1608 17	- I		
(107)m=	0	0	0	0	0	42.88	57.98	47.72	0	0	0	0		
			I	I	I	<u> </u>	<u> </u>		Total	= Sum(	107)	=	148.58	(107)
Space	cooling	requirer	ment in l	kWh/m²/y	year				(107)	÷ (4) =			2.1	(108)
8f. Fab	ric Ene	rgy Effici	iency ( <u>c</u>	alculated	l only un	der spec	cial cond	litions, s	ee sectic	on 11) _				
Fabric	Energ	y Efficier	псу						(99) -	+ (108) =	=		32.94	(109)
Targe	et Fabri	c Energ	y Efficie	ency (TF	EE)							ĺ	37.88	(109)

			User D	etails:						
Assessor Name:	Zahid Ashraf			Stroma	a Num	ber:		STRO	001082	
Software Name:	Stroma FSAP	2012		Softwa	are Ver	sion:		Versio	on: 1.0.5.9	
		Р	roperty /	Address:	Plot 32					
Address :										
1. Overall dwelling dimer	nsions:									
Ground floor				<b>a(m²)</b> 0.86	(1a) x	Av. Hei	i <b>ght(m)</b>	(2a) =	Volume(m <sup>3</sup> )	(3a)
Total floor area TFA = (1a	)+(1b)+(1c)+(1d)	+(1e)+(1r			(4)			]		
Dwelling volume	/ -/ ( -/ ( -/		, <u> </u>	0.00		+(3c)+(3d	)+(3e)+	.(3n) =	177.14	(5)
2. Ventilation rate:								l		
2. Vontilation rate.	main	secondar	у	other		total			m <sup>3</sup> per hour	
Number of chimneys	heating	heating <sup>▶</sup> 0	] + [	0	] = [	0	x 4	40 =	0	(6a)
Number of open flues	0	• 0	_ + _	0	] = [	0	x 2	20 =	0	(6b)
Number of intermittent far	IS				- Ē	0	<b>x</b> 1	0 =	0	(7a)
Number of passive vents					Ē	0	x 1	0 =	0	(7b)
Number of flueless gas fir	es				Γ	0	x 4	40 =	0	(7c)
					_			A : a b		
					_			Air ch	anges per ho	ur –
Infiltration due to chimney If a pressurisation test has be					continue fro	0 0 (9) to (		÷ (5) =	0	(8)
Number of storeys in the		ionaca, procee	<i>u to (11),</i> c			5111 (0) 10 (	10)		0	(9)
Additional infiltration							[(9)-	1]x0.1 =	0	(10)
Structural infiltration: 0.2	25 for steel or tim	ber frame or	0.35 for	masonr	y constr	uction			0	(11)
if both types of wall are pre deducting areas of opening			the great	er wall area	a (after					
If suspended wooden flo	oor, enter 0.2 (un	sealed) or 0	.1 (seale	d), else	enter 0				0	(12)
If no draught lobby, ente	er 0.05, else ente	r 0							0	(13)
Percentage of windows	and doors draug	ht stripped							0	(14)
Window infiltration				0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)
Infiltration rate				(8) + (10) ·	+ (11) + (1	2) + (13) +	+ (15) =		0	(16)
Air permeability value, o			•	•	•	etre of e	nvelope	area	3	(17)
If based on air permeabilit	-								0.15	(18)
Air permeability value applies Number of sides sheltered		st has been dor	ie or a deg	gree air pei	rmeability i	is being us	sed	ĺ		
Shelter factor	L			(20) = 1 - [	0.075 x (1	9)] =			2 0.85	(19) (20)
Infiltration rate incorporation	ng shelter factor			(21) = (18)					0.03	(21)
Infiltration rate modified fo	0	beed							0.10	
		lay Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table 7								-	
(22)m= 5.1 5	4.9 4.4 4	3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22	)m - 4									
	, 	0.95	0.95	0.92	1	1.08	1.12	1.18		
L I I										

Adjust	ed infiltra	ation rat	e (allowi	ng for sł	nelter an	d wind s	peed) =	(21a) x	(22a)m						
	0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15			
	ate effecter echanica		•	rate for t	he appli	cable ca	se								
				andix N (2	3h) - (23a	a) x Emv (e	auation (I	N5)), othe	nvice (23b	) - (232)				.5	(23a)
			0 11		, (	, ,	• •	,, .		) = (23a)				.5	(23b)
			-	-	-			n Table 4h			006)	<b>1</b> (00 -)		.05	(23c)
		0.26	0.26	0.25	0.24	at recove		HR) (24a	a)m = (22)	2D)m + (. 0.24	23D) × [ 0.25	1 – (23c) 0.25	÷ 100] I		(24a)
(24a)m=												0.25			(24a)
,			· · · · · ·	· · · · · ·		· · · · · ·	<u> </u>	ИV) (24b	ŕ	, ,	· · · · · · · · · · · · · · · · · · ·		1		(24b)
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0			(240)
					•	•		on from c c) = (22b		5 × (23b	)	-			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24c)
,					•	•		on from l 0.5 + [(2		0.5]					
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24d)
Effe	ctive air	change	rate - er	nter (24a	) or (24t	o) or (24	c) or (24	d) in boy	x (25)						
(25)m=	0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25			(25)
3 He	at losse	s and he	at loss r	naramet	⊃r.								-		
	IENT	Gros		Openin		Net Ar	ea	U-valı	ue	AXU		k-value	<del>)</del>	АX	( k
		area		n		A ,r		W/m2		(W/I	<b>&lt;</b> )	kJ/m²·l		kJ/l	
Doors						2	x	1.4	=	2.8					(26)
Windo	ws Type	e 1				6.097	7 x1	/[1/( 1.4 )+	0.04] =	8.08					(27)
Windo	ws Type	2				5.107	7 x1	/[1/( 1.4 )+	0.04] =	6.77					(27)
Walls <sup>•</sup>	Type1	35.7	<b>′</b> 2	11.2	2	24.51	x	0.15		3.68	ן ר				(29)
Walls	Type2	11.	7	2		9.7	x	0.14	; = [	1.37	i F		ז ר		(29)
Walls	ТуреЗ	16.7	76	0		16.76	3 X	0.13		2.22	i F		i r		(29)
Total a	area of e	lements	, m²			64.18	3		I				L		(31)
* for win		roof wind	ows, use e			alue calcul		formula 1	/[(1/U-valu	e)+0.04] a	ns given in	n paragraph	n 3.2		. ,
	heat los							(26)(30)	) + (32) =				24	.92	(33)
	apacity			,					((28)	.(30) + (32	2) + (32a).	(32e) =		3.73	(34)
	al mass		. ,		- TFA) ir	n kJ/m²K			Indica	tive Value:	: Low			00	(35)
For des		sments wh	ere the de	tails of the	,			ecisely the	e indicative	values of	TMP in T	able 1f			
Therm	al bridge	es : S (L	x Y) cal	culated	using Ap	pendix I	<						6.	81	(36)
if details	s of therma	al bridging	are not kn	iown (36) =	= 0.05 x (3	1)									
Total f	abric he	at loss							(33) +	(36) =			31	.73	(37)
Ventila	ation hea	at loss ca	alculated	monthl	/				(38)m	= 0.33 × (	25)m x (5	)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
(38)m=	15.63	15.44	15.25	14.32	14.14	13.2	13.2	13.02	13.58	14.14	14.51	14.88			(38)
Heat t	ransfer c	coefficier	nt, W/K						(39)m	= (37) + (3	38)m		_		
(39)m=	47.35	47.17	46.98	46.05	45.86	44.93	44.93	44.75	45.3	45.86	46.24	46.61			_
									/	Average =	Sum(39)	12 <b>/12=</b>	4	16	(39)

