### SUSTAINABILITY AND ENERGY STATEMENT:

### 62 Avenue Road, Camden

11<sup>th</sup> Oct 2016





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### **1.0 INTRODUCTION**

This Sustainability and Energy Statement has been prepared by Leema Technologies Ltd to accompany the Planning application submitted by BB Partnership Ltd to Camden Borough Council for the purpose the demolition of an existing outdated dwelling to create a new family home at 62 Avenue Rd, Camden, London.

The proposed development has been designed to meet and exceed current sustainability and energy efficiency requirements as per Document L1a Part L of the 2012 Building Regulations.

This report should be read alongside other supplemental reports prepared by the design team for the planning application

### 2.0 SITE DESCRIPTION AND PROPOSED DEVELOPMENT

- 2.1 The propose development is located at 62 Avenue Road, in the London Borough of Camden. The site falls on the boarder of the Elsworthy Conservation area. However, does not fall within the Conservation area. The area has been developed in stages over a period of seventy years and there have been little subsequent alterations of building frontage. This area has also retained its residential character, and as a result much of its architectural detail and character.
- 2.2 The proposed development at 62 Avenue Road intends to maintain the surrounding characteristics of the area and will be designed as carefully crafted traditional styled family home that is sympathetic to its surroundings. It will be built with Lower Ground, Ground, First and Second floor. Providing off street parking for 2 cars with cycle stores for 4 bikes. In addition there will be a large forecourt to the front of the building. Currently there is an existing dwelling on site. However, this is a tired and very much outdated property. The client has therefore requested that the existing dwelling is carefully demolished and all useable materials, where viable, shall be used in the construction of the new dwelling.
- 2.3 Policy CS13 of the Camden Core Strategy seeks to ensure all new developments minimize carbon emissions by following the energy hierarchy, makes use of the decentralised energy networks and generating renewable energy on site. This policy also states new developments should minimize the potential for surface water flooding incorporating efficient water infrastructure.

### **3.0 POLICY CONTEXT**

Camden Planning Guidance (CPG23) on Sustainability provides further guidance on reducing carbon emissions, in line with Policy CS13 and DM22. Within this document it is stated that developments should target a 35% reduction in carbon emissions. Sustainable development is a core principle underpinning planning, and has a key role to play in the creation of sustainable communities. In order to ensure the implementation of sustainable developments and to determine the target of standards to be met by the proposed development, it is necessary to review the relevant national, regional and local planning policies with respect to sustainability

#### New Residential Development, 62 Avenue Road, London Sustainability and Energy Statement

and the site location. A summary of the planning policy context for the site and propose development is provided below.

#### 3.1 Targets:

This Sustainability Statement sets out the targets and commitments of BB Partnership Ltd in relation to the proposed new development at 62 Avenue Road and the measures by which the company will meet these commitments. The BB Partnership Sustainability Statement reflects existing policy frameworks at a number of levels including national, regional and local guidance. The key component that underpins Policy at all levels is the concept of sustainable development. The following provides an overview of the policy documents that form the basis for the principles, targets and measures.

#### **3.2 National Policy:**

The Government White Paper of 2003, 'Our Energy Future – Creating a Low Carbon Economy' marked a change in energy policy in bringing environmental concerns to the fore by defining a long-term strategic vision for energy policy, combining environmental, security of supply, competitiveness and social goals.

One stated aim is for government to 'set an example throughout the public sector by improving energy efficiency in buildings and procurement'. National Energy reduction targets set out in: *The UK Fuel Poverty Strategy, 2001DTI; Energy White Paper 2003, DEFRA: and the Government's Strategy (2004) for combined Heat and Power,* are as follows:

- 2050 60% reduction in CO2
- 2020 To increase renewable generation by 20%
- 2018 Eradicate fuel poverty in vulnerable households
- 2010 Reduce domestic energy consumption by 30%
- 2010 10% of electricity generation from renewables
- 2010 Good quality Combined Heat and Power generation of 10,000 MW

The aforementioned subject areas are embedded in Government Planning Policy Statements (PPS) and Planning Policy Guidance (PPG) which set out national policy on land use planning. These policies complement but do not replace other national planning policies. All PPS's and PPG's are embedded in Regional Spatial Strategies (RSS's), the London Plan and local planning authorities in the preparation of local development documents. They may also be material to decisions on individual planning applications.

- PPS 1: Delivering Sustainable Development: (February 2005) sets out the relationship between planning, land use and sustainable development. It places an emphasis on community involvement in the process of building a high quality environment. Inclusive and accessible design, as well as health and safety are also prioritised.
- PPS 1: A Supplement Planning and Climate Change: (December 2007) strengthens the emphasis on sustainable development and sets out guidelines for local planning authorities in relation to regional mitigation and adaptation measures for current and future climate change.
- PPS 3: Housing: (June 2010) sets out the Governments strategic housing policy. Objectives aim to ensure that everyone has the opportunity to live in a decent home, which they can afford in a community where they want to live. This policy seeks to improve housing choice, widen access to affordable homes;

develop more opportunities for home ownership and create sustainable and inclusive mixed communities.

- PPS 10: Planning for Sustainable Waste Management: (May 2006) identifies the production of less waste and its use as a resource wherever possible as the key objective. Disposing of waste is only to be considered as a last resort. The Government seeks to break the link between economic growth and the environmental impact of waste. This policy also specifies the decision making responsibilities, to the extent appropriate, of regional planning bodies and all planning authorities in waste management.
- PPS 22: Renewable Energy (August 2004) calls for regional strategies and local authorities to actively encourage renewable energy development through local planning policies. Technologies such as combined heat and power systems (CHP), wind turbines, photo voltaic cells and biomass heating should be considered in all new developments.
- PPS 25: Development and Flood Risk (March 2005) aims to ensure that flood risk is taken into account at all stages of the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas of highest risk. Where new development is, exceptionally, necessary in such areas, policy aims to make it safe, without increasing flood risk elsewhere, and, where possible, reducing flood risk overall. It advises that developments on sites in excess of 1 hectare should be accompanied by a Flood Risk Assessment in order to evaluate the risks and order that they are appropriately mitigated or minimised.

#### 3.3 Regional policy

The current London Plan was adopted in February 2008 with an updated Chapter 4A on *Climate Change and London's Metabolism*. Strengthened policies emphasising energy efficient design and decentralised energy supply are introduced promoting adaptation as well as mitigation in sustainable building design.

Policy 4A.1 *Tackling Climate Change* requires developments to minimise CO2 emissions and states that the following hierarchy will be used to assess applications:

- using less energy, in particular by adopting sustainable design and construction measures (Policy 4A.3)
- supplying energy efficiently, in particular by prioritising decentralised energy generation (Policy 4A.6), and
- Using renewable energy (Policy 4A.7)

Policy 4A.3 *Sustainable Design and Construction*, requires future developments to make the most efficient use of land and existing buildings, and to reduce the need to travel. Passive solar design, natural ventilation, heating and cooling are advocated as ways to reduce energy use in policies 4A.3, *Decentralised Heat*, 4A.6 *Cooling and Power*, 4A.9 *Adaptation*, and 4A.10 *Overheating*.

