

77-79 CHARLOTTE STREET

ENERGY STATEMENT ADDENDUM

1 BACKGROUND

This document forms an addendum to the consented Energy Statement dated February 2015 prepared by Scotch Partners. It should be read in conjunction with the consented Energy Statement and all other documents forming part of the section 73 application.

The energy strategy has been updated in line with changes to the proposed development. The revised strategy follows the same energy reduction hierarchy in line with guidance produced by Camden Council. The following sections describe the revisions to the energy strategy and provides a summary of the overall CO_2 emissions reduction predicted for the proposed development.

1.1 S73 DEVELOPMENT OVERVIEW

The S73 Development includes the erection of a new six storey building and double basement. The development includes a single dwelling located over the 4th and 5th floors, and non-domestic office space from the basement to the 3rd floor.

2 REVISED STRATEGY

The energy strategy for the proposed development continues to follow the same energy hierarchy as the consented Energy statement and has been developed in line with Camden Council Policy CPG 3 section 2. At each stage of the hierarchy the proposed development's CO₂ emissions are evaluated and the percentage reduction achieved reported.

Regulated energy use and the associated CO_2 emissions have been calculated using Part L energy assessment software Stroma FSAP 2012 v1.0.4.7 for the domestic elements, and DesignBuilder 5.0.3.007 SBEM engine version 5.2.g.3 for the non-domestic elements.

All total development CO₂ emissions reported are based on the outputs from the SBEM BRUKL reports and SAP worksheets using the Building Emissions Rate (BER), Dwelling Emissions Rate (DER) and Target Emission Rate (TER). Where the TER from the 'Be Lean' scenario is used to represent the energy use of the Building Regulations Part L compliant development baseline, hereafter referred to as the 'notional development'. Total development figures are then calculated as an area weighted average.

Unregulated emissions for the domestic units have been estimated using the BREDEM 2012 Domestic Energy Model Version 1.0 calculations for 'Appliance' and 'Cooking' energy consumption. Notional unregulated emissions for the non-domestic elements have been taken from the SBEM BRUKL report as the 'equipment' load.

2.1 BE LEAN – REDUCE ENERGY DEMAND

The Development continues to use high efficiency HVAC systems and lighting as per the consented scheme as given in appendix 1. The fabric performance of the Development continues to match or improve upon the Part L notional building values as shown in Table 2.1 below.

Through the application of these measures a CO_2 emissions reduction of 7.1% could be achieved over the notional development baseline.

Table 2.1 – Development Fabric Performance

Model	Commercial	Residential	
Air Permeability	10m ³ /hm ² @50Pa	3m ³ /hm ² @50Pa	
Roof U-value	0.18W/m²K	0.13W/m²K	
Floor over commercial	_	0.065W/m ² K	
U-value		0.003 W/ III K	
Basement Floor U-value	0.22W/m²K	-	
External Wall U-value	0.26W/m²K	0.18W/m²K	
Basement Wall U-value0.26W/m²K		-	
Window U-value1.4 W/m²K		1.4 W/m²K	
Frame Fraction/Factor0.17 to 0.3		0.17 to 0.3	
G-value T Solar 0.40		0.63	
L Solar	0.71	-	
Roof light U-value	-	1.1 W/m²K	
Frame Fraction	-	0.83	
T Solar	-	0.63	
L Solar	-	-	

2.2 BE CLEAN – SUPPLY ENERGY EFFICIENTLY

No changes have been made to the "Be Clean" strategy, clean measures are therefore as per the consented Energy Statement.

2.3 BE GREEN – USE RENEWABLE ENERGY

The Development continues to use air source heat pumps (ASHPs) to supply heating and cooling to the development. Where the consented scheme included 6no. solar thermal panels, these have been replaced with 6no. solar photovoltaic (PV) panels to reflect the reduction in domestic hot water demand.

Table 2.2 provides a summary of the final area weighting CO_2 emissions including energy efficient measures as per the consented Energy Statement and the changes described above. The domestic element has improved from 15.57kg CO_2/m^2 to 12.80 57kg CO_2/m^2 . The non-domestic elements were not modelled within the original energy strategy.

Table 2.2 – Development Total Regulated and Unregulated CO₂ Emissions

able 212 Development rotar negaratea and onnegaratea 602 2mmshons					
	Total Floor Area (m²)	Area Weighted DER/BER (kgCO ₂ /m ²)	Total Regulated CO ₂ Emissions (kgCO ₂ /annum)	Total Unregulated CO2 Emissions (kgCO2/annum)	
Domestic	167	12.80	2,132	3,882	
Non-Domestic	1,004	14.80	14,859	18,378	
Site Total	1,171	14.52	16,992	22,260	

2.4 DEVELOPMENT ENERGY HIERARCHY CO₂ EMISSIONS SAVINGS

2.4.1 BREAKDOWN OF DOMESTIC AND NON-DOMESTIC EMISSIONS SAVINGS

Table 2.3 lists the domestic and non-domestic CO_2 emission reductions after each stage of the energy hierarchy following the changes in energy reduction measures described above. Through measures applied the dwelling achieves a 21.9% reduction in CO_2 and the non-domestic elements show 19.6% reduction over the notional development baseline.

	Domestic		Non-Domestic	
	CO ₂ Emissions (tCO ₂ /annum)	Percentage CO₂ Emissions Savings	CO ₂ Emissions (tCO ₂ /annum)	Percentage CO ₂ Emissions Savings
Building Regulations 2013 Part L Compliant Development	2.731		18.474	
Savings from Energy Demand Reduction	0.003	0.1%	1.506	8.2%
Savings from clean measures	0.000	0.0%	0.000	0.0%
Savings from Renewable Energy	0.595	21.8%	2.108	11.4%
Cumulative On-Site Savings	0.598	21.9%	3.614	19.6%

Table 2.3 – D	Domestic and	Non-Domestic	Regulated	CO2 Emissions	and Savings

2.4.2 TOTAL DEVELOPMENT EMISSIONS SAVINGS

Table 2.4 and Figure 2.1 gives the total development regulated CO_2 emissions at each stage of the energy hierarchy. The table shows that there is 7.1% CO_2 emission reduction after the "Be Lean" energy efficiency measures and a 12.7% CO_2 emission reduction after the renewable energy measures.

Table 2.4– Development Total Regulated CO₂ Emissions and Savings

Stages of the Energy Hierarchy	CO2 Emissions (kgCO2/annum)	Percentage CO ₂ Emissions Savings
Building Regulations 2013 Part L Compliant Development	21.204	
After energy efficiency measures savings	19.695	7.1%
After clean measures savings	19.695	0.0%
After renewable measures savings	16.992	12.7%
Total site savings		19.9%





3 CONCLUSION

Scotch Partners have prepared this energy strategy addendum for the S73 planning submission for the proposed development at 77 Charlotte Street in accordance with the Camden councils planning policy.

Through a range of 'Be Lean', 'Be Clean' and 'Be Green' measures the Development achieves an overall 19.9% reduction in CO₂ over a Building Regulations Part L 2013 compliant development. It has been estimated that the proposed development could produce 22.8% of its energy demand through renewable heating from the ASHPs and electricity produced from the PV Panels.

APPENDIX 1 – SBEM & SAP MODEL INPUTS

FABRIC PERFORMANCE

Model	Commercial	Residential
Air Permeability	10m ³ /hm ² @50Pa	3m ³ /hm ² @50Pa
Roof U-value	0.18W/m ² K	0.13W/m ² K
Floor over commercial		$0.0 \in \mathbb{N}/m^{2}k$
U-value	-	
Basement Floor U-value	0.22W/m ² K	-
External Wall U-value	0.26W/m ² K	0.18W/m ² K
Basement Wall U-value	0.26W/m ² K	-
Window U-value	1.4 W/m ² K	1.4 W/m ² K
Frame Fraction/Factor	0.17 to 0.3	0.17 to 0.3
G-value T Solar	0.40	0.63
L Solar	0.71	-
Roof light U-value	-	1.1 W/m ² K
Frame Fraction	-	0.83
T Solar	-	0.63
L Solar	-	-

LIGHTING

Model	Office	Reception	Circulation	Garage/Store
	LED	LED	LED	LED
Lamp & Ballast Emcacy	113lm/W	113lm/W	78lm/W	80lm/W
Light Output Ratio	1	-	1	1
Photoelectric Control	PH Dimming	PH Dimming	-	-
Occupancy Sensing	Throughout	Throughout	Throughout	Throughout
Display Lighting	-	Yes 60lm/W	-	-

VENTILATION

Model	Office	Dwelling
	Mechanical	
Main Areas & Toilet	SFP 1.6W/l/s	Natural & Nuaire MVHR
	Heat Recovery Efficiency 85%	

HEATING & COOLING

Model	Office	Dwelling
Primary areas	Multi Split ASHP Grid Supplied Electricity SCOP 3.69 EER 4.48 SEER 5.62	Daikin ASHP ERLQ0006CAV3 + EHBH08CB3V
Stairs	Electric Panel Grid Supplied Electricity SCOP 1	

DOMESTIC HOT WATER

Model	Office	Dwelling
DHW Throughout	Instant Electric	From Heating System

APPENDIX 2 – DATA SOURCES

MODEL GEOMETRY INPUTS

NODEL GEOMETRY INFORS				
	Comment			
Architect	MR Partnership			
SBEM Site Location	London			
	3108A_201 - B	S73 Proposed Basement Plan		
	3108A_202 - B	S73 Proposed Lower Ground Floor Plan		
	3108A_203 - B	S73 Proposed Ground Floor Plan		
Diana (CIA)a	3108A_204 - B	S73 Proposed First Floor Plan		
Plans/ GIA S	3108A_205 - C	S73 Proposed Second Floor Plan		
	3108A_206 - C	S73 Proposed Third Floor Plan		
	3108A_207 - A	S73 Proposed Fourth Floor Plan		
	3108A_208 - C	S73 Proposed Fifth Floor Plan		
	3108A_351 - C	S73 Proposed Main Elevation		
	3108A_352 - C	S73 Proposed Main Elevation 2		
	3108A_353 - B	S73 Proposed Rear Elevation		
Elevations & Sections	3108A_301 - B	S73 Proposed Sections A-A		
	3108A_302 - C	S73 Proposed Sections B-B		
	3108A_303 - B	S73 Proposed Sections C-C		
	3108A_304 - B	S73 Proposed Sections D-D		

MODEL HVAC INPUTS

	Comment	
M&E Consultant	Scotch Partners LLP	

REFERENCE DOCUMENTATION

	Comment
Local Planning Policy	CPG 3 Planning Guidance on Sustainability
Building Regulations	Approved Document L2A
Building Regulations	Approved Document L1A

Compliance with England Building Regulations Part L 2013

Project name

77-79 Charlotte Street

Date: Thu Jul 20 14:58:17 2017

Administrative information

Building Details

Address: London, W1

Certification tool

Calculation engine: SBEM Calculation engine version: v5.3.a.0 Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v5.0.3 BRUKL compliance check version: v5.3.a.0

Owner Details Name: Telephone number: Address: , ,

Certifier details Name: Scotch Partners LLP Telephone number: Address: , ,

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

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	18.4
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	18.4
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	16.9
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

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

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

Building fabric

Element	U a-Limit	Ua-Calc	U i-Calc	Surface where the maximum value occurs*
Wall**	0.35	0.26	0.26	-02 Basement - Stairs_W_7
Floor	0.25	0.13	0.22	-02 Basement - Office_F_19
Roof	0.25	0.18	0.18	-02 Basement - Office_R_4
Windows***, roof windows, and rooflights	2.2	1.4	1.4	-02 Basement - Stairs_G_12
Personnel doors	2.2	1.5	1.5	00 Grd Floor Garage - Store_D_9
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"
Ua-Limit = Limiting area-weighted average U-values [W	//(m²K)]			

 U_{a-Calc} = Calculated area-weighted average U-values [W/(mrK)]

 U_{i-Calc} = Calculated maximum individual element U-values [W/(m²K)]

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

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

*** Display windows and similar glazing are excluded from the U-value check.

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

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

As designed

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- Elec Panel

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR	R efficiency	
This system	1	-	-	-	-		
Standard value	N/A	N/A	N/A	N/A	N//	٩	
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system YES							

2- VRF Split

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency	
This system	0.91	4.48	-	-	-	
Standard value	2.5*	2.6	N/A	N/A	N/A	
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system YES						
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.						

1- Instant Electric

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

Local mechanical ventilation, exhaust, and terminal units

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

Zone name		SFP [W/(I/s)]								UD officiency		
ID of system type	Α	В	С	D	Е	F	G	н	I	HR emclency		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard	
-02 Basement - Stairs	-	-	-	-	-	-	-	-	-	-	N/A	
00 Grd Floor Garage - Store	-	-	-	-	-	-	-	-	-	-	N/A	
00 Ground Office Level - Reception	-	-	-	1.6	-	-	-	-	-	0.85	0.5	
-02 Basement - Office	-	-	-	1.6	-	-	-	-	-	0.85	0.5	
-02 Basement - WC	-	-	-	1.6	-	-	-	-	-	0.85	0.5	

General lighting and display lighting	Lumino	us effic		
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
-02 Basement - Stairs	-	78	-	234

General lighting and display lighting	Lumino	us effic		
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
00 Grd Floor Garage - Store	80	-	-	50
00 Ground Office Level - Reception	-	113	60	66
-02 Basement - Office	113	-	-	4499
-02 Basement - WC	-	78	-	366

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
00 Grd Floor Garage - Store	N/A	N/A
00 Ground Office Level - Reception	NO (-4.5%)	NO
-02 Basement - Office	NO (-43.9%)	NO
-02 Basement - WC	NO (-73.8%)	NO

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

Separate submission

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

Separate submission

EPBD (Recast): Consideration of alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional	%
Area [m ²]	1004	1004	
External area [m ²]	767.3	767.3	
Weather	LON	LON	100
Infiltration [m ³ /hm ² @ 50Pa]	10	3	
Average conductance [W/K]	355.74	453.92	
Average U-value [W/m ² K]	0.46	0.59	
Alpha value* [%]	23.63	19.54	

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area Building Type

	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
)	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Institutions: Hospitals and Care Homes
	C2 Residential Institutions: Residential schools
	C2 Residential Institutions: Universities and colleges
	C2A Secure Residential Institutions
	Residential spaces
	D1 Non-residential Institutions: Community/Day Centre
	D1 Non-residential Institutions: Libraries, Museums, and Galleries
	D1 Non-residential Institutions: Education
	D1 Non-residential Institutions: Primary Health Care Building
	D1 Non-residential Institutions: Crown and County Courts
	D2 General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs

Others: Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	6.82	3.96
Cooling	6.23	8.42
Auxiliary	5.53	2.37
Lighting	11.77	20.82
Hot water	2.31	2.67
Equipment*	35.27	35.27
TOTAL**	32.66	38.24

* Energy used by equipment does not count towards the total for calculating emissions. ** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

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

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	116.59	134.76
Primary energy* [kWh/m ²]	100.25	104.7
Total emissions [kg/m ²]	16.9	18.4

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

ŀ	IVAC Sys	stems Per	rformanc	е						
Sys	stem Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST	[ST] Other local room heater - unfanned, [HS] Room heater, [HFT] Electricity, [CFT] Natural Gas									
	Actual	99.7	11.7	32.9	0	0	0.84	0	1	0
	Notional	86.9	64.2	29.5	0	0	0.82	0		
[ST	[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity									
	Actual	14.2	102.9	4.4	6.8	6	0.89	4.2	0.91	5.62
	Notional	14.1	119.2	1.6	9.2	2.6	2.43	3.6		

Key to terms

Heat dem [MJ/m2] Cool dem [MJ/m2] Heat con [kWh/m2] Cool con [kWh/m2] Aux con [kWh/m2] Heat SSEFF Cool SSEER Heat gen SSEFF	 Heating energy demand Cooling energy demand Heating energy consumption Cooling energy consumption Auxiliary energy consumption Heating system seasonal efficiency (for notional building, value depends on activity glazing class) Cooling system seasonal energy efficiency ratio Heating generator seasonal efficiency
Heat gen SSEFF	 Heating generator seasonal efficiency Cooling generator seasonal energy efficiency ratio
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

= Cooling fuel type

Key Features

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

Building fabric

Element	U і-Тур	Ui-Min	Surface where the minimum value occurs*
Wall	0.23	0.26	-02 Basement - Stairs_W_7
Floor	0.2	0.1	00 Grd Floor Garage - Store_S_3
Roof	0.15	0.18	-02 Basement - Office_R_4
Windows, roof windows, and rooflights	1.5	1.4	-02 Basement - Stairs_G_12
Personnel doors	1.5	1.5	00 Grd Floor Garage - Store_D_9
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"
High usage entrance doors	1.5	-	"No external high usage entrance doors"
U _{i-Typ} = Typical individual element U-values [W/(m ² K)]			U _{i-Min} = Minimum individual element U-values [W/(m ² K)]
* There might be more than one surface where the minimum U-value occurs.			

Air Permeability	Typical value	This building	
m³/(h.m²) at 50 Pa	5	10	

Compliance with England Building Regulations Part L 2013

Project name

77-79 Charlotte Street

Date: Thu Jul 27 10:38:37 2017

Administrative information

Building Details

Address: London, W1

Certification tool

Calculation engine: SBEM Calculation engine version: v5.3.a.0

Interface to calculation engine: DesignBuilder SBEM Interface to calculation engine version: v5.0.3 BRUKL compliance check version: v5.3.a.0

Owner Details Name: Telephone number: Address: , ,

Certifier details Name: Scotch Partners LLP Telephone number: Address: , ,

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

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	18.4
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	18.4
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	14.8
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

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

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

Building fabric

Element	U a-Limit	Ua-Calc	U i-Calc	Surface where the maximum value occurs*
Wall**	0.35	0.26	0.26	-02 Basement - Stairs_W_7
Floor	0.25	0.13	0.22	-02 Basement - Office_F_19
Roof	0.25	0.18	0.18	-02 Basement - Office_R_4
Windows***, roof windows, and rooflights	2.2	1.4	1.4	-02 Basement - Stairs_G_12
Personnel doors	2.2	1.5	1.5	00 Grd Floor Garage - Store_D_9
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"
Ua-Limit = Limiting area-weighted average U-values [W	//(m²K)]			

 U_{a-Calc} = Calculated area-weighted average U-values [W/(mrK)]

 U_{i-Calc} = Calculated maximum individual element U-values [W/(m²K)]

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

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

*** Display windows and similar glazing are excluded from the U-value check.

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

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

As designed

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- Elec Panel

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR	R efficiency	
This system	1	-	-	-	-		
Standard value	N/A	N/A	N/A	N/A	N/A		
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system YES							

2- VRF Split

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(I/s)]	HR efficiency		
This system	3.69	4.48	-	-	-		
Standard value	2.5*	2.6	N/A	N/A	N/A		
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system YES							
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.							

1- Instant Electric

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

Local mechanical ventilation, exhaust, and terminal units

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

Zone name	SFP [W/(I/s)]							UD officiency			
ID of system type	Α	В	С	D	Е	F	G	н	I	HR efficiency	
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
-02 Basement - Stairs	-	-	-	-	-	-	-	-	-	-	N/A
00 Grd Floor Garage - Store	-	-	-	-	-	-	-	-	-	-	N/A
00 Ground Office Level - Reception	-	-	-	1.6	-	-	-	-	-	0.85	0.5
-02 Basement - Office	-	-	-	1.6	-	-	-	-	-	0.85	0.5
-02 Basement - WC	-	-	-	1.6	-	-	-	-	-	0.85	0.5

General lighting and display lighting	Lumino	us effic		
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
-02 Basement - Stairs	-	78	-	234

General lighting and display lighting	Lumino	us effic	acy [lm/W]	
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
00 Grd Floor Garage - Store	80	-	-	50
00 Ground Office Level - Reception	-	113	60	66
-02 Basement - Office	113	-	-	4499
-02 Basement - WC	-	78	-	366

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
00 Grd Floor Garage - Store	N/A	N/A
00 Ground Office Level - Reception	NO (-4.5%)	NO
-02 Basement - Office	NO (-43.9%)	NO
-02 Basement - WC	NO (-73.8%)	NO

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

Separate submission

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

Separate submission

EPBD (Recast): Consideration of alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional	%
Area [m ²]	1004	1004	
External area [m ²]	767.3	767.3	
Weather	LON	LON	100
Infiltration [m ³ /hm ² @ 50Pa]	10	3	
Average conductance [W/K]	355.74	453.92	
Average U-value [W/m ² K]	0.46	0.59	
Alpha value* [%]	23.63	19.54	

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area Building Type

	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
)	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Institutions: Hospitals and Care Homes
	C2 Residential Institutions: Residential schools
	C2 Residential Institutions: Universities and colleges
	C2A Secure Residential Institutions
	Residential spaces
	D1 Non-residential Institutions: Community/Day Centre
	D1 Non-residential Institutions: Libraries, Museums, and Galleries
	D1 Non-residential Institutions: Education
	D1 Non-residential Institutions: Primary Health Care Building
	D1 Non-residential Institutions: Crown and County Courts
	D2 General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs

Others: Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	3.78	3.96
Cooling	6.23	8.42
Auxiliary	5.53	2.37
Lighting	11.77	20.82
Hot water	2.31	2.67
Equipment*	35.27	35.27
TOTAL**	29.61	38.24

* Energy used by equipment does not count towards the total for calculating emissions. ** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	1.12	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	116.59	134.76
Primary energy* [kWh/m ²]	90.91	104.7
Total emissions [kg/m ²]	14.8	18.4

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

ŀ	IVAC Sys	stems Per	formanc	е						
Sys	stem Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Other loca	al room hea	ter - unfanr	ned, [HS] Ro	oom heater	, [HFT] Elec	tricity, [CF	T] Natural G	Bas	
	Actual	99.7	11.7	32.9	0	0	0.84	0	1	0
	Notional	86.9	64.2	29.5	0	0	0.82	0		
[ST] Split or m	ulti-split sy	stem, [HS]	Heat pump	(electric): a	air source, [HFT] Electr	icity, [CFT]	Electricity	
	Actual	14.2	102.9	1.1	6.8	6	3.62	4.2	3.69	5.62
	Notional	14.1	119.2	1.6	9.2	2.6	2.43	3.6		

Key to terms

Heat dem [MJ/m2] Cool dem [MJ/m2] Heat con [kWh/m2] Cool con [kWh/m2] Aux con [kWh/m2] Heat SSEFF Cool SSEER Heat gen SSEFF	 Heating energy demand Cooling energy demand Heating energy consumption Cooling energy consumption Auxiliary energy consumption Heating system seasonal efficiency (for notional building, value depends on activity glazing class) Cooling system seasonal energy efficiency ratio Heating generator seasonal efficiency
Heat gen SSEFF	 Heating generator seasonal efficiency Cooling generator seasonal energy efficiency ratio
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

= Cooling fuel type

Key Features

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

Building fabric

Element	U і-Тур	Ui-Min	Surface where the minimum value occurs*
Wall	0.23	0.26	-02 Basement - Stairs_W_7
Floor	0.2	0.1	00 Grd Floor Garage - Store_S_3
Roof	0.15	0.18	-02 Basement - Office_R_4
Windows, roof windows, and rooflights	1.5	1.4	-02 Basement - Stairs_G_12
Personnel doors	1.5	1.5	00 Grd Floor Garage - Store_D_9
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"
High usage entrance doors	1.5	-	"No external high usage entrance doors"
U _{i-Typ} = Typical individual element U-values [W/(m ² K)]		U _{i-Min} = Minimum individual element U-values [W/(m ² K)]
* There might be more than one surface where the n	ninimum U	l-value oco	curs.