Heat lo	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	0.67	0.67	0.66	0.65	0.65	0.63	0.63	0.63	0.64	0.65	0.65	0.66		
Numb	er of day		nth (Tab	le 12)					,	Average =	Sum(40)1.	.12 /12=	0.65	(40)
Numbe	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
. ,														
4. Wa	ater heat	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF				: [1 - exp	0(-0.0003	849 x (TF	FA -13.9	)2)] + 0.(	0013 x ( <sup>-</sup>	TFA -13		27		(42)
Reduce	the annua	al average	hot water	usage by	es per da 5% if the a vater use, l	welling is	designed			se target o		.67		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat	er usage ii	n litres pei	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m=	101.93	98.23	94.52	90.81	87.11	83.4	83.4	87.11	90.81	94.52	98.23	101.93		<b>-</b>
Energy	content of	hot water	used - cal	culated m	onthly $= 4$ .	190 x Vd,r	m x nm x [	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1		1112.02	(44)
(45)m=	151.17	132.21	136.43	118.94	114.13	98.48	91.26	104.72	105.97	123.5	134.81	146.4		
lf instan	taneous w	ater heati	na at point	t of use (no	o hot water	storage).	enter 0 in	boxes (46		Total = Su	m(45) <sub>112</sub> =		1458.03	(45)
(46)m=	22.67	19.83	20.46	17.84	17.12	14.77	13.69	15.71	15.9	18.53	20.22	21.96		(46)
· · ·	storage			_										
Storag	e volum	e (litres)	) includir	ng any se	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
	•	•			velling, e			```	ora) ont	or (0) in (	(47)			
	storage		not wate	er (uns n	ncludes i	instantial			ers) erne		(47)			
	•		eclared I	oss facto	or is kno	wn (kWł	n/day):					C		(48)
Tempe	erature f	actor fro	m Table	2b								C		(49)
			-	, kWh/y				(48) x (49)	) =		1	10		(50)
,					loss fact le 2 (kWl						0.	02		(51)
		-	ee secti			1, nu o, uo	· <b>J</b> /				0.	02		(01)
Volum	e factor	from Ta	ble 2a								1.	03		(52)
Tempe	erature f	actor fro	m Table	2b							0	.6		(53)
			-	e, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		03		(54)
	. ,	(54) in (5		faraab				((50)			1.	03		(55)
			<b></b>	for each			1	((56)m = (						(50)
(56)m= If cylinde	32.01 er contains	28.92 s dedicate	32.01 d solar sto	30.98 rage, (57)	32.01 m = (56)m	30.98 x [(50) – (	32.01 H11)] ÷ (5	32.01 0), else (5	30.98 7)m = (56)	32.01 m where (	30.98 H11) is fro	32.01 m Append	ix H	(56)
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primar	v circuit	loss (ar	nual) fro	om Table	• 3							)		(58)
Primar	y circuit	loss cal	culated	for each	month (		. ,	. ,						
•		-	r	r	here is s			- <u>-</u>	· ·	1	, 	00.00		(50)
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi	loss ca	alculated	for eac	h month	(61)m =	(60)	÷ 365 × (4	41)m							
(61)m=	0	0	0	0	0		0 0		0	0	0	0	0	]	(61)
Total h	eat rec	uired for	water h	eating c	alculated	d for	each mon	th (62	2)m =	0.85 ×	(45)m +	(46)m +	(57)m +	- (59)m + (61)m	
(62)m=	206.44	182.14	191.71	172.44	169.41	15	1.98 146.5	4 1	60	159.47	178.78	188.31	201.67	]	(62)
Solar DI	-IW input	calculated	using Ap	pendix G o	r Appendix	cH(r	negative quar	ntity) (er	nter '0	' if no sola	r contribu	ition to wate	er heating)	)	
(add a	dditiona	al lines if	FGHRS	S and/or	WWHRS	S ap	plies, see /	Appen	ndix (	G)					
(63)m=	0	0	0	0	0		0 0		0	0	0	0	0	]	(63)
Output	from w	vater hea	ter												
(64)m=	206.44	182.14	191.71	172.44	169.41	15	1.98 146.5	4 1	60	159.47	178.78	188.31	201.67	]	
					•				Out	out from w	ater heate	er (annual)	112	2108.87	(64)
Heat g	ains fro	m water	heating	ı, kWh/m	onth 0.2	5 ´ [	0.85 × (45)	)m + (	61)n	n] + 0.8 x	k [(46)m	n + (57)m	+ (59)m	ו ]	
(65)m=	94.48	83.9	89.58	82.34	82.17	75	5.54 74.57	7 79	9.04	78.03	85.29	87.62	92.9	]	(65)
inclu	ide (57)	)m in calo	culation	of (65)m	only if c	ylin	der is in th	e dwe	lling	or hot w	ater is f	from com	munity h	neating	
5. Int	ternal o	ains (see	e Table	5 and 5a	):				-				-	-	
		ns (Table			/										
metab	Jan	Feb	Mar	Apr	May		lun Jul		Aug	Sep	Oct	Nov	Dec	]	
(66)m=	136	136	136	136	136		36 136		36	136	136	136	136		(66)
Liahtin	a aains	(calcula	ted in A	 .ppendix	L. equat	ion	L9 or L9a)	also	see	Table 5	I	1	L	1	
(67)m=	46.45	41.25	33.55	25.4	18.99	1	6.03 17.32		2.51	30.22	38.37	44.78	47.74	1	(67)
		1	l ulated i	n Appen	l dixlea	L Uati	on L13 or l	13a)	also	i See Ta	l ble 5		ļ	1	
(68)m=	297.44	300.53	292.75	276.19	255.29	r –	5.65 222.5	<u>_</u>	9.44	227.21	243.77	264.67	284.32	1	(68)
							L15 or L15					1		]	
(69)m=	50.87	50.87	50.87	50.87	50.87	-	0.87 50.87	<u> </u>	).87	50.87	50.87	50.87	50.87	1	(69)
					00.01					00.01	00.07	00.01	00.01	]	()
(70)m=		ins gains		5a)	0	<u> </u>	0 0		0	0	0	0	0	1	(70)
									0	0	0	0	0	]	(10)
	<u> </u>	vaporatic	-90.67	T	<u>, , ,</u>	r –	<u> </u>	7 0	0.67	00.67	-90.67	-90.67	-90.67	1	(71)
(71)m=	-90.67			-90.67	-90.67	-9	0.67 -90.6	/ -90	0.67	-90.67	-90.67	-90.67	-90.67	]	(71)
		gains (T	· · · ·	-					0.04	100.00		1 4 9 4 9 9		1	(70)
(72)m=	127	124.85	120.41	114.37	110.44	10	4.92 100.2		6.24	108.38	114.63		124.86	]	(72)
		I gains =	i			<u> </u>	(66)m + (67	<u> </u>	,	· <i>`</i>		1		1	(70)
(73)m=	567.09	1	542.91	512.16	480.92	45	52.8 436.2	7 44	4.39	462.01	492.97	527.35	553.12	J	(73)
	lar gain			or flux from	Tabla 6a	and	associated ec	untions	e to cr	powert to th		blo oriontai	tion		
-		Access F	•	Area		anu	Flux	Juations	5 10 00		ie applica	FF	uon.	Gains	
Onenta		Table 6d		m <sup>2</sup>	L		Table 6a		Т	g_ able 6b	٦	Table 6c		(W)	
Southe	ast <mark>0.9x</mark>	0.77			4	. Г	36.79	<b>_</b> _	_	0.62	<b></b> _г	0.7	=	. ,	(77)
	ast 0.9x	0.77	`			×L				0.63		0.7		68.56	-
	ast 0.9x	0.77	`			×L	62.67		-	0.63		0.7		116.78	(77)
	ast 0.9x	0.77	`			×	85.75			0.63		0.7	=	159.78	(77)
		0.77	`				106.25	×		0.63		0.7	=	197.98	(77)
Sourie	ast <mark>0.9x</mark>	0.77	>	6	.1	x	119.01	X		0.63	X	0.7	=	221.76	(77)