Policy 4A.2 *Mitigating Climate Change* specifies minimum reduction targets for London as a whole from 1990 levels of:

- $\circ$   $\phantom{0}$  15% by 2010
- o 20% by 2015
- o 25% by 2020
- o 30% by 2025.

Policy 4A.7 *Renewable Energy* requires all new developments to reduce CO2 emissions by 20% through the use of on-site renewable energy generation where feasible

#### 3.4 Local Policy

Development Policies – which will support the Core Strategy by setting out additional planning policies that the Council will use when making decisions on applications for planning permission. It goes into more detail on a number of the issues covered in the Core Strategy.

#### **4.0 SUSTAINABILITY PRINCIPLES SUMMARY**

The Climate Change Act (November 2008) was the first Bill of its kind to set out a framework for moving the UK to a low-carbon economy. The Act sets legally binding targets for the reduction of targeted greenhouse gas emission for the year 2050 through the following framework:

- The UK net carbon account for the year 2050 will be at least 80% lower than the 1990 baseline with the interim target of 2020 at 34%
- The establishment of a new *Committee on Climate Change*, to provide independent expert advice and guidance to Government on achieving targets and carbon budgets
- Greater energy efficiency, with more consumers becoming "producers" of their own energy at home
- A change in the way energy supply companies operate, so that they focus on reducing demand, rather than just supplying as much energy as possible 2 Investment in low-carbon fuels and technologies, such as wind, wave, solar power and carbon capture and storage.

**4.1 Transport** (April 2001) establishes the integration of planning and transport at the national, regional, strategic and local level and promotion of more sustainable transport choices both for carrying people and for moving freight as the key objective. This will be achieved through promoting accessibility to jobs, shopping, leisure facilities and services by public transport, walking and cycling, and through reducing the need to travel, especially by car.

#### 4.2 Air Quality, Noise and Pollution

The term "sustainable development" has various definitions which are under constant critical the scale of global to local. As such, the 2005 UK Government publication 'Securing the Future: delivering UK sustainable development strategy' replaced the previous strategy for sustainable development, 'A better quality of life: A strategy for sustainable development' which was published in 1999. 'Securing the Future' has agreed four priorities for the UK and its devolved administrations. These priorities are:

- 1. Sustainable consumption and production,
- 2. Climate change and energy,
- 3. Protecting our natural resources and enhancing the environment
- 4. Creating sustainable communities and a fairer world

All priorities are incorporated into policy at the regional and local level.

#### 4.3 Materials and Waste Management

There is an existing dwelling on site. This property has been deemed unsuitable and inflexible in space arrangement for adaptation for the 21<sup>st</sup> Century and beyond.

The client has therefore requested that the existing building is carefully deconstructed and all usable materials are either re-used on site as fill material or taken away to be recycled at local recycling facilities. The contractor will provide a site waste management plan to demonstrate the following:-

- a. Target benchmarks for resource efficiency, i.e. m3 of waste per 100 m2 or tonnes of waste per 100m2 set in accordance with best practice
- b. Procedures and commitments to minimize non-hazardous construction waste at design stage. Specify waste minimisation actions relating to at least 3 waste groups and support them by appropriate monitoring of waste.
- c. Procedures for minimising hazardous waste
- d. Monitoring, measuring and reporting of hazardous and non-hazardous site waste production according to the defined waste groups (according to the waste streams generated by the scope of the works)

Where there is a compliant Site Waste Management Plan (SWMP) including procedures and commitments to sort and divert waste from landfill, through either;

- a. Re-use on site (In situ of for new applications)
- b. Re-use on other sites
- c. Salvage/reclaim for re-use
- d. Return to supplier via a 'take-back' scheme
- e. Recovery and recycling using an approved waste management contractor

Demolition of existing building and Site Waste Management..

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#### 4.4 Water Consumption, Surface Water & Water Run-Off and Flood Risk

Full report completed separately.

#### 4.5 Biodiversity and Ecology

Full report completed separately.

### **5.0 ENERGY STATEMENT**

#### **SUMMARY**

5.1 The proposed combined development without renewable energy contribution is predicted to generate **89,377 kWh**/annum.

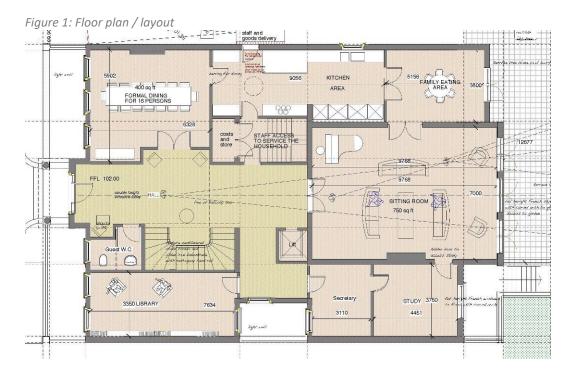
By replacing the gas boilers with Air to Water Source Heat Pumps as a renewable energy to provide space heating and contribute to hot water, the overall energy consumption is predicted to achieve **64,208 kWh**/annum.

The system should be installed by a specialist contractor and selection of appropriate emitters such as underfloor heating is recommended. This results in a 28% contribution of renewable energy contribution on site.

### Layout, Floor Plate and Ceiling Heights

The general footprint of the building is 15 meters wide x 30 meters long. The width of the building allows for perimeter rooms that can take advantage of natural daylight & ventilation and a central circulation core with natural light via a skylight over.

The floor to ceiling heights are generous at 3200mm. Referring to CIBSE Guide AM10 advises that single sided ventilation is effective to 2.5 x ceiling height based a double opening which is made available with sliding sash windows. The high ceilings also offer a suitable 'reservoir' to contain warm air in the summer which can be ventilated out at night time via trickle ventilators.

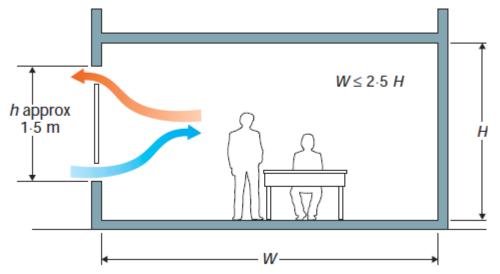


#### Windows

The windows are sliding sash units which provide effective ventilation. The bottom sash can slide up and the top sash can slide down. This forms two effective ventilation openings. The lower will be the intake of the cooler air. The upper opening will extract the warmer air. See figure 1 below:-

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Figure 1: Single Sided Double Opening (Figure 2.19 from CIBSE AM10)



Combined with high ceilings and having two separate ventilation openings, you avoid turbulence that is experience with single opening windows and therefore provides more efficient ventilation which is particularly useful in summertime.

The windows range in size from 1125w x 1725h to 1125w x 2400h. These will allow good levels of daylight and passive solar gains into the internal spaces.

Shading is provides by the glass itself which will be a double glazed unit with low-e coating and multiple glazing bars. The design of the property does not lend itself to contemporary forms of external shading.

Trickle ventilators will be provided to allow for background ventilation as required for secure night-time ventilation.

#### Impact on Surround Renewable Resources

We have assessed the immediate local environment. Currently, there are no wind turbines, solar thermal or Photovoltaic panels on adjacent properties that will be affected by the proposed development.