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	10

User Details.	
Assessor Name:Stroma Number:Software Name:Stroma FSAP 2012Software Version:Version: 1.0.4.7	
Property Address: Charlotte Street - Lean	
Address : 77-79 Charlotte Street, London, W1	
1. Overall dwelling dimensions:	
Area(m ²) Av. Height(m) Volume(n	m ³)
Ground floor $(1a) \times (2.55) (2a) = (295.8)$	(3a)
First floor 50.6 (1b) x 2.76 (2b) = 139.66	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 166.6 (4)	
Dwelling volume $(3a)+(3c)+(3d)+(3e)+(3n) = 435.46$	(5)
2. Ventilation rate:	
main secondary other total m ³ per he	our
Number of chimneys $0 + 0 + 0 = 0 \times 40 = 0$	(6a)
Number of open flues $0 + 0 + 0 = 0 \times 20 = 0$	(6b)
Number of intermittent fans $4 \times 10 = 40$	(7a)
Number of passive vents	(7b)
Number of flueless gas fires 0 × 40 = 0	(7c)
Air changes per	hour
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7c) = 40$ \div (5) = 0.09	(8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)	
Number of storeys in the dwelling (ns)	(9)
Additional infiltration $[(9)-1]x0.1 = 0$	(10)
Structural infiltration: 0.25 for steel of timber frame or 0.35 for masonry construction	(11)
deducting areas of openings); if equal user 0.35	
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 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 $0.25 - [0.2 \times (14) \div 100] = 0$	(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	(17)
If based on air permeability value, then $(18) = [(17) \div 20]+(8)$, otherwise $(18) = (16)$ 0.34	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used	
Shelter factor $(20) = 1 - [0.075 \times (19)] = 0.95$	(19)
Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$	(20)
Infiltration rate modified for monthly wind speed	(21)
Jan Feb Mar Apr May Jun Jul Aug Sen 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	

Wind F	actor (2	2a)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			
Adjuste	ed infiltra	ation rat	e (allowi	ng for sh	nelter ar	nd wind s	peed) =	(21a) x	(22a)m						
-	0.37	0.36	0.36	0.32	0.31	0.28	0.28	0.27	0.29	0.31	0.33	0.34			
Calcula	ate effec	tive air	change i	rate for t	he appli	cable ca	se								
If me	echanica	l ventila	ition:											0	(23a)
lf exh	aust air he	eat pump	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (I	N5)), other	wise (23b	o) = (23a)				0	(23b)
lf bala	anced with	heat reco	overy: effici	ency in %	allowing	for in-use f	actor (from	n Table 4h)) =					0	(23c)
a) If	balance	d mecha	anical ve	ntilation	with he	at recove	ery (MVI	HR) (24a	i)m = (2	2b)m + (2 1	23b) × [′	1 – (23c)	÷ 100]	
(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24a)
b) If	balance	d mecha	anical ve	ntilation	without	heat rec	overy (N	ИV) (24b)m = (22	2b)m + (2	23b)	1			
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24b)
c) If	whole ho	ouse ex	tract ven	tilation o	or positiv	/e input v	entilatio	on from o	outside	- (00)	,				
	if (22b)m	$1 < 0.5 \times$	k (23b), ti	hen (240	c) = (23t	o); otherv	vise (24	c) = (22b) m + 0	.5 × (23b) 		1		$(0,1,\mathbf{c})$
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24C)
d) lf	natural v if (22b)m	/entilatio	on or whe	ole hous m – (22k	e positi	ve input v arwise (2	ventilatio	$rac{1}{2}$	Oft 2h)m² v	0.51					
(24d)m-	0.57	0.57		0.55	0.55	0.54	0.54	0.5 + [(2.	0.54	0.5	0.55	0.56			(24d)
Effor	ctivo air (change	rate - on	tor (24a) or (24)	(24)	$r = \frac{1}{2}$	d) in hor	(25)	0.00	0.00	0.00			
(25)m=		0.57	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56			(25)
(20)11-	0.07	0.07	0.00	0.00	0.00	0.04	0.04	0.04	0.04	0.00	0.00	0.00			()
3. He	at losses	s and he	eat loss p	paramete	er:									_	
3. He ELEN	at losses /IENT	s and he Gros area	eat loss p ss (m²)	oaramete Openin m	er: gs 2	Net Ar A ,r	ea n²	U-valu W/m2	ue K	A X U (W/ł	<)	k-value kJ/m²·l	÷ ≺	A k.	X k J/K
3. He ELEN Windo ^v	at losses /IE <mark>NT</mark> ws Type	s and he Gros area 1	eat loss p ss (m²)	oaramete Openin m	er: gs 2	Net Ar A ,r	ea n² x1	U-valu W/m2 /[1/(1.4)+	ue K 0.04] =	A X U (W/ł 1.91	<)	k-value kJ/m²·I	€ ≺	A k.	X k J/K (27)
3. He ELEN Windov Windov	at losses //ENT ws Type ws Type	and he Gros area 1 2	eat loss p ss (m²)	oaramete Openin m	er: gs 2	Net Ar A ,r 1.44	ea n² 	U-valu W/m2 /[1/(1.4)+ /[1/(1.4)+	ue K 0.04] = 0.04] =	A X U (W/ł 1.91	<)	k-value kJ/m²-I	€ ≺	A k.	X k J/K (27) (27)
3. He ELEN Windov Windov	at losses /ENT ws Type ws Type ws Type	s and he Gros area 1 2 3	eat loss p ss (m²)	oaramete Openin m	er: gs 2	Net Ar A ,r 1.44 1.23 0.64	ea n ² x1. x1. x1.	U-valu W/m2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	Je K 0.04] = 0.04] = 0.04] =	A X U (W/I 1.91 1.63 0.85	<) 	k-value kJ/m²·I	€ ≺	A k.	X k J/K (27) (27) (27)
3. He ELEN Windov Windov Windov	at losses /ENT ws Type ws Type ws Type ws Type	s and he Gros area 1 2 3 4	eat loss p ss (m²)	Openin M	er: gs 2	Net Ar A ,r 1.44 1.23 0.64 5.11	ea n ² x1 x1 x1 x1 x1	U-valu W/m2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	ue K 0.04] = 0.04] = 0.04] =	A X U (W/ł 1.91 1.63 0.85 6.77	<)	k-value kJ/m²+l	÷ ≺	A k.	X k J/K (27) (27) (27) (27)
3. He ELEN Windov Windov Windov Windov	at losses IENT ws Type ws Type ws Type ws Type ws Type ws Type	s and he Gros area 1 2 3 4 5	eat loss p ss (m²)	Openin M	er: gs ,2	Net Ar A ,r 1.44 1.23 0.64 5.11 4.65	ea n ² x1. x1. x1. x1. x1. x1.	U-valu W/m2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	Je K 0.04] = 0.04] = 0.04] = 0.04] =	A X U (W/I 1.91 1.63 0.85 6.77 6.16		k-value kJ/m²-I	≥ ≺	A k.	X k J/K (27) (27) (27) (27) (27) (27)
3. He ELEN Windov Windov Windov Windov	at losses IENT ws Type ws Type ws Type ws Type ws Type ws Type	s and he Gros area 1 2 3 4 5 6	eat loss p SS (m ²)	oaramete Openin m	er: gs ,2	Net Ar A ,r 1.44 1.23 0.64 5.11 4.65 1.28	ea n ² x1. x1. x1. x1. x1. x1. x1. x1.	U-valu W/m2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	Je K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	A X U (W/I 1.91 1.63 0.85 6.77 6.16 1.7		k-value kJ/m²•I	2 K	A k.	X k (27) (27) (27) (27) (27) (27) (27)
3. He ELEN Windov Windov Windov Windov Windov	at losses IENT ws Type ws Type ws Type ws Type ws Type ws Type ws Type	s and he Gros area 1 2 3 4 5 6 7	eat loss p ss (m²)	Openin m	er: gs 2	Net Ar A ,r 1.44 1.23 0.64 5.11 4.65 1.28 6.83	ea n ² x1. x1. x1. x1. x1. x1. x1. x1.	U-valu W/m2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	Je K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	A X U (W/I 1.91 1.63 0.85 6.77 6.16 1.7 9.05		k-value kJ/m²-I	≥ ≺	A k.	X k (27) (27) (27) (27) (27) (27) (27) (27)
3. He ELEN Windov Windov Windov Windov Windov Windov	at losses IENT ws Type ws Type ws Type ws Type ws Type ws Type ws Type ws Type ws Type	s and he Gros area 1 2 3 4 5 6 7 8	eat loss p ss (m ²)	Openin m	gs 2	Net Ar A ,r 1.44 1.23 0.64 5.11 4.65 1.28 6.83 2.59	ea n ² x1. x1. x1. x1. x1. x1. x1. x1.	U-valu W/m2 /[1/(1.4)+ /[1/(1.4)+	Je K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	A X U (W/I 1.91 1.63 0.85 6.77 6.16 1.7 9.05 3.43		k-value kJ/m²·I	≥ ≺	A k.	X k (27) (27) (27) (27) (27) (27) (27) (27)
3. He ELEN Windov Windov Windov Windov Windov Windov Windov	at losses IENT ws Type ws Type ws Type ws Type ws Type ws Type ws Type ws Type ws Type ws Type	s and he Gros area 1 2 3 4 5 6 7 8 9	eat loss p ss (m ²)	Openin m	er: gs ²	Net Ar A ,r 1.44 1.23 0.64 5.11 4.65 1.28 6.83 2.59 2.28	ea n ² x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	U-valu W/m2 /[1/(1.4)+ /[1/(1.4)+	Je K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	A X U (W/I 1.91 1.63 0.85 6.77 6.16 1.7 9.05 3.43 3.02		k-value kJ/m²·I	≥ ≺	A k.	X k (27) (27) (27) (27) (27) (27) (27) (27)
3. He ELEN Windov Windov Windov Windov Windov Windov Windov	at losses IENT ws Type ws Type	s and he Gros area 1 2 3 4 5 6 7 8 9 10	eat loss p ss (m ²)	Openin m	er: gs ,2	Net Ar A ,r 1.44 1.23 0.64 5.11 4.65 1.28 6.83 2.59 2.28 6.83	ea n ² x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	U-valu W/m2 /[1/(1.4)+ /[1/(1.4)+	Je K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	A X U (W/I 1.91 1.63 0.85 6.77 6.16 1.7 9.05 3.43 3.02 9.05	\diamond	k-value kJ/m²•I	€ ≺	A k.	X k (27) (27) (27) (27) (27) (27) (27) (27)
3. He ELEN Windov Windov Windov Windov Windov Windov Windov Windov	at losses IENT ws Type ws Type ys Type	s and he Gros area 1 2 3 4 5 6 7 8 9 10	eat loss p ss (m²)	Openin m	er: gs 2	Net Ar A,r 1.44 1.23 0.64 5.11 4.65 1.28 6.83 2.59 2.28 6.83 0.79385	ea n ² x1. x1. x1. x1. x1. x1. x1. x1.	U-valu W/m2 /[1/(1.4)+ /[1/(1.4)+	Je K 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	A X U (W/4 1.91 1.63 0.85 6.77 6.16 1.7 9.05 3.43 3.02 9.05 1.34955	\diamond	k-value kJ/m²-I	2	A k.	X k (27) (27) (27) (27) (27) (27) (27) (27)
3. He ELEN Windov Windov Windov Windov Windov Windov Windov Rindov Rooflig Floor	at losses IENT ws Type ws Type ws Type ws Type ws Type ws Type ws Type ws Type ws Type ws Type ys Type ys Type	s and he Gros area 1 2 3 4 5 6 7 8 9 10	eat loss p ss (m ²)	Openin m	er: gs 2	Net Ar A ,r 1.44 1.23 0.64 5.11 4.65 1.28 6.83 2.59 2.28 6.83 0.79385 116.1	ea n ² x1. x1. x1. x1. x1. x1. x1. x1.	U-valu W/m2 /[1/(1.4)+ /[1/(1.7) + (0.13	Je N.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] = 0.04] =	A X U (W/I 1.91 1.63 0.85 6.77 6.16 1.7 9.05 3.43 3.02 9.05 1.34955 15.1008		k-value kJ/m²-I		A	X k (27) (27) (27) (27) (27) (27) (27) (27)
3. He ELEN Windov Windov Windov Windov Windov Windov Windov Riooflig Floor Walls	at losses IENT ws Type ws Type ws Type ws Type ws Type ws Type ws Type ws Type ys Type hts Type1	s and he Gros area 1 2 3 4 5 6 7 8 9 10	at loss p ss (m ²)	Openin m	gs 2	Net Ar A ,r 1.44 1.23 0.64 5.11 4.65 1.28 6.83 2.59 2.28 6.83 0.79385 116.10 21.09	ea n ² x1. x1. x1. x1. x1. x1. x1. x1.	U-valu W/m2 /[1/(1.4)+ /[1/(1.7) + (0.13 0.18	Je K 0.04] = 0.04] =	A X U (W/I 1.91 1.63 0.85 6.77 6.16 1.7 9.05 3.43 3.02 9.05 1.34958 15.1008 3.8		k-value kJ/m²-I		A k.	X k (27) (27) (27) (27) (27) (27) (27) (27)
3. He ELEN Windov Windov Windov Windov Windov Windov Windov Windov Windov Windov Windov Windov Windov Windov Windov Windov Windov Windov Windov	at losses IENT ws Type ws Type ws Type ws Type ws Type ws Type ws Type ws Type ws Type ys Type fype1 Type2	s and he Gross area 1 2 3 4 5 6 7 8 9 10	r3 (m ²)	Openin m 8.64	gs 2	Net Ar A,r 1.44 1.23 0.64 5.11 4.65 1.28 6.83 2.59 2.28 6.83 0.79385 116.1 21.09 10.93	ea n ² x1. x1. x1. x1. x1. x1. x1. x1.	U-valu W/m2 /[1/(1.4)+ /[1/(1.7) + (0.13 0.18 0.18	Je K 0.04] = 0.04] = 1 =	A X U (W/I 1.91 1.63 0.85 6.77 6.16 1.7 9.05 3.43 3.02 9.05 1.34955 15.1008 3.8 1.97		k-value kJ/m²·I		A k.	X k (27) (27) (27) (27) (27) (27) (27) (27)
3. He ELEN Windov Windo	at losses IENT ws Type ws Type ws Type ws Type ws Type ws Type ws Type ws Type ws Type ys Type type1 Type2 Type3	s and he Gross area 1 2 3 4 5 6 7 8 9 10 10	r3 (m ²)	Openin m 8.64 4.65 7.62	gs 2	Net Ar A,r 1.44 1.23 0.64 5.11 4.65 1.28 6.83 2.59 2.28 6.83 0.79385 116.11 21.09 10.93 15.27	ea n ² x1. x1. x1. x1. x1. x1. x1. x1.	U-valu W/m2 /[1/(1.4)+ /[1/(Je K 0.04] = 0.04] = 1 0.04] = 1 0.04] = 1 0.04] = 1 0.04] = 1 0.04] = 0.04] =	A X U (W/k 1.91 1.63 0.85 6.77 6.16 1.7 9.05 3.43 3.02 9.05 1.34955 15.1008 3.8 1.97 2.75		k-value kJ/m²-I		A k.	X k (27) (27) (27) (27) (27) (27) (27) (27)
3. He ELEN Windov Windo	at losses IENT ws Type ws Type ws Type ws Type ws Type ws Type ws Type ws Type ws Type ys Type type1 Type2 Type3 Type4	s and he Gross area 1 2 3 4 5 6 7 8 9 10 10 29.7 15.5 22.8 16.9	r3 (m ²)	Openin m 8.64 4.65 7.62 0.64	gs 2	Net Ar A,r 1.44 1.23 0.64 5.11 4.65 1.28 6.83 2.59 2.28 6.83 0.79385 116.1 21.09 10.93 15.27 16.32	ea n ² x1. x1. x1. x1. x1. x1. x1. x1.	U-valu W/m2 /[1/(1.4)+ /[1/(1.3)+/[1/(1.3)	Je K 0.04] = 0.04] = 1 = 1 = 1 = 1 = 1 =	A X U (W/4 1.91 1.63 0.85 6.77 6.16 1.7 9.05 3.43 3.02 9.05 1.34955 1.34955 1.34955 1.34955 1.34955 1.34955 1.34955 2.94		k-value kJ/m²-I		A k.	X k (27) (27) (27) (27) (27) (27) (27) (27)

Walls Type6												
•••	26.16	6.8	3	19.33	3 X	0.18	=	3.48				(29)
Walls Type7	30.59	11.	7	18.89) X	0.18	= =	3.4	īĒ		=	(29)
Walls Type8	39.55	0		39.55	5 X	0.18	= =	7.12	īĒ		\exists \square	(29)
Walls Type9	11.51	0		11.51	x	0.18	= =	2.07	i F		\exists	(29)
Roof Type1	50.6	1.5	9	49.01	x	0.13	= =	6.37	i F		\exists	(30)
Roof Type2	26.96	0		26.96		0.13	=	3.5	i F		\dashv	(30)
Total area of el	ements, m ²			399.2	5	L	'					(31)
* for windows and i ** include the areas	roof windows, u s on both sides	se effective w of internal wa	vindow U-va Ills and par	alue calcula titions	ated using	j formula 1,	/[(1/U-valı	ıe)+0.04] a	s given in	paragrap	h 3.2	
Fabric heat loss	s, W/K = S (/	۹xU)				(26)(30)	+ (32) =				110.42	(33)
Heat capacity $Cm = S(A \times k)$ ((28)(30) + (32) + (32a)(32e) = 0 (32a)											(34)	
Thermal mass parameter (TMP = $Cm \div TFA$) in kJ/m²KIndicative Value: Medium250											(35)	
For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation.												
Thermal bridge	s : S (L x Y)	calculated	using Ap	pendix ł	<						19.96	(36)
if details of thermal	bridging are no	t known (36)	= 0.15 x (3	1)				(2.2)				_
I otal fabric hea	it loss	4 a al a 4 b	L .				(33) +	(36) =	05)		130.38	(37)
ventilation heat			Mov	lun	1.1	Aug	(38)m	= 0.33 × (.	25)m x (5)	Dec	1	
(38)m- 81.71	81.33 80.0	ar Apr 5 79.19	78.86	77 33	Jui 77 33	Aug	5ep	78.86	79.53	80.23		(38)
			1 10.00	11.00			(00)	(07) . ((10.00	00.20		(00)
Heat transfer co		K 200 58	200.25	207 71	207 71	207.42	(39)m	=(37)+(37)	200.01	210.61	л —	
	211.71 211.	203.30	203.23	207.71	207.71	201.40	200.5	Average =	Sum(39)	12/12=	209.57	(39)
Hea <mark>t loss</mark> parar	neter (HLP),	W <mark>/m²K</mark>					(40)m	= (39)m ÷	(4)		200.01	
(40)m= 1.27	1.27 1.2	7 1.26	1.26	1.25	1.25	1.25	1.25	1.26	1.26	1.26		
Number of days	s in month (7	able 1a)						Average =	Sum(40)₁	12 /12=	1.26	(40)
Jan	Feb M	ar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(41)m= 31	28 31	30	31	30	31	31	30	31	30	31	1	(41)
					L]	
						<u> </u>]	
4. Water heati	ng energy re	quirement			1	1		1		kWh/y	Lear:	
4. Water heati	ng energy re bancy, N)40 x (TE	- 12.0		012 x (TEA 12	2	kWh/y 96	_ rear:]	(42)
4. Water heati Assumed occup if TFA > 13.9 if TFA £ 13.9	ng energy re pancy, N , N = 1 + 1.7 , N = 1	quirement 6 x [1 - exp	: >(-0.0003	349 x (TF	-A -13.9)2)] + 0.() 0013 x (TFA -13.	<u>2</u> 9)	kWh/y 96	rear:	(42)
4. Water heati Assumed occup if TFA > 13.9 if TFA £ 13.9 Annual average	ng energy re ⊃ancy, N , N = 1 + 1.7 , N = 1 ≩ hot water u	quirement 6 x [1 - exp sage in litr	: >(-0.0003 es per da	349 x (TF ay Vd,av	⁻ A -13.9 erage =)2)] + 0.0 (25 x N)	0013 x (* + 36	TFA -13.	2 9) 10	kWh/y 96 4.45	rear:	(42)
4. Water heati Assumed occup if TFA > 13.9 if TFA £ 13.9 Annual average Reduce the annual not more that 125 I	ng energy re pancy, N , N = 1 + 1.7 , N = 1 > hot water u average hot wa itres per persor	quirement 6 x [1 - exp sage in litro iter usage by per day (all v	: o(-0.0003 es per da <i>5% if the o</i> <i>vater use, l</i>	349 x (TF ay Vd,ave Iwelling is o hot and co	FA -13.9 erage = designed t)2)] + 0.((25 x N) to achieve	0013 x (* + 36 a water us	TFA -13. se target of	9) 10	kWh/y 96 4.45	rear:]]	(42) (43)
4. Water heati Assumed occup if TFA > 13.9 if TFA £ 13.9 Annual average Reduce the annual not more that 125 I	ng energy re pancy, N , N = 1 + 1.7 , N = 1 \Rightarrow hot water u average hot wa itres per persor	quirement 6 x [1 - exp sage in litro ter usage by per day (all v	c)(-0.0003 es per da 5% if the d vater use, l	349 x (TF ay Vd,ave twelling is a 'not and co	FA -13.9 erage = designed t Id)	(25 x N) to achieve	0013 x (* + 36 a water us	TFA -13. se target of	9) 2 10	kWh/y 96 4.45	」 rear:]]	(42) (43)
4. Water heati Assumed occup if TFA > 13.9 if TFA £ 13.9 Annual average Reduce the annual not more that 125 I Jan Hot water usage in	ng energy re bancy, N , N = 1 + 1.7 , N = 1 \Rightarrow hot water us average hot wa itres per persor Feb M litres per day for	quirement 6 x [1 - exp sage in litro nter usage by per day (all w ar Apr r each month	$\frac{1}{2} \int (-0.0003) = 0$ $\frac{5\% \text{ if the } a}{5\% \text{ if the } a}$ $\frac{1}{2} \int May$ $\frac{1}{2} Vd, m = fa$	349 x (TF ay Vd,avo twelling is hot and cou Jun ctor from 7	FA -13.9 erage = designed t Id) Jul Fable 1c x	(25 x N) to achieve Aug (43)	0013 x (* + 36 a water us Sep	TFA -13. se target of Oct	2 9) 10 Nov	kWh/y 96 4.45 Dec	rear:]]]	(42) (43)
4. Water heati Assumed occup if TFA > 13.9 if TFA £ 13.9 Annual average Reduce the annual not more that 125 I Jan Hot water usage in (44)m= 114.9	ng energy re bancy, N , N = 1 + 1.7 , N = 1 \Rightarrow hot water us average hot water itres per persor Feb Ma litres per day for 110.72 106.	quirement 6 x [1 - exp sage in litro ter usage by per day (all w ar Apr r each month 54 102.36	D(-0.0003) $es per da 5% if the co vater use, I May Vd,m = fa 98.19$	349 x (TF ay Vd,ave fwelling is a hot and con 	FA -13.9 erage = designed t Id) Table 1c x 94.01	(25 x N) (25 x N) to achieve (43) 98.19	0013 x ([*] + 36 <i>a water us</i> Sep	TFA -13. se target of Oct 106.54	2 9) Nov 110.72	kWh/y 96 4.45 Dec 114.9	_ rear:]]]	(42) (43)
4. Water heati Assumed occup if TFA > 13.9 if TFA £ 13.9 Annual average Reduce the annual not more that 125 I Jan Hot water usage in (44)m= 114.9	ng energy re pancy, N , N = 1 + 1.7 , N = 1 e hot water u average hot water itres per persor Feb Mi litres per day fe 110.72 106.	equirement 6 x [1 - exp sage in litr ther usage by per day (all u ar Apr or each month 54 102.36	D(-0.0003) es per da 5% if the constraints water use, I May Vd,m = fa 98.19	349 x (TF ay Vd,av welling is a hot and co Jun ctor from 7 94.01	FA -13.9 erage = designed t Id) Jul Fable 1c x 94.01	(25 x N) to achieve (43) 98.19	0013 x ([*] + 36 <i>a water us</i> Sep 102.36	TFA -13. se target of Oct 106.54 Total = Sur	2 9) 10 Nov 110.72 m(44)112	kWh/y 96 4.45 Dec 114.9	_ rear:]]]] 	(42) (43)
4. Water heati Assumed occup if TFA > 13.9 if TFA £ 13.9 Annual average Reduce the annual not more that 125 f Jan Hot water usage in (44)m= 114.9 Energy content of f	ng energy re bancy, N , N = 1 + 1.7 , N = 1 a hot water u varage hot water varage hot	equirement 6 x [1 - exp sage in litr ater usage by per day (all v ar Apr r each month 54 102.36	$\frac{1}{2}$	349 x (TF ay Vd,av twelling is hot and counce Jun ctor from 7 94.01	FA - 13.9 erage = designed of Id) Jul Table 1c x 94.01 n x nm x E	(25 x N) (25	0013 x (+ 36 a water us Sep 102.36	TFA -13. se target of Oct 106.54 Total = Sun th (see Ta	2 9) Nov 110.72 m(44) ₁₁₂ =	kWh/y 96 4.45 Dec 114.9 c, 1d)	_ (ear:]]]] 	(42) (43)
4. Water heati Assumed occup if TFA > 13.9 if TFA £ 13.9 Annual average Reduce the annual not more that 125 I Jan Hot water usage in (44)m= 114.9 Energy content of I (45)m= 170.39	ng energy re pancy, N , N = 1 + 1.7 , N = 1 P hot water u vaverage hot water vaverage	equirement 6 x [1 - exp sage in litr ater usage by per day (all w ar Apr r each month 54 102.36 calculated m 78 134.07	$\frac{1}{2}$	349 x (TF ay Vd,avi twelling is hot and cou Jun ctor from 7 94.01 190 x Vd,n 111.01	$FA - 13.9$ erage = designed i ld) Jul Table 1c x 94.01 $n \times nm \times D$ 102.87	(25 x N) to achieve (43) 98.19 (118.04	0013 x (+ 36 a water us Sep 102.36 kWh/mor 119.45	TFA -13. se target of Oct 106.54 Total = Sun oth (see Ta 139.21	2 9) 10 Nov 110.72 m(44)112 tbles 1b, 1 151.96	kWh/y 96 4.45 Dec 114.9 c, 1d) 165.01	_ (ear:]]]] 	(42) (43)
4. Water heati Assumed occup if TFA > 13.9 if TFA £ 13.9 Annual average Reduce the annual not more that 125 I Jan Hot water usage in (44)m= 114.9 Energy content of R (45)m= 170.39	ng energy re pancy, N , N = 1 + 1.7 , N = 1 e hot water u average hot wa itres per persor Feb Mi litres per day for 110.72 106. 100 water used 149.02 153.	equirement 6 x [1 - exp sage in litr ater usage by per day (all w ar Apr r each month 54 102.36 calculated m 78 134.07 oint of use (n	$c_{1}(-0.0003)$ $c_{2}(-0.0003)$ $c_{3}(-0.0003)$ $c_{3}(-0.003)$ $c_{3}(-0.$	349 x (TF ay Vd,ave twelling is hot and co. Jun ctor from 7 94.01 190 x Vd,n 1111.01	FA -13.9 erage = designed i Id) Table 1c x 94.01 n x nm x D 102.87 enter 0 in	(25 x N) to achieve (25 x N) to achieve (43) 98.19 07m / 3600 118.04 boxes (46)	0013 x (+ 36 a water us Sep 102.36 0 kWh/mor 119.45) to (61)	TFA -13. se target of Oct 106.54 Total = Sun nth (see Ta 139.21 Total = Sun	2 9) 10 Nov 110.72 m(44) ₁₁₂ bbles 1b, 1 151.96 m(45) ₁₁₂	kWh/y 96 4.45 Dec 114.9 <i>c, 1d)</i> 165.01	<pre>'ear: 'ear: ' 'ear: ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' '</pre>	(42) (43) (44) (45)
4. Water heati Assumed occup if TFA > 13.9 if TFA £ 13.9 Annual average Reduce the annual not more that 125 I Uan Hot water usage in (44)m= 114.9 Energy content of I (45)m= 170.39 If instantaneous water (46)m= 25.56	ng energy re pancy, N , N = 1 + 1.7 , N = 1 e hot water u average hot with itres per person Feb M litres per day for 110.72 106. not water used 149.02 153. hter heating at p	equirement 6 x [1 - exp sage in litr ater usage by per day (all u ar Apr r each month 54 102.36 calculated m 78 134.07 oint of use (n	b(-0.0003) $es per da 5% if the c water use, I May Vd,m = fa 98.19 128.64 o hot water 19.3$	349 x (TF ay Vd,av welling is hot and co. Jun ctor from 7 94.01 190 x Vd,n 111.01	FA -13.9 erage = designed i ld) Jul Table 1c x 94.01 $n \times nm \times D$ 102.87 enter 0 in	(25 x N) to achieve (25 x N) to achieve (43) 98.19 07m / 3600 118.04 boxes (46,	0013 x (+ 36 a water us Sep 102.36 kWh/mor 119.45 ; to (61)	TFA -13. se target of Oct 106.54 Total = Sun 139.21 Total = Sun 20.88	2 9) 10 Nov 110.72 m(44)112 bles 1b, 1 151.96 m(45)112	kWh/y 96 4.45 Dec 114.9 c, 1d) 165.01 =	_ /ear:]]]]]]]]]]]]]]]]]]]	(42) (43) (44) (44) (45) (46)