	$butheast_{0.9x} 0.77 \times 6.1 \times 118.15 \times 0.63 \times 0.77 = 220.15 $ (77)																
Southea	ast <mark>0.9x</mark>	0.77	X	6	.1	x	1	18.15	x		0.63	_ × [	0.7	=		220.15	(77)
Southea	ast <mark>0.9x</mark>	0.77	x	6	.1	x	1	13.91	x		0.63	×	0.7	=		212.25	(77)
Southea	ast <mark>0.9x</mark>	0.77	×	6	.1	x	1	04.39	x		0.63	_ × [	0.7		Ē	194.51	(77)
Southea	ast <mark>0.9x</mark>	0.77	×	6	.1	x	g	2.85	×		0.63	_ × [	0.7	=		173.01	(77)
Southea	ast <mark>0.9x</mark>	0.77	×	6	.1	x	6	9.27	x		0.63	] × [	0.7		Ē	129.07	(77)
Southea	ast <mark>0.9x</mark>	0.77	×	6	.1	x	4	4.07	x		0.63		0.7	<b>-</b>	Ē	82.12	(77)
Southea	ast <mark>0.9x</mark>	0.77	×	6	.1	x	3	1.49	x		0.63	_ × [	0.7	= -	Ē	58.67	(77)
Northwe	est <mark>0.9x</mark>	0.77	×	5.	11	x	1	1.28	x		0.63	_ × [	0.7			17.61	(81)
Northwe	est <mark>0.9x</mark>	0.77	×	5.	11	x	2	2.97	x		0.63	_ × [	0.7	<b>-</b>	Ē	35.85	(81)
Northwe	est <mark>0.9x</mark>	0.77	×	5.	11	x	4	1.38	x		0.63	_ × [	0.7	= -	Ē	64.58	(81)
Northwe	est <mark>0.9x</mark>	0.77	×	5.	11	x	6	57.96	x		0.63	_ × [	0.7	= -		106.06	(81)
Northwe	est <mark>0.9x</mark>	0.77	×	5.	11	x	g	1.35	x		0.63	_ × [	0.7	=	Γ	142.57	(81)
Northwe	est <mark>0.9x</mark>	0.77	×	5.	11	x	g	7.38	×		0.63	_ × [	0.7	=		151.99	(81)
Northwe	est <mark>0.9x</mark>	0.77	×	5.	11	x	9	91.1	x		0.63	_ x [	0.7	=		142.19	(81)
Northwe	est <mark>0.9x</mark>	0.77	x	5.	11	x	7	2.63	x		0.63	x	0.7	=		113.35	(81)
Northwe	orthwest 0.9x 0.77 x 5.11 x 50.42 x 0.63 x 0.7 =											78.69	(81)				
Northwe	est <mark>0.9x</mark>	0.77	x	5.	11	x	2	8.07	x		0.63	×	0.7	=		43.81	(81)
Northwe	est <mark>0.9x</mark>	0.77	×	5.	11	x		14.2	x		0.63	_ × [	0.7	=		22.16	(81)
Northwe	est <mark>0.9x</mark>	0.77	×	5.	11	x	9	9.21	×		0.63	_ × [	0.7	=		14.38	(81)
Solar g	ains in	watts, ca	alculate	d for eac	h month	1		-	(83)m	n = Su	m(74)m	(82)m	-		_		
(83)m=	86.17	152.63	224.37	304.04	364.32	3	72.15	354.44	307	.87	251.71	172.87	104.28	73.05			(83)
Total g	ains – i	nternal a	and sola	r (84)m	= (73)m	+ (8	83)m	, watts	_				-		_		
(84)m=	653.26	715.47	767.28	816.2	845.25	8	24.94	790.7	752	.26	713.72	665.85	631.63	626.18	3		(84)
7. Me	an inter	nal temp	perature	(heating	g seasor	ר)											
Temp	erature	during h	neating	periods i	n the livi	ing	area	from Tab	ole 9	, Th1	(°C)				Г	21	(85)
-		ctor for g	•			-				,	( )						
Cunce	Jan	Feb	Mar	Apr	May	T	Jun	Jul	A	ug	Sep	Oct	Nov	Dec			
(86)m=         0.86         0.81         0.74         0.62         0.49         0.34         0.25									0.2	-	0.43	0.65	0.8	0.87			(86)
	interne																
1		l temper	r		· · ·	-		i	r	- T		00.00	00.50	00.00			(97)
(87)m= 20.3 20.46 20.66 20.85 20.95 20.99 21 21 20.98 20.86 20.58 20.28												(87)					
· · · ·		during h	· · · · ·	1	r	-		i	r	- T	<u> </u>				_		
(88)m=	20.37	20.37	20.37	20.39	20.39	2	20.4	20.4	20	.4	20.39	20.39	20.38	20.38			(88)
						1.0	/		0-1								