#### **Daylight & Reduction of Artificial lighting**

To meet the recommendations of Daylight provision we have suggested a daylight factor of 1.5% to living rooms, dining rooms and studies should be implemented.

The main ground floor sitting room to the North-West elevation achieves this if it has a minimum of 7.6m2 of glazing.

The ground floor study to the same elevation achieves >2% daylight factor which exceeds the afore mentioned.

The ground floor dining room to the North-West elevation achieves in excess of 2% daylight factor based on the current window design.

The central circulation stairwell receives natural light from a skylight over.

Generally the rooms are located to the building perimeter and each has a window to provide natural light.

Lighting control will be manual to occupied rooms. The circulation spaces, stores and other ancillary areas will have PIR's to operate lighting and daylight sensors.

Project:	62 Avenue Road, Ca	mden	
Project Ref:	L104		
Room:	Sitting Room		
Input:	Window area (m2)	12.15	
Input:	Floor Area (m2)	68.4	
Input:	Room perimeter (m)	33.54	
Select:	Ceiling height (m)	3	
	Total Surface Area (m2) =	237.42	
Select:	Glazing Type	Double low-e	
Select:	Visible Sky Angle	60 degrees	
Select:	Surface Reflectance	Medium (0.5)	
	RESULT:	2.39%	Daylight Factor

### Green and Brown roof

1) An Intensive Roof

Intensive – intensive living roofs are very much intended for human use and as such take on a more 'landscaped' feel with deeper substrates (at least 150mm up to a meter and beyond) catering for a wide variety of grasses, shrubs and trees. Maintenance is both essential and regular as lawns need mowing and shrubs pruning – an irrigation system should also be installed.

There is NO maintenance - No mowing option – no irrigation system is appropriate at this height.

#### 2) An Extensive Roof

Extensive – an extensive living roof is not normally intended for human use and is unquestionably the most popular form. It's relatively cheap to install, has lower weight loadings and requires minimal maintenance. Usually the plants are set in a light-weight growing medium or substrate of a depth of between 20mm and 150mm. The plants themselves tend to be highly resistant to drought, ground hugging species such as sedum.

The principles behind these types of roof are driven by ecological concerns. Pioneered by the Swiss, the bio-diverse roof is steadily becoming a more common feature as policy makers seek to replace lost habitats for local flora and fauna.

Local Flora and Fauna will not benefit from a roof 12,000mm above the Ground.

The installation of logs, small rocks and sanded areas encourage invertebrates, birds and even lizards to use the roof. Initially the roof will look no better than a rough, stony, weed-infested area but in time will develop; constantly changing as different species come to the fore or take up residence.

During the growing and flowering seasons a mature roof can resemble something akin to an English meadow. Many people think they look messy and unkempt but in fact these roofs do more for the environment than sedum-based and intensive roofs.

A roof 12,000mm above the ground will NOT encourage local invertebrates or lizards to use the roof. It will not look an English meadow when it can't be SEEN

To be able to re-green impermeable surfaces such as roofs gives us the ability to readjust the imbalance – plants store carbon, therefore, if we have more plants we can store more carbon. Living roofs won't save the world but they serve as a fundamental tool with which to address the problem.

The hard surface area of the existing building + terrace + car park is GREATER than the proposed scheme. The rainwater run-off is reduced from 19litres/sec to 17 litres /sec on the proposed scheme. The proposed building is no worse for the environment than the existing building. However, a separate SUDs report will accompany this document.

The only place for a Green roof is the small flat roof over the kitchen extension – otherwise this project is NOT suitable for a Green or Brown roof solution.

#### 5.2 Building Insulation

The proposed U values for the development are identified in table 1 below:-

Element	Building Regs (W/m2.K)	Proposed (W/m2.K)	Improvement
Walls	0.30 W/m <sup>2</sup> .K	0.23 W/m <sup>2</sup> .K	24%
Roof	0.20 W/m <sup>2</sup> .K	0.11 W/m <sup>2</sup> .K	45%
Floor	0.25 W/m <sup>2</sup> .K	0.12 W/m <sup>2</sup> .K	52%
Windows	2.00 W/m <sup>2</sup> .K	1.4 W/m <sup>2</sup> .K	30%
Doors	2.00 W/m <sup>2</sup> .K	1.8 W/m <sup>2</sup> .K	10%

Table 1: Proposed U values for the building envelope

The proposed dwelling is to exceed the current building regulations Part L1a between 10-45% of the external insulation values.

The target design air permeability is to be  $5m^3/hr/m^2$ . This is a 50% improvement on current building regulation values.

#### 5.3 Heating

#### **Air Source Heat Pumps**

An Air Source Heat Pump (ASHP) system extracts heat from the outside air. It delivers low temperature hot water and would therefore benefit under floor heating or oversized radiators. Suitable radiators are Purmo Radiators. These would need to be sized by the heating specialist. The ASHP system is potentially more beneficial to this scheme due to the possible lack of deep ground to accommodate a GSHP system. The typical Coefficient of Performance (CoP) is 2.75 (Which equates to 275% efficiency compared with a gas boiler of 90%).

It is recommended to run the ASHP system throughout the winter period. We ran the proposed building through a study to determine the predicted energy required.

One of the downsides of air source heat pumps is the noise. They can provide a consistent background noise. But this occurs more often in winter when the likelihood is that windows will be shut. We recommend providing screening to the ASHP to baffle the noise but allow adequate ventilation. The units can also be unreliable if used intermittently. If the accommodation is to be used as Student Accommodation, this type of heating may not be appropriate and may cause continuous maintenance issues. They are also unsightly and can be expensive to run if not used correctly.



#### **Photovoltaic System**

With the significant size of the scheme and resultant high levels of energy demand, Photovoltaic Panels are considered.

To achieve a target of **32,055 kWh/Year** to meet **20%** on-site energy generation, then it is estimated that the scheme requires **47 kWp system**. The estimated of panels orientated and tilted south is **320m**<sup>2</sup>. This scheme has a top floor roof area of 342m<sup>2</sup> available. But some areas may be shaded and will need reviewing with firm proposals prior to commencement. Space could be restrictive and recommend a detail review upon detail design. Overshadowing of adjacent buildings also needs to be reviewed.

Other issues to consider are structural loading, access for maintenance, cleaning the panels to maximize efficiency and maintaining the roof finish to prevent leaks.

Systems are available to suit flat roofs such as sit on systems mounted on adjustable angled frameworks as indicated in figures 8 and 9 below. There are also targeted flat roof systems such as the Solyndra (Cylindrical Model) which allow the white roof membrane to reflect daylight onto the underside of the system cylinders.



Figure 8: Tilted frame system

Figure 9: Solyndra Cylindrical PV system

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The specification will need to be designed by a specialist (MCS) contractor to meet the required demand and qualify for the feed-in tariff.