Water	storage	loss:												
Storag	e volum	e (litres)) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If com	nunity h vise if no	eating a	and no ta hot wate	ank in dw er (this ir	velling, e Includes i	nter 110 nstantar) litres in neous co	(47) mbi boil	ers) ente	er '0' in (47)			
Water	storage	loss:								(,			
a) If m	anufact	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature f	actor fro	m Table	2b								0		(49)
Energy	/ lost fro	m watei	r storage	e, kWh/ye	ear			(48) x (49) =			0		(50)
b) If m	anufact	urer's d	eclared	cylinder l	oss fact	or is not	known:						ı	
Hot wa	iter stora	age loss	s factor fi	rom Tabl	e 2 (kvv	h/litre/da	ay)					0	l	(51)
Volum	e factor	from Ta	ble 2a	011 4.5								0	1	(52)
Tempe	erature f	actor fro	m Table	2b								0		(53)
Energy	/ lost fro	m watei	r storage	e, kWh/ye	ear			(47) x (51) x (52) x (53) =		0		(54)
Enter	(50) or ((54) in (5	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 contains	s dedicate	d solar sto	orage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	om Append	ix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	y circuit	loss (ar	nual) fro	om Table	93							0		(58)
Primar	y c <mark>ircuit</mark>	loss cal	lculated	for each	month (<mark>59)</mark> m = ((58) ÷ 36	65 × (41)	m					
(moo	difi <mark>e</mark> d by	factor f	rom Tab	le H5 if t	here is s	solar wat	ter heatii	ng and a	<mark>a cy</mark> linde	r th <mark>ermo</mark>	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	loss ca	culated	for each	n month ((61)m =	(60) ÷ 36	65 × (41))m						
(61)m=	50.96	46.03	50.96	49. <mark>3</mark> 2	50.03	46.36	47.91	50.03	49.32	5 <mark>0.96</mark>	49.32	50.96		(61)
Total h	eat requ	uired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 × 0	(45)m +	(46)m +	(57)m +	(59)m + (6	61)m
(62)m=	221.35	195.05	204.74	183.38	178.68	157.37	150.77	168.07	168.76	190.17	201.27	215.97		(62)
Solar DH	HW input o	calculated	using App	endix G or	Appendix	H (negati	ve quantity	y) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	iter											
(64)m=	221.35	195.05	204.74	183.38	178.68	157.37	150.77	168.07	168.76	190.17	201.27	215.97		
								Out	out from w	ater heate	r (annual)	112	2235.5	58 (64)
Heat g	ains fro	m water	heating	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	n + (61)n	n] + 0.8 >	x [(46)m	+ (57)m	+ (59)m]	
(65)m=	69.39	61.06	63.87	56.91	55.28	48.5	46.18	51.76	52.05	59.03	62.85	67.61		(65)
inclu	ide (57)	m in cale	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	vater is fr	om com	munity h	eating	
5. Int	ernal ga	ains (see	e Table 5	5 and 5a):									
Metab	olic gain	s (Table	e 5), Wat	tts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	147.9	147.9	147.9	147.9	147.9	147.9	147.9	147.9	147.9	147.9	147.9	147.9		(66)
Lightin	g gains	(calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	30.14	26.77	21.77	16.48	12.32	10.4	11.24	14.61	19.61	24.9	29.06	30.98		(67)
Applia	nces ga	ins (calc	ulated ir	n Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5				
(68)m=	338.07	341.57	332.73	313.91	290.16	267.83	252.91	249.41	258.25	277.07	300.82	323.15		(68)

Cookin	g gains	(calcula	ted in Ap	opendix	L, equat	ion L15	or L15a)	, also se	e Table	5				
(69)m=	37.79	37.79	37.79	37.79	37.79	37.79	37.79	37.79	37.79	37.79	37.79	37.79	(69)	
Pumps	and far	ns gains	(Table 5	ia)										
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3	(70)	
Losses	e.g. ev	aporatio	n (negat	ive valu	es) (Tab	le 5)								
(71)m=	-118.32	-118.32	-118.32	-118.32	-118.32	-118.32	-118.32	-118.32	-118.32	-118.32	-118.32	-118.32	(71)	
Water	heating	gains (T	able 5)											
(72)m=	93.27	90.86	85.85	79.04	74.3	67.36	62.07	69.57	72.29	79.34	87.3	90.87	(72)	
Total i	nternal	gains =				(66)	m + (67)m	ı + (68)m +	- (69)m + ((70)m + (7	1)m + (72)	m		
(73)m=	531.85	529.57	510.72	479.8	447.15	415.96	396.59	403.95	420.51	451.67	487.55	515.37	(73)	

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

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	1.44	x	11.28	x	0.63	×	0.7	=	29.79	(75)
Northeast 0.9x	0.77	x	6.83	x	11.28	x	0.63	×	0.7] =	23.55	(75)
Northeast 0.9x	0.77	x	1.44	x	22.97	x	0.63	х	0.7		60.64	(75)
Northeast 0.9x	0.77	x	6.83	x	22.97	x	0.63	x	0.7		47.94	(75)
Northeast 0.9x	0.77	x	1.44	х	41.38	×	0.63	x	0.7	=	109.26	(75)
Northeast 0.9x	0.77	x	6.83	x	41.38	x	0.63	x	0.7	=	86.37	(75)
Northeast 0.9x	0.77	x	1.44	x	67.96	x	0.63	x	0.7] =	179.44	(75)
Northeast 0.9x	0.77	x	6.83	x	67.96	х	0.63	x	0.7] =	141.85	(75)
Northeast 0.9x	0.77	x	1.44	x	91.35	x	0.63	x	0.7	=	241.2	- (75)
Northeast 0.9x	0.77	x	6.83	x	91.35	x	0.63	×	0.7	=	190.67	(75)
Northeast 0.9x	0.77	x	1.44	x	97.38	x	0.63	x	0.7	=	257.14	(75)
Northeast 0.9x	0.77	x	6.83	x	97.38	x	0.63	×	0.7	=	203.27	- (75)
Northeast 0.9x	0.77	x	1.44	x	91.1	x	0.63	x	0.7	=	240.55	_ (75)
Northeast 0.9x	0.77	x	6.83	x	91.1	x	0.63	×	0.7	=	190.16	(75)
Northeast 0.9x	0.77	x	1.44	x	72.63	x	0.63	×	0.7	=	191.77	_ (75)
Northeast 0.9x	0.77	x	6.83	x	72.63	x	0.63	x	0.7	=	151.6	(75)
Northeast 0.9x	0.77	x	1.44	x	50.42	x	0.63	×	0.7	=	133.14	(75)
Northeast 0.9x	0.77	x	6.83	x	50.42	x	0.63	×	0.7	=	105.24	- (75)
Northeast 0.9x	0.77	x	1.44	x	28.07	x	0.63	x	0.7	=	74.11	(75)
Northeast 0.9x	0.77	x	6.83	x	28.07	x	0.63	×	0.7	=	58.59	(75)
Northeast 0.9x	0.77	x	1.44	x	14.2	x	0.63	×	0.7	=	37.49	_ (75)
Northeast 0.9x	0.77	x	6.83	x	14.2	x	0.63	x	0.7	=	29.63	(75)
Northeast 0.9x	0.77	x	1.44	x	9.21	x	0.63	×	0.7	=	24.33	- (75)
Northeast 0.9x	0.77	x	6.83	x	9.21	x	0.63	x	0.7	=	19.23	(75)
Southeast 0.9x	0.54	x	0.64	x	36.79	x	0.63	×	0.7] =	5.05	(77)
Southeast 0.9x	0.54	x	0.64	x	62.67	x	0.63	x	0.7] =	8.6	(77)

		-					0.00	~	0.7	_	11.70	· · · · /
Southeast 0.9x	0.54	x	0.64	x	106.25	x	0.63	x	0.7	1 =	14.57	(77)
Southeast 0.9x	0.54	x	0.64	x	119.01	x	0.63	x	0.7	i =	16.32	(77)
Southeast 0.9x	0.54	x	0.64	x	118.15	x	0.63	x	0.7] =	16.21	(77)
Southeast 0.9x	0.54	x	0.64	x	113.91	x	0.63	x	0.7] =	15.62	(77)
Southeast 0.9x	0.54	x	0.64	x	104.39	x	0.63	x	0.7] =	14.32	(77)
Southeast 0.9x	0.54	x	0.64	x	92.85	x	0.63	x	0.7] =	12.74	(77)
Southeast 0.9x	0.54	x	0.64	x	69.27	x	0.63	x	0.7] =	9.5	(77)
Southeast 0.9x	0.54	x	0.64	x	44.07	x	0.63	x	0.7	=	6.05	(77)
Southeast 0.9x	0.54	x	0.64	x	31.49	x	0.63	x	0.7	=	4.32	(77)
Southwest <mark>0.9x</mark>	0.54	x	1.23	x	36.79]	0.63	x	0.7] =	9.7	(79)
Southwest <mark>0.9x</mark>	0.54	x	5.11	x	36.79]	0.63	x	0.7	=	40.3	(79)
Southwest <mark>0.9x</mark>	0.54	x	1.28	x	36.79]	0.63	x	0.7] =	10.09	(79)
Southwest <mark>0.9x</mark>	0.77	x	2.59	x	36.79]	0.63	x	0.7] =	29.12	(79)
Southwest _{0.9x}	0.77	x	2.28	x	36.79]	0.63	x	0.7] =	25.64	(79)
Southwest <mark>0.9x</mark>	0.77	x	6.83	x	36.79]	0.63	x	0.7] =	76.8	(79)
Southwest <mark>0.9x</mark>	0.54	x	1.23	x	62.67]	0.63	x	0.7] =	16.52	(79)
Sout <mark>hwest</mark> 0.9x	0.54	x	5.11	×	62.67		0.63	х	0.7	=	68.64	(79)
Sout <mark>hwest_{0.9x}</mark>	0.54] ×	1.28	x	62.67		0.63	x	0.7] =	17.19	(79)
Sout <mark>hwest_{0.9x}</mark>	0.77	x	2.59	x	62.67		0.63	x	0.7	=	49.61	(79)
Sout <mark>hwest_{0.9x}</mark>	0.77] x	2.28	x	62.67		0.63	x	0.7	=	43.67	(79)
Sout <mark>hwest</mark> 0.9x	0.77) x	6.83	x	62.67]	0.63	x	0.7] =	130.82	(79)
Sout <mark>hwest</mark> 0.9x	0.54] x	1.23	x	85.75		0.63	x	0.7	=	<mark>2</mark> 2.61	(79)
Sout <mark>hwest_{0.9x}</mark>	0.54	x	5.11	x	85.75]	0.63	x	0.7] =	93.92	(79)
Southwest _{0.9x}	0.54	x	1.28	x	85.75]	0.63	x	0.7	=	23.53	(79)
Southwest0.9x	0.77	x	2.59	x	85.75]	0.63	x	0.7	=	67.88	(79)
Southwest _{0.9x}	0.77	x	2.28	x	85.75]	0.63	x	0.7] =	59.75	(79)
Southwest0.9x	0.77	x	6.83	x	85.75]	0.63	x	0.7] =	178.99	(79)
Southwest _{0.9x}	0.54	x	1.23	x	106.25]	0.63	x	0.7	=	28.01	(79)
Southwest0.9x	0.54	x	5.11	x	106.25]	0.63	x	0.7	=	116.37	(79)
Southwest0.9x	0.54	x	1.28	x	106.25		0.63	x	0.7	=	29.15	(79)
Southwest0.9x	0.77	x	2.59	x	106.25]	0.63	x	0.7	=	84.1	(79)
Southwest0.9x	0.77	x	2.28	x	106.25]	0.63	x	0.7] =	74.04	(79)
Southwest0.9x	0.77	x	6.83	x	106.25]	0.63	x	0.7	=	221.78	(79)
Southwest0.9x	0.54	x	1.23	x	119.01]	0.63	x	0.7] =	31.37	(79)
Southwest0.9x	0.54	x	5.11	x	119.01]	0.63	x	0.7	=	130.34	(79)
Southwest _{0.9x}	0.54	x	1.28	x	119.01]	0.63	x	0.7	=	32.65	(79)
Southwest _{0.9x}	0.77	x	2.59	x	119.01]	0.63	x	0.7	=	94.2	(79)
Southwest <mark>0.9x</mark>	0.77	x	2.28	x	119.01]	0.63	x	0.7	=	82.93	(79)
Southwest <mark>0.9</mark> x	0.77	x	6.83	x	119.01]	0.63	x	0.7] =	248.42	(79)
Southwest <mark>0.9x</mark>	0.54	x	1.23	x	118.15]	0.63	x	0.7	=	31.15	(79)

Southwest0.9x	0.54	x	5.11	x	118.15]	0.63	x	0.7	=	129.4	(79)
Southwest0.9x	0.54	x	1.28	x	118.15	İ	0.63	x	0.7] =	32.41	(79)
Southwest0.9x	0.77	x	2.59	x	118.15	İ	0.63	x	0.7] =	93.52	(79)
Southwest0.9x	0.77	x	2.28	x	118.15	Ī	0.63	x	0.7] =	82.33	(79)
Southwest0.9x	0.77	x	6.83	x	118.15	İ	0.63	×	0.7] =	246.62	
Southwest0.9x	0.54	x	1.23	x	113.91]	0.63	×	0.7] =	30.03	(79)
Southwest0.9x	0.54	x	5.11	x	113.91]	0.63	x	0.7	=	124.75	(79)
Southwest0.9x	0.54	x	1.28	x	113.91]	0.63	x	0.7] =	31.25	(79)
Southwest0.9x	0.77	x	2.59	x	113.91]	0.63	x	0.7	=	90.16	(79)
Southwest0.9x	0.77	x	2.28	x	113.91]	0.63	x	0.7] =	79.37	(79)
Southwest0.9x	0.77	x	6.83	x	113.91]	0.63	x	0.7	=	237.77	(79)
Southwest0.9x	0.54	x	1.23	x	104.39]	0.63	×	0.7] =	27.52	(79)
Southwest0.9x	0.54	x	5.11	x	104.39]	0.63	x	0.7	=	114.33	(79)
Southwest0.9x	0.54	x	1.28	x	104.39]	0.63	x	0.7	=	28.64	(79)
Southwest0.9x	0.77	x	2.59	x	104.39]	0.63	x	0.7	=	82.63	(79)
Southwest0.9x	0.77	x	2.28	x	104.39]	0.63	x	0.7	=	72.74	(79)
Southwest0.9x	0.77	x	6.83	x	104.39]	0.63	x	0.7	=	217.9	(79)
Southwest0.9x	0.54	x	1.23	X	92.85		0.63	х	0.7] =	24.48	(79)
Southwest _{0.9x}	0.54] x	5.11	x	92.85		0.63	x	0.7] =	101.69	(79)
Southwest0.9x	0. <mark>54</mark>	x	1.28	x	92.85		0.63	x	0.7	=	25.47	(79)
Southwest0.9x	0.7 <mark>7</mark>	x	2.59	x	92.85		0.63	x	0.7	=	73.5	(79)
Southwest _{0.9x}	0.77] ×	2.28	x	92.8 <mark>5</mark>]	0.63	x	0.7] =	64.7	(79)
Southwest0.9x	0.77] x	6.83	x	92.85		0.63	x	0.7	=	193.81	(79)
Southwest0.9x	0.54	x	1.23	x	69.27]	0.63	x	0.7] =	18.26	(79)
Southwest0.9x	0.54	x	5.11	x	69.27]	0.63	x	0.7] =	75.86	(79)
Southwest0.9x	0.54	x	1.28	x	69.27]	0.63	x	0.7] =	19	(79)
Southwest0.9x	0.77	x	2.59	x	69.27]	0.63	x	0.7] =	54.83	(79)
Southwest0.9x	0.77	x	2.28	x	69.27]	0.63	x	0.7] =	48.27	(79)
Southwest0.9x	0.77	x	6.83	x	69.27]	0.63	×	0.7] =	144.58	(79)
Southwest0.9x	0.54	x	1.23	×	44.07]	0.63	×	0.7] =	11.62	(79)
Southwest0.9x	0.54	x	5.11	x	44.07]	0.63	x	0.7] =	48.27	(79)
Southwest0.9x	0.54	x	1.28	x	44.07]	0.63	×	0.7] =	12.09	(79)
Southwest0.9x	0.77	x	2.59	x	44.07]	0.63	x	0.7] =	34.88	(79)
Southwest0.9x	0.77	x	2.28	x	44.07]	0.63	x	0.7] =	30.71	(79)
Southwest0.9x	0.77	x	6.83	x	44.07]	0.63	x	0.7	=	91.99	(79)
Southwest0.9x	0.54	x	1.23	x	31.49]	0.63	x	0.7	=	8.3	(79)
Southwest _{0.9x}	0.54	x	5.11	x	31.49]	0.63	x	0.7	=	34.49	(79)
Southwest _{0.9x}	0.54	x	1.28	x	31.49]	0.63	×	0.7	=	8.64	(79)
Southwest _{0.9x}	0.77	x	2.59	×	31.49]	0.63	×	0.7] =	24.92	(79)
Southwest _{0.9x}	0.77	x	2.28	×	31.49]	0.63	×	0.7] =	21.94	(79)
Southwest _{0.9x}	0.77	x	6.83	×	31.49]	0.63	×	0.7	=	65.73	(79)

Northw	est <mark>0.9x</mark>	0.54)	(4.65		x	1	1.28	X		0.63	x	0.7] =	11.24	(81)
Northw	est <mark>0.9x</mark>	0.54	,	(4.65		x	2	2.97	Īx		0.63	×	0.7] =	22.89	(81)
Northw	est <mark>0.9x</mark>	0.54	,	(4.65		x	4	1.38	- x	Γ	0.63	×	0.7] =	41.24	(81)
Northw	est <mark>0.9x</mark>	0.54)	(4.65		x	6	7.96	X		0.63	x	0.7] =	67.73	(81)
Northw	est <mark>0.9x</mark>	0.54	,	(4.65		x	9	1.35		Γ	0.63	×	0.7] =	91.04	(81)
Northw	est <mark>0.9x</mark>	0.54	,	(4.65		x	9	7.38	- x	Γ	0.63	x	0.7] =	97.05	(81)
Northw	est <mark>0.9x</mark>	0.54	,	(4.65		x	9	91.1	X		0.63	x	0.7] =	90.79	(81)
Northw	est <mark>0.9x</mark>	0.54)	(4.65		x	7	2.63] x		0.63	x	0.7] =	72.38	(81)
Northw	est <mark>0.9x</mark>	0.54)	(4.65		x	5	60.42	x		0.63	x	0.7] =	50.25	(81)
Northw	est <mark>0.9x</mark>	0.54)	(4.65		x	2	8.07	x		0.63	x	0.7		=	27.97	(81)
Northw	est <mark>0.9x</mark>	0.54)	(4.65		x		14.2	x		0.63	x	0.7] =	14.15	(81)
Northw	est <mark>0.9x</mark>	0.54)	(4.65		x	9	9.21	x		0.63	x	0.7		=	9.18	(81)
Rooflig	hts <mark>0.9x</mark>	1)	(0.79		x	3	37.03] x		0.63	x	0.7] =	23.34	(82)
Rooflig	hts <mark>0.9x</mark>	1)	(0.79		x	7	0.28	x		0.63	x	0.7] =	44.29	(82)
Rooflig	hts <mark>0.9x</mark>	1)	(0.79		x	1	11.87	x		0.63	x	0.7		=	70.5	(82)
Rooflig	hts <mark>0.9x</mark>	1)	(0.79		x	1:	59.33	x		0.63	x	0.7		=	100.4	(82)
Rooflig	hts <mark>0.9x</mark>	1)	(0.79		x	1	93.3	x		0.63	x	0.7] =	121.81	(82)
Rooflig	nts 0.9x	1	,	<	0.79		x	19	97.35	x		0.63	x	0.7] =	124.36	(82)
Rooflig	hts 0.9x	1	,	ĸ	0.79		x	18	88.08] x		0.63	x	0.7] =	118.52	(82)
Rooflig	hts <mark>0.9x</mark>	1	,	ĸ	0.79		x	1	62.62] ×		0.63	x	0.7		=	102.47	(82)
Rooflig	hts <mark>0.9x</mark>	1)	<	0.79		x	1:	28.66] x		0.63	x	0.7	•] =	81.08	(82)
Rooflig	hts <mark>0.9x</mark>	1	,	ĸ	0.79		x	8	2.24	X		0.63	x	0.7		=	51.83	(82)
Rooflig	hts <mark>0.9x</mark>	1	,	<	0.79		x	4	5.75] ×		0.63	x	0.7] =	28.83	(82)
Rooflig	hts 0.9x	1	,	¢	0.79		x	3	0.74	x		0.63	x	0.7] =	19.37	(82)
Solar g	pains in	watts, ca	alculate	d	for each	month	<u>\</u>		1	(83))m =	Sum(74)m .	(82)m				I	
(83)m=	284.62	510.81	765.8		1057.43	$\frac{1280.95}{(72)}$		313.46	1248.98	10	76.2	9 866.1	582.8	345.7	24	0.45		(83)
i otal g	ains - i	nternal a	and sola	ar T	(84)m = 0	(73)m	+ ((83)m	, watts		00.0	4 4000 0	4004	47 000 0		F 00	l	(94)
(84)m=	816.47	1040.39	1276.52	-	1537.23	1728.1	11	729.42	1645.57	14	80.Z	4 1286.6	1034.4	47 833.2	5 75	5.82		(04)
7. Me	an inter	rnal temp	perature	e (heating s	seasor	า)											_
Temp	erature	during h	neating	pe	eriods in	the liv	ing	area	from Tal	ble	9, T	h1 (°C)					21	(85)
Utilisa	ation fac	ctor for g	ains for	· li	ving area	a, h1,n	n (s	see Ta	ble 9a)	1				<u> </u>			l	
	Jan	Feb	Mar	╇	Apr	May	┢	Jun	Jul		Aug	Sep	Oc	t Nov		Dec		(22)
(86)m=	1	1	0.99		0.96	0.87		0.7	0.54	C).61	0.87	0.98	1		1		(86)
Mean	interna	l temper	ature ir	n li	ving area	a T1 (f	ollo	ow ste	ps 3 to 7	7 in	Tab	ole 9c)					I	
(87)m=	19.5	19.69	20.01		20.41	20.75		20.94	20.99	2	0.97	20.82	20.3	6 19.85	5 19	9.46		(87)
Temp	erature	during h	eating	pe	eriods in	rest of	f dv	velling	from Ta	able	9, '	Th2 (°C)						
(88)m=	19.86	19.86	19.87		19.87	19.88		19.88	19.88	1	9.88	19.88	19.8	3 19.87	19	9.87		(88)
Utilisa	ation fac	ctor for g	ains for	re	est of dw	elling,	h2	2,m (se	e Table	9a)							
(89)m=	1	1	0.99		0.94	0.82		0.61	0.41	C).48	0.8	0.97	1		1		(89)

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

(90)m=	17.86	18.14	18.6	19.19	19.64	19.84	19.88	19.87	19.73	19.12	18.37	17.81		(90)
l									f	LA = Livin	g area ÷ (4	4) =	0.21	(91)
Moon	intorna	ltomnor	oturo (fo	r tho wh	olo dwo	lling) – fl	Λ 🗸 Τ1	ı (1 fl	A) v T2			I		
(92)m=	18.2	18 47	18.9	19 45	19.87	20.07	20.11	+(1-1)	19.96	19.38	18 68	18 16		(92)
Annly	adiustn	nent to t	he mear	internal	temper	ature fro	m Table	4e whe		nriate	10.00	10.10		(/
(93)m=	18.2	18.47	18.9	19.45	19.87	20.07	20.11	20.11	19.96	19.38	18.68	18.16		(93)
8 Sp	ace hea	tina real	Jirement											. ,
Set Ti	i to the r	nean int	ernal ter	nperatur	re obtair	ed at ste	ep 11 of	Table 9	o so tha	t Ti m=()	76)m an	d re-calc	ulate	
the ut	ilisation	factor fo	or gains	using Ta	ble 9a				o, oo ma	c 11,111–(1	rojin an		uluto	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	:										
(94)m=	1	0.99	0.98	0.94	0.82	0.62	0.44	0.51	0.8	0.97	1	1		(94)
Usefu	ıl gains,	hmGm	, W = (94	4)m x (84	4)m									
(95)m=	814.94	1034.43	1252.99	1439.19	1416.7	1077.38	720.44	751.47	1032.54	1002.63	829.57	754.82		(95)
Month	nly avera	age exte	ernal 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	loss rate	e for mea	an interr	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m]				
(97)m=	2948.38	2872.62	2619.85	2210.03	1710.15	1136.66	729.29	768.65	1221.38	1837.45	2431.83	2939.89		(97)
Space	e heatin	g require	ement fo	r each m	honth, k	Nh/mont	h = 0.02	2 <mark>4 x [(9</mark> 7)m – (95)m] x (4′	1)m			
(98)m=	1587.28	1235.27	1016.94	555.01	218.33	0	0	0	0	621.11	1153.62	1625.6 <mark>9</mark>		
								Tota	l per year	(kWh/year) = Sum(9	8)15,912 =	8013.25	(98)
Space	e heatin	g requ <mark>ire</mark>	ement in	kWh/m ²	/year								48.1	(99)
9a. En	erav rec	uiremer	nts – Ind	ividu al h	eating s	vstems i	ncluding	micro-C	CHP)					
Space	e heatir	ng:												
Fra <mark>cti</mark>	on of sp	ace hea	at from s	econdary	y/supple	mentary	system						0	(201)
Fracti	on of sp	ace hea	at from m	nain syst	em(s)			(202) = 1	- (201) =			ļ	1	(202)
Fracti	on of to	tal heati	na from	main svs	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficie	ancy of r	nain ena	aco hoat	ing syste	om 1							l	02.4	
						~ ~ ~ ~ ~ ~ ~	. 0/						95.4	
EIIICIE		seconda	ry/suppi	ementar	y neating	g system	1, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space	e heatin	g require	ement (c	alculate	d above))								
	1587.28	1235.27	1016.94	555.01	218.33	0	0	0	0	621.11	1153.62	1625.69		
(211)m	ı = {[(98)m x (20	4)] } x 1	00 ÷ (20)6)									(211)
	1699.45	1322.56	1088.81	594.22	233.76	0	0	0	0	665	1235.14	1740.57		_
								Tota	l (kWh/yea	ar) =Sum(2	2 11) _{15,1012}	=	8579.5	(211)
Space	e heatin	g fuel (s	econdar	y), kWh/	month							-		_
= {[(98)m x (20	01)]}x 1	00 ÷ (20	8)					-					
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
								Tota	l (kWh/yea	ar) =Sum(2	215) _{15,1012}	=	0	(215)
Water	heating	I										•		
Output	from w	ater hea	ter (calc	ulated al	bove)									
	221.35	195.05	204.74	183.38	178.68	157.37	150.77	168.07	168.76	190.17	201.27	215.97		_
Efficier	ncy of w	ater hea	iter										80.3	(216)