Utilisa	ation fac	tor for g	ains for	rest of d	welling, l	h2,m (se	e Table	9a)					
(89)m=	0.85	0.8	0.72	0.6	0.46	0.31	0.22	0.24	0.39	0.62	0.78	0.86	(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (fo	ollow ste	ps 3 to 7	7 in Tabl	e 9c)			
													(00)

$fLA = Living area \div (4) = 0.41$	
	(91)

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

(92)m=	19.8	20	20.24	20.47	20.59	20.64	20.65	20.65	20.62	20.48	20.15	19.77	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

	<b>-</b>
(93)m=         19.8         20         20.24         20.47         20.59         20.64         20.65         20.62         20.48         20.15         19.77	(93)
8. Space heating requirement	
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-c the utilisation factor for gains using Table 9a	liculate
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov De	
Utilisation factor for gains, hm:	
(94)m= 0.83 0.79 0.72 0.6 0.47 0.33 0.23 0.25 0.41 0.62 0.77 0.85	(94)
Useful gains, hmGm , W = (94)m x (84)m	_
(95)m= 544.71 564.53 551.06 491.96 394.74 269.03 181.39 189.42 289.91 414.57 489.4 530.0	(95)
Monthly average external temperature from Table 8	_
(96)m=         4.3         4.9         6.5         8.9         11.7         14.6         16.6         16.4         14.1         10.6         7.1         4.2	(96)
Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m– (96)m ]	
(97)m= 734.08 712.15 645.49 533.02 407.77 271.37 181.83 190.05 295.56 453.35 603.45 725.8	. (97)
Space heating requirement for each month, kWh/month = $0.024 \times [(97)m - (95)m] \times (41)m$	
(98)m= 140.89 99.2 70.26 29.57 9.69 0 0 0 0 28.86 82.12 145.6	
Total per year (kWh/year) = Sum(98) <sub>15912</sub>	= 606.28 (98)
Space heating requirement in kWh/m²/year	8.56 (99)
9b. Energy requirements – Community heating scheme	
This part is used for space heating, space cooling or water heating provided by a community scheme.	
Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none	0 (301)
Fraction of space heat from community system $1 - (301) =$	1 (302)
The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources	; the latter
includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C. Fraction of heat from Community boilers	1 (303a)
Fraction of total space heat from Community boilers (302) x (303a) =	
Factor for control and charging method (Table 4c(3)) for community heating system	1 (305)
Distribution loss factor (Table 12c) for community heating system	1.05 (306)
Space heating	kWh/year
Annual space heating requirement	606.28
Space heat from Community boilers(98) x (304a) x (305) x (306) =	636.59 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0 (308
Space heating requirement from secondary/supplementary system $(98) \times (301) \times 100 \div (308) =$	0 (309)
Water heating	
Annual water heating requirement	2108.87
If DHW from community scheme:	
Water heat from Community boilers $(64) \times (303a) \times (305) \times (306) =$	2214.31 (310a)
Electricity used for heat distribution $0.01 \times [(307a)(307e) + (310a)(310e)]$	28.51 (313)
Cooling System Energy Efficiency Ratio	0 (314)
Space cooling (if there is a fixed cooling system, if not enter 0) $= (107) \div (314) =$	
	0 (315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside	0 (315) 245.83 (330a)

warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/	/year	=(330a) + (330b) + (330g) =	245.83	(331)
Energy for lighting (calculated in Ap	ppendix L)		328.11	(332)
Electricity generated by PVs (Appel	ndix M) (negative quantity)		-716.31	(333)
Electricity generated by wind turbin	e (Appendix M) (negative quantity)		0	(334)
10b. Fuel costs – Community heat	ting scheme			
	<b>Fuel</b> kWh/year	<b>Fuel Price</b> (Table 12)	<b>Fuel Cost</b> £/year	
Space heating from CHP	(307a) x	4.24 × 0.0	1 = 26.99	(340a)
Water heating from CHP	(310a) x	4.24 × 0.0	1 = 93.89	(342a)
		Fuel Price		_
Pumps and fans	(331)	13.19 × 0.0	1 = 32.42	(349)
Energy for lighting	(332)	13.19 × 0.0	1 = 43.28	(350)
Additional standing charges (Table	12)		120	(351)
Energy saving/generation technolog Total energy cost	= (340a)(342e) + (345)(354) =		316.58	(355)
11b. SAP rating - Community heat	ting scheme			
Energy cost deflator (Table 12)			0.42	(356)
Energy cost factor (ECF)	[(355) x (356)] ÷ [(4) + 45.0] =		1.15	(357)
SAP rating (section12)			83.99	(358)
12b. CO2 Emissions – Community		nergy Emission fact	tor Emissions	
		Wh/year kg CO2/kWh	kg CO2/year	
CO2 from other sources of space a Efficiency of heat source 1 (%)	<b>U</b> ( )	els repeat (363) to (366) for the second	d fuel 94	(367a)
CO2 associated with heat source 1	[(307b)+(310b)]	x 100 ÷ (367b) x 0.22	= 655.1	(367)
Electrical energy for heat distributio	on [(313) x	0.52	= 14.8	(372)
Total CO2 associated with commun	nity systems (363)	(366) + (368)(372)	= 669.9	(373)
CO2 associated with space heating	g (secondary) (309) x	0	= 0	(374)
CO2 associated with water from im	mersion heater or instantaneous he	eater (312) x 0.22	= 0	(375)
Total CO2 associated with space a	nd water heating (373) +	(374) + (375) =	669.9	(376)
CO2 associated with electricity for p	pumps and fans within dwelling (3	31)) x 0.52	= 127.58	(378)
CO2 associated with electricity for I	lighting (332))) ;	x 0.52	= 170.29	(379)
Energy saving/generation technolog	gies (333) to (334) as applicable	0.52 × 0.0	1 =	(380)
Total CO2, kg/year	sum of (376)(382) =		596	(383)