#### **2.0 ENERGY CALCULATIONS**

# **Regulations Compliance Report**

Approved Document L1A 2010 edition assessed by Stroma FSAP 2009 program, Version: 1.5.0.69

EW DWELLING / te Reference : ddress : Client Details:	() <b>AS BUILT</b> New Project 62, Avenue Road,		Building Type:	Detached House	
Dwelling Details: EW DWELLING A te Reference : ddress : Client Details:	New Project				
te Reference : ddress : Client Details:	New Project				
ddress : Client Details:	-				
Client Details:	62, Avenue Road,		Plot Reference:	7th Amendment	
		LONDON, NW8 6H1			
ame: ddress :					
-	s items included w e report of regulat	ithin the SAP calculations. ions compliance.			
TER and DER					
uel factor: 1.47 (e arget Carbon Dio:	kide Emission Rate	(TER)	22.64 kg/m² 16.86 kg/m²		ок
Element External v Floor Roof Openings Air permeabilit Air permeab Maximum		Average 0.18 (max. 0.30) 0.12 (max. 0.25) 0.11 (max. 0.20) 1.45 (max. 2.00)	Highest 0.20 (max. 0.70) 0.12 (max. 0.70) 0.11 (max. 0.35) 2.00 (max. 3.30) 10.00 10.0		OK OK OK
Heating efficie	ncy				
Main Heatin Secondary h	g system: neating system:	Heat pumps with radiators or Air-to-water heat pump (elect None			
Cylinder insula	tion				
Hot water St	orage:	Nominal cylinder loss: 1.50 k Permitted by DBSCG: 2.86 k	-		
Primary pipe Controls	ework insulated:	Yes			ОК
Space heati	ng controls	Time and temperature zone of	control		ок
Hot water co	ontrols:	Cylinderstat			ΟΚ
		Independent timer for DHW			OK
Low energy lig					
Percentage Minimum	of fixed lights with lo	ow-energy fittings	100.0% 75.0%		ок

# **Regulations Compliance Report**

Not applicable	
Summertime temperature	
Overheating risk (Thames valley):	Not significant Ok
ed on:	
Overshading:	Average or unknown
Windows facing: South West	20.14m <sup>2</sup> , Overhang twice as wide as window, ratio Nal
Windows facing: South West	20.14m <sup>2</sup> , Overhang twice as wide as window, ratio Nal
Windows facing: South West	20.14m <sup>2</sup> , Overhang twice as wide as window, ratio Nal
Windows facing: South West	16.78m <sup>2</sup> , Overhang twice as wide as window, ratio Nat
Windows facing: North East	4.68m <sup>2</sup> , Overhang twice as wide as window, ratio NaN
Windows facing: North East	10.08m <sup>2</sup> , Overhang twice as wide as window, ratio Nat
Windows facing: North East	2.8m <sup>2</sup> , Overhang twice as wide as window, ratio NaN
Windows facing: North East	3.66m <sup>2</sup> , Overhang twice as wide as window, ratio NaN
Windows facing: North East	2.4m <sup>2</sup> , Overhang twice as wide as window, ratio NaN
Windows facing: North East	4.84m <sup>2</sup> , Overhang twice as wide as window, ratio NaN
Windows facing: North East	1.81m <sup>2</sup> , Overhang twice as wide as window, ratio NaN
Windows facing: South East	2.56m <sup>2</sup> , Overhang twice as wide as window, ratio NaN
Windows facing: North West	2.74m <sup>2</sup> , Overhang twice as wide as window, ratio NaN
Windows facing: South East	4.76m <sup>2</sup> , Overhang twice as wide as window, ratio NaN
Roof windows facing: Unspecified	6.13m <sup>2</sup>
Ventilation rate:	5.00
Blinds/curtains:	
	shutter closed 100% of daylight hours
Key jeatures	
Windows U-value	1.4 W/m²K
Roofs U-value	0.11 W/m²K
External Walls U-value	0.13 W/m²K
Floors U-value	0.12 W/m²K

# SAP Input

### Property Details: 7th Amendment

Address:	62, Avenue Road, LONDON, NW8 6HT
Located in:	England
Region:	Thames valley
UPRN:	1392868468
Date of assessment:	08 December 2011
Date of certificate:	29 April 2014
Assessment type:	New dwelling as built
Transaction type:	New dwelling
Tenure type:	Unknown
Related party disclosure:	No related party
Thermal Mass Parameter:	Indicative Value Low
Dwelling designed to use less than	125 litres per Person per day: False

Property descriptio	n:					
Dwelling type:		House				
Detachment:		Detached				
Year Completed:		2011				
Floor Location:		Floor area:	Sto	orey height	:	
Basement floor		382.22 m <sup>2</sup>	3	.2 m		
Floor 1		319.56 m <sup>2</sup>	3	.2 m		
Floor 2		301.73 m <sup>2</sup>		m		
Floor 3		219.26 m <sup>2</sup>	2	.8 m		
Living area:		50 m <sup>2</sup> (fraction 0.041)				
Front of dwelling f	faces:	South West				
Opening types:						
Name:	Source:	Туре:	Glazing:		Argon:	Frame:
Front Access	Manufacturer	Solid	j.			Wood
Lhs	Manufacturer	Solid				Wood
RHS ACCESS	Manufacturer	Solid				Wood
F1	Manufacturer	Windows	low-E, $En = 0.0$	05, soft coat	Yes	Wood
F2	Manufacturer	Windows	low-E, $En = 0.0$	05, soft coat	Yes	Wood
DORMER	Manufacturer	Windows	low-E, $En = 0.0$	05, soft coat	Yes	Wood
R1	Manufacturer	Windows	low-E, $En = 0.0$	05, soft coat	Yes	Wood
R2	Manufacturer	Windows	low-E, $En = 0.0$		Yes	Wood
R3	Manufacturer	Windows	low-E, $En = 0.0$		Yes	Wood
DORMER	Manufacturer	Windows	low-E, $En = 0.0$		Yes	Wood
DORMER	Manufacturer	Windows	low-E, $En = 0.0$		Yes	Wood
L1 ACCESS	Manufacturer	Windows	low-E, $En = 0.0$		Yes	Wood
L2	Manufacturer	Windows	low-E, En = $0.0$		Yes	Wood
L3	Manufacturer	Windows	low-E, En = $0.0$		Yes	Wood
DORMER	Manufacturer	Windows	low-E, En = $0.0$		Yes	Wood
DORMER	Manufacturer	Windows	low-E, En = $0.0$		Yes	Wood
RHS	Manufacturer	Windows	low-E, En = $0.0$		Yes	Wood
DOME	SAP 2009	Roof Windows	low-E, $En = 0.0$	JS, SUIT COAL	Yes	Wood
Name:	Gap:	Frame Facto	r: g-value:	U-value:	Area:	No. of Openings:
Front Access	mm	0.7	0	1.8	3.09	1
Lhs	mm	0.7	0	1.8	2.4	1
RHS ACCESS	mm	0.7	0	1.8	2.69	1
F1	16mm or more	0.7	0.63	1.4	3.356	6
F2	16mm or more	0.7	0.63	1.4	3.356	6
DORMER	16mm or more	0.7	0.63	1.4	3.356	6
R1	16mm or more	0.7	0.63	1.4	3.356	5
R2	16mm or more	0.7	0.63	1.4	2.34	2