(017)		00.50	07.00	05.50	00.0	00.0	00.0	00.0	07.04	00.74	00.00	1	(217)		
	00.00	00.00	07.00	00.00	60.3	80.3	80.3	80.3	07.01	00.74	89.09		(217)		
Fuel for wate $(219)m = (6)$	er neating, 4)m x 10(KVVN/m) ∸ (217)	onth Im												
(219)m= 248.6	2 219.47	231.25	209.19	208.84	195.98	187.76	209.31	210.17	216.56	226.8	242.43				
							Tota	l = Sum(2	19a) ₁₁₂ =			2606.39	(219)		
Annual tota	ls								k	Wh/yea	r	kWh/yea			
Space heati	ng fuel use	ed, main	system	1								8579.5			
Water heatir	ng fuel use	ed										2606.39			
Electricity fo	r pumps, f	ans and	electric	keep-ho	t										
central hea	ting pump	:									30		(230c)		
boiler with	a fan-assis	sted flue									45		(230e)		
Total electric	city for the	above, l	kWh/yea	r			sum	of (230a)	(230g) =			75	(231)		
Electricity fo	r liabtina														
Electricity 10	riignung											532.26	(232)		
12a. CO2 6	in the above, kWh/year sum of (230a)(230g) = 75 (231) is ilectricity for lighting 532.26 (232) 12a. CO2 emissions – Individual heating systems including micro-CHP Energy Emission factor Emissions														
12a. CO2 e	emissions -	– Individ	ual heati	ing syste	ems inclu En kW	uding mi I ergy /h/year	cro-CHF)	Emiss kg CO2	ion fac 2/kWh	tor	Emissions kg CO2/ye	(232) s ar		
12a. CO2 e	emissions - emissions - ng (main s	– Individ ystem 1	ual heati	ing syste	ems inclu En kW (21 [,]	uding mi ergy /h/year 1) x	cro-CHF)	Emiss kg CO2	ion fac 2/kWh	tor =	Emissions kg CO2/ye	(232) ar		
12a. CO2 e Space heati Space heati	missions missions ng (main s ng (second	– Individ system 1 dary)	ual heati	ing syste	ems inclu En kW (21 ² (21)	uding mi ergy /h/year 1) x 5) x	cro-CHF		Emiss kg CO 0.2	ion fac 2/kWh 16	tor = =	Emissions kg CO2/ye 1853.17	(232) ar (261) (263)		
12a. CO2 e Space heati Space heati Water heatir	missions missions ng (main s ng (second	– Individ system 1 dary)	ual heati	ing syste	ems inclu En kW (21* (21) (21)	uding mi ergy /h/year 1) x 5) x 9) x	cro-CHF		Emiss kg CO 0.2 0.5	ion fac 2/kWh 16 19	tor = = =	532.26 Emissions kg CO2/ye 1853.17 0 562.98	(232) ar (261) (263) (264)		
Space heati Space heati Water heatir Space and v	ng (main s ng (main s ng (secono ng vater heati	– Individ ystem 1 dary)	ual heati	ing syste	ems inclu En kW (21* (21) (21) (21) (26*	uding mi ergy /h/year 1) x 5) x 9) x 1) + (262)	cro-CHF + (263) + ((264) =	Emiss kg CO 0.2 0.5	ion fac 2/kWh 16 19	tor = = =	532.26 Emissions kg CO2/ye 1853.17 0 562.98 2416.15	(232) ar (261) (263) (264) (265)		
Space heati Space heati Space heati Water heatir Space and w Electricity fo	emissions ng (main s ng (secono ng vater heati r pumps, f	– Individ system 1 dary) ing ans and	ual heati) elec <mark>tric</mark> l	ing syste	ems inclu En kW (21 ² (21) (21) (26 ² t (23)	uding mi ergy /h/year 1) x 5) x 9) x 1) + (262) 1) x	cro-CHF + (263) + (264) =	Emiss kg CO 0.2 0.5	ion fac 2/kWh 16 19 16	tor = = =	532.26 Emissions kg CO2/ye 1853.17 0 562.98 2416.15 38.93	(232) ar (261) (263) (264) (265) (267)		
Space heati Space heati Space heati Water heatir Space and w Electricity fo	emissions og (main s og (second og vater heati r pumps, f r lighting	– Individ system 1 dary) ing ans and	ual heati	ing syste	ems inclu En kW (21* (218) (26* t (23* (23*	uding mi ergy /h/year 1) x 5) x 9) x 1) + (262) 1) x 2) x	cro-CHF + (263) + ((264) =	Emiss kg CO2 0.2 0.5 0.2	ion fac 2/kWh 16 19 16	tor = = = =	532.26 Emissions kg CO2/ye 1853.17 0 562.98 2416.15 38.93 276.24	(232) ar (261) (263) (264) (265) (267) (268)		
Space heati Space heati Space heati Water heatir Space and w Electricity fo Electricity fo Total CO2, F	missions mg (main s ng (second ng vater heati r pumps, f r lighting cg/year	– Individ system 1 dary) ans and	ual heati	ing syste	ems inclu En kW (21* (218) (26* t (23* (23*	uding mi h/year 1) x 5) x 9) x 1) + (262) 1) x 2) x	cro-CHF + (263) + ((264) = sum c	Emiss kg CO 0.2 0.5 0.5 0.5	ion fac 2/kWh 16 19 16 19 19 19 271) =	tor = = = =	532.26 Emissions kg CO2/ye 1853.17 0 562.98 2416.15 38.93 276.24 2731.32	(232) ar (261) (263) (264) (265) (265) (267) (268) (272)		

TER =

16.39 (273)

				User D	etails:									
Assessor Name: Software Name:	Stroma FS	AP 201	2		Strom Softwa	a Num are Ver	ber: sion:		Versio	n: 1.0.4.7				
	77 70 01 11		P	roperty /	Address	Charlot	te Stree	t - Lean						
Address :	77-79 Charl	otte Stre	et, Lonc	ion, wi										
T. Overall dwelling dime	INSIONS.			A * 0	- (m ²)			abt(m)		Volumo(m3)				
Ground floor				Alea	a(III-)	(1a) x		55	(2a) =	205.8](3a)			
					110			.55	(2a) -	293.6				
					50.6	(1b) x	2	.76	(2b) =	139.66	(3b)			
Total floor area $TFA = (1)$	a)+(1b)+(1c)+	(1d)+(1e)+(1n	I) 1	66.6	(4)								
Dwelling volume						(3a)+(3b))+(3c)+(3d)+(3e)+	.(3n) =	435.46	(5)			
2. Ventilation rate: main secondary other total m heating heating														
	m ³ per hour													
Number of chimneys		"ז + ר	0] + [0] = [0	x 4	40 =	0	(6a)			
Number of open flues	0		0	i + F	0] = [0	x 2	20 =	0	(6b)			
Number of intermittent fa	ins					л Г Г	0	x 1	10 =	0] (7a)			
Number of passive vents							0	x 1	10 =	0	(7b)			
Number of flueless gas fi	res						0	x 4	40 =	0](7c)			
Infiltration due to chimpe	vs flues and f	ans = (6)	a)+(6b)+(7	a)+(7b)+(7c) =				Air ch	anges per hou	ır Tox			
If a pressurisation test has b	peen carried out of	r is intende	d. proceed	d to (17), d	otherwise o	continue fro	0 0 (9) to ((16)	÷ (3) =	0	(0)			
Number of storeys in the	he dw <mark>elling</mark> (ne	6)					- (-) - (-/		0	(9)			
Additional infiltration								[(9)-	-1]x0.1 =	0	(10)			
Structural infiltration: 0	.25 for steel or	timber f	rame or	0.35 foi	r masonr	y constr	uction			0	(11)			
if both types of wall are pl	resent, use the va	lue corresp 0 35	oonding to	the great	er wall are	a (after								
If suspended wooden f	floor, enter 0.2	(unseale	ed) or 0.	1 (seale	ed), else	enter 0				0	(12)			
If no draught lobby, en	ter 0.05, else e	enter 0								0	(13)			
Percentage of windows	s and doors dr	aught st	ripped							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,	q50, expresse	ed in cub	ic metre	s per ho	our per so	quare m	etre of e	nvelope	area	3	(17)			
If based on air permeabil	ity value, then	(18) = [(17	7) ÷ 20]+(8	3), otherwi	se (18) = (16)				0.15	(18)			
Air permeability value applie	es if a pressurisation	on test has	been don	e or a deg	gree air pei	rmeability	is being us	sed			1(10)			
Shelter factor	u				(20) = 1 -	[0.075 x (1	9)] =			0.85	(19)			
Infiltration rate incorporat	ting shelter fac	tor			(21) = (18)) x (20) =				0.00	(21)			
Infiltration rate modified f	or monthly wir	nd speed								0.10	1,,			
Jan Feb	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
Monthly average wind so	eed from Tabl	e 7								I				
(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 F	actor (2	2a)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			
Adjust	ed infiltra	ation rat	te (allow	ing for sl	nelter ar	nd wind s	speed) =	(21a) x	(22a)m						
-	0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15			
Calcul	ate effec	tive air	change	rate for t	he appl	icable ca	se				<u> </u>				
If me	echanica	al ventila	ation:	and the NL (C	20L) (00	-)) (00-)			C).5	(23a)
If exh	aust air ne	eat pump	using App	enaix IN, (2	23D) = (23	a) × Fmv (e	equation (I	v5)), otne	rwise (23b) = (23a)			0).5	(23b)
IT Dala	anced with	neat rec	overy: effic	ciency in %	allowing	for in-use f	actor (from	n Table 4h) =				75	5.65	(23c)
a) If	balance	d mech	anical ve	entilation	with he	at recov	ery (MVI	HR) (24a	a)m = (22)	2b)m + (23b) × [′	1 – (23c)	÷ 100] I		(0.4-)
(24a)m=	0.28	0.28	0.28	0.26	0.26	0.24	0.24	0.24	0.25	0.26	0.27	0.27			(24a)
b) If	balance	d mech	anical ve	entilation	without	t heat red	covery (N	ИV) (24t Т	o)m = (22	2b)m + (2 1	23b)	-	1		(2.4)
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24b)
c) If	whole h	ouse ex	tract ver	ntilation of	or positiv	ve input	ventilatio	on from (outside	E (00k					
(0.1 c) -	if (22b)m	1 < 0.5 :	x (23D), 1	tnen (24)	c) = (231	b); otner		c) = (221	5) m + 0.	.5 × (230) 		1		(24c)
(24c)m=		0	0	0	0	0	0	0	0	0	0	0			(240)
d) If	natural v if (22h)m	ventilati	on or wh Ion (24d)	iole hous m – (22	se positi h)m oth	ve input erwise (2	ventilatio 24d)m –	on from 1	0ft 2h)m² x	0 51					
(24d)m=		0									0	0			(24d
Effe	ctive air	change	rate - ei	nter (24a	$1 - \frac{1}{24}$	b) or (24	c) or (24	d) in hor	(25)						
(25)m=	0.28	0.28	0.28	0.26	0.26	0.24	0.24	0.24	0.25	0.26	0.27	0.27			(25)
3. He	at losses	s and h	eat loss	paramet	er:						_				
ELEN		Gro	SS (m²)	Openin	igs 1 ²	Net Ar	rea m²	U-val W/m2	ue K	A X U	K)	k-value	e) ≺		A X k k.I/K
Windo	ws Type	1	(,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			2.37	x1	/[1/(1.4)+	0.04] =	3.14					(27)
Windo	ws Type	2				2.03		/[1/(1.4)+	0.04] =	2 69	-				(27)
Windo	ws Type	3				1.05	x1.	- /[1/(1.4)+	0.04] =	1.39	=				(27)
Windo	ws Type	4				8.44	x1.	- /[1/(1.4)+	0.04] =	11.19	=				(27)
Windo	ws Type	5				7.68		/[1/(1.4)+	0.04] =	10.18	\exists				(27)
Windo	ws Type	6				2.11		/[1/(1.4)+	0.04] =	2.8	\exists				(27)
Windo	ws Type	7				11.27	7 x1	/[1/(1.4)+	0.04] =	14.94	\exists				(27)
Windo	ws Type	8				4.28		/[1/(1.4)+	0.04] =	5.67	=				(27)
Windo	ws Type	9				3.76		/[1/(1.4)+	0.04] =	4.98	\exists				(27)
Windo	ws Type	10				11.27	7 x1	/[1/(1.4)+	0.04] =	14.94	=				(27)
Rooflig	phts					1.31	x1.	/[1/(1.1) +	0.04] =	1.441	=				(27b)
Floor						116.1	6 ×	0.065	=	7.5504	 [(28)
Walls	Type1	29.	73	14.2	2	15.5	x	0.18	=	2.79			- i		(29)
Walls	Type2	15.	58	7.68	3	7.9	×	0.18		1.42			i F	. <u> </u>	(29)
Walls	ТуреЗ	22.	89	12.5	8	10.3	1 X	0.18		1.86			i F		(29)
Walls	Type4	16.	96	1.05	5	15.9	1 X	0.18		2.86			i F		(29)
Walls -	Туре5	12.	56	0		12.56	3 X	0.18	=	2.26	-		i F		(29)

Walls Type6 26.16 11.2	27 14.89 X	0.18 =	2.68			(29)
Walls Type7 30.59 19.3	31 11.28 ×	0.18 =	2.03		\exists	(29)
Walls Type8 39.55 0	39.55 ×	0.09 =	3.56		╡	(29)
Walls Type9 11.51 0	11.51 ×	0.09 =	1.04		\dashv	(29)
Roof Type1 50.6 2.6	2 47.98 ×	0.13 =	6.24		\dashv	(30)
Roof Type2 26.96 0	26.96 ×	0.13 =	3.5			`´´ (30)
Total area of elements, m ²	399.25					` ´ ´ (31)
* for windows and roof windows, use effective w ** include the areas on both sides of internal wa	vindow U-value calculated using	g formula 1/[(1/U-valı	ıe)+0.04] as given in	paragrapl	h 3.2	. ,
Fabric heat loss, $W/K = S (A \times U)$, ,	(26)(30) + (32) =			128.2	(33)
Heat capacity $Cm = S(A \times k)$		((28)	.(30) + (32) + (32a).	(32e) =	0	(34)
Thermal mass parameter (TMP = Cm	÷ TFA) in kJ/m²K	Indica	tive Value: Medium		250	(35)
For design assessments where the details of th	e construction are not known p	recisely the indicative	values of TMP in Ta	able 1f		
can be used instead of a detailed calculation. Thermal bridges : $S(I \times X)$ calculated	using Appendix K				50.00	
if details of thermal bridging are not known (36)	$= 0.15 \times (31)$				59.89	(36)
Total fabric heat loss	= 0.10 x (01)	(33) +	(36) =		188.09	(37)
Ventilation heat loss calculated month	ly	(38)m	= 0.33 × (25)m x (5)			
Jan Feb Mar Apr	May Jun Jul	Aug Sep	Oct Nov	Dec		
(38)m= 40.86 40.4 39.94 37.65	37.19 34.9 34.9	34.44 35.82	3 <mark>7.19 38.11</mark>	39.02		(38)
Heat transfer coefficient, W/K		(39)m	= (37) + (38)m			
(39)m= 228.94 228.48 228.03 225.74	225.28 222.99 222.99	222.53 223.9	225.28 226.19	<mark>22</mark> 7.11		
			Average = Sum(39)1	12 /12=	2 <mark>25.62</mark>	(39)
Heat loss parameter (HLP), W/m ² K		(40)m	= (39)m ÷ (4)	4.00	1	
(40)m = 1.37 1.37 1.37 1.35	1.35 1.34 1.34	1.34 1.34	1.35 1.36	1.36	1.25	
Number of days in month (Table 1a)		,	-verage – Oum(40)1.	12 / 12-	1.00	(+0)
Jan Feb Mar Apr	May Jun Jul	Aug Sep	Oct Nov	Dec		
(41)m= 31 28 31 30	31 30 31	31 30	31 30	31		(41)
4. Water heating energy requirement				kWh/y	ear:	
Assumed occupancy, N					1	(40)
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - ex	כ(-0.000349 x (TFA -13.9	9)2)] + 0.0013 x (⁻	2. TFA -13.9)	96]	(42)
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - ex if TFA £ 13.9, N = 1	o(-0.000349 x (TFA -13.9	9)2)] + 0.0013 x ([*]	TFA -13.9)	96]	(42)
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - ex if TFA £ 13.9, N = 1 Annual average hot water usage in litr Reduce the annual average hot water usage by	o(-0.000349 x (TFA -13.9 es per day Vd,average = <i>5% if the dwelling is designed</i>	9)2)] + 0.0013 x (* ; (25 x N) + 36 to achieve a water us	TFA -13.9)	96]	(42) (43)
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp if TFA £ 13.9, N = 1 Annual average hot water usage in litr Reduce the annual average hot water usage by not more that 125 litres per person per day (all	o(-0.000349 x (TFA -13.9 es per day Vd,average = 5% if the dwelling is designed vater use, hot and cold)	9)2)] + 0.0013 x (* s (25 x N) + 36 to achieve a water us	IFA -13.9) 2. See target of 104	96]	(42) (43)
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp if TFA £ 13.9, N = 1 Annual average hot water usage in litr Reduce the annual average hot water usage by not more that 125 litres per person per day (all Jan Feb Mar Apr	o(-0.000349 x (TFA -13.9 es per day Vd,average = 5% if the dwelling is designed water use, hot and cold) May Jun Jul	9)2)] + 0.0013 x ([*] (25 x N) + 36 <i>to achieve a water us</i> Aug Sep	TFA -13.9) se target of Oct Nov	96 4.45 Dec]]	(42) (43)
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - ex] if TFA £ 13.9, N = 1 Annual average hot water usage in litr Reduce the annual average hot water usage by not more that 125 litres per person per day (all Jan Feb Mar Apr Hot water usage in litres per day for each month	c)(-0.000349 x (TFA -13.9 es per day Vd,average = 5% if the dwelling is designed water use, hot and cold) May Jun Jul 1 Vd,m = factor from Table 1c x	9)2)] + 0.0013 x ((25 x N) + 36 to achieve a water us Aug Sep (43)	TFA -13.9) 2. Se target of Oct Nov	96 4.45 Dec]]	(42) (43)
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp if TFA £ 13.9, N = 1 Annual average hot water usage in litre Reduce the annual average hot water usage by not more that 125 litres per person per day (all Jan Feb Mar Apr Hot water usage in litres per day for each month (44)m= 114.9 110.72 106.54 102.36	$D(-0.000349 \times (TFA - 13.9))$ es per day Vd, average = 5% if the dwelling is designed water use, hot and cold) $May \qquad Jun \qquad Jul \\ Vd, m = factor from Table 1c \times 98.19 \qquad 94.01 \qquad 94.01$	9)2)] + 0.0013 x ((25 x N) + 36 to achieve a water us Aug Sep (43) 98.19 102.36	IFA -13.9) 104 Se target of 104 Oct Nov 106.54 110.72	96 4.45 Dec 114.9]]]	(42)
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp if TFA £ 13.9, N = 1 Annual average hot water usage in litre Reduce the annual average hot water usage by not more that 125 litres per person per day (all Jan Feb Mar Apr Hot water usage in litres per day for each month (44)m= 114.9 110.72 106.54 102.36 Energy content of hot water used - calculated m	b) $(-0.000349 \times (TFA - 13.9))$ es per day Vd, average = 5% if the dwelling is designed water use, hot and cold) May Jun Jul 1 Vd, m = factor from Table 1c x 98.19 94.01 94.01 100thly = 4.190 x Vd, m x nm x l	9)2)] + 0.0013 x ((25 x N) + 36 to achieve a water us Aug Sep (43) 98.19 102.36	2. TFA -13.9) Se target of Oct Nov 106.54 110.72 Total = Sum(44)_112 = oth (see Tables 1b, 1	96 4.45 Dec 114.9]] 1253.43	(42) (43)
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp if TFA £ 13.9, N = 1 Annual average hot water usage in litr Reduce the annual average hot water usage by not more that 125 litres per person per day (all Jan Feb Mar Apr Hot water usage in litres per day for each month (44)m= 114.9 110.72 106.54 102.36 Energy content of hot water used - calculated m (45)m= 170.39 149.02 153.78 134.07	p(-0.000349 x (TFA -13.9 es per day Vd,average = 5% if the dwelling is designed water use, hot and cold) May Jun Jul Nd,m = factor from Table 1c x 98.19 94.01 94.01 nonthly = 4.190 x Vd,m x nm x l	9)2)] + 0.0013 x ((25 x N) + 36 to achieve a water us Aug Sep (43) 98.19 102.36 DTm / 3600 kWh/mor 118.04 119.45	2. TFA -13.9) Se target of Oct Nov 106.54 110.72 Total = Sum(44) 112 = oth (see Tables 1b, 1) 139.21 151.96	96 4.45 Dec 114.9 = c, 1d) 165.01]] 	(42) (43)
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp if TFA £ 13.9, N = 1 Annual average hot water usage in litr Reduce the annual average hot water usage in litr Reduce the annual average hot water usage by not more that 125 litres per person per day (all the Jan Feb Mar Apr Hot water usage in litres per day for each month (44)m= 114.9 110.72 106.54 102.36 Energy content of hot water used - calculated m (45)m= 170.39 149.02 153.78 134.07	$p(-0.000349 \times (TFA - 13.9))$ es per day Vd, average = 5% if the dwelling is designed water use, hot and cold) May Jun Jul Nd,m = factor from Table 1c x 98.19 94.01 94.01 ponthly = 4.190 x Vd,m x nm x l 128.64 111.01 102.87	9)2)] + 0.0013 x ((25 x N) + 36 to achieve a water us Aug Sep (43) 98.19 102.36 DTm / 3600 kWh/mor 118.04 119.45	2. TFA -13.9) Se target of Oct Nov 106.54 110.72 Total = Sum(44)112 oth (see Tables 1b, 1 139.21 151.96 Total = Sum(45)112	96 4.45 Dec 114.9 <i>c, 1d</i>) 165.01]] 	(42) (43) (44) (45)
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp if TFA £ 13.9, N = 1 Annual average hot water usage in litre Reduce the annual average hot water usage by not more that 125 litres per person per day (all Jan Feb Mar Apr Hot water usage in litres per day for each month (44)m= 114.9 110.72 106.54 102.36 Energy content of hot water used - calculated m (45)m= 170.39 149.02 153.78 134.07 If instantaneous water heating at point of use (red)	p(-0.000349 x (TFA -13.9 es per day Vd,average = 5% if the dwelling is designed water use, hot and cold) May Jun Jul Nd,m = factor from Table 1c x 98.19 94.01 94.01 nonthly = 4.190 x Vd,m x nm x 1 128.64 111.01 102.87 o hot water storage), enter 0 in	9)2)] + 0.0013 x (* (25 x N) + 36 to achieve a water us Aug Sep (43) 98.19 102.36 DTm / 3600 kWh/mor 118.04 119.45 a boxes (46) to (61)	2. TFA -13.9) Se target of Oct Nov 106.54 110.72 Total = Sum(44)112 nth (see Tables 1b, 1 139.21 151.96 Total = Sum(45)112	96 4.45 Dec 114.9 c, 1d) 165.01] 1253.43 1643.44	(42) (43) (44) (45)
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp if TFA £ 13.9, N = 1 Annual average hot water usage in litre Reduce the annual average hot water usage by not more that 125 litres per person per day (all Jan Feb Mar Apr Hot water usage in litres per day for each month (44)m= 114.9 110.72 106.54 102.36 Energy content of hot water used - calculated m (45)m= 170.39 149.02 153.78 134.07 If instantaneous water heating at point of use (red) (46)m= 25.56 22.35 23.07 20.11	p(-0.000349 x (TFA -13.9 es per day Vd,average = 5% if the dwelling is designed water use, hot and cold) May Jun Jul Nd,m = factor from Table 1c x 98.19 94.01 94.01 98.19 94.01 94.01 ionthly = 4.190 x Vd,m x nm x h 128.64 111.01 102.87 o hot water storage), enter 0 in 19.3 16.65 15.43	9)2)] + 0.0013 x (* (25 x N) + 36 to achieve a water us Aug Sep (43) 98.19 102.36 DTm / 3600 kWh/mor 118.04 119.45 boxes (46) to (61) 17.71 17.92	2. TFA -13.9) Se target of Oct Nov 106.54 110.72 Total = Sum(44)_112 ith (see Tables 1b, 1 139.21 151.96 Total = Sum(45)_112 20.88 22.79	96 4.45 Dec 114.9 c, 1d) 165.01 24.75]] 	(42) (43) (44) (45) (46)