Dwelling CO2 Emission Rate (383) ÷ (4) =				8.41	(384)
El rating (section 14)				93.11	(385)
13b. Primary Energy – Community heating scheme					
	Energy kWh/year	Primary factor		Energy Vh/year	
Energy from other sources of space and water heating ( Efficiency of heat source 1 (%) If there is 0	not CHP) CHP using two fuels repeat (363) to	(366) for the second	d fuel	94	(367a)
Energy associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x	1.22	=	3700.11	(367)
Electrical energy for heat distribution	[(313) x		=	87.52	(372)
Total Energy associated with community systems	(363)(366) + (368)(37	2)	=	3787.63	(373)
if it is negative set (373) to zero (unless specified othe	rwise, see C7 in Appendix C	C)		3787.63	(373)
Energy associated with space heating (secondary)	(309) x	0	=	0	(374)
Energy associated with water from immersion heater or i	instantaneous heater(312) x	1.22	=	0	(375)
Total Energy associated with space and water heating	(373) + (374) + (375) =			3787.63	(376)
Energy associated with space cooling	(315) x	3.07	=	0	(377)
Energy associated with electricity for pumps and fans wi	thin dwelling (331)) x	3.07	=	754.69	(378)
Energy associated with electricity for lighting	(332))) x	3.07	=	1007.3	(379)
Energy saving/generation technologies Item 1		3.07 × 0.0	1 =	-2199.08	(380)
Total Primary Energy, kWh/year sum	of (376)(382) =			3350.54	(383)

			User D	etails:						
Assessor Name:	Zahid Ashraf			Strom	a Num	ber:		STRO	001082	
Software Name:	Stroma FSAP	2012		Softwa				Versic	on: 1.0.5.9	
		Р	roperty /	Address:	Plot 32					
Address :										
1. Overall dwelling dimer	nsions:									
0 14				a(m²)			ight(m)	-	Volume(m <sup>3</sup> )	
Ground floor			7	0.86	(1a) x	2	2.5	(2a) =	177.14	(3a)
Total floor area TFA = (1a	)+(1b)+(1c)+(1d)	+(1e)+(1r	I) 7	0.86	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	.(3n) =	177.14	(5)
2. Ventilation rate:										
	main heating	secondar heating	У	other		total			m <sup>3</sup> per hou	٢
Number of chimneys		+ 0	+	0	] = [	0	X	40 =	0	(6a)
Number of open flues	0	+ 0	<u> </u> + [	0	-   =	0	x	20 =	0	(6b)
Number of intermittent far	IS					3	x	10 =	30	(7a)
Number of passive vents						0	x ·	10 =	0	(7b)
Number of flueless gas fir	es					0	x.	40 =	0	(7c)
i de la						0			0	
								Air ch	anges per ho	ur
Infiltration due to chimney	s, flues and fans	= (6a)+(6b)+(7	a)+(7b)+(	7c) =		30		÷ (5) =	0.17	(8)
If a pressurisation test has be		tended, procee	d to (17), c	otherwise o	continue fro	om (9) to (	(16)			_
Number of storeys in th	e dwelling (ns)								0	(9)
Additional infiltration Structural infiltration: 0.2	25 for stool or tim	hor framo or	0.25 for	macan	av constr	uction	[(9)	-1]x0.1 =	0	(10)
if both types of wall are pre deducting areas of opening	esent, use the value c	orresponding to			•	uction			0	(11)
If suspended wooden fl			1 (seale	d), else	enter 0				0	(12)
If no draught lobby, ente	er 0.05, else ente	er O							0	(13)
Percentage of windows	and doors draug	ht stripped							0	(14)
Window infiltration				0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)
Infiltration rate				(8) + (10)					0	(16)
Air permeability value, o			•	•	•	etre of e	envelope	area	5	(17)
If based on air permeabilit	-					:			0.42	(18)
Air permeability value applies Number of sides sheltered		st nas been don	e or a deg	ree air pei	rmeability	is being u	sea		2	(19)
Shelter factor	A			(20) = 1 -	[0.075 x (1	9)] =			0.85	(13)
Infiltration rate incorporati	ng shelter factor			(21) = (18)	) x (20) =				0.36	(21)
Infiltration rate modified for	r monthly wind s	peed								_
Jan Feb I	Var Apr N	/lay Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table 7									
(22)m= 5.1 5	4.9 4.4 4	.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22	)m ÷ 4									
		08 0.95	0.95	0.92	1	1.08	1.12	1.18		
	I	I					I	I	I	