# **SAP Input**

R3	16mm o	r more	0.7	0.63	1.4	3.36	3	
DORMER	16mm o	r more	0.7	0.63	1.4	1.4	2	
DORMER	16mm o	r more	0.7	0.63	1.4	1.83	2	
L1 ACCESS	16mm o	r more	0.7	0.63	1.4	2.4	1	
L2	16mm o		0.7	0.63	1.4	2.42	2	
L3	16mm o		0.7	0.63	1.4	1.81	1	
DORMER	16mm o		0.7	0.63	1.4	1.28	2	
DORMER			0.7					
	16mm o			0.63	1.4	1.37	2	
RHS	16mm o		0.7	0.63	1.4	2.38	2	
DOME	16mm o	r more	0.7	0.63	2	6.13	1	
Name:	Type-Nam		ocation:	Orient:		Width:	Heig	h+.
Front Access	туре-мани		l Walls	South West		0	0	
Lhs			I Walls	South East		0	0	
RHS ACCESS			I Walls	South West		0	0	
F1			I Walls	South West		0	0	
F2			I Walls	South West		0	0	
DORMER			I Walls	South West		0	0	
R1		AI	l Walls	South West		0	0	
R2		AI	I Walls	North East		0	0	
R3		AI	l Walls	North East		0	0	
DORMER		М	ansard	North East		0	0	
DORMER			ansard	North East		0	0	
L1 ACCESS			I Walls	North East		0	0	
L2			L Walls	North East		0	0	
L2 L3			I Walls	North East		0	0	
						Ũ		
DORMER			ansard	South East		0	0	
DORMER			ansard	North West		0	0	
RHS			I Walls	South East		0	0	
DOME								
		G	round Floor Deck	Unspecified		0	0	
		Gi	round Floor Deck	Unspecified		0	0	
Overshading:				Unspecified		0	0	
Overshading:			round Floor Deck e or unknown	Unspecified		0	0	
Overshading: Opaque Elements:				Unspecified		0	0	
Opaque Elements:	Gross area:			Unspecified U-value:	Ru value:	0 Curtain		Карра:
Opaque Elements:	Gross area:	Averag	e or unknown		Ru value:			Kappa:
Opaque Elements: Type:	Gross area: 765.4	Averag	e or unknown Net area:	U-value:	Ru value:			
Opaque Elements: Type: <u>External Elements</u> All Walls	765.4	Averag Openings: 113.94	e or unknown Net area: 651.46	U-value: 0.2	0	Curtain False		N/A
Opaque Elements: Type: External Elements All Walls Mansard	765.4 213.1	Averag Openings: 113.94 11.76	e or unknown Net area: 651.46 201.34	U-value: 0.2 0.13	0 0	Curtain		N/A N/A
Opaque Elements: Type: External Elements All Walls Mansard Ground Floor Deck	765.4 213.1 62.66	Averag Openings: 113.94 11.76 6.13	e or unknown Net area: 651.46 201.34 56.53	U-value: 0.2 0.13 0.11	0 0 0	Curtain False		N/A N/A N/A
Opaque Elements: Type: External Elements All Walls Mansard Ground Floor Deck Top Floor	765.4 213.1 62.66 158.87	Averag Openings: 113.94 11.76	e or unknown Net area: 651.46 201.34	U-value: 0.2 0.13 0.11 0.11	0 0	Curtain False		N/A N/A N/A N/A
Opaque Elements: Type: <u>External Elements</u> All Walls Mansard Ground Floor Deck Top Floor Lower Ground Floor	765.4 213.1 62.66 158.87 382.22	Averag Openings: 113.94 11.76 6.13	e or unknown Net area: 651.46 201.34 56.53	U-value: 0.2 0.13 0.11 0.11 0.12	0 0 0	Curtain False		N/A N/A N/A N/A N/A
Opaque Elements: Type: <u>External Elements</u> All Walls Mansard Ground Floor Deck Top Floor Lower Ground Floor Ground floor	765.4 213.1 62.66 158.87	Averag Openings: 113.94 11.76 6.13	e or unknown Net area: 651.46 201.34 56.53	U-value: 0.2 0.13 0.11 0.11	0 0 0	Curtain False		N/A N/A N/A N/A
Opaque Elements: Type: <u>External Elements</u> All Walls Mansard Ground Floor Deck Top Floor Lower Ground Floor Ground floor Internal Elements	765.4 213.1 62.66 158.87 382.22 319.56	Averag Openings: 113.94 11.76 6.13	e or unknown Net area: 651.46 201.34 56.53	U-value: 0.2 0.13 0.11 0.11 0.12	0 0 0	Curtain False		N/A N/A N/A N/A N/A
Opaque Elements: Type: <u>External Elements</u> All Walls Mansard Ground Floor Deck Top Floor Lower Ground Floor Ground floor <u>Internal Elements</u> Lower GF	765.4 213.1 62.66 158.87 382.22 319.56 78.836	Averag Openings: 113.94 11.76 6.13	e or unknown Net area: 651.46 201.34 56.53	U-value: 0.2 0.13 0.11 0.11 0.12	0 0 0	Curtain False		N/A N/A N/A N/A N/A N/A
Opaque Elements: Type: <u>External Elements</u> All Walls Mansard Ground Floor Deck Top Floor Lower Ground Floor Ground floor <u>Internal Elements</u> Lower GF GF	765.4 213.1 62.66 158.87 382.22 319.56 78.836 77.608	Averag Openings: 113.94 11.76 6.13	e or unknown Net area: 651.46 201.34 56.53	U-value: 0.2 0.13 0.11 0.11 0.12	0 0 0	Curtain False		N/A N/A N/A N/A N/A N/A
Opaque Elements: Type: <u>External Elements</u> All Walls Mansard Ground Floor Deck Top Floor Lower Ground Floor Ground floor <u>Internal Elements</u> Lower GF GF FF	765.4 213.1 62.66 158.87 382.22 319.56 78.836 77.608 81.778	Averag Openings: 113.94 11.76 6.13	e or unknown Net area: 651.46 201.34 56.53	U-value: 0.2 0.13 0.11 0.11 0.12	0 0 0	Curtain False		N/A N/A N/A N/A N/A N/A N/A
Opaque Elements: Type: <u>External Elements</u> All Walls Mansard Ground Floor Deck Top Floor Lower Ground Floor Ground floor <u>Internal Elements</u> Lower GF GF	765.4 213.1 62.66 158.87 382.22 319.56 78.836 77.608	Averag Openings: 113.94 11.76 6.13	e or unknown Net area: 651.46 201.34 56.53	U-value: 0.2 0.13 0.11 0.11 0.12	0 0 0	Curtain False		N/A N/A N/A N/A N/A N/A N/A N/A
Opaque Elements: Type: <u>External Elements</u> All Walls Mansard Ground Floor Deck Top Floor Lower Ground Floor Ground floor <u>Internal Elements</u> Lower GF GF FF	765.4 213.1 62.66 158.87 382.22 319.56 78.836 77.608 81.778	Averag Openings: 113.94 11.76 6.13	e or unknown Net area: 651.46 201.34 56.53	U-value: 0.2 0.13 0.11 0.11 0.12	0 0 0	Curtain False		N/A N/A N/A N/A N/A N/A N/A
Opaque Elements: Type: <u>External Elements</u> All Walls Mansard Ground Floor Deck Top Floor Lower Ground Floor Ground floor <u>Internal Elements</u> Lower GF GF FF 2nd F	765.4 213.1 62.66 158.87 382.22 319.56 78.836 77.608 81.778 59.754	Averag Openings: 113.94 11.76 6.13	e or unknown Net area: 651.46 201.34 56.53	U-value: 0.2 0.13 0.11 0.11 0.12	0 0 0	Curtain False		N/A N/A N/A N/A N/A N/A N/A N/A
Opaque Elements: Type: External Elements All Walls Mansard Ground Floor Deck Top Floor Lower Ground Floor Ground floor Internal Elements Lower GF GF FF 2nd F ground first	765.4 213.1 62.66 158.87 382.22 319.56 78.836 77.608 81.778 59.754 319.56 301.73	Averag Openings: 113.94 11.76 6.13	e or unknown Net area: 651.46 201.34 56.53	U-value: 0.2 0.13 0.11 0.11 0.12	0 0 0	Curtain False		N/A N/A N/A N/A N/A N/A N/A N/A N/A
Opaque Elements: Type: <u>External Elements</u> All Walls Mansard Ground Floor Deck Top Floor Lower Ground Floor Ground floor <u>Internal Elements</u> Lower GF GF FF 2nd F ground first 2nd	765.4 213.1 62.66 158.87 382.22 319.56 78.836 77.608 81.778 59.754 319.56 301.73 219.26	Averag Openings: 113.94 11.76 6.13	e or unknown Net area: 651.46 201.34 56.53	U-value: 0.2 0.13 0.11 0.11 0.12	0 0 0	Curtain False		N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A
Opaque Elements: Type: <u>External Elements</u> All Walls Mansard Ground Floor Deck Top Floor Lower Ground Floor Ground floor <u>Internal Elements</u> Lower GF GF FF 2nd F ground first 2nd ground	765.4 213.1 62.66 158.87 382.22 319.56 78.836 77.608 81.778 59.754 319.56 301.73 219.26 319.56	Averag Openings: 113.94 11.76 6.13	e or unknown Net area: 651.46 201.34 56.53	U-value: 0.2 0.13 0.11 0.11 0.12	0 0 0	Curtain False		N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A
Opaque Elements:Type:External ElementsAll WallsMansardGround Floor DeckTop FloorLower Ground FloorGround floorInternal ElementsLower GFGFFF2nd Fgroundgroundfirst2ndgroundfirst	765.4 213.1 62.66 158.87 382.22 319.56 78.836 77.608 81.778 59.754 319.56 301.73 219.26 319.56 301.73	Averag Openings: 113.94 11.76 6.13	e or unknown Net area: 651.46 201.34 56.53	U-value: 0.2 0.13 0.11 0.11 0.12	0 0 0	Curtain False		N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A
Opaque Elements: Type: <u>External Elements</u> All Walls Mansard Ground Floor Deck Top Floor Lower Ground Floor Ground floor <u>Internal Elements</u> Lower GF GF FF 2nd F ground first 2nd ground first 2nd	765.4 213.1 62.66 158.87 382.22 319.56 78.836 77.608 81.778 59.754 319.56 301.73 219.26 319.56	Averag Openings: 113.94 11.76 6.13	e or unknown Net area: 651.46 201.34 56.53	U-value: 0.2 0.13 0.11 0.11 0.12	0 0 0	Curtain False		N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A
Opaque Elements:Type:External ElementsAll WallsMansardGround Floor DeckTop FloorLower Ground FloorGround floorInternal ElementsLower GFGFFF2nd Fgroundgroundfirst2ndgroundfirst	765.4 213.1 62.66 158.87 382.22 319.56 78.836 77.608 81.778 59.754 319.56 301.73 219.26 319.56 301.73	Averag Openings: 113.94 11.76 6.13	e or unknown Net area: 651.46 201.34 56.53	U-value: 0.2 0.13 0.11 0.11 0.12	0 0 0	Curtain False		N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A