Water	storage	loss:												
Storag	e volum	e (litres)) includir	ng any so	olar or W	WHRS	storage	within sa	ame ves	sel		0		(47)
If com	munity h	neating a	and no ta	ank in dw	velling, e	enter 110	litres in	(47)						
Otherv	vise if no	o stored	hot wate	er (this ir	icludes i	instantar	neous co	ombi boil	ers) ente	er '0' in (47)			
Water	storage	loss:		ana fant			- (-) -						1	
а) II II т		urer s d			or is kno	wn (kvvr	i/day):					0		(48)
i empe	erature f	actor fro	m Table	2D								0		(49)
Energy	/ lost fro	om water	r storage	e, kVVh/ye cylinder l	ear	or is not	known:	(48) x (49) =			0		(50)
Hot wa	ater stor	age loss	s factor f	rom Tabl	e 2 (kW	h/litre/da	ay)					0		(51)
If com	munity h	eating s	see secti	on 4.3	,		5,					-		
Volum	e factor	from Ta	ble 2a									0		(52)
Tempe	erature f	actor fro	m Table	e 2b								0		(53)
Energy	y lost fro	om water	r storage	e, kWh/ye	ear			(47) x (51) x (52) x (53) =		0		(54)
Enter	(50) or	(54) in (8	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	0), 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	nual) fro	om Table	93							0		(58)
Primar	y c <mark>ircuit</mark>	loss cal	lculated	for each	month ((<mark>59)</mark> m = ((58) ÷ 36	65 × (41)	m					
(mo	dified by	factor f	rom Tab	le H5 if t	here is s	solar wat	ter heatii	ng and a	<mark>a cy</mark> linde	r th <mark>ermo</mark>	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	loss ca	Iculated	for each	n month ((61)m =	(60) ÷ 30	65 × (41))m						
(61)m=	50.96	46.03	50.96	49.32	50.03	46.36	47.91	50.03	49.32	5 <mark>0.96</mark>	49.32	50.96		(61)
Total h	heat requ	uired for	water h	eating ca	alculated	d for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	' (59)m + (61)m
(62)m=	221.35	195.05	204.74	183.38	178.68	157.37	150.77	168.07	168.76	190.17	201.27	215.97		(62)
Solar DI	-IW input	calculated	using App	endix G or	· Appendix	H (negati	ve quantity	y) (enter '0	' if no sola	r contribut	ion to wate	er heating)	I	
(add a	dditiona	l lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	iter											
(64)m=	221.35	195.05	204.74	183.38	178.68	157.37	150.77	168.07	168.76	190.17	201.27	215.97		
				•				Outp	out from w	ater heate	r (annual)	12	2235.58	(64)
Heat g	ains fro	m water	heating	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	ı + (61)m	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m]	
(65)m=	69.39	61.06	63.87	56.91	55.28	48.5	46.18	51.76	52.05	59.03	62.85	67.61		(65)
inclu	ude (57)	m in cal	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Int	ternal da	ains (see	e Table {	5 and 5a):	•						•	J. J. J. J. J. J. J. J. J. J. J. J. J. J	
Metab	olic gain	s (Table	5) Wat	te) -									
metab	Jan	Feb	 Mar	Apr	Mav	Jun	Jul	Aua	Sep	Oct	Nov	Dec		
(66)m=	147.9	147.9	147.9	147.9	147.9	147.9	147.9	147.9	147.9	147.9	147.9	147.9		(66)
Liahtin	u gains	r (calcula	ted in A	opendix	L. equat	ion L9 o	rL9a)a	lso see '	Table 5	I	I	I	I	
(67)m=	30.14	26.77	21.77	16.48	12.32	10.4	11.24	14.61	19.61	24.9	29.06	30.98		(67)
Annlia	L	ins (calc	L ulated in			L Liation I	L 13 or I 1	I 3a) also	I See Ta	hle 5			I	
(68)m=	338.07	341 57	332 73	313.91	290 16	267.83	252.91	249 41	258 25	277 07	300.82	323 15		(68)
(l		1			I	L	L	L	I		l	

Cookin	g gains	(calcula	ted in Ap	opendix	L, equat	ion L15	or L15a)	, also se	e Table	5				
(69)m=	37.79	37.79	37.79	37.79	37.79	37.79	37.79	37.79	37.79	37.79	37.79	37.79	(69)	
Pumps	and far	ns gains	(Table 5	ia)										
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3	(70)	
Losses	e.g. ev	aporatio	n (negat	ive valu	es) (Tab	le 5)								
(71)m=	-118.32	-118.32	-118.32	-118.32	-118.32	-118.32	-118.32	-118.32	-118.32	-118.32	-118.32	-118.32	(71)	
Water	heating	gains (T	able 5)											
(72)m=	93.27	90.86	85.85	79.04	74.3	67.36	62.07	69.57	72.29	79.34	87.3	90.87	(72)	
Total i	nternal	gains =				(66)	m + (67)m	ı + (68)m +	- (69)m + (70)m + (7	1)m + (72)	m		
(73)m=	531.85	529.57	510.72	479.8	447.15	415.96	396.59	403.95	420.51	451.67	487.55	515.37	(73)	

6. Solar gains:

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

Orientation:	Access Factor Table 6d		Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	2.37	x	11.28	x	0.63	x	0.72	=	50.43	(75)
Northeast 0.9x	0.77	x	11.27	x	11.28	x	0.63	x	0.78	=	43.3	(75)
Northeast 0.9x	0.77	x	2.37	x	22.97	x	0.63	х	0.72	=	102.66	(75)
Northeast 0.9x	0.77	x	11.27	x	22.97	х	0.63	x	0.78		88.14	(75)
Northeast 0.9x	0.77	x	2.37	x	41.38	×	0.63	x	0.72	=	184.96	(75)
Northeast 0.9x	0.77	x	11.27	x	41.38	x	0.63	x	0.78	=	158.81	
Northeast 0.9x	0.77	x	2.37	x	67.9 <mark>6</mark>	x	0.63	x	0.72	=	3 <mark>03.76</mark>	(75)
Northeast 0.9x	0.77	x	11.27	x	67.96	х	0.63	x	0.78	=	2 <mark>60.81</mark>	(75)
Northeast 0.9x	0.77	x	2.37	x	91.35	x	0.63	x	0.72	=	4 <mark>08.31</mark>	(75)
Northeast 0.9x	0.77	x	11.27	x	91.35	x	0.63	x	0.78	=	350.58	(75)
Northeast 0.9x	0.77	x	2.37	x	97.38	x	0.63	x	0.72	=	435.31	(75)
Northeast 0.9x	0.77	x	11.27	x	97.38	x	0.63	x	0.78	=	373.75	(75)
Northeast 0.9x	0.77	x	2.37	x	91.1	x	0.63	x	0.72	=	407.22	(75)
Northeast 0.9x	0.77	x	11.27	x	91.1	x	0.63	x	0.78	=	349.64	(75)
Northeast 0.9x	0.77	x	2.37	x	72.63	x	0.63	x	0.72	=	324.64	(75)
Northeast 0.9x	0.77	x	11.27	x	72.63	x	0.63	x	0.78	=	278.73	(75)
Northeast 0.9x	0.77	x	2.37	x	50.42	x	0.63	x	0.72	=	225.38	(75)
Northeast 0.9x	0.77	x	11.27	x	50.42	x	0.63	x	0.78	=	193.51	(75)
Northeast 0.9x	0.77	x	2.37	x	28.07	x	0.63	x	0.72	=	125.46	(75)
Northeast 0.9x	0.77	x	11.27	x	28.07	x	0.63	x	0.78	=	107.72	(75)
Northeast 0.9x	0.77	x	2.37	x	14.2	x	0.63	x	0.72	=	63.46	(75)
Northeast 0.9x	0.77	x	11.27	x	14.2	x	0.63	x	0.78	=	54.49	(75)
Northeast 0.9x	0.77	x	2.37	x	9.21	x	0.63	x	0.72	=	41.19	(75)
Northeast 0.9x	0.77	x	11.27	x	9.21	x	0.63	x	0.78	=	35.36	- (75)
Southeast 0.9x	0.54	x	1.05	x	36.79	x	0.63	x	0.82	=	9.7	(77)
Southeast 0.9x	0.54	x	1.05	x	62.67	x	0.63	x	0.82	=	16.52	(77)

Southeast 0.9x	0.54	x	1.05	x	85.75	x	0.63	x	0.82	=	22.61	7(77)
Southeast 0.9x	0.54	x	1.05	x	106.25	x	0.63	x	0.82	=	28.01] ₍₇₇₎
Southeast 0.9x	0.54	x	1.05	x	119.01	x	0.63	x	0.82	1 =	31.37](77)
Southeast 0.9x	0.54	x	1.05	x	118.15	×	0.63	x	0.82	1 =	31.15	ے (77)
Southeast 0.9x	0.54	x	1.05	x	113.91	×	0.63	x	0.82	i =	30.03] (77)
Southeast 0.9x	0.54	x	1.05	x	104.39	x	0.63	x	0.82	i =	27.52] (77)
Southeast 0.9x	0.54	×	1.05	x	92.85	×	0.63	x	0.82	i =	24.48	- (77)
Southeast 0.9x	0.54	x	1.05	x	69.27	×	0.63	x	0.82	=	18.26	- (77)
Southeast 0.9x	0.54	x	1.05	x	44.07	×	0.63	x	0.82] =	11.62	(77)
Southeast 0.9x	0.54	x	1.05	x	31.49	×	0.63	x	0.82] =	8.3	(77)
Southwest _{0.9x}	0.54	x	2.03	x	36.79]	0.63	x	0.83	=	18.98	(79)
Southwest _{0.9x}	0.54	x	8.44	x	36.79]	0.63	x	0.78	=	74.16	(79)
Southwest _{0.9x}	0.54	x	2.11	x	36.79]	0.63	x	0.82	=	19.49	(79)
Southwest _{0.9x}	0.77	x	4.28	x	36.79]	0.63	x	0.84	=	57.75	(79)
Southwest _{0.9x}	0.77	x	3.76	x	36.79]	0.63	x	0.83] =	50.13	(79)
Southwest _{0.9x}	0.77	x	11.27	x	36.79]	0.63	x	0.78	=	141.21	(79)
Southwest _{0.9x}	0.54	x	2.03	x	62.67]	0.63	x	0.83	=	32.33	(79)
Southwest0.9x	0.54	x	8.44	X	62.67		0.63	х	0.78] =	126.33	(79)
Sout <mark>hwest_{0.9x}</mark>	0.54] x	2.11	x	62.67		0.63	x	0.82] =	33.2	(79)
Sout <mark>hwest</mark> 0.9x	0.77	x	4.28	х	62.67		0.63	x	0.84] =	98.37	(79)
Sout <mark>hwest_{0.9x}</mark>	0.77] ×	3.76	x	62.67		0.63	x	0.83	=	85.39	(79)
Sout <mark>hwest</mark> 0.9x	0.77	x	11.27	×	62.67]	0.63	x	0.78] =	2 <mark>40.53</mark>	(79)
Southwest <mark>0.9x</mark>	0.54) ×	2.03	x	85.75		0.63	x	0.83	=	44.24	(79)
Sout <mark>hwest_{0.9x}</mark>	0.54	x	8.44	x	85.75]	0.63	x	0.78	=	172.85	(79)
Southwest _{0.9x}	0.54	x	2.11	x	85.75]	0.63	x	0.82	=	45.43	(79)
Southwest _{0.9x}	0.77	x	4.28	x	85.75]	0.63	x	0.84	=	134.6	(79)
Southwest _{0.9x}	0.77	x	3.76	×	85.75]	0.63	x	0.83] =	116.84	(79)
Southwest _{0.9x}	0.77	x	11.27	x	85.75]	0.63	x	0.78	=	329.11	(79)
Southwest _{0.9x}	0.54	x	2.03	x	106.25]	0.63	x	0.83] =	54.81	(79)
Southwest0.9x	0.54	x	8.44	x	106.25]	0.63	x	0.78] =	214.17	(79)
Southwest _{0.9x}	0.54	x	2.11	x	106.25		0.63	x	0.82	=	56.29	(79)
Southwest _{0.9x}	0.77	x	4.28	x	106.25]	0.63	x	0.84	=	166.78	(79)
Southwest0.9x	0.77	x	3.76	x	106.25		0.63	x	0.83	=	144.77	(79)
Southwest _{0.9x}	0.77	x	11.27	x	106.25		0.63	x	0.78	=	407.78	(79)
Southwest _{0.9x}	0.54	x	2.03	x	119.01]	0.63	x	0.83] =	61.4	(79)
Southwest _{0.9x}	0.54	x	8.44	x	119.01		0.63	x	0.78	=	239.88	(79)
Southwest _{0.9x}	0.54	x	2.11	×	119.01]	0.63	x	0.82] =	63.05	(79)
Southwest _{0.9x}	0.77	x	4.28	×	119.01		0.63	x	0.84	=	186.8	(79)
Southwest _{0.9x}	0.77	x	3.76	x	119.01		0.63	x	0.83	=	162.15	(79)
Southwest _{0.9x}	0.77	x	11.27	x	119.01		0.63	x	0.78	=	456.75	(79)
Southwest _{0.9x}	0.54	x	2.03	x	118.15]	0.63	x	0.83	=	60.95	(79)

Southwest0.9x	0.54	x	8.44	x	118.15]	0.63	x	0.78	=	238.15	(79)
Southwest _{0.9x}	0.54	x	2.11	x	118.15	1	0.63	×	0.82] =	62.59	– (79)
Southwest _{0.9x}	0.77	x	4.28	x	118.15]	0.63	×	0.84] =	185.45	(79)
Southwest _{0.9x}	0.77	x	3.76	x	118.15]	0.63	×	0.83] =	160.98	(79)
Southwest _{0.9x}	0.77	x	11.27	x	118.15	İ	0.63	x	0.78] =	453.45	(79)
Southwest _{0.9x}	0.54	x	2.03	x	113.91]	0.63	×	0.83] =	58.76	(79)
Southwest0.9x	0.54	x	8.44	×	113.91]	0.63	×	0.78] =	229.6	(79)
Southwest _{0.9x}	0.54	x	2.11	x	113.91]	0.63	x	0.82] =	60.34	(79)
Southwest _{0.9x}	0.77	x	4.28	x	113.91]	0.63	x	0.84] =	178.8	(79)
Southwest0.9x	0.77	x	3.76	×	113.91]	0.63	×	0.83] =	155.2	(79)
Southwest _{0.9x}	0.77	x	11.27	x	113.91]	0.63	x	0.78] =	437.17	(79)
Southwest _{0.9x}	0.54	x	2.03	x	104.39]	0.63	x	0.83] =	53.85	(79)
Southwest _{0.9x}	0.54	x	8.44	x	104.39]	0.63	x	0.78] =	210.41	(79)
Southwest _{0.9x}	0.54	x	2.11	x	104.39]	0.63	x	0.82] =	55.3	(79)
Southwest _{0.9x}	0.77	x	4.28	x	104.39	1	0.63	x	0.84	=	163.85	(79)
Southwest _{0.9x}	0.77	x	3.76	x	104.39	j	0.63	×	0.83] =	142.23	(79)
Southwest _{0.9x}	0.77	x	11.27	x	104.39	İ	0.63	x	0.78] =	400.64	(79)
Southwest0.9x	0.54	x	2.03	X	92.85		0.63	x	0.83	=	47.9	(79)
Southwest <mark>0.9x</mark>	0.54	x	8.44	x	92.85	İ.	0.63	x	0.78	-	187.16	(79)
Sout <mark>hwest</mark> 0.9x	0.54	x	2.11	x	92.85	i /	0.63	x	0.82	=	49.19	(79)
Sout <mark>hwest</mark> 0.9x	0.77	x	4.28	x	92.85	i/	0.63	x	0.84	=	145.74	(79)
Sout <mark>hwest</mark> 0.9x	0.77	x	3.76	x	92.85	Í	0.63	x	0.83] =	126.51	(79)
Sout <mark>hwest</mark> 0.9x	0.77	x	11.27	x	92.85	i i	0.63	x	0.78] =	356.36	(79)
Sout <mark>hwest_{0.9x}</mark>	0.54	x	2.03	x	69.27	j	0.63	x	0.83] =	35.73	(79)
Southwest _{0.9x}	0.54	x	8.44	x	69.27]	0.63	x	0.78] =	139.62	(79)
Southwest _{0.9x}	0.54	x	2.11	x	69.27]	0.63	×	0.82] =	36.69	(79)
Southwest _{0.9x}	0.77	x	4.28	x	69.27]	0.63	×	0.84] =	108.72	(79)
Southwest _{0.9x}	0.77	x	3.76	x	69.27	1	0.63	×	0.83] =	94.38	(79)
Southwest _{0.9x}	0.77	x	11.27	x	69.27]	0.63	x	0.78] =	265.84	(79)
Southwest0.9x	0.54	x	2.03	x	44.07]	0.63	x	0.83] =	22.74	(79)
Southwest _{0.9x}	0.54	x	8.44	x	44.07]	0.63	x	0.78] =	88.83	(79)
Southwest _{0.9x}	0.54	x	2.11	x	44.07]	0.63	x	0.82] =	23.35	(79)
Southwest0.9x	0.77	x	4.28	x	44.07]	0.63	×	0.84] =	69.17	(79)
Southwest _{0.9x}	0.77	x	3.76	x	44.07]	0.63	×	0.83] =	60.05	(79)
Southwest _{0.9x}	0.77	x	11.27	x	44.07]	0.63	x	0.78] =	169.14	(79)
Southwest _{0.9x}	0.54	x	2.03	x	31.49	j	0.63	×	0.83] =	16.24	(79)
Southwest _{0.9x}	0.54	x	8.44	×	31.49]	0.63	×	0.78] =	63.47	(79)
Southwest _{0.9x}	0.54	×	2.11	×	31.49	ĺ	0.63	×	0.82] =	16.68	(79)
Southwest _{0.9x}	0.77	×	4.28	×	31.49]	0.63	×	0.84] =	49.42	(79)
Southwest _{0.9x}	0.77	×	3.76	×	31.49	İ	0.63	×	0.83] =	42.9	(79)
Southwest _{0.9x}	0.77	×	11.27	×	31.49	Ī	0.63	×	0.78] =	120.85	(79)
-		-		-		-		-		-		

Northwe	est <mark>0.9x</mark>	0.54		x	7.6	8	x	1	1.28	×		0.63	x	0.91	=		24.14	(81)
Northwe	est <mark>0.9x</mark>	0.54		x	7.6	8	x	2	2.97	x		0.63	×	0.91	=		49.14	(81)
Northwe	est <mark>0.9x</mark>	0.54		x	7.6	8	x	4	1.38	x		0.63	×	0.91	=		88.54	(81)
Northwe	est <mark>0.9x</mark>	0.54		x	7.6	8	x	6	7.96] ×		0.63	×	0.91	=		145.41	(81)
Northwe	est <mark>0.9x</mark>	0.54		x	7.6	8	x	9	1.35] ×		0.63	×	0.91	=		195.46	(81)
Northwe	est <mark>0.9x</mark>	0.54		x	7.6	8	x	9	7.38	×		0.63	×	0.91	=		208.39	(81)
Northwe	est <mark>0.9x</mark>	0.54		x	7.6	8	x		91.1] ×		0.63	×	0.91	=		194.94	(81)
Northwe	est <mark>0.9x</mark>	0.54		x	7.6	8	x	7	2.63] ×		0.63	×	0.91	=		155.41	(81)
Northwe	est <mark>0.9x</mark>	0.54		x	7.6	8	x	5	0.42] ×		0.63	×	0.91	=		107.89	(81)
Northwe	est <mark>0.9x</mark>	0.54		x	7.6	8	x	2	8.07	×		0.63	x	0.91	=		60.06	(81)
Northwe	est <mark>0.9x</mark>	0.54		x	7.6	8	x		14.2	×		0.63	×	0.91	=		30.38	(81)
Northwe	est <mark>0.9x</mark>	0.54		x	7.6	8	x	9	9.21	×		0.63	×	0.91	=		19.72	(81)
Roofligh	nts <mark>0.9x</mark>	1		x	1.3	1	x	3	7.03			0.63	×	0.83	=		45.66	(82)
Roofligh	nts <mark>0.9x</mark>	1		x	1.3	1	x	7	0.28	×		0.63	×	0.83	=		86.66	(82)
Roofligh	nts <mark>0.9x</mark>	1		x	1.3	1	x	1	11.87	×		0.63	x	0.83	=		137.94	(82)
Roofligh	nts <mark>0.9x</mark>	1		x	1.3	1	x	1:	59.33	x		0.63	x	0.83	=		196.45	(82)
Roofligh	nts <mark>0.9x</mark>	1		x	1.3	1	x	1	93.3	x		0.63	×	0.83	=		238.34	(82)
Roofligh	nts 0.9x	1		x	1.3	1	X	19	97.35	×		0.63	x	0.83	=		243.33	(82)
Roofligh	nts <mark>0.9x</mark>	1		x	1.3	1	x	18	88.08	x		0.63	x	0.83	-		231.9	(82)
Roofligh	nts <mark>0.9x</mark>	1		x	1.3	:1	х	1	62.62] ×		0.63	x	0.83	=		200.5	(82)
Roofligh	nts <mark>0.9x</mark>	1		x	1.3	1	x	1:	28.66	x		0.63	x	0.83	=		158.64	(82)
Roofligh	nts <mark>0.9x</mark>	1		x	1.3	1	x	8	2.24	x		0.63	x	0.83			101.41	(82)
Roofligh	nts <mark>0.9x</mark>	1		x	1.3	1	x	4	5.75	×		0.63	x	0.83	=		56.41	(82)
Roofligh	nts 0.9x	1		x	1.3	1	x	3	0.74	×		0.63	x	0.83	=		37.91	(82)
										-								_
Solar g	ains in	watts, ca	alcula	ted	for eac	n mont	h			(83)r	n = S	um(74)m	.(82)m			_		
(83)m=	534.97	959.29	1435.	92	1979.03	2394.1	24	453.49	2333.6	20	13.1	1622.76	1093.9	9 649.62	452.04			(83)
Total g	ains – i	nternal a	and sc	lar	(84)m =	: (73)m) + (83)m	, watts	-						-		()
(84)m=	1066.82	1488.87	1946.	64	2458.83	2841.2	5 28	369.45	2730.19	241	7.05	2043.26	1545.5	6 1137.17	967.41			(84)
7. Me	an inter	rnal temp	beratu	re ((heating	seaso	n)											
Temp	erature	during h	neating	g p	eriods ir	the liv	/ing	area	from Tal	ole 9), Th	1 (°C)					21	(85)
Utilisa	ation fac	ctor for g	ains fo	or li	iving are	ea, h1,	m (s	ee Ta	ble 9a)							_		
	Jan	Feb	Ma	ar	Apr	Мау	′	Jun	Jul	A	ug	Sep	Oct	Nov	Dec			
(86)m=	1	0.99	0.96	5	0.86	0.68		0.49	0.36	0.	42	0.69	0.94	0.99	1			(86)
Mean	interna	l temper	ature	in l	iving are	ea T1 (follo	ow ste	ps 3 to 7	7 in ⁻	Tabl	e 9c)						
(87)m=	19.51	19.8	20.2	2	20.66	20.9	2	20.98	21	20	.99	20.92	20.52	19.91	19.45			(87)
Temp	erature	during h	neating	g p	eriods ir	n rest c	of dv	velling	from Ta	able	9, T	h2 (°C)						
(88)m=	19.78	19.79	19.7	9	19.8	19.8	Ţ.	19.81	19.81	19	.81	19.81	19.8	19.8	19.79	٦		(88)
l Itilies	ation fac	tor for a	i ains f	or r	est of d	velling	h2	m (se	e Table	921								
(89)m=	1	0.98	0.94		0.82	0.61	, <u>112</u>	0.4	0.26	0.	31	0.59	0.91	0.99	1	٦		(89)
										1								