Adjust	ed infiltra	ation rat	e (allowi	ng for sł	nelter an	d wind s	peed) =	(21a) x	(22a)m						
	0.45	0.45	0.44	0.39	0.38	0.34	0.34	0.33	0.36	0.38	0.4	0.42			
			change i	rate for t	he appli	cable ca	se			-			-		
	echanica		using Appe	ondix N (2	(2b) = (22c)		austion (	(5)) othou	nuico (22h	) = (22a)			0		(23a)
										) = (23a)			0		(23b)
			overy: effici	-	-					<b>)</b>	006)	4 (00-)	0		(23c)
			i		i	i	<u> </u>	1	1	<u> </u>	· -	1 – (23c)	÷ 100] I		(24a)
(24a)m=		0	0	0	0	0	0	0	0	0	0	0			(24d)
,			anical ve		1	1	· · · · ·	r í í	í .	r í	, 		1		(0.41)
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24b)
,			tract ven < (23b), t		•	•				5 × (23b	))				
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24c)
,			on or wh en (24d)							0.5]					
(24d)m=	0.6	0.6	0.6	0.58	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59			(24d)
Effe	ctive air	change	rate - er	iter (24a	) or (24t	o) or (24	c) or (24	d) in boy	(25)			•			
(25)m=	0.6	0.6	0.6	0.58	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59			(25)
2 40	at locco	e and he	eat loss p	aramat	or:							•			
ELEN		Gros		Openin		Net Ar	62	U-valı		AXU		k-value	3	АX	' k
		area		m		A,r		W/m2		(W/I	K)	kJ/m²-ł		kJ/ł	
Doors						2	x	1	=	2					(26)
Windo	ws Type	e 1				6.097	, x1,	/[1/( 1.4 )+	0.04] =	8.08	=				(27)
Windo	ws Type	2				5.107	, x1	/[1/( 1.4 )+	0.04] =	6.77	=				(27)
Walls	Type1	35.7	2	11.2	2	24.51	x	0.18	] = [	4.41	= 				(29)
Walls	Type2	11.	7	2		9.7	×	0.18		1.75	= i		<b>i</b> F		](29)
Walls <sup>-</sup>	ТуреЗ	16.7		0	=	16.76	<b>x</b>	0.18	=	3.02	= i		<b>i</b> F		](29)
	area of e					64.18			[		L				(31)
				ffective wi	ndow U-va			ı formula 1,	/[(1/U-valu	ie)+0.04] a	as given in	paragraph	3.2		(0.)
			sides of in				0			<i>,</i> .	0	, , ,			
Fabric	heat los	s, W/K :	= S (A x	U)				(26)(30)	+ (32) =				26.0	)3	(33)
Heat c	apacity	Cm = S(	(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	713.	73	(34)
Therm	al mass	parame	ter (TMF	P = Cm -	<del>:</del> TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		25	0	(35)
	-		ere the de tailed calcu		construct	ion are noi	t known pr	ecisely the	e indicative	values of	TMP in T	able 1f			
Therm	al bridge	es : S (L	x Y) cal	culated	using Ap	pendix l	<						5.2	4	(36)
if details	s of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)									
Total fa	abric he	at loss							(33) +	(36) =			31.2	27	(37)
Ventila	ation hea	at loss ca	alculated	monthl	y				(38)m	= 0.33 × (	25)m x (5	)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
(38)m=	35.27	35.03	34.8	33.72	33.52	32.58	32.58	32.41	32.94	33.52	33.93	34.36			(38)
Heat tr	ransfer c	coefficier	nt, W/K						(39)m	= (37) + (3	38)m				
(39)m=	66.53	66.3	66.07	64.99	64.79	63.85	63.85	63.67	64.21	64.79	65.19	65.62			
										Average =	Sum(39)1	12 /12=	64.9	<del>)</del> 9	(39)

Heat lo	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	· (4)			
(40)m=	0.94	0.94	0.93	0.92	0.91	0.9	0.9	0.9	0.91	0.91	0.92	0.93		
Numb			nth (Tab					<b>I</b>	,	Average =	Sum(40) <sub>1.</sub>	12 /12=	0.92	(40)
NULLD	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
()	0.													~ /
4. Wa	ater heat	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF				: [1 - exp	0(-0.0003	849 x (TF	FA -13.9	)2)] + 0.(	0013 x ( <sup>-</sup>	ΓFA -13.		27		(42)
Reduce	the annua	al average	hot water	usage by		lwelling is	designed	(25 x N) to achieve		se target o		.03		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat	er usage i	n litres pei	r day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m=	96.84	93.32	89.8	86.27	82.75	79.23	79.23	82.75	86.27	89.8	93.32	96.84		
Energy	content of	hot water	used - cal	culated m	onthly = 4.	190 x Vd,r	m x nm x [	OTm / 3600			m(44) <sub>112</sub> = ables 1b, 1	L	1056.42	(44)
(45)m=	143.61	125.6	129.61	113	108.42	93.56	86.7	99.49	100.67	117.33	128.07	139.08		
lf incton	tonoquo u	votor hooti	ng of point	t of upp (n		, otorogo)	ontor 0 in	hoven (46		Total = Su	m(45) <sub>112</sub> =	-	1385.13	(45)
			· ·		1			boxes (46)		47.0	40.04	20.00		(46)
(46)m= Water	21.54 storage	18.84 IOSS:	19.44	16.95	16.26	14.03	13	14.92	15.1	17.6	19.21	20.86		(40)
Storag	e volum	e (litres)	) includir	ng any s	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
	-	-			velling, e									
	vise if no storage		hot wate	er (this ir	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (	47)			
	-		eclared I	oss fact	or is kno	wn (kWł	n/dav):				1.	39		(48)
			m Table			,	,					54		(49)
Energ	/ lost fro	m watei	<sup>-</sup> storage	, kWh/y	ear			(48) x (49)	) =		0.	75		(50)
,				•	loss fact									(= .)
		•	ee secti		le 2 (kW	n/litre/da	ay)					0		(51)
	•	from Ta										0		(52)
Tempe	erature f	actor fro	m Table	2b								0		(53)
0.			<sup>-</sup> storage	e, kWh/y	ear			(47) x (51)	) x (52) x (	53) =		0		(54)
	. ,	(54) in (5									0.	75		(55)
		r	culated t				i	((56)m = (			1			
(56)m=	23.33	21.07	23.33	22.58	23.33 m = (56)m	22.58	23.33 H11)1 ÷ (5	23.33	22.58 7)m – (56)	23.33	22.58 H11) is fro	23.33 m Appendi	iv H	(56)
		r				r		· · · · ·						(57)
(57)m=	23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		
	-		nnual) fro			50)m - 4	(58) · 24	65 × (41)	m			0		(58)
	•				,	,	• •	ng and a		r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	, 22.51	23.26		(59)