Thermal bridges

Thermal bridges:

No information on thermal bridging (y=0.15) (y =0.15)

# **SAP Input**

Ventilation:	
Pressure test: Ventilation: Number of chimneys: Number of open flues: Number of fans: Number of sides sheltered: Pressure test:	Yes (As built) Natural ventilation (extract fans) 0 0 13 2 10 (Assessed dwelling is tested)
Main heating system:	
Main heating system:	Central heating systems with radiators or underfloor heating Heat pumps Fuel: Electricity Info Source: SAP Tables SAP Table: 204 Air-to-water heat pump (electric) Systems with radiators Pump in heat space: Yes
Main heating Control:	
Main heating Control:	Time and temperature zone control Control code: 2207 Boiler interlock: Yes
Secondary heating system:	
Secondary heating system: Water heating: Water heating:	None From main heating system Water code: 901 Fuel :Electricity Hot water cylinder Cylinder volume: 300 litres Cylinder insulation: Measured loss, 1.5kWh/day Primary pipework insulation: True Cylinderstat: True Cylinder in heated space: True Solar panel: False
Others:	
Electricity tariff: In Smoke Control Area: Conservatory: Low energy lights: Terrain type: EPC language: Wind turbine: Photovoltaics: Assess Zero Carbon Home:	standard tariff Unknown No conservatory 100% Dense urban English No None No

				User D	etails:						
Assessor Name: Software Name:	Stroma FS	AP 200	-		Stroma Softwa	ire Ver	sion:		Versio	on: 1.5.0.69	
						7th Am	endment				
Address :	62, Avenue	Road, L	ONDON	, NV8 (	SHI						
1. Overall dwelling dime	IISIONS.			۸ro	a(m²)		Ave Hei	iaht(m)		Volume(m <sup>3</sup>	\ \
Basement					• •	(1a) x	3.	• • •	(2a) =	1223.1	(3a)
Ground floor				3	19.56	(1b) x	3.	2	(2b) =	1022.59	(3b)
First floor				3	01.73	(1c) x		3	(2c) =	905.19	(3c)
Second floor				2	19.26	(1d) x	2.	8	(2d) =	613.93	(3d)
Total floor area TFA = (1a	a)+(1b)+(1c)+(	1d)+(1e	)+(1r	1) 1222.77	700042724	<b>§</b> 4)			J		
Dwelling volume						(3a)+(3b)	)+(3c)+(3d)	+(3e)+	.(3n) =	3764.81	(5)
2. Ventilation rate:	<u>.</u>	_	•								
	main heating	<u>h</u>	econdar eating		other		total			m <sup>3</sup> per hou	_
Number of chimneys	0	+	0	_  +	0		0		40 =	0	(6a)
Number of open flues	0		0	」⁺ L	0	] = [	0		20 =	0	(6b)
Number of intermittent far	าร						13		10 =	130	(7a)
Number of passive vents						Ļ	0		10 =	0	(7b)
Number of flueless gas fir	es						0	X	40 = Air ch	onanges per ho	(7c)
Infiltration due to chimney	s flues and f	ans - (68	a)+(6b)+(7	a)+(7b)+(	7c) =		130		÷ (5) =	0.03	(8)
If a pressurisation test has be						ontinue fro			÷ (0) –	0.03	
Number of storeys in th								,		0	(9)
Additional infiltration								[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.	25 for steel or	timber f	rame or	0.35 fo	r masonr	y constr	uction			0	(11)
if both types of wall are pro deducting areas of openin			oonding to	the great	er wall area	a (after					
If suspended wooden fl			ed) or 0.	1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ent	er 0.05, else e	enter 0								0	(13)
Percentage of windows	and doors dr	aught sti	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,				•	•	•	etre of er	nvelope	area	10	(17)
If based on air permeabili Air permeability value applies	•						is heina us	ed		0.53	(18)
Number of sides on which					, 0 por	<i>somy</i> 1				2	(19)
Shelter factor					(20) = 1 - [	0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorporati	ng shelter fac	tor			(21) = (18)	x (20) =				0.45	(21)
Infiltration rate modified for	or monthly win	d speed									_
Jan Feb	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		