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

(90)m=	17.81	18.25	18.84	19.44	19.72	19.8	19.81	19.81	19.76	19.27	18.41	17.74		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.21	(91)
Moon	internal	l tompor	aturo (fo	r tho wh	olo dwo	llina) – fl	I A √ T1	⊥ (1 _ fl	۸) v T2					
(92)m=	18.17	18.58	19.13	19.69	19.97	20.05	20.06	20.06	20	19.54	18.72	18.1		(92)
AlaaA	adiustn	nent to t	he mear	l interna	l temper	I ature fro	m Table	4e, whe	ere appro	opriate		-		
(93)m=	18.17	18.58	19.13	19.69	19.97	20.05	20.06	20.06	20	19.54	18.72	18.1		(93)
8. Spa	ace hea	tina reau	uirement	1										
Set Ti	i to the r	mean int	ernal ter	mperatu	re obtair	ned at ste	ep 11 of	Table 9	o, so tha	t Ti.m=(76)m an	d re-calc	ulate	
the ut	ilisation	factor fo	or gains	using Ta	able 9a				-,					
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	1:										
(94)m=	0.99	0.98	0.93	0.81	0.62	0.42	0.28	0.34	0.61	0.91	0.99	1		(94)
Usefu	I gains,	hmGm	, W = (9	4)m x (8-	4)m									
(95)m=	1060.77	1457.89	1817.61	1995.74	1752.56	1199.93	769.52	810.21	1247.21	1399.09	1120.97	963.7		(95)
Month	nly avera	age exte	ernal 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	loss rate	e for mea	an interr	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m]				
(97)m=	3175.61	3125.03	2879.99	2436.56	1862.85	1215.26	771.5	814.41	1321.38	2012.87	2628.95	3157.86		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(97])m – (95)m] x (4	1)m		I	
(98)m=	1573.45	1120.32	790.41	317.39	82.06	0	0	0	0	456.65	1085.75	1632.4 <mark>6</mark>		
								Tota	l per year	(kWh/year) = Sum(9	8)15,912 =	7058.48	(98)
Space	e heatin	a require	ement in	kWh/m ²	/vear								12.27	
		5 1			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,								42.57	(99)
8c. Sr	pace co	olina rec	uiremer	nt 👘	, your								42.57	(99)
8c. Sp Calcu	bace coo	oling rec r June	uiremer July and	nt August.	See Tal	ole 10b				-			42.37	(99)
8c. Sp Calcu	bace coo lated fo Jan	oling red r June, J	uiremer July and Mar	nt Aug <mark>ust.</mark> Apr	See Tal May	ole 10b Jun	Jul	Aug	Sep	Oct	Nov	Dec	42.31	(99)
8c. Sp Calcu Heat I	bace coo lated fo Jan loss rate	oling rec r June, J Feb e Lm (ca	uiremer July and Mar Iculated	nt August. Apr using 24	See Tal May 5°C inter	ole 10b Jun mal temp	Jul	Aug and exte	Sep ernal ten	Oct	Nov e from T	Dec able 10)	-2.37	(99)
8c. Sp Calcu Heat (100)m=	lated fo Jan loss rate	oling rec r June, J Feb e Lm (ca 0	July and Mar Iculated	nt August. Apr using 25	See Tal May 5°C inter	ole 10b Jun nal temp 2096.09	Jul perature 1650.11	Aug and exter 1691.23	Sep ernal ten 0	Oct nperatur 0	Nov e from T 0	Dec able 10)	-2.37	(100)
8c. Sr Calcu Heat (100)m= Utilisa	lated fo Jan loss rate 0	oling rec r June, Feb e Lm (ca 0 tor for lo	Juiremen July and Mar Iculated 0 oss hm	nt August. Apr using 25	See Tal May 5°C inter 0	ole 10b Jun nai tem 2096.09	Jul perature 1650.11	Aug and exte 1691.23	Sep ernal ten 0	Oct nperatur 0	Nov e from T 0	Dec able 10) 0	-2.37	(100)
8c. Sp Calcu Heat (100)m= Utilisa (101)m=	lated fo Jan oss rate 0 ation fac	oling rec r June, C Feb e Lm (ca 0 tor for lc 0	July and Mar Iculated 0 Dess hm 0	nt August. Apr using 29 0	See Tal May 5°C inter 0	ole 10b Jun nal temp 2096.09 0.96	Jul perature 1650.11 0.98	Aug and exte 1691.23 0.96	Sep ernal ten 0	Oct nperatur 0	Nov e from T 0	Dec able 10) 0	-2.37	(100)
8c. Sp Calcu Heat I (100)m= Utilisa (101)m= Usefu	lated fo Jan loss rate 0 ation fac 0	oling rec r June, C Feb e Lm (ca 0 tor for lc 0 mLm (W	July and Mar Iculated 0 oss hm 0 Vatts) = 0	1t August. Apr using 28 0 0 (100)m x	See Tal May 5°C inter 0 (101)m	ole 10b Jun nal temp 2096.09 0.96	Jul perature 1650.11 0.98	Aug and exte 1691.23	Sep ernal ten 0	Oct nperatur 0	Nov e from T 0	Dec able 10) 0	-2.37	(100) (101)
8c. Sp Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m=	lated fo Jan oss rate 0 ation fac 0 I loss, h 0	oling rec r June, C Feb e Lm (ca 0 tor for lc 0 mLm (W 0	July and Mar Iculated 0 oss hm 0 Vatts) = 0	nt August. Apr using 25 0 0 (100)m x 0	See Tal May 5°C inter 0 (101)m	0le 10b Jun nal temp 2096.09 0.96	Jul perature 1650.11 0.98 1613.5	Aug and exte 1691.23 0.96	Sep ernal ten 0	Oct nperatur 0	Nov e from T 0	Dec Table 10) 0		(100) (101) (102)
8c. Sp Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains	lated fo Jan loss rate 0 ation fac 0 I loss, h 0 s (solar s	oling rec r June, C Feb e Lm (ca 0 ttor for lc 0 mLm (W 0 gains ca	July and Mar Iculated 0 oss hm 0 Vatts) = 0 Iculated	August. Apr using 25 0 0 (100)m x 0 for appli	See Tal May 5°C inter 0 (101)m cable we	0le 10b Jun nal temp 2096.09 0.96 2006.03 eather re	Jul perature 1650.11 0.98 1613.5 egion, se	Aug and exte 1691.23 0.96 1629.94 ee Table	Sep ernal ten 0 0 10)	Oct nperatur 0	Nov e from T 0	Dec able 10) 0		(100) (101) (102)
8c. Sp Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m=	lated fo Jan oss rate 0 ation fac 0 I loss, h 0 s (solar g 0	oling rec r June, C Feb e Lm (ca 0 tor for lc 0 mLm (W 0 gains ca 0	July and Mar Iculated 0 oss hm 0 Vatts) = 0 Iculated 0	August. Apr using 25 0 (100)m × 0 for appli 0	See Tal May 5°C inter 0 (101)m 0 cable we	01e 10b Jun nal temp 2096.09 0.96 2006.03 eather re 3511.24	Jul perature 1650.11 0.98 1613.5 egion, se 3344.07	Aug and exte 1691.23 0.96 1629.94 ee Table 2976.38	Sep ernal ten 0 0 10) 0	Oct nperatur 0 0	Nov e from T 0 0	Dec able 10) 0		(100) (101) (102) (103)
8c. Sp Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= <i>Space</i>	lated fo Jan loss rate 0 ation fac 0 il loss, h 0 s (solar g 0 e cooling	oling rec r June, C Feb e Lm (ca 0 ttor for lc 0 mLm (W 0 gains ca 0 g require	July and Mar Iculated 0 oss hm 0 Vatts) = 0 Iculated 0 ement fo	August. Apr Using 25 0 (100)m x (100)m x for appli 0 r month,	See Tal May 5°C inter 0 (101)m cable we 0 whole c	0le 10b Jun nal temp 2096.09 0.96 2006.03 2006.03 eather re 3511.24	Jul Derature 1650.11 0.98 1613.5 egion, se 3344.07 <i>continue</i>	Aug and exte 1691.23 0.96 1629.94 ee Table 2976.38 ous (kW	Sep ernal ten 0 0 10) 0 <i>(h)</i> = 0.0	Oct nperatur 0 0 24 x [(10	Nov e from T 0 0 0 23)m – (Dec able 10) 0 0 0 102)m] :	x (41)m	(100) (101) (102) (103)
8c. Sp Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1	lated fo Jan oss rate 0 ation fac 0 il loss, h 0 s (solar g 0 e cooling 04)m to	oling rec r June, C Feb e Lm (ca 0 tor for lc 0 mLm (W 0 gains ca 0 g require zero if (July and Mar Iculated 0 oss hm 0 Vatts) = 0 Iculated 0 Iculated 0 ament fo 104)m <	August. Apr using 25 0 (100)m × 0 for appli 0 r month, 3 × (98	See Tal May 5°C inter 0 (101)m 0 cable we 0 whole c)m	01e 10b Jun nal temp 2096.09 0.96 2006.03 eather re 3511.24	Jul Derature 1650.11 0.98 1613.5 egion, se 3344.07 continue	Aug and exte 1691.23 0.96 1629.94 ee Table 2976.38 ous (kW	Sep ernal ten 0 0 10) 0 <i>(h) = 0.0</i>	Oct nperatur 0 0 0 24 x [(10	Nov e from T 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Dec able 10) 0 0 0 102)m]:	x (41)m	(100) (101) (102) (103)
8c. Sp Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m=	ation fac 0 ation fac 0 1 loss, h 0 (solar o 0 (solar o 0 0 (solar o 0 0 (solar o 0 0 0 (solar o 0 0 0 0 0 0 0 0	oling rec r June, C Feb e Lm (ca 0 tor for lc 0 mLm (W 0 gains ca 0 g require zero if (0	July and Mar Iculated 0 oss hm 0 Vatts) = 0 Iculated 0 cement fo (104)m < 0	August. Apr using 2! 0 (100)m × 0 for appli 0 r month, 3 × (98) 0	See Tal May 5°C inter 0 (101)m cable we 0 whole c)m 0	Die 10b Jun Jun nal temp 2096.09 0.96 2006.03 eather re 3511.24 dwelling, 1083.75	Jul Derature 1650.11 0.98 1613.5 egion, se 3344.07 continue 1287.54	Aug and exte 1691.23 0.96 1629.94 ee Table 2976.38 ous (kW 1001.75	Sep ernal ten 0 0 10) 0 (h) = 0.0	Oct nperatur 0 0 24 x [(10	Nov e from T 0 0 0 0 0 3) <i>m</i> – (0	Dec able 10) 0 0 102)m] : 0	x (41)m	(100) (101) (102) (103)
8c. Sp Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m=	ation fac 0 1 loss rate 0 ation fac 0 1 loss, h 0 5 (solar g 0 6 cooling 04)m to 0	oling rec r June, C Feb e Lm (ca 0 tor for lc 0 mLm (W 0 gains ca 0 g require zero if (0	July and Mar Iculated 0 oss hm 0 Vatts) = 0 Iculated 0 Iculated 0 ament fo 104)m < 0	1t August. Apr using 2! 0 0 (100)m x 0 for appli 0 r month, < 3 × (98 0	See Tal May 5°C inter 0 (101)m 0 cable we 0 whole c)m 0	Die 10b Jun nal temp 2096.09 0.96 2006.03 eather re 3511.24 dwelling, 1083.75	Jul Derature 1650.11 0.98 1613.5 egion, se 3344.07 continue 1287.54	Aug and exte 1691.23 0.96 1629.94 ee Table 2976.38 ous (kW 1001.75	Sep ernal ten 0 0 10) 0 (h) = 0.0 0 Total	Oct nperatur 0 0 0 0 24 x [(10 0 0 = Sum(Nov e from T 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1,0,4)	Dec able 10) 0 0 0 102)m]: 0 =	x (41)m 3373.04	(100) (101) (102) (103)
8c. Sp Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m= Cooled	lated fo Jan ioss rate 0 ation fac 0 il loss, h 0 (solar o 0 (solar o 0))	oling rec r June, C Feb e Lm (ca 0 tor for lc 0 tor for lc 0 mLm (W 0 gains ca 0 g require zero if (0	July and Mar Iculated 0 oss hm 0 Vatts) = 0 Iculated 0 cement fo (104)m < 0	August. Apr using 29 0 0 (100)m × 0 for appli 0 r month, 3 × (98 0	See Tal May 5°C inter 0 (101)m (101)m (101)m (0 (101)m (0 (101)m (0)(10)m (0)(10)m (ole 10b Jun nal temp 2096.09 0.96 2006.03 eather re 3511.24 dwelling, 1083.75	Jul Derature 1650.11 0.98 1613.5 egion, se 3344.07 continue 1287.54	Aug and exte 1691.23 0.96 1629.94 ee Table 2976.38 ous (kW 1001.75	Sep ernal ten 0 0 10) 0 (h) = 0.0 0 Total f C =	Oct nperatur 0 0 24 x [(10 0 = Sum(cooled a	Nov e from T 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Dec able 10) 0 0 102)m] : 0 = 4) =	x (41)m 3373.04 0.78	(100) (101) (102) (103) (104) (105)
8c. Sp Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m= Coolect Intermi (106)m=	lated fo Jan oss rate 0 ation fac 0 il loss, h 0 il loss, h 0 is (solar g 0 e cooling 04)m to 0 il fractior ttency fa	oling reo r June, C Feb e Lm (ca 0 tor for lo 0 umLm (W 0 gains ca 0 g require zero if (0	puirement July and Mar Iculated 0 0 Vatts) = 0 Iculated 0 Iculated 0 104)m < 0	$\begin{array}{c c} August. \\ Apr \\ using 2! \\ 0 \\ 0 \\ 0 \\ (100)m \times \\ 0 \\ for appli \\ 0 \\ for appli \\ 0 \\ r month, \\ 3 \times (98) \\ 0 \\ $	See Tal May 5°C inter 0 (101)m 0 cable we 0 whole c)m 0	01e 10b Jun nal temp 2096.09 0.96 2006.03 eather re 3511.24 dwelling, 1083.75	Jul Derature 1650.11 0.98 1613.5 egion, se 3344.07 continue 1287.54	Aug and exte 1691.23 0.96 1629.94 ee Table 2976.38 ous (kW 1001.75	Sep ernal ten 0 0 10) 0 (h) = 0.0 (h) = 0.0 Total f C =	Oct nperatur 0 0 0 0 24 x [(10 0 1 = Sum(cooled a	Nov e from T 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1,04) area ÷ (4	Dec able 10) 0 0 0 102)m] 2 102)m] 2	x (41)m 3373.04 0.78	(100) (101) (102) (103) (104) (105)
8c. Sp Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m= Coolecc Intermi (106)m=	lated fo Jan oss rate 0 ation fac 0 il loss, h 0 il loss, h 0 is (solar o 0 e cooling 04)m to 0 d fractior ttency fa 0	oling rec r June, c Feb e Lm (ca 0 tor for lc 0 mLm (W 0 gains ca 0 g require zero if (0 n actor (Ta 0	July and July and Mar Iculated 0 pss hm 0 Vatts) = 0 0 Iculated 0 Vatts) = 0 0 Iculated 0 ement for 104)m 0 able 10b 0	August. Apr using 2! 0 (100)m × 0 for appli 0 r month, 3 × (98) 0 0	See Tal May 5°C inter 0 (101)m 0 (101)m 0 x(101)m 0 x(101)m 0 x(101)m 0 x(101)m 0 x(101)m 0 x(101)m 0	Die 10b Jun nal temp 2096.09 0.96 2006.03 eather re 3511.24 dwelling, 1083.75 0.25	Jul Derature 1650.11 0.98 1613.5 egion, se 3344.07 continue 1287.54 0.25	Aug and exte 1691.23 0.96 1629.94 ee Table 2976.38 ous (kW 1001.75	Sep ernal ten 0 0 10) 0 (h) = 0.0 0 Total f C = 0 Total	Oct nperatur 0	Nov e from T 0 0 0 0 0 0 0 0 0 0 0	Dec able 10) 0 0 0 102)m] : 4) = 0 -	x (41)m 3373.04 0.78	(100) (101) (102) (103) (104) (105)
8c. Sp Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m= Coolect Intermi (106)m=	lated fo Jan oss rate 0 ation fac 0 il loss, h 0 il ss, h 0 il loss, h 0 i loss, h 0 i loss, h loss, h 0 i loss, h i loss,	oling rec r June, C Feb e Lm (ca 0 tor for lc 0 mLm (W 0 gains ca 0 g require 2 ero if (0 n actor (Ta 0	uiremenJuly andMarIculated0 0 0 Vatts) = 00Iculated0Iculated0104)m 0able 10b0	August. August. using 2! 0 0 0 0 for appli 0 or month, 3 × (98) 0 0	See Tal May 5°C inter 0 0 (101)m 0 x(101)m 0 x(101)m 0 x(101)m 0 x(101)m 0 x(104)m	Die 10b Jun nal temp 2096.09 0.96 2006.03 eather re 3511.24 dwelling, 1083.75 0.25 x (105)	Jul Derature 1650.11 0.98 1613.5 egion, se 3344.07 continue 1287.54 0.25 x (106)r	Aug and exte 1691.23 0.96 1629.94 2976.38 ous (kW 1001.75 0.25	Sep ernal ten 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 Total 0 Total 0	Oct nperatur 0 0 24 x [(10 0 = Sum(cooled a 0 1 = Sum(Nov e from T 0 0 0 0 0 0 0 0 0 0 104) area ÷ (4 0 (104)	Dec able 10) 0 0 0 102)m] : 0 = 4) = 0 =	x (41)m 3373.04 0.78	(100) (101) (102) (103) (104) (105) (106)
8c. Sp Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m= Coolect Intermi (106)m= Space (107)m=	lated fo Jan loss rate 0 ation fac 0 il loss, h 0 il r>loss, h 0 i loss, h 0 i loss, h 0 i loss, h 0 i loss, h l	oling rec r June, C Feb e Lm (ca 0 tor for lc 0 mLm (W 0 gains ca 0 g require zero if (0 n actor (Ta 0 requirer 0	uiremenJuly andMarIculated0 0 0 0 0 0 0 0 1 0 0 1 0 0 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0	August. Apr using 2! 0 (100)m × 0 for appli 0 for appli 0 or month, 3 × (98) 0 0 0 0	See Tal May 5°C inter 0 0 (101)m 0 x(101)m 0 x(101)m 0 x(101)m 0 x(101)m 0 x(101)m 0 x(104)m 0	ole 10b Jun nal temp 2096.09 0.96 2006.03 eather re 3511.24 <i>dwelling,</i> 1083.75 0.25 × (105) 211.42	Jul Derature 1650.11 0.98 1613.5 egion, se 3344.07 continue 1287.54 0.25 × (106)r 251.17	Aug and exte 1691.23 0.96 1629.94 ee Table 2976.38 ous (kW 1001.75 0.25 m	Sep ernal ten 0 0 10) 0 10) 0 Totalf C = $0Totalf C =0Total$	Oct nperatur 0	Nov e from T 0 0 0 0 0 0 0 0 0 0 0	$ \begin{array}{c} Dec \\ able 10) \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 102)m]; \\ 0 \\ = \\ 4) = \\ 0 \\ = \\ 0 \\ = \\ 0 \\ 0 \\ = \\ 0 \\ $	x (41)m 3373.04 0.78	(100) (101) (102) (103) (104) (105) (106)
8c. Sf Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m= Coolect Intermi (106)m= Space (107)m=	lated fo Jan oss rate 0 ation fac 0 il loss, h 0 il loss, h 0 il loss, h 0 is (solar (0 cooling 0 fractior ttency fa 0 0	oling rec r June, C Feb e Lm (ca 0 tor for lc 0 mLm (W 0 gains ca 0 gains ca 0 g require 2 ero if (0 n actor (Ta 0 n actor (Ta 0	uiremenJuly andMarIculated0 0 0 Vatts) = 00Iculated0Iculated0Iculated0able 10b0able 10b0ment for0	August. August. using 2! 0 (100)m × 0 for appli 0 r month, 3 × (98) 0 0 0 0	See Tal May 5°C inter 0 0 (101)m 0 xhole x 0 whole x 0 0 (104)m 0 0	ole 10b Jun nal temp 2096.09 0.96 2006.03 eather re 3511.24 <i>Jwelling,</i> 1083.75 0.25 × (105) 211.42	Jul Derature 1650.11 0.98 1613.5 egion, se 3344.07 continue 1287.54 0.25 × (106)r 251.17	Aug and exte 1691.23 0.96 1629.94 2976.38 ous (kW 1001.75 0.25 m	Sep ernal ten 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 Total f C = 0 Total 0	Oct nperatur 0 0 24 x [(10 0 = Sum(cooled a 0 / = Sum(0 1 = Sum(Nov e from T 0 0 0 0 0 0 0 0 0 0 104) area ÷ (4 0 104) 104) 0 104) 0 104)	$ \begin{array}{c} Dec \\ able 10) \\ 0 \\ 0 \\ 0 \\ 0 \\ 102)m]; \\ 0 \\ 102)m]; \\ 0 \\ = \\ 4) = \\ 0 \\ 0 \\ = \\ 0 \\ 0 \\ = \\ 0 \\ $	x (41)m 3373.04 0.78	(100) (101) (102) (103) (104) (105) (106)
8c. SF Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space (103)m= Coolect Intermi (106)m= Space (107)m=	lated fo Jan oss rate 0 ation fac 0 il loss, h 0 il loss, h 0 i (solar (0 cooling 0 cooling 0	oling rec r June, C Feb e Lm (ca 0 tor for lc 0 mLm (W 0 gains ca 0 g require zero if (0 n actor (Ta 0 requirer 0	uiremenJuly andMarIculated0 0 0 0 0 0 0 0 104)m 0 0 104)m 0 0 0 0 0 0 0 0 0 0 0 0	$\frac{August.}{Apr}$ $\frac{Apr}{using 2!}$ 0 $(100)m \times 0$ $(100)m \times 0$ $for appli 0$ $for appli 0$ $r month,$ $(3 \times (98))$ 0 $month =$ 0 $(Wh/m2h)$	See Tal May 5°C inter 0 0 (101)m 0 cable we 0 whole c)m 0 0 (104)m 0	ole 10b Jun nal temp 2096.09 0.96 2006.03 eather re 3511.24 <i>dwelling,</i> 1083.75 0.25 × (105) 211.42	Jul Derature 1650.11 0.98 1613.5 egion, se 3344.07 continue 1287.54 0.25 × (106)r 251.17	Aug and exte 1691.23 0.96 1629.94 ee Table 2976.38 ous (kW 1001.75 0.25 m 195.42	Sep ernal ten 0 0 10) 0 10) 0 Totalf C = $0Totalf C =0Totalf C =0$	Oct nperatur 0 0 $24 \times [(10)]$ 0 $24 \times [(10)]$ 0 $24 \times [(10)]$ 0 $24 \times [(10)]$ 0 $24 \times [(10)]$ 0 0 $24 \times [(10)]$ 0 0 $24 \times [(10)]$ 0 1 = Sum((10)) 0 1 = Sum((10)) 0 1 = Sum((10)) 0 1 = Sum((10)) 0 0 1 = Sum((10)) 0 0 1 = Sum((10)) 0 1 br>1 = Sum((10)) 0 1 ((10)) 1 = Sum((10))	Nov e from T 0 0 0 0 0 0 0 0 0 0 0	Dec able 10) 0 0 0 102)m]: 4) = 4) = 0 = 0 =	x (41)m 3373.04 0.78 0	(100) (101) (102) (103) (104) (105) (106) (107) (108)

9a. En	ergy rec	quiremer	nts – Ind	ividual h	eating sy	ystems i	ncluding	micro-C	HP)					
Spac	e heatir	ng:			, .									٦
Fract	ion of sp	ace hea	at from s	econdar	y/supple	mentary	system	(000) 4	(004)			·	0	(201)
Fract	ion of sp	bace hea	at from n	nain syst	em(s)			(202) = 1 -	- (201) =	(222)]			1	(202)
Fract	ion of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficie	ency of r	main spa	ace heat	ing syste	em 1								95.8	(206)
Efficio	ency of s	seconda	ry/suppl	ementar	y heating	g system	ז, %						0	(208)
Cooli	ng Syste	em Ener	gy Effici	ency Ra	tio		-			-	-		6.05	(209)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ır
Spac	e heatin	g require	ement (o	alculate	d above))								
	1573.45	1120.32	790.41	317.39	82.06	0	0	0	0	456.65	1085.75	1632.46		
(211)n	$n = \{[(98)]$)m x (20	4)] } x 1	$100 \div (20)$)6) 	0		0	0	470.07	4400.05	4704.00		(211)
	1642.43	1169.43	825.07	331.31	85.66	0	0	U Tota	U L (k\\/h/ve	470.07	1133.35	- 1704.02	7267.02	7(211)
Snac	o hoatin	a fuol (s	econdar	w) k\//b/	month			Tota	i (ittili yot		- ' ' / 15,1012	2	7307.93	
= {[(98	3)m x (20)1)]}x1	00 ÷ (20	9), KVVII/)8)	monun									
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
				•				Tota	l (kWh/yea	ar) =Sum(2	215) _{15,1012}	2=	0	(215)
Water	heating													
Output	t from wa	ater hea	ter (calc	ulated a	bove)									
Efficie	221.35	195.05	204.74	183.38	178.68	157.37	150.77	168.07	168.76	190.17	201.27	215.97	00.5	
				02 17	80.22	96.5	96.5	96.5	86.5	02.86	04.22	04.61	86.5	(217)
	94.55	boating	95.75	001th	09.23	00.5	00.0	00.0	00.5	92.00	94.22	94.01		(217)
(219)n	n = (64)	m x 100) ÷ (217))m				-						
(219) <mark>m=</mark>	234.12	206.85	218.44	198.96	200.25	181.93	174.3	194.31	195.1	204.78	213.63	228.27		_
								Tota	I = Sum(2	19a) ₁₁₂ =			2450.93	(219)
Space	e cooling	g fuel, k	Wh/mo	nth.										
(221)m=		0	0	0	0	34.96	41.53	32.31	0	0	0	0		
								Tota	I = Sum(2	21) ₆₈ =			108.8	(221)
Annua	al totals									k'	Wh/vear	•	kWh/vear	J
Space	heating	fuel use	ed, main	system	1						, , , , , , , , , , , , , , , , , , ,		7367.93	1
Water	heating	fuel use	d										2450.93	i
Space	cooling	fuel use	d										108.8	1
Electri	city for p	oumps, f	ans and	electric	keep-ho	t								1
mech	anical v	entilatio	n - balar	nced ext	ract or n	ositive ir	nout from	n outside	2			453.69		(230a)
centr	al heatin		. balai				parnor					400.00		(230c)
boilo	r with a f	ig pump	stad flua									30		(2300)
Totol		all-assis		k\1/h/200	r			eum	of (2302)	(230a) -		45	500.00	(2008)](221)
			auuve,	күүп/уеа	u			Sulli	or (200d).	(2009) =			528.69	$\int_{(231)}^{(231)}$
Electri	city for li	ghting											532.26	(232)

12a. CO2 emissions – Individual heating systems including micro-CHP Energy **Emission factor** Emissions kg CO2/kWh kg CO2/year kWh/year (211) x Space heating (main system 1) 0.216 = 1591.47 (261) Space heating (secondary) (215) x = (263)0.519 0 (219) x Water heating = (264) 0.216 529.4 (261) + (262) + (263) + (264) = Space and water heating (265) 2120.88 (221) x Space cooling = (266) 0.519 56.47 Electricity for pumps, fans and electric keep-hot (231) x = (267) 0.519 274.39 (232) x Electricity for lighting (268) 0.519 = 276.24 sum of (265)...(271) = Total CO2, kg/year (272) 2727.98 **Dwelling CO2 Emission Rate** $(272) \div (4) =$ (273) 16.37 El rating (section 14) 83 (274)

Assessor Name:Stroma FSAP 2012Stroma Number:Software Name:Stroma FSAP 2012Software Version:Version: 1.0.4.7Property Address: Charlotte Street - GreenAddress :77-79 Charlotte Street, London, W11. Overall dwelling dimensions:Area(m²)Av. Height(m)Volume(m³)Ground floor116(1a) x2.55(2a) =295.8(3a)
Address: Charlotte Street - Green Address: 77-79 Charlotte Street, London, W1 1. Overall dwelling dimensions: Area(m²) Av. Height(m) Volume(m³) Ground floor 116 (1a) x 2.55 (2a) = 295.8 (3a)
Address : Introduction of the street, condition, with 1. Overall dwelling dimensions: Area(m²) Av. Height(m) Volume(m³) Ground floor 116 (1a) x 2.55 (2a) = 295.8 (3a)
Area(m²) Av. Height(m) Volume(m³) Ground floor 116 (1a) x 2.55 (2a) = 295.8 (3a)
Ground floor $116 (1a) \times 2.55 (2a) = 295.8 (3a)$
First floor 50.6 (1b) x 2.76 (2b) = 139.66 (3b)
Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$
Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 435.46$ (5)
2. Ventilation rate:
main secondary other total m ³ per hour
Number of chimneys $0 + 0 = 0$ $\times 40 = 0$ (6a)
Number of open flues $0 + 0 + 0 = 0 \times 20 = 0$ (6b)
Number of intermittent fans $0 \times 10 = 0$ (7a)
Number of passive vents $0 \times 10 = 0$ (7b)
Number of flueless gas fires
Air changes per hour
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7c) = 0$ \div (5) = 0 (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)
Number of storeys in the dwelling (ns) 0 (9) Additional infiltration (0) (4)
Additional initiation: $(9)-1$ (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
Percentage of windows and doors draught stripped
Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ 0(14)
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
Number of sides sheltered $(20) = 1 - 10.075 \times (19)$
Silenter factor $(20) = 1 + [0.075 \times (10)] = 0.85$ (20)
Infiltration rate modified for monthly wind speed (21)
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