Combi	loss ca	alculated	for eac	ch r	nonth (	61)m =	(60	)) ÷ 36	65 × (41)	)m							
(61)m=	0	0	0		0	0		0	0	0	0	0	0	0			(61)
Total h	neat req	uired for	water	hea	ating ca	alculated	d fo	r eacl	n month	(62)m	= 0.85 ×	(45)m	+ (46)m +	(57)m	1 + (	(59)m + (61)m	
(62)m=	190.2	167.69	176.2		158.09	155.02	1:	38.65	133.29	146.08	3 145.77	163.9	2 173.16	185.6	57		(62)
Solar DI	-IW input	calculated	using Ap	oper	ndix G or	Appendix	(H)	(negati	ve quantity	/) (enter	'0' if no sola	ar contrib	ution to wat	er heatin	ng)		
(add a	dditiona	al lines if	FGHR	Sa	nd/or V	VWHRS	s ap	oplies	, see Ap	pendix	G)						
(63)m=	0	0	0		0	0		0	0	0	0	0	0	0			(63)
Output	t from w	ater hea	ter														
(64)m=	190.2	167.69	176.2		158.09	155.02	1:	38.65	133.29	146.08	3 145.77	163.9	2 173.16	185.6	57		
										O	utput from w	ater hea	ter (annual)	112	Τ	1933.75	(64)
Heat g	ains fro	m water	heating	g, k	(Wh/mo	onth 0.2	5 ′	[0.85	× (45)m	+ (61)	m] + 0.8 :	x [(46)r	n + (57)m	+ (59)	)m [	]	
(65)m=	85.03	75.43	80.37		73.64	73.33	6	67.18	66.1	70.36	69.55	76.29	78.66	83.52	2		(65)
inclu	de (57)	m in calo	culatior	n of	<sup>i</sup> (65)m	only if c	ylir	nder i	s in the c	dwellin	g or hot w	/ater is	from com	munity	 y he	eating	
5. In	ternal a	ains (see	e Table	5 a	and 5a)	):					-			•		-	
		ns (Table			ĺ												
Wietab	Jan	Feb	Mar		Apr	May		Jun	Jul	Aug	Sep	Oct	Nov	Deo	с		
(66)m=	113.34	113.34	113.34	-	113.34	113.34	-	13.34	113.34	113.34		113.3		113.3	34		(66)
Liahtin	a aains	(calcula	ted in A		pendix l	L. equat	ion	L9 o	r L9a), a	lso see	e Table 5	1		1			
(67)m=	18.58	16.5	13.42	<u> </u>	10.16	7.59	<u> </u>	6.41	6.93	9.01	12.09	15.35	17.91	19.1			(67)
	nces da	uns (calc	ulated	in /	Append	lix Lea	L Uat	tion L	13 or I 1	( 3a) al	so see Ta	ble 5					
(68)m=	199.29	201.35	196.14	- T	185.05	171.05	r	57.88	149.09	147.02		163.3	3 177.33	190.4	19		(68)
											see Table						. ,
(69)m=	34.33	34.33	34.33	<u> </u>	34.33	24.33	-	34.33	34.33	34.33		34.33	34.33	34.33	3		(69)
						0.000			0 1100	0 1100			0.000	0.000			()
(70)m=		ins gains			1) 3	3		3	3	3	3	3	3	3			(70)
		vaporatic							Ū	0		Ŭ		Ů			(
(71)m=	-90.67	T	-90.67	<b>—</b>	-90.67	-90.67	<b>—</b>	90.67	-90.67	-90.67	-90.67	-90.67	-90.67	-90.6	7		(71)
					-90.07	-90.07	<u> </u>	90.07	-90.07	-90.07	-90.07	-90.07	-90.07	-90.0	1		(1)
	114.28	gains (T 112.25	· · · · ·	<u> </u>	102.28	98.56		2.24	88.85	04.50	96.59	102.5	1 100.05	112.2			(72)
(72)m=			108.03	<u>'</u>	102.20	90.00		93.31		94.56					.0		(12)
	r	I gains =	· · · · ·		057.40	007.0			. ,	. ,		<u> </u>	(71)m + (72	T	<u> </u>		(73)
(73)m=	392.15	1	377.59	,	357.49	337.2	3	817.6	304.87	310.59	320.92	341.2	1 364.49	381.8	15		(73)
	lar gain ains are		usina so	lar f	flux from	Table 6a	and	associ	iated equa	tions to	convert to th	ne annlic	able orienta	tion			
		Access F	Ũ		Area		unu	Flu	•		g_		FF			Gains	
Onorm		Table 6d			m²				ole 6a		9_ Table 6b		Table 6c			(W)	
Southe	ast <mark>0.9x</mark>	0.77		×Г	6.7	1	x	3	6.79	I x [	0.63	x	0.7	<u> </u>	= <b>Г</b>	68.56	(77)
	ast 0.9x	0.77		∧ L x [	0. 6.^		x		2.67		0.63		0.7		- L - F	116.78	](77)
	ast 0.9x	0.77		∩∟ ×Γ	6.		x		5.75		0.63	╡ ^	0.7		- L - Г	159.78	](77)
	ast 0.9x	0.77		^ L x [	6. 6.		x		06.25		0.63	╡ ^	0.7		- L = T	197.98	]( <i>' ' )</i> ](77)
	ast 0.9x			^ L x [			x								- L = T		]( <i>77</i> )
		0.77		<b>^</b>	6.′	<u> </u>	^		19.01		0.63	^	0.7		- 1	221.76	

Southeast 0.9x	0.77	x	6.	1	× 1	18.15	x	0.63	x	0.7	=	220.15	(77)
Southeast 0.9x	0.77	x	6.	1	x 1	13.91	x	0.63	x	0.7	=	212.25	(77)
Southeast 0.9x	0.77	x	6.	1	<b>x</b> 1	04.39	x	0.63	x	0.7	=	194.51	(77)
Southeast 0.9x	0.77	x	6.	1	x	92.85	x	0.63	x	0.7	=	173.01	(77)
Southeast 0.9x	0.77	x	6.	1	x	69.27	x	0.63	x	0.7	=	129.07	(77)
Southeast 0.9x	0.77	x	6.	1	x	14.07	x	0.63	x	0.7	=	82.12	(77)
Southeast 0.9x	0.77	x	6.	1	x :	31.49	x	0.63	x	0.7	=	58.67	(77)
Northwest 0.9x	0.77	x	5.1	1	x	11.28	x	0.63	x	0.7	=	17.61	(81)
Northwest 0.9x	0.77	x	5.1	1	x	22.97	x	0.63	x	0.7	=	35.85	(81)
Northwest 0.9x	0.77	x	5.1	1	x	41.38	x	0.63	x	0.7	=	64.58	(81)
Northwest 0.9x	0.77	x	5.1	1	x	67.96	x	0.63	x	0.7	=	106.06	(81)
Northwest 0.9x	0.77	x	5.1	1	x	91.35	x	0.63	x	0.7	=	142.57	(81)
Northwest 0.9x	0.77	x	5.1	1	x	97.38	×	0.63	x	0.7	=	151.99	(81)
Northwest 0.9x	0.77	x	5.1	1	x	91.1	x	0.63	x	0.7	=	142.19	(81)
Northwest 0.9x	0.77	x	5.1	1	x	72.63	x	0.63	x	0.7	=	113.35	(81)
Northwest 0.9x	0.77	x	5.1	1	x !	50.42	x	0.63	x	0.7	=	78.69	(81)
Northwest 0.9x	0.77	x	5.1	1	x	28.07	x	0.63	x	0.7	=	43.81	(81)
Northwest 0.9x	0.77	x	5.1	1	x	14.2	x	0.63	x	0.7	=	22.16	(81)
Northwest 0.9x	0.77	x	5.1	1	x	9.21	×	0.63	x	0.7	=	14.38	(81)
Solar gains in	watts, ca	alculated	for eac	n month			(83)m	n = Sum(74)m	(82)m				
(83)m= 86.17	152.63	224.37	304.04	364.32	372.15	354.44	307	.87 251.71	172.8	7 104.28	73.05		(83)
Total gains – i	nternal a	nd solar	(84)m =	= (73)m ·	+ (83)m	, watts			•				
(84)m= 478.32	542.73	601.96	661.54	701.52	689.75	659.3	618	.46 572.62	514.0	9 468.77	454.9		(84)
7. Mean inter	nal temp	erature	(heating	season	)								
Temperature	during h	eating p	eriods ir	n the livi	ng area	from Tal	ble 9	, Th1 (°C)				21	(85)