Monthl	y avera	ge wind	speed f	rom Tab	e 7		-		-		_	-			
(22)m=	5.4	5.1	5.1	4.5	4.1	3.9	3.7	3.7	4.2	4.5	4.8	5.1			
Wind F	actor (2	22a)m =	(22)m ÷	- 4											
(22a)m=	1.35	1.27	1.27	1.12	1.02	0.98	0.92	0.92	1.05	1.12	1.2	1.27			
Adjuste	ed infiltr	ation rate	e (allow	ing for sl	nelter an	nd wind s	speed) =	= (21a) x	(22a)m						
	0.61	0.58	0.58	0.51	0.47	0.44	0.42	0.42	0.48	0.51	0.55	0.58			
		<i>ctive air (</i> al ventila	-	rate for t	he appli	cable ca	se	•	•			-			
				endix N, (2	(23a) = (23a	a) x Fmv (e	equation (	N5)) . othe	erwise (23t	(23a) = (23a)			C		(23a) (23b)
				ciency in %						., (,					(23c)
			-	entilation	-					2b)m + ()	23b) × [	1 – (23c)			
(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24a)
b) If	balance	d mecha	anical ve	entilation	without	heat rec	covery (	MV) (24I	)m = (2	1 2b)m + (2	23b)				
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24b)
c) If	whole h	iouse ex	tract vei	ntilation of	or positiv	/e input v	ventilati	on from	outside		-				
i	f (22b)r	n < 0.5 ×	(23b), <sup>-</sup>	then (24	c) = (23b	o); other\	wise (24	lc) = (22	b) m + 0	.5 × (23b	)		I		
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		-	(24c)
				nole hous )m = (22	· · ·					0.5]		_			
(24d)m=	0.69	0.67	0.67	0.63	0.61	0.6	0.59	0.59	0.61	0.63	0.65	0.67			(24d)
Effec	ctive air	change	rate - e	nter (24a	) or (24k	o) or (24	c) or (24	4d) in bo	x (25)						
(25)m=	0.69	0.67	0.67	0.63	0.61	0.6	0.59	0.59	0.61	0.63	0.65	0.67			(25)
3. Hea	at losse	s and he	eat loss	paramet	er:										
ELEN	IENT	Gros area		Openin m		Net Ar A ,r		U-val W/m2		A X U (W/I	K)	k-value kJ/m²∙ł		A X kJ/ł	
Doors <sup>-</sup>	Type 1					3.09	x	1.8	=	5.562					(26)
Doors <sup>-</sup>	Type 2					2.4	x	1.8	=	4.32					(26)
Doors <sup>-</sup>	Туре З					2.69	x	1.8	=	4.842					(26)
Window	ws Type	e 1				3.356	3 x1	/[1/( 1.4 )+	+ 0.04] =	4.45					(27)
Window	ws Type	e 2				3.356	3 x1	/[1/( 1.4 )+	+ 0.04] =	4.45					(27)
Window	ws Type	e 3				3.356	3 x1	/[1/( 1.4 )+	+ 0.04] =	4.45					(27)
Window	ws Type	e 4				3.356	3 x1	/[1/( 1.4 )+	+ 0.04] =	4.45					(27)
Window	ws Type	e 5				2.34	x1	/[1/( 1.4 )+	+ 0.04] =	3.1					(27)
Window	ws Type	e 6				3.36	x1	/[1/( 1.4 )+	+ 0.04] =	4.45					(27)
Window	ws Type	e 7				1.4	x1	/[1/( 1.4 )+	+ 0.04] =	1.86					(27)
Window	ws Type	e 8				1.83	x1	I/[1/( 1.4 )+	+ 0.04] =	2.43					(27)
Window	ws Type	9				2.4	x1	I/[1/( 1.4 )+	+ 0.04] =	3.18					(27)
Window	ws Type	e 10				2.42	x1	I/[1/( 1.4 )+	+ 0.04] =	3.21					(27)
Window	ws Type	e 11				1.81	x1	I/[1/( 1.4 )+	+ 0.04] =	2.4					(27)

Windo	ws Type	912				1.28	x1	/[1/( 1.4 )+	0.04] =	1.7				(27)
Windo	ws Type	913				1.37	x1	/[1/( 1.4 )+	0.04] =	1.82				(27)
Windo	ws Type	e 14				2.38	x1	/[1/( 1.4 )+	0.04] =	3.16				(27)
Rooflig	ghts					6.13	×	1/[1/(2) + 0	0.04] =	12.26	=			(27b)
Floor T	Гуре 1					382.2	2 X	0.12	= [	45.87	Ξ r			(28)
Floor T	Гуре 2					319.5	6 X	0.12	= [	38.35	i T		$\neg$	(28)
Walls -	Type1	765	.4	113.9	94	651.4	6 X	0.2	= [	130.29	i T		$\neg$	(29)
Walls -	Type2	213	.1	11.7	6	201.3	4 X	0.13	= [	26.17	i T		$\neg$	(29)
Roof T	Гуре1	62.6	6	6.13	3	56.53	3 X	0.11	= [	6.22	i T		$\neg$	(30)
Roof 1	Гуре2	158.	87	0		158.8	7 X	0.11		17.48	i T		$\neg$	(30)
Total a	rea of e	lements	, m²		 19	901.81002	426147		I					(31)
Interna	al wall **					78.84	 ↓				Г			(32c)
Interna	al wall **					77.61					Ē		$\neg$	(32c)
Interna	al wall **					81.78	3				Ē		$\exists$	(32c)
Interna	al wall **					59.75	5				Г		$\neg$	(32c)
Interna	al floor					319.5	6				Γ		$\neg$	(32d)
Interna	al floor					301.7	3				Ē			(32d)
Interna	al floor					219.2	6						= =	 (32d)
Interna	al ceiling					319.5	6				Ē			(32e)
Interna	al ceiling					301.7	3				Ē			(32e)
Interna	al ceiling					219.2	6				Ē			(32e)
* for win	dows and	roof wind	ows, use e	effective wi	indow U-va	alue calcul	ated using	formula 1	/[(1/U-valu	ie)+0.04] a	∟ Is given in	paragraph	n 3.2	
				nternal wal	ls and par	titions		(00) (00)						
			= S (A x	U)				(26)(30)					446.25	(33)
		Cm = S(	. ,			. I. I/ma 21/						(32e) =	92835.6484510	$\dashv$
		•	``		,	ה kJ/m²K ion are noi		acisaly the		tive Values		oble 1f	100	(35)
	0		tailed calc		construct	ion ale noi	. KHOWH PI	ecisely life	indicative	values of	11011 11110			
Therm	al bridge	əs : S (L	x Y) cal	culated	using Ap	pendix I	<						285.27	(36)
			are not kn	10wn (36) =	= 0.15 x (3	:1)				(2.2)				
	abric he			1						(36) =	05)		731.52	(37)
ventila			· · · · · ·		í	luna	11	A	. ,		25)m x (5)		1	
(38)m=	Jan 854.9	Feb 829.66	Mar 829.66	Apr 783.49	May 755.92	Jun 743.1	Jul 730.92	Aug 730.92	Sep 762.57	Oct 783.49	Nov 805.85	Dec 829.66		(38)
				100.40	100.02	740.1	100.02	100.02				020.00		(00)
(39)m=		coefficier	1561.18	1515.01	1487.44	1474.62	1462.44	1462.44	(39)m 1494.1	= (37) + (3 1515.01		1561.18		
(55)11-	1300.43	1301.10	1301.10	1010.01	1407.44	1474.02	1402.44	1402.44	-		Sum(39)1.		1518.2	(39)
Heat lo	oss para	meter (H	HLP), W	/m²K	-	-		-		= (39)m ÷				` ´
(40)m=	1.3	1.28	1.28	1.24	1.22	1.21	1.2	1.2	1.22	1.24	1.26	1.28		
Numbr	ar of day	in mor	nth (Tab	(12					,	Average =	Sum(40)1.	12 /12=	1.24	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)