Wind F	actor (2	2a)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			
Adjust	ed infiltra	ation rat	te (allow	ing for sl	nelter ar	nd wind s	speed) =	(21a) x	(22a)m						
-	0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15			
Calcul	ate effec	tive air	change	rate for t	he appl	icable ca	se				<u> </u>				
If me	echanica	al ventila	ation:	and the NL (C	20L) (00	-)) (00-)			C).5	(23a)
If exh	aust air ne	eat pump	using App	enaix IN, (2	23D) = (23	a) × Fmv (e	equation (I	v5)), otne	rwise (23b) = (23a)			0).5	(23b)
IT Dala	anced with	neat rec	overy: effic	ciency in %	allowing	for in-use f	actor (from	n Table 4h) =				75	5.65	(23c)
a) If	balance	d mech	anical ve	entilation	with he	at recov	ery (MVI	HR) (24a	a)m = (22)	2b)m + (23b) × [′	1 – (23c)	÷ 100] I		(0.4-)
(24a)m=	0.28	0.28	0.28	0.26	0.26	0.24	0.24	0.24	0.25	0.26	0.27	0.27			(24a)
b) If	balance	d mech	anical ve	entilation	without	t heat red	covery (N	ИV) (24t Т	o)m = (22	2b)m + (2 1	23b)	-	1		(2.4)
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24b)
c) If	whole h	ouse ex	tract ver	ntilation of	or positiv	ve input	ventilatio	on from (outside	E (00k					
(0.1 c) -	if (22b)m	1 < 0.5 :	x (23D), 1	tnen (24)	c) = (231	b); otner		c) = (221	5) m + 0.	.5 × (230) 		1		(24c)
(24c)m=		0	0	0	0	0	0	0	0	0	0	0			(240)
d) If	natural v if (22h)m	ventilati	on or wh Ion (24d)	iole hous m – (22	se positi h)m oth	ve input erwise (2	ventilatio 24d)m –	on from 1	0ft 2h)m² x	0 51					
(24d)m=		0									0	0			(24d
Effe	ctive air	change	rate - ei	nter (24a	$1 - \frac{1}{24}$	b) or (24	c) or (24	d) in hor	(25)						
(25)m=	0.28	0.28	0.28	0.26	0.26	0.24	0.24	0.24	0.25	0.26	0.27	0.27			(25)
3. He	at losses	s and h	eat loss	paramet	er:						_				
ELEN		Gro	SS (m²)	Openin	igs 1 ²	Net Ar	rea m²	U-val W/m2	ue K	A X U	K)	k-value	e) ≺		A X k k.I/K
Windo	ws Type	1	(,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			2.37	x1	/[1/(1.4)+	0.04] =	3.14					(27)
Windo	ws Type	2				2.03		/[1/(1.4)+	0.04] =	2 69	-				(27)
Windo	ws Type	3				1.05	x1.	- /[1/(1.4)+	0.04] =	1.39	=				(27)
Windo	ws Type	4				8.44	x1.	- /[1/(1.4)+	0.04] =	11.19	=				(27)
Windo	ws Type	5				7.68		/[1/(1.4)+	0.04] =	10.18	\exists				(27)
Windo	ws Type	6				2.11		/[1/(1.4)+	0.04] =	2.8	\exists				(27)
Windo	ws Type	7				11.27	7 x1	/[1/(1.4)+	0.04] =	14.94	\exists				(27)
Windo	ws Type	8				4.28		/[1/(1.4)+	0.04] =	5.67	=				(27)
Windo	ws Type	9				3.76		/[1/(1.4)+	0.04] =	4.98	\exists				(27)
Windo	ws Type	10				11.27	7 x1	/[1/(1.4)+	0.04] =	14.94	=				(27)
Rooflig	phts					1.31	x1.	/[1/(1.1) +	0.04] =	1.441	=				(27b)
Floor						116.1	6 ×	0.065	=	7.5504	 [(28)
Walls	Type1	29.	73	14.2	2	15.5	x	0.18	=	2.79			- i		(29)
Walls	Type2	15.	58	7.68	3	7.9	×	0.18		1.42			i F	. <u> </u>	(29)
Walls	ТуреЗ	22.	89	12.5	8	10.3	1 X	0.18		1.86	-		i F		(29)
Walls	Type4	16.	96	1.05	5	15.9	1 X	0.18		2.86			i F		(29)
Walls -	Туре5	12.	56	0		12.56	3 X	0.18	=	2.26	= i		i F		(29)

Walls Type6 26.16 11.2	27 14.89 X	0.18 =	2.68			(29)
Walls Type7 30.59 19.3	31 11.28 ×	0.18 =	2.03		\exists	(29)
Walls Type8 39.55 0	39.55 ×	0.09 =	3.56		╡	(29)
Walls Type9 11.51 0	11.51 ×	0.09 =	1.04		\dashv	(29)
Roof Type1 50.6 2.6	2 47.98 ×	0.13 =	6.24		\dashv	(30)
Roof Type2 26.96 0	26.96 ×	0.13 =	3.5			`´´ (30)
Total area of elements, m ²	399.25					` ´ ´ (31)
* for windows and roof windows, use effective w ** include the areas on both sides of internal wa	vindow U-value calculated using	g formula 1/[(1/U-valı	ıe)+0.04] as given in	paragrapl	h 3.2	. ,
Fabric heat loss, $W/K = S (A \times U)$, ,	(26)(30) + (32) =			128.2	(33)
Heat capacity $Cm = S(A \times k)$		((28)	.(30) + (32) + (32a).	(32e) =	0	(34)
Thermal mass parameter (TMP = Cm	÷ TFA) in kJ/m²K	Indica	tive Value: Medium		250	(35)
For design assessments where the details of th	e construction are not known p	recisely the indicative	values of TMP in Ta	able 1f		
can be used instead of a detailed calculation. Thermal bridges : $S(I \times X)$ calculated	using Appendix K				50.00	
if details of thermal bridging are not known (36)	$= 0.15 \times (31)$				59.89	(36)
Total fabric heat loss	= 0.10 x (01)	(33) +	(36) =		188.09	(37)
Ventilation heat loss calculated month	ly	(38)m	= 0.33 × (25)m x (5)			
Jan Feb Mar Apr	May Jun Jul	Aug Sep	Oct Nov	Dec		
(38)m= 40.86 40.4 39.94 37.65	37.19 34.9 34.9	34.44 35.82	3 <mark>7.19 38.11</mark>	39.02		(38)
Heat transfer coefficient, W/K		(39)m	= (37) + (38)m			
(39)m= 228.94 228.48 228.03 225.74	225.28 222.99 222.99	222.53 223.9	225.28 226.19	<mark>22</mark> 7.11		
			Average = Sum(39)1	12 /12=	2 <mark>25.62</mark>	(39)
Heat loss parameter (HLP), W/m ² K		(40)m	= (39)m ÷ (4)	4.00	1	
(40)m = 1.37 1.37 1.37 1.35	1.35 1.34 1.34	1.34 1.34	1.35 1.36	1.36	1.25	
Number of days in month (Table 1a)		,	-verage – Oum(40)1.	12 / 12-	1.00	(+0)
Jan Feb Mar Apr	May Jun Jul	Aug Sep	Oct Nov	Dec		
(41)m= 31 28 31 30	31 30 31	31 30	31 30	31		(41)
4. Water heating energy requirement				kWh/y	ear:	
Assumed occupancy, N					1	(40)
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - ex	כ(-0.000349 x (TFA -13.9	9)2)] + 0.0013 x (⁻	2. TFA -13.9)	96]	(42)
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - ex if TFA £ 13.9, N = 1	o(-0.000349 x (TFA -13.9	9)2)] + 0.0013 x ([*]	TFA -13.9)	96]	(42)
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - ex if TFA £ 13.9, N = 1 Annual average hot water usage in litr Reduce the annual average hot water usage by	o(-0.000349 x (TFA -13.9 es per day Vd,average = <i>5% if the dwelling is designed</i>	9)2)] + 0.0013 x (* ; (25 x N) + 36 to achieve a water us	TFA -13.9)	96]	(42) (43)
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp if TFA £ 13.9, N = 1 Annual average hot water usage in litr Reduce the annual average hot water usage by not more that 125 litres per person per day (all	o(-0.000349 x (TFA -13.9 es per day Vd,average = 5% if the dwelling is designed vater use, hot and cold)	9)2)] + 0.0013 x (* s (25 x N) + 36 to achieve a water us	IFA -13.9) 2. See target of 104	96]	(42) (43)
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp if TFA £ 13.9, N = 1 Annual average hot water usage in litr Reduce the annual average hot water usage by not more that 125 litres per person per day (all Jan Feb Mar Apr	o(-0.000349 x (TFA -13.9 es per day Vd,average = 5% if the dwelling is designed water use, hot and cold) May Jun Jul	9)2)] + 0.0013 x ([*] (25 x N) + 36 <i>to achieve a water us</i> Aug Sep	TFA -13.9) se target of Oct Nov	96 4.45 Dec]]	(42) (43)
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - ex] if TFA £ 13.9, N = 1 Annual average hot water usage in litr Reduce the annual average hot water usage by not more that 125 litres per person per day (all Jan Feb Mar Apr Hot water usage in litres per day for each month	c)(-0.000349 x (TFA -13.9 es per day Vd,average = 5% if the dwelling is designed water use, hot and cold) May Jun Jul 1 Vd,m = factor from Table 1c x	9)2)] + 0.0013 x ((25 x N) + 36 to achieve a water us Aug Sep (43)	2. TFA -13.9) se target of Oct Nov	96 4.45 Dec]]	(42) (43)
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp if TFA £ 13.9, N = 1 Annual average hot water usage in litre Reduce the annual average hot water usage by not more that 125 litres per person per day (all Jan Feb Mar Apr Hot water usage in litres per day for each month (44)m= 114.9 110.72 106.54 102.36	$D(-0.000349 \times (TFA - 13.9))$ es per day Vd, average = 5% if the dwelling is designed water use, hot and cold) $May \qquad Jun \qquad Jul \\ Vd, m = factor from Table 1c \times 98.19 \qquad 94.01 \qquad 94.01$	9)2)] + 0.0013 x ((25 x N) + 36 to achieve a water us Aug Sep (43) 98.19 102.36	2. TFA -13.9) Se target of Oct Nov 106.54 110.72	96 4.45 Dec 114.9]]]	(42)
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp if TFA £ 13.9, N = 1 Annual average hot water usage in litre Reduce the annual average hot water usage by not more that 125 litres per person per day (all Jan Feb Mar Apr Hot water usage in litres per day for each month (44)m= 114.9 110.72 106.54 102.36 Energy content of hot water used - calculated m	b) $(-0.000349 \times (TFA - 13.9))$ es per day Vd, average = 5% if the dwelling is designed water use, hot and cold) May Jun Jul 1 Vd, m = factor from Table 1c x 98.19 94.01 94.01 100thly = 4.190 x Vd, m x nm x l	9)2)] + 0.0013 x ((25 x N) + 36 to achieve a water us Aug Sep (43) 98.19 102.36	2. TFA -13.9) Se target of Oct Nov 106.54 110.72 Total = Sum(44)_112 = oth (see Tables 1b, 1	96 4.45 Dec 114.9]] 1253.43	(42) (43)
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp if TFA £ 13.9, N = 1 Annual average hot water usage in litr Reduce the annual average hot water usage by not more that 125 litres per person per day (all Jan Feb Mar Apr Hot water usage in litres per day for each month (44)m= 114.9 110.72 106.54 102.36 Energy content of hot water used - calculated m (45)m= 170.39 149.02 153.78 134.07	p(-0.000349 x (TFA -13.9 es per day Vd,average = 5% if the dwelling is designed water use, hot and cold) May Jun Jul Nd,m = factor from Table 1c x 98.19 94.01 94.01 nonthly = 4.190 x Vd,m x nm x l	9)2)] + 0.0013 x ((25 x N) + 36 to achieve a water us Aug Sep (43) 98.19 102.36 DTm / 3600 kWh/mor 118.04 119.45	2. TFA -13.9) Se target of Oct Nov 106.54 110.72 Total = Sum(44) 112 = oth (see Tables 1b, 1) 139.21 151.96	96 4.45 Dec 114.9 = c, 1d) 165.01]] 	(42) (43)
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp if TFA £ 13.9, N = 1 Annual average hot water usage in litr Reduce the annual average hot water usage in litr Reduce the annual average hot water usage by not more that 125 litres per person per day (all the Jan Feb Mar Apr Hot water usage in litres per day for each month (44)m= 114.9 110.72 106.54 102.36 Energy content of hot water used - calculated m (45)m= 170.39 149.02 153.78 134.07	$p(-0.000349 \times (TFA - 13.9))$ es per day Vd, average = 5% if the dwelling is designed water use, hot and cold) May Jun Jul Nd,m = factor from Table 1c x 98.19 94.01 94.01 ponthly = 4.190 x Vd,m x nm x l 128.64 111.01 102.87	9)2)] + 0.0013 x (* (25 x N) + 36 to achieve a water us Aug Sep (43) 98.19 102.36 DTm / 3600 kWh/mor 118.04 119.45	2. TFA -13.9) Se target of Oct Nov 106.54 110.72 Total = Sum(44)112 oth (see Tables 1b, 1) 139.21 151.96 Total = Sum(45)112	96 4.45 Dec 114.9 <i>c, 1d</i>) 165.01]] 	(42) (43) (44) (45)
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp if TFA £ 13.9, N = 1 Annual average hot water usage in litre Reduce the annual average hot water usage by not more that 125 litres per person per day (all Jan Feb Mar Apr Hot water usage in litres per day for each month (44)m= 114.9 110.72 106.54 102.36 Energy content of hot water used - calculated m (45)m= 170.39 149.02 153.78 134.07 If instantaneous water heating at point of use (red)	p(-0.000349 x (TFA -13.9 es per day Vd,average = 5% if the dwelling is designed water use, hot and cold) May Jun Jul Nd,m = factor from Table 1c x 98.19 94.01 94.01 nonthly = 4.190 x Vd,m x nm x 1 128.64 111.01 102.87 o hot water storage), enter 0 in	9)2)] + 0.0013 x (* (25 x N) + 36 to achieve a water us Aug Sep (43) 98.19 102.36 DTm / 3600 kWh/mor 118.04 119.45 a boxes (46) to (61)	2. TFA -13.9) Se target of Oct Nov 106.54 110.72 Total = Sum(44)112 nth (see Tables 1b, 1 139.21 151.96 Total = Sum(45)112	96 4.45 Dec 114.9 c, 1d) 165.01] 1253.43 1643.44	(42) (43) (44) (45)
Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp if TFA £ 13.9, N = 1 Annual average hot water usage in litre Reduce the annual average hot water usage by not more that 125 litres per person per day (all Jan Feb Mar Apr Hot water usage in litres per day for each month (44)m= 114.9 110.72 106.54 102.36 Energy content of hot water used - calculated m (45)m= 170.39 149.02 153.78 134.07 If instantaneous water heating at point of use (red) (46)m= 25.56 22.35 23.07 20.11	p(-0.000349 x (TFA -13.9 es per day Vd,average = 5% if the dwelling is designed water use, hot and cold) May Jun Jul Nd,m = factor from Table 1c x 98.19 94.01 94.01 98.19 94.01 94.01 ionthly = 4.190 x Vd,m x nm x h 128.64 111.01 102.87 o hot water storage), enter 0 in 19.3 16.65 15.43	9)2)] + 0.0013 x (* (25 x N) + 36 to achieve a water us Aug Sep (43) 98.19 102.36 DTm / 3600 kWh/mor 118.04 119.45 boxes (46) to (61) 17.71 17.92	2. TFA -13.9) Se target of Oct Nov 106.54 110.72 Total = Sum(44)_112 ith (see Tables 1b, 1 139.21 151.96 Total = Sum(45)_112 20.88 22.79	96 4.45 Dec 114.9 c, 1d) 165.01 24.75]] 	(42) (43) (44) (45) (46)

Water	storage	loss:													
Storag	e volum	e (litres)) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		200			(47)
If comr Otherw Water	munity h vise if no storage	neating a o stored loss: turer's de	and no ta hot wate	ink in dw er (this ir oss facte	velling, e ncludes i or is kno	nter 110 nstantar wn (kWt) litres in neous co n/day):	(47) ombi boil	ers) ente	er '0' in (47)	21			(48)
Tompo	anunao raturo f	actor fro	m Table	2h			"duy).				0.	Z1 			(40)
Enorm					oor			$(49) \times (40)$	\ _		0.	54			(49)
b) If m Hot wa	anufact	urer's de age loss	eclared of factor fr	cylinder l com Tabl	oss fact e 2 (kW	or is not h/litre/da	known: ay)	(40) X (49) =		0.	0			(50)
If comr	nunity h	eating s	see secti	on 4.3			• ·								
Volume	e factor	from Ta	ble 2a									0			(52)
Tempe	rature f	actor fro	m Table	2b								0			(53)
Energy	lost fro	om water	r storage	, kWh/ye	ear			(47) x (51) x (52) x (53) =		0			(54)
Enter	(50) or	(54) in (5	55)								0.	11			(55)
Water	storage	loss cal	culated	for each	month			((56)m = ((55) × (41)	m					
(56)m=	3.52	3.18	3.52	3.4	3.52	3.4	3.52	3.52	3.4	3.52	3.4	3.52			(56)
If cylinde	er contain	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	lix H		
(57)m=	3.52	3.18	3.52	3.4	3.52	3.4	3.52	3.52	3.4	3.52	3.4	3.52			(57)
Primar	v circuit	loss (ar	nual) fro	om Table	3							0			(58)
Primar (mod	y c <mark>ircuit dified by</mark>	loss cal factor f	Iculated	for each le H5 if t	month (here is s	59)m = (solar wat	(58) ÷ 36 ter h <mark>eati</mark> i	65 × (41) ng and a	m a cylinde	r th <mark>ermo</mark>	stat)				
(59)m=	23.26	21.01	23.26	22. <mark>5</mark> 1	23.26	0	0	0	0	23.26	22.51	23.26			(59)
Combi	loss ca	Iculated	for each	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 h	eating ca	alculated	for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m +	(61)m	l
(62)m=	197.17	173.21	180.56	159.98	155.42	114.41	106.38	121.56	122.85	165.98	177.87	191.79			(62)
Solar DH	W input	calculated	using App	endix G or	· Appendix	: H (negati	ve quantity	y) (enter '0	' if no sola	r contributi	ion to wate	er heating)			
(add a	dditiona	l lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (G)		-	-			
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0			(63)
Output	from w	ater hea	iter												
(64)m=	197.17	173.21	180.56	159.98	155.42	0	0	0	0	165.98	177.87	191.79			
ļ			•			•		Out	out from wa	ater heater	r (annual)₁	12	1401	.98	(64)
Output	immers	sion													
(64)m=	0	0	0	0	0	114.41	106.38	121.56	122.85	0	0	0			
I					I		I	Out	ut from im	mersion (a	I annual)112		465.19792	373698	3 (64)
Heat a	ains fro	m water	heating.	kWh/m	onth 0.2	5´[0.85	x (45)m	ı + (61)n	י 1] + 0.8	(46)m	+ (57)m	+ (59)m	1		-
(65)m=	78.08	68.9	72.55	65.31	64.2	39.63	37.02	42.06	42.44	67.71	71.26	76.29			(65)
inclu	de (57)	n in calı	L	L of (65)m	only if c	l Vlinder i	s in the	dwelling	or hot w	L ater is fr	om com	I munitv h	leating		,
5 Jot	ernal g	ains (soc		and 5a).			a noning					Journy		
- 5. mi	ernar ga				/•										
ivietabo	blic gain	is (Table	<u>e 5), vvat</u>	IS											

	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m=	147.9	147.9	147.9	147.9	147.9	147.9	147.9	147.9	147.9	147.9	147.9	147.9

Lightin	g gains	(calcula	ted in Ap	pendix	L, equat	ion L9 oi	r L9a), a	ISO SEE	able 5				
(67)m=	30.14	26.77	21.77	16.48	12.32	10.4	11.24	14.61	19.61	24.9	29.06	30.98	(67)
Appliar	nces gai	ins (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), also	see Tal	ole 5			
(68)m=	338.07	341.57	332.73	313.91	290.16	267.83	252.91	249.41	258.25	277.07	300.82	323.15	(68)
Cookin	g gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a)	, also se	e Table	5			
(69)m=	37.79	37.79	37.79	37.79	37.79	37.79	37.79	37.79	37.79	37.79	37.79	37.79	(69)
Pumps	and far	ns gains	(Table 5	ōa)									
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70)
Losses	e.g. ev	aporatio	n (nega	tive valu	es) (Tab	le 5)							
(71)m=	-118.32	-118.32	-118.32	-118.32	-118.32	-118.32	-118.32	-118.32	-118.32	-118.32	-118.32	-118.32	(71)
Water	heating	gains (T	able 5)										
(72)m=	104.94	102.53	97.52	90.71	86.28	55.04	49.75	56.53	58.94	91.01	98.97	102.54	(72)
Total i	nternal	gains =				(66)	m + (67)m	ı + (68)m +	- (69)m + (70)m + (7	1)m + (72)	m	
(73)m=	540.52	538.24	519.39	488.47	456.13	400.64	381.27	387.92	404.17	460.34	496.22	524.04	(73)
6. Sol	ar gains	s:											

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

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

Orientation:	Access Factor		Area		Flux		g_		FF		Gains	
	Table 6d		m²		Table 6a		Table 6b		Table 6c		(W)	
Northeast 0.9x	0.77	x	2.37	x	11.28] ×	0.63	x	0.72	=	5 <mark>0.43</mark>	(75)
Northeast 0.9x	0.77	x	11.27	x	11.28	x	0.63	x	0.78] =	43.3	(75)
Northeast 0.9x	0.77	x	2.37	×	22.97	×	0.63	x	0.72	=	102.66	(75)
Northeast 0.9x	0.77	x	11.27	x	22.97	x	0.63	x	0.78	=	88.14	(75)
Northeast 0.9x	0.77	x	2.37	x	41.38	x	0.63	x	0.72	=	184.96	(75)
Northeast 0.9x	0.77	x	11.27	×	41.38	x	0.63	x	0.78	=	158.81	(75)
Northeast 0.9x	0.77	x	2.37	x	67.96	x	0.63	x	0.72	=	303.76	(75)
Northeast 0.9x	0.77	x	11.27	x	67.96	x	0.63	x	0.78	=	260.81	(75)
Northeast 0.9x	0.77	x	2.37	x	91.35	x	0.63	x	0.72	=	408.31	(75)
Northeast 0.9x	0.77	x	11.27	x	91.35	x	0.63	x	0.78	=	350.58	(75)
Northeast 0.9x	0.77	x	2.37	x	97.38	x	0.63	x	0.72	=	435.31	(75)
Northeast 0.9x	0.77	x	11.27	x	97.38	x	0.63	x	0.78	=	373.75	(75)
Northeast 0.9x	0.77	x	2.37	x	91.1	x	0.63	x	0.72	=	407.22	(75)
Northeast 0.9x	0.77	x	11.27	x	91.1	x	0.63	x	0.78	=	349.64	(75)
Northeast 0.9x	0.77	x	2.37	x	72.63	x	0.63	x	0.72	=	324.64	(75)
Northeast 0.9x	0.77	x	11.27	x	72.63	x	0.63	x	0.78	=	278.73	(75)
Northeast 0.9x	0.77	x	2.37	x	50.42	x	0.63	x	0.72	=	225.38	(75)
Northeast 0.9x	0.77	x	11.27	x	50.42	x	0.63	x	0.78	=	193.51	(75)
Northeast 0.9x	0.77	x	2.37	x	28.07	x	0.63	x	0.72	=	125.46	(75)
Northeast 0.9x	0.77	x	11.27	x	28.07	x	0.63	x	0.78	=	107.72	(75)
Northeast 0.9x	0.77	x	2.37	x	14.2	x	0.63	x	0.72	=	63.46	(75)
Northeast 0.9x	0.77	x	11.27	x	14.2	×	0.63	x	0.78	=	54.49	(75)

		1		1		1				1		-
Northeast 0.9x	0.77	x	2.37	x	9.21	x	0.63	x	0.72	=	41.19	(75)
Northeast 0.9x	0.77	x	11.27	x	9.21	x	0.63	x	0.78	=	35.36	(75)
Southeast 0.9x	0.54	x	1.05	x	36.79	x	0.63	x	0.82	=	9.7	(77)
Southeast 0.9x	0.54	x	1.05	x	62.67	x	0.63	x	0.82	=	16.52	(77)
Southeast 0.9x	0.54	x	1.05	x	85.75	x	0.63	x	0.82	=	22.61	(77)
Southeast 0.9x	0.54	x	1.05	x	106.25	x	0.63	x	0.82] =	28.01	(77)
Southeast 0.9x	0.54	x	1.05	×	119.01	x	0.63	x	0.82	=	31.37	(77)
Southeast 0.9x	0.54	x	1.05	x	118.15	x	0.63	x	0.82] =	31.15	(77)
Southeast 0.9x	0.54	x	1.05	x	113.91	x	0.63	x	0.82	=	30.03	(77)
Southeast 0.9x	0.54	x	1.05	x	104.39	x	0.63	x	0.82	=	27.52	(77)
Southeast 0.9x	0.54	x	1.05	x	92.85	x	0.63	x	0.82	=	24.48	(77)
Southeast 0.9x	0.54	x	1.05	x	69.27	x	0.63	x	0.82	=	18.26	(77)
Southeast 0.9x	0.54	x	1.05	x	44.07	x	0.63	x	0.82] =	11.62	(77)
Southeast 0.9x	0.54	x	1.05	x	31.49	x	0.63	x	0.82] =	8.3	(77)
Southwest0.9x	0.54	x	2.03	x	36.79]	0.63	x	0.83] =	18.98	(79)
Southwest0.9x	0.54	x	8.44	x	36.79]	0.63	x	0.78	=	74.16	(79)
Southwest0.9x	0.54	x	2.11	x	36.79]	0.63	x	0.82	=	19.49	(79)
Southwest0.9x	0.77	x	4.28	×	36.79		0.63	х	0.84	=	57.75	(79)
Southwest _{0.9x}	0.77	x	3.76	x	36.79		0.63	x	0.83] =	5 <mark>0.13</mark>	(79)
Southwest0.9x	0.77	x	11.27	x	36.79		0.63	x	0.78	=	141.21	(79)
Southwest0.9x	0.5 <mark>4</mark>	x	2.03	×	62.67		0.63	x	0.83] =	<mark>3</mark> 2.33	(79)
Southwest0.9x	0.54	x	8.44	×	62.67		0.63	x	0.78] =	126.33	(79)
Southwest0.9x	0.54	x	2.11	x	62.67		0.63	x	0.82] =	33.2	(79)
Southwest0.9x	0.77	x	4.28	x	62.67]	0.63	x	0.84] =	9 <mark>8.37</mark>	(79)
Southwest0.9x	0.77	×	3.76	x	62.67]	0.63	x	0.83	=	85.39	(79)
Southwest0.9x	0.77	x	11.27	x	62.67]	0.63	x	0.78] =	240.53	(79)
Southwest0.9x	0.54	x	2.03	x	85.75]	0.63	x	0.83	=	44.24	(79)
Southwest0.9x	0.54	x	8.44	x	85.75]	0.63	x	0.78] =	172.85	(79)
Southwest0.9x	0.54	x	2.11	x	85.75]	0.63	x	0.82	=	45.43	(79)
Southwest0.9x	0.77	x	4.28	x	85.75]	0.63	x	0.84	=	134.6	(79)
Southwest0.9x	0.77	x	3.76	x	85.75]	0.63	x	0.83	=	116.84	(79)
Southwest0.9x	0.77	x	11.27	x	85.75]	0.63	x	0.78	=	329.11	(79)
Southwest0.9x	0.54	x	2.03	x	106.25]	0.63	x	0.83	=	54.81	(79)
Southwest0.9x	0.54	x	8.44	x	106.25]	0.63	x	0.78	=	214.17	(79)
Southwest0.9x	0.54	x	2.11	x	106.25]	0.63	x	0.82	=	56.29	(79)
Southwest0.9x	0.77	×	4.28	×	106.25		0.63	x	0.84	=	166.78	(79)
Southwest _{0.9x}	0.77	×	3.76	×	106.25]	0.63	x	0.83	=	144.77	(79)
Southwest _{0.9x}	0.77	×	11.27	×	106.25]	0.63	x	0.78] =	407.78	(79)
Southwest _{0.9x}	0.54	×	2.03	×	119.01]	0.63	×	0.83] =	61.4	(79)
Southwest _{0.9x}	0.54	×	8.44	×	119.01]	0.63	x	0.78	=	239.88	(79)
Southwest0.9x	0.54	×	2.11	×	119.01]	0.63	x	0.82	=	63.05	(79)