#### Utilisation factor for gains for living area, h1,m (see Table 9a)

	lon	Feb	Mar		Mov	È.	Jul	Aug	Son	Oct	Nov	Dec	l	
	Jan	гер	Iviai	Apr	May	Jun	Jui	Aug	Sep	UCI	INOV	Dec		
(86)m=	1	0.99	0.98	0.92	0.79	0.58	0.42	0.47	0.73	0.95	0.99	1		(86)
Mean	interna	l temper	ature in	living ar	ea T1 (fo	ollow ste	ps 3 to 7	7 in Tabl	e 9c)					
(87)m=	20.13	20.27	20.49	20.75	20.93	20.99	21	21	20.97	20.74	20.39	20.1		(87)
Temp	erature	during h	neating p	eriods ir	n rest of	dwelling	from Ta	able 9, T	h2 (°C)				•	
(88)m=	20.13	20.14	20.14	20.15	20.16	20.17	20.17	20.17	20.16	20.16	20.15	20.15		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling, I	h2,m (se	e Table	9a)					-	
(89)m=	0.99	0.99	0.97	0.9	0.73	0.51	0.35	0.39	0.66	0.92	0.99	1		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to	7 in Tabl	e 9c)				
(90)m=	18.97	19.18	19.5	19.87	20.09	20.16	20.17	20.17	20.14	19.86	19.36	18.94		(90)
			•	•		•	•	•	f	LA = Livin	g area ÷ (4	4) =	0.41	(91)
													,	

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

						0,							_
(92)m=	19.45	19.63	19.91	20.24	20.44	20.5	20.51	20.51	20.48	20.23	19.79	19.43	(92)

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

	<u> </u>	0 40.04			0.05	00.54	00.54	00.40		40.70	10.10	l	(93)
· /	9.45 19.6		20.24	20.44	20.5	20.51	20.51	20.48	20.23	19.79	19.43		(93)
8. Space heating requirement Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate													
the utilisation factor for gains using Table 9a													
	Jan Fe	b Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisatio	on factor fo	r gains, hr	n:	-							-		
	0.99 0.99		0.9	0.75	0.54	0.38	0.42	0.69	0.93	0.99	1		(94)
	ains, hmG		1	r i								I	
	75.28 535.		595.37	527.93	372.74	249.33	261.06	393.06	476.51	462.04	452.68		(95)
Monthly average external temperature from Table 8           (96)m=         4.3         4.9         6.5         8.9         11.7         14.6         16.6         16.4         14.1         10.6         7.1         4.2												(06)	
· · /				11.7			16.4	14.1	10.6	7.1	4.2		(96)
	s rate for r		736.9	erature, 566.08	Lm , vv =	=[(39)m ] 249.73	x [(93)m 261.82	– (96)m 409.67	623.72	827.27	999.11		(97)
· · ·	eating req									-	999.11		(37)
	96.22 296.	1	101.9	28.38		0 = 0.02		0	109.53	262.97	406.54		
	200.	220.00	101.0	20.00		Ŭ	-	l per year				1828.72	(98)
<b>.</b> .				o./			1012	ii per year	(itterityca)	) = 00m(0	0,15,912 -		
Space h	eating req	uirement ii	n kvvh/m	²/year								25.81	(99)
	y requiren	nents – Inc	dividual h	leating s	ystems i	ncluding	micro-C	CHP)					
Space heating:													
Fraction of space heat from secondary/supplementary system								0	(201)				
Fraction of space heat from main system(s) (202) = 1 – (201) =									1	(202)			
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$									1	(204)			
Efficiency of main space heating system 1										93.5	(206)		
Efficiency of secondary/supplementary heating system, %									0	(208)			
	Jan Fe	b Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Space h	eating req	uirement (	calculate	d above	)		-	-		-			
39	96.22 296.	62 226.56	101.9	28.38	0	0	0	0	109.53	262.97	406.54		
(211)m =	{[(98)m x	(204)] } x	100 ÷ (20	06)			-	-		-			(211)
42	23.76 317.	24 242.31	108.99	30.35	0	0	0	0	117.14	281.25	434.8		
							Tota	ll (kWh/yea	ar) =Sum(2	211) <sub>15,1012</sub>	<u>–</u>	1955.85	(211)
Space heating fuel (secondary), kWh/month													
	x (201)] }		T			1		1	1	1	1	l	
(215)m=	0 0	0	0	0	0	0	0	0	0	0	0		<b>-</b>
							lota	ll (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>	<b>;</b> =	0	(215)
Water he	-												
-	om water h 90.2   167.0		158.09	bove) 155.02	138.65	133.29	146.08	145.77	163.92	173.16	185.67		
	of water h		100.00	100.02	100.00	100.20	110.00	1 10.17	100.02		100.01	79.8	(216)
	6.73 86.3		83.68	81.29	79.8	79.8	79.8	79.8	83.77	85.93	86.85	10.0	(217)
	vater heati			L 01.20			L	L			00.00		
	<u>(64)m x</u>												
(219)m= 21			188.92	190.7	173.75	167.03	183.06	182.66	195.69	201.53	213.79		
							Tota	I = Sum(2	19a) <sub>112</sub> =			2316.83	(219)
Annual to									k	Wh/year		kWh/yea	r
Space heating fuel used, main system 1								1955.85					

Water heating fuel used				2316.83	7
Electricity for pumps, fans and electric keep-hot					_
central heating pump:	]	(230c)			
boiler with a fan-assisted flue		(230e)			
Total electricity for the above, kWh/year	sum of (230		75	(231)	
Electricity for lighting				328.11	(232)
12a. CO2 emissions – Individual heating systems	s including micro-CHP				
	<b>Energy</b> kWh/year	Emission fac kg CO2/kWh	ctor	<b>Emissions</b> kg CO2/yea	
Space heating (main system 1)	(211) x	0.216	=	422.46	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	500.43	(264)
Space and water heating	(261) + (262) + (263) + (264) =			922.9	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	170.29	(268)
Total CO2, kg/year	sur	n of (265)(271) =		1132.11	(272)

TER =

(273)

15.98