Southwest _{0.9x}	0.77	x	4.28	x	119.01]	0.63	x	0.84	=	186.8	(79)
Southwest _{0.9x}	0.77	x	3.76	x	119.01	İ	0.63	x	0.83] =	162.15	(79)
Southwest _{0.9x}	0.77	x	11.27	x	119.01	İ	0.63	x	0.78] =	456.75	(79)
Southwest _{0.9x}	0.54	x	2.03	x	118.15	Ī	0.63	x	0.83	=	60.95	(79)
Southwest _{0.9x}	0.54	x	8.44	x	118.15	İ	0.63	x	0.78] =	238.15	(79)
Southwest _{0.9x}	0.54	x	2.11	x	118.15]	0.63	x	0.82] =	62.59	(79)
Southwest <mark>0.9x</mark>	0.77	x	4.28	x	118.15]	0.63	x	0.84] =	185.45	(79)
Southwest _{0.9x}	0.77	x	3.76	x	118.15]	0.63	x	0.83] =	160.98	(79)
Southwest _{0.9x}	0.77	x	11.27	x	118.15]	0.63	x	0.78	=	453.45	(79)
Southwest <mark>0.9</mark> x	0.54	x	2.03	x	113.91]	0.63	x	0.83] =	58.76	(79)
Southwest _{0.9x}	0.54	x	8.44	x	113.91]	0.63	x	0.78	=	229.6	(79)
Southwest _{0.9x}	0.54	x	2.11	x	113.91]	0.63	x	0.82	=	60.34	(79)
Southwest _{0.9x}	0.77	x	4.28	x	113.91]	0.63	x	0.84	=	178.8	(79)
Southwest _{0.9x}	0.77	x	3.76	x	113.91]	0.63	x	0.83	=	155.2	(79)
Southwest _{0.9x}	0.77	x	11.27	x	113.91]	0.63	x	0.78	=	437.17	(79)
Southwest _{0.9x}	0.54	x	2.03	x	104.39]	0.63	x	0.83] =	53.85	(79)
Southwest _{0.9x}	0.54	x	8.44	x	104.39]	0.63	x	0.78	=	210.41	(79)
Southwest0.9x	0.54	x	2.11	X	104.39		0.63	х	0.82	=	55.3	(79)
Sout <mark>hwest_{0.9x}</mark>	0.77] x	4.28	x	104.39		0.63	x	0.84] =	163.85	(79)
Sout <mark>hwest_{0.9x}</mark>	0.77	x	3.76	x	104.39		0.63	x	0.83	=	142.23	(79)
Sout <mark>hwest_{0.9x}</mark>	0.77] x	11.27	x	104.39		0.63	x	0.78	=	400.64	(79)
Sout <mark>hwest_{0.9x}</mark>	0.54] x	2.03	x	92.8 <mark>5</mark>]	0.63	x	0.83] =	47.9	(79)
Sout <mark>hwest</mark> 0.9x	0.54	x	8.44	x	92.85		0.63	x	0.78] =	187.16	(79)
Sout <mark>hwest_{0.9x}</mark>	0.54	x	2.11	x	92.85]	0.63	x	0.82] =	49.19	(79)
Southwest _{0.9x}	0.77	x	4.28	x	92.85]	0.63	x	0.84] =	145.74	(79)
Southwest _{0.9x}	0.77	x	3.76	x	92.85]	0.63	x	0.83] =	126.51	(79)
Southwest _{0.9x}	0.77	x	11.27	x	92.85]	0.63	x	0.78] =	356.36	(79)
Southwest _{0.9x}	0.54	x	2.03	x	69.27]	0.63	x	0.83] =	35.73	(79)
Southwest _{0.9x}	0.54	x	8.44	x	69.27]	0.63	x	0.78] =	139.62	(79)
Southwest0.9x	0.54	x	2.11	x	69.27]	0.63	x	0.82	=	36.69	(79)
Southwest _{0.9x}	0.77	x	4.28	x	69.27]	0.63	x	0.84] =	108.72	(79)
Southwest _{0.9x}	0.77	x	3.76	x	69.27]	0.63	x	0.83	=	94.38	(79)
Southwest0.9x	0.77	x	11.27	x	69.27]	0.63	x	0.78	=	265.84	(79)
Southwest _{0.9x}	0.54	x	2.03	x	44.07]	0.63	x	0.83] =	22.74	(79)
Southwest _{0.9x}	0.54	x	8.44	x	44.07]	0.63	x	0.78] =	88.83	(79)
Southwest <mark>0.9x</mark>	0.54	x	2.11	×	44.07]	0.63	x	0.82] =	23.35	(79)
Southwest <mark>0.9x</mark>	0.77	x	4.28	x	44.07]	0.63	x	0.84	=	69.17	(79)
Southwest _{0.9x}	0.77	x	3.76	x	44.07]	0.63	x	0.83] =	60.05	(79)
Southwest <mark>0.9x</mark>	0.77	x	11.27	×	44.07]	0.63	×	0.78] =	169.14	(79)
Southwest <mark>0.9x</mark>	0.54	x	2.03	×	31.49]	0.63	×	0.83] =	16.24	(79)
Southwest <mark>0.9x</mark>	0.54	x	8.44	×	31.49]	0.63	x	0.78] =	63.47	(79)

Southw	est <mark>0.9x</mark>	0.54	x	Γ	2.11	×	3	31.49]		0.63	x	0.82	=	16.68	(79)
Southw	est <mark>0.9x</mark>	0.77	×	Ē	4.28	j ×	3	31.49	Ī		0.63	- X	0.84	=	49.42	(79)
Southw	est <mark>0.9x</mark>	0.77	×	Ē	3.76	j ×	3	31.49	Ī		0.63	×	0.83	=	42.9	(79)
Southw	est <mark>0.9x</mark>	0.77	×	Ē	11.27] ×	3	31.49	Ī		0.63	×	0.78	=	120.85	(79)
Northw	est <mark>0.9x</mark>	0.54	×	Ē	7.68	×	1	1.28	x		0.63	×	0.91	=	24.14	(81)
Northw	est <mark>0.9x</mark>	0.54	×	Ē	7.68	×	2	2.97	x		0.63	×	0.91	=	49.14	(81)
Northw	est <mark>0.9x</mark>	0.54	×	Ē	7.68	_] x	4	1.38	x		0.63	×	0.91	=	88.54	(81)
Northw	est <mark>0.9x</mark>	0.54	×	Ē	7.68	X	6	7.96	x		0.63	×	0.91	=	145.41	(81)
Northw	est <mark>0.9x</mark>	0.54	x		7.68	x	g	1.35	x		0.63	x	0.91	=	195.46	(81)
Northw	est <mark>0.9x</mark>	0.54	x		7.68] ×	9	7.38	x		0.63	×	0.91	=	208.39	(81)
Northw	est <mark>0.9x</mark>	0.54	x		7.68	x		91.1	x		0.63	x	0.91	=	194.94	(81)
Northw	est <mark>0.9x</mark>	0.54	x		7.68	x	7	2.63	x		0.63	x	0.91	=	155.41	(81)
Northw	est <mark>0.9x</mark>	0.54	x		7.68] ×	5	0.42	x		0.63	×	0.91	=	107.89	(81)
Northw	est <mark>0.9x</mark>	0.54	x		7.68	x	2	8.07	x		0.63	x	0.91	=	60.06	(81)
Northw	est <mark>0.9x</mark>	0.54	×		7.68	x		14.2	x		0.63	×	0.91	=	30.38	(81)
Northw	est <mark>0.9x</mark>	0.54	x		7.68] x		9.21	x		0.63	x	0.91	=	19.72	(81)
Rooflig	hts <mark>0.9x</mark>	1	×		1.31	x	3	37.03	x		0.63	×	0.83	=	45.66	(82)
Rooflig	hts 0.9x	1	×		1.31	X	7	0.28	x		0.63	x	0.83	=	86.66	(82)
Rooflig	hts 0.9x	1	×		1.31	x	1	11.87] x		0.63	x	0.83	-	137.94	(82)
Rooflig	hts <mark>0.9x</mark>	1	×		1.31	x	1	59.33] ×		0.63	x	0.83	=	196.45	(82)
Rooflig	hts <mark>0.9x</mark>	1	×		1.31	x	1	93.3	x		0.63	x	0.83	=	2 <mark>38.34</mark>	(82)
Rooflig	hts <mark>0.9x</mark>	1	×		1.31] ×	1	97.35	x		0.63	x	0.83	=	243.33	(82)
Rooflig	hts <mark>0.9x</mark>	1	×		1.31] x	1	88.08	x		0.63	×	0.83	=	231.9	(82)
Roof <mark>lig</mark> l	hts 0.9x	1	×		1.31	x	1	62.62	x		0.63	×	0.83	=	200.5	(82)
Rooflig	hts <mark>0.9x</mark>	1	×		1.31	x	1	28.66	x		0.63	×	0.83	=	158.64	(82)
Rooflig	hts <mark>0.9x</mark>	1	x		1.31	x	8	32.24	x		0.63	×	0.83	=	101.41	(82)
Rooflig	hts <mark>0.9x</mark>	1	×		1.31	x	4	5.75	x		0.63	×	0.83	=	56.41	(82)
Rooflig	hts <mark>0.9x</mark>	1	×		1.31] ×	3	0.74	x		0.63	x	0.83	=	37.91	(82)
0-1				-1 6		41-			(00)	0	(74)	(00)				
Solar g	534 97	959 29	1435 92		or each mon		2453 49	2333.6	(83)n 201	3 ± 31	n(74)m 1622 76	.(82)m 1093.9	649.62	452 04	1	(83)
Total g	ains – i	nternal a	ind sola	r (8	(73)m = (73)n	<u>'</u> n +	(83)m	, watts	201	0.1	022.10			102.01	J	()
(84)m=	1075.49	1497.54	1955.31		2467.5 2850.2	23	2854.13	2714.87	240	1.02 2	2026.92	1554.2	3 1145.84	976.08		(84)
7. Me	an inter	nal temp	erature	h)	eating seaso	on)			•	•			•		•	
Temp	erature	during h	eating	per	riods in the li	ving	g area	from Tal	ble 9	, Th1	(°C)				21	(85)
Utilisa	ation fac	tor for g	ains for	livi	ing area, h1,	m ((see Ta	ble 9a)								
	Jan	Feb	Mar		Apr Ma	y 🛛	Jun	Jul	A	ug	Sep	Oct	Nov	Dec		
(86)m=	1	0.99	0.96		0.85 0.67		0.49	0.36	0.4	12	0.69	0.94	0.99	1		(86)
Mean	interna	l temper	ature in	liv	ring area T1	(fol	low ste	ps 3 to 7	7 in T	able	9c)				-	
(87)m=	21	21	21	Γ	21 21	Ì	21	21	2	1	21	21	21	21		(87)
Temn	erature	durina h	eating	oer	riods in rest o	 b fc	welling	from Ta	able 9		2 (°C)					
(88)m=	19.78	19.79	19.79		19.8 19.8	Ţ	19.81	19.81	19.	81	19.81	19.8	19.8	19.79]	(88)

Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)						
(89)m=	1	0.98	0.94	0.81	0.61	0.4	0.26	0.32	0.6	0.91	0.99	1		(89)
Mean	interna	l temper	ature in	the rest	of dwell	ing T2 (fe	ollow ste	eps 3 to 7	7 in Tabl	e 9c)				
(90)m=	19.78	19.79	19.79	19.8	19.8	19.81	19.81	19.81	19.81	19.8	19.8	19.79		(90)
							_		f	iLA = Livin	g area ÷ (4	4) =	0.21	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	llina) = fl	_A × T1	+ (1 – fL	A) × T2					
(92)m=	20.04	20.04	20.04	20.05	20.05	20.06	20.06	20.06	, 20.06	20.05	20.05	20.05		(92)
Apply	adjustn	nent to t	he mear	interna	l temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	20.04	20.04	20.04	20.05	20.05	20.06	20.06	20.06	20.06	20.05	20.05	20.05		(93)
8. Spa	ace hea	ting requ	uirement											
Set Ti the ut	i to the r ilisation	nean int factor fo	ernal ter or gains	mperatu using Ta	re obtair able 9a	ned at ste	ep 11 of	Table 9b	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	1 <u></u> 1:	. <u> </u>									
(94)m=	1	0.99	0.95	0.82	0.62	0.42	0.28	0.34	0.62	0.92	0.99	1		(94)
Usefu	Il gains,	hmGm	, W = (9	4)m x (8	4)m	-				-		-		
(95)m=	1071.65	1475.52	1849.47	2031.83	1767.89	1202.03	769.83	810.82	1254.88	1426.91	1134.65	973.78		(95)
Mo <mark>nt</mark> h	nly aver	age exte	rnal terr	perature	e from T	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	los <mark>s rate</mark>	e for mea	an interr	al temp	erature,	Lm , W =	=[(39) <mark>m</mark>	x [(93)m-	– (96)m]				
(97)m=	<mark>36</mark> 03.46	3459.5 <mark>5</mark>	<mark>308</mark> 8.15	2517.26	1881.75	1217.83	771.86	815.15	1334.04	2129.56	2929.14	<mark>35</mark> 98.86		(97)
Space	e heatin	g requ <mark>ire</mark>	ement fo	r each n	nonth, k	Wh/mont	h = 0.02	24 x [(97)) <mark>m –</mark> (95)m] x (4′	1)m			
(98)m=	18 <mark>83.67</mark>	1333.27	921.58	349.51	84.71	0	0	0	0	522.77	1292.03	1953.06		_
								Tota	l per yea <mark>r</mark>	(kWh/year) = Sum(9	8)15,912 =	8340.6	(98)
Space	e heatin	g require	ement in	kWh/m²	²/year								50.06	(99)
8c. Sr	bace co	oling rec	quiremer	nt										
Calcu	lated fo	r June, J	July and	August.	See Ta	ble 10b								
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat	loss rate	e Lm (ca	lculated	using 2	5°C inte	rnal temp	perature	and exte	ernal ten	nperatur	e from T	able 10)		
(100)m=	0	0	0	0	0	2096.09	1650.11	1691.23	0	0	0	0		(100)
Utilisa	ation fac	tor for lo	oss hm											
(101)m=	0	0	0	0	0	0.96	0.98	0.96	0	0	0	0		(101)
Usefu	l loss, h	mLm (V	Vatts) =	(100)m >	(101)m	1								
(102)m=	0	0	0	0	0	2004.97	1613.01	1629.02	0	0	0	0		(102)
Gains	(solar (gains ca	Iculated	for appli	cable w	eather re	egion, se	e Table	10)					
(103)m=	0	0	0	0	0	3498.92	3331.75	2963.34	0	0	0	0		(103)
Space	e coolin	g require	ement fo	r month,	whole o	dwelling,	continu	ous (kW	(h) = 0.0	24 x [(10)3)m – (102)m]:	(41)m	
set (1	04)m to	zero IT ((104)m <	3 × (98)m	1075.65	1070 75	000.74	0	0	0	0		
(104)m=	0	0	0	0	0	1075.65	1276.75	992.74	U Tatal			0		
Coolec	Ifraction	h							f C –	cooled :	104) area - (4	= 1) _	0.78	(104)
Intermi	ttencv f	actor (T:	able 10h)					10-	550150 (urou - (*	., –	0.70	
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		
			ļ	I	ļ				Total	l = Sum(104)	=	0	(106)
											-			

Space	e cooling	require	ment for	month =	: (104)m	× (105)	× (106)r	m						
(107)m:	0	0	0	0	0	209.83	249.46	193.66	0	0	0	0		
									Total	= Sum(107)	=	652.95	(107)
Space	e cooling	require	ment in l	kWh/m²/	year				(107)) ÷ (4) =			3.92	(108)
9a. Er	nergy rea	quiremer	nts – Ind	ividual h	eating s	ystems i	ncluding	j micro-C	CHP)					
Spac	ce heatii	ng:												_
Fract	tion of sp	bace hea	at from s	econdar	y/supple	ementary	system						0	(201)
Fract	tion of sp	bace hea	at from n	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fract	tion of to	tal heati	ng from	main sys	stem 1			(204) = (20	02) × [1 –	(203)] =			1	(204)
Effici	ency of	main spa	ace heat	ting syste	em 1								407.16	(206)
Effici	ency of	seconda	ry/suppl	ementar	y heatin	g systen	n, %						0	(208)
Cool	ing Syste	em Ener	gy Effici	ency Ra	tio								6.05	(209)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Spac	e heatin	g require	ement (a	calculate	d above)							-	
	1883.67	1333.27	921.58	349.51	84.71	0	0	0	0	522.77	1292.03	1953.06		
(211)r	n = {[(98	s)m x (20	04)] } x ´	100 ÷ (20	06)									(211)
	462.64	327.46	226.34	85.84	20.81	0	0	0	0	128.4	317.33	479.68		
				-				Tota	l (kWh/yea	ar) =Sum(2	211) _{15,1012}	=	2048.5	(211)
Spac	e heatin	g fuel (s	econdar	y), kWh/	month									
= {[(<mark>98</mark>	3)m x (20	01)]	00 ÷ (20)8)										
(215)m:	=0	0	0	0	0	0	0	0	0	0	0	0		-
								lota	I (kWh/yea	ar) =Sum(2	215) _{15,1012}	2	0	(215)
Water	r heating	j star haa	tor (oolo		h ay (a)									
Outpu	197.17	173.21	180.56	159.98	155.42	0	0	0	0	165.98	177.87	191.79		
Efficie	ency of w	rater hea	i ater								I		183.44	(216)
(217)m:	183.44	183.44	183.44	183.44	183.44	183.44	183.44	183.44	183.44	183.44	183.44	183.44		(217)
Fuel fo	or water	heating,	kWh/m	onth	1									
(219)r	n <u>= (64</u>)	<u>m x 100</u>) ÷ (217)m						r				
(219)m:	107.48	94.42	98.43	87.21	84.72	0	0	0	0	90.48	96.96	104.55		-
					\ \			Tota	1 = Sum(2	19a) ₁₁₂ =			764.25	(219)
vvater	neating) 0	114.41	106.38	121.56	122.85	0	0	0		
Efficie	encv of w	l ater hea	ter (Imn	nersion)						-			100	(216)
(217)m:	0	0	0	0	0	100	100	100	100	0	0	0		(217)
Fuel fo	or water	L heating	I (Immers	L sion), kW	I /h/month	۱ ۱								
(219)r	n = [(64)m + (21	<u>8) m] x</u>	<u>100 ÷ (2</u>	217)m		1			i	i	·		
(219)m:	0	0	0	0	0	114.41	106.38	121.56	122.85	0	0	0		_
								Tota	I = Sum(2	19a) ₁₁₂ =			465.2	(219)
Space (221)	e coolin	g fuel, k	נ Wh/mo ו מו	nth.										
(221)m:) 11 . (20)	0	0	0	34.69	41.25	32.02	0	0	0	0		
,				<u> </u>		I	I	Tota	l = Sum(22	1 21) _{6 8} =			107.96	(221)
Annu	al totale									L.	White	. l	kWb/voo	`´´ r
Space	e heating	fuel use	ed, main	system	1					N.	, in year	[2048.5	T

Water heating fuel used				764.25]
Water heating fuel used (Immersion)				465.2]
Space cooling fuel used				107.96]
Electricity for pumps, fans and electric keep-hot					
mechanical ventilation - balanced, extract or posit	ive input from outside		453.69]	(230a)
Total electricity for the above, kWh/year	sum of	f (230a)(230g) =		453.69	(231)
Electricity for lighting				532.26	(232)
Electricity generated by PVs				-263.47	(233)
12a. CO2 emissions – Individual heating systems	including micro-CHP				
	Energy kWh/year	Emission fa kg CO2/kWh	ctor	Emissions kg CO2/yea	ar
Space heating (main system 1)	(211) x	0.519	=	1063.17	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.519	=	396.65	(264)
Water heating (Immersion)	(219) x	0.519	-	241.44	(264)
Space and water heating	(261) + (262) + (263) + (26	64) =		1701.25	(265)
Space cooling	(221) x	0.519	=	56.03	(266)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	235.47	(267)
Electricity for lighting	(232) x	0.519	=	276.24	(268)
Energy saving/generation technologies Item 1		0.519	=	-1 <mark>36.74</mark>	(269)
Total CO2, kg/year		sum of (265)(271) =		2132.25	(272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =		12.8	(273)
EI rating (section 14)				86	(274)

Regulations Compliance Report

Approved Documer Printed on 28 July 2	nt L1A, 2013 Edition, 2017 at 11:16:31	England assessed by Stroma	FSAP 2012 program, Ver	sion: 1.0.4.7
Project Information	n:			
Assessed By:	0		Building Type:	Flat
Dwelling Details:				
NEW DWELLING	DESIGN STAGE		Total Floor Area: 1	66.6m²
Site Reference :	77-79 Charlotte Str	eet	Plot Reference:	Charlotte Street - Green
Address :	77-79 Charlotte Str	eet, London, W1		
Client Details:				
Name: Address :				
This report covers It is not a complet	items included wite e report of regulation	hin the SAP calculations.		
1a TER and DER				
Fuel for main heatir	ng system: Electricity	1		
Fuel factor: 1.47 (el	ectricity)			
Target Carbon Diox	tide Emission Rate (24.05 kg/m ²	
1b TEEE and DEE	OXIDE EMISSION Rate	(DER)	12.80 kg/m²	UK
Target Fabric Energy	v Efficiency (TEEE)		61.2 kWh/m ²	
Dwelling Fabric Ene	ergy Efficiency (DFE	E)	61.2 kWh/m ²	
Ŭ				ОК
2 Fabric U-values	5			
Element		Average	Highest	
External w	vall 🛛 👘	0.15 (max. 0.30)	0.18 (max. 0.70)	ОК
Floor		0.06 (max. 0.25)	0.06 (<mark>max.</mark> 0.70)	ОК
Roof		0.13 (max. 0.20)	0.13 (<mark>max.</mark> 0.35)	ОК
Openings		1.39 (max. 2.00)	1.40 (max. 3.30)	OK
2a Thermal bridg	ing			
Thermal b	ridging calculated us	ing user-specified y-value of 0.	15	
3 Air permeability	y			
Air permeabi	ility at 50 pascals		3.00 (design valu	le)
Iviaximum			10.0	UK
4 Heating efficier	су			
Main Heating	g system:	Heat pumps with radiators or Daikin Altherma ERLQ006CA	underfloor heating - electr V3 + EHBH08CB3V	ic
Secondary h	eating system:	None		
5 Cylinder insula	tion			
Hot water St	orage:	Measured cylinder loss: 0.21 Permitted by DBSCG: 2 24 kV	kWh/day Vh/day	ОК
Primary pipe	work insulated:	Yes		ок

Regulations Compliance Report

Space heating controls	Programmer and at least	two room thermostats	0
Hot water controls:	Cylinderstat		0
	Independent timer for DH	W	0
Boiler interlock:	Yes		0
ow energy lights			
Percentage of fixed lights wit	h low-energy fittings	100.0%	
Minimum		75.0%	0
echanical ventilation			
Continuous supply and extra	ct system		
Specific fan power:		0.61	
Maximum		1.5	0
MVHR efficiency:		89%	
Minimum		70%	0
ummertime temperature			
Overheating risk (Thames va	lley):	Medium	0
d on:			
Overshading:		Average or unknown	
Windows facing: North East		14.22m ²	
Windows facing: South West		2.03m ²	
Windows facing: South East		1.05m ²	
Windows facing: South West		8.44m²	
Windows facing: North West		2.11m ²	
Windows facing: North East		11 27m ²	
Windows facing: North East		4.28m ²	
Windows facing: South West		3.76m ²	
Windows facing: South West		11.27m ²	
Roof windows facing: South	West	2.62m ²	
Ventilation rate:		4.00	
Blinds/curtains:		Dark-coloured curtain or ro	oller blind
		Closed 100% of daylight h	oure

Air permeablility External Walls U-value Floors U-value Photovoltaic array Fixed cooling system 3.0 m³/m²h 0.09 W/m²K 0.06 W/m²K

Date Created: July 2017

Prepared by: Kyle Gray Energy Consultant Checked by: Kirsten Elder

Lead Sustainability Consultant

Scotch Partners LLP Clerkenwell House 45 Clerkenwell Green London EC1R 0HT

T: 0203 544 5400 E: <u>enquiries@scotchpartners.com</u>