4. Wa	ater heat	ting ener	gy requi	irement:								kWh/ye	ear:	
if TF				[1 - exp	(-0.0003	849 x (TF	A -13.9)	)2)] + 0.(	)013 x ( <sup>-</sup>	TFA -13.		33		(42)
Reduce	Annual average hot water usage in litres per day Vd, average = $(25 \times N) + 36$ Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)												(43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate						ctor from T		<u> </u>	000	•••		200		
(44)m=	158.72	152.95	147.17	141.4	135.63	129.86	129.86	135.63	141.4	147.17	152.95	158.72		
									-	Total = Su	l m(44) <sub>112</sub> =	=	1731.46	(44)
Energy of	content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,n	n x nm x D	Tm / 3600	kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		-
(45)m=	235.94	206.35	212.94	185.64	178.13	153.71	142.44	163.45	165.4	192.76	210.41	228.49		_
lf instan	taneous w	vater heatii	ng at point	of use (no	hot water	· storage),	enter 0 in	boxes (46,		Total = Su	m(45) <sub>112</sub> =	=	2275.65	(45)
(46)m=	35.39	30.95	31.94	27.85	26.72	23.06	21.37	24.52	24.81	28.91	31.56	34.27		(46)
Water	storage	loss:												
a) If m	anufactu	urer's de	clared lo	oss facto	r is knov	vn (kWh	/day):				1	.5		(47)
Tempe	erature f	actor fro	m Table	2b							0.	.54		(48)
		m water r's decla	-			s not kno		(47) x (48)	=		0.	81		(49)
			-			age with						0		(50)
		-				litres in bo eous comb		enter '0' in	box (50)					
						h/litre/da						0		(51)
		from Ta			·							0		(52)
Tempe	erature f	actor fro	m Table	2b								0		(53)
Energy	/ lost fro	m water	storage	, kWh/ye	ear			((50) x (51	) x (52) x	(53) =		0		(54)
Enter (	(49) or (	54) in (5	5)								0.	81		(55)
Water	storage	loss cal	culated f	or each	month			((56)m = (	55) × (41)ı	m				
(56)m=	25.11	22.68	25.11	24.3	25.11	24.3	25.11	25.11	24.3	25.11	24.3	25.11		(56)
If cylinde	er contains	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (50	0), else (57	7)m = (56)	m where (	H11) is fro	m Append	ix H	
(57)m=	25.11	22.68	25.11	24.3	25.11	24.3	25.11	25.11	24.3	25.11	24.3	25.11		(57)
Primar	y circuit	loss (an	nual) fro	om Table	e 3						3	60		(58)
Primar	y circuit	loss cal	culated f	for each	month (	59)m = (	58) ÷ 36	5 × (41)	m					
(moo		factor fi	om Tab	le H5 if t	here is s	olar wat	er heatir	ng and a	cylinde	r thermo	stat)			
(59)m=	30.58	27.62	30.58	29.59	30.58	29.59	30.58	30.58	29.59	30.58	29.59	30.58		(59)
Combi	loss ca	lculated	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 requ	uired for	water he	eating ca	alculated	for eacl	n month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	291.62	256.65	268.62	239.53	233.81	207.6	198.12	219.13	219.29	248.44	264.3	284.18		(62)
Solar DH	-IW input o	calculated	using App	endix G or	Appendix	H (negativ	ve quantity	v) (enter '0'	if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or V	WWHRS	applies	see Ap	pendix C	S)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)

Output from wa	ater heater														
(64)m= 291.62	256.65 26	68.62	239.53	233.81	2	07.6	198.12	219	.13	219.29	248.44	4 264.3	284.18		
						I			Outpu	It from wa	ter hea	ter (annual)	12	2931.3	(64)
Heat gains fron	n water he	ating,	kWh/mo	onth 0.2	5 x	[0.85	× (45)m	n + (6	61)m	] + 0.8 x	: [(46)ı	m + (57)m	+ (59)	m ]	
(65)m= 123	108.85 11	15.35	104.84	103.78	9	4.22	91.91	98.	89	98.11	108.64	113.07	120.52		(65)
include (57)n	n in calcula	ation o	f (65)m	only if c	ylir	nder is	in the c	dwell	ing o	or hot wa	ater is	from com	munity	heating	
5. Internal gai	ins (see Ta	able 5	and 5a)	):											
Metabolic gains	s (Table 5)	. Watt	s												
Jan		Mar	Apr	May		Jun	Jul	A	ug	Sep	Oct	Nov	Dec	7	
(66)m= 259.89	259.89 25	59.89	259.89	259.89	25	59.89	259.89	259	.89	259.89	259.89	9 259.89	259.89	-	(66)
Lighting gains (	calculated	l in Ap	pendix l	_, equat	ion	L9 or	L9a), a	lso s	ee T	able 5		-		_	
(67)m= 265.31	235.65 19	91.64	145.08	108.45	9	1.56	98.93	128	3.6	172.6	219.16	3 255.79	272.69	'	(67)
Appliances gair	ns (calcula	ated in	Append	lix L, eq	uat	ion L1	3 or L1	3a), a	also	see Tab	ole 5				
(68)m= 1545.57	1561.6 15	521.19	1435.15	1326.54	12	24.46	1156.27	1140	).23	1180.64	1266.6	8 1375.29	1477.3	7	(68)
Cooking gains	(calculated	d in Ap	pendix	L, equa	tion	L15 c	or L15a)	, als	o see	e Table	5				
(69)m= 65.32	65.32 6	5.32	65.32	65.32	6	5.32	65.32	65.	32	65.32	65.32	65.32	65.32		(69)
Pumps and fan	s gains (Ta	able 5	a)											_	
(70)m= 10	10	10	10	10		10	10	1(	C	10	10	10	10		(70)
Losses e.g. eva	aporation (	negati	ve valu	es) (Tab	ole ;	5)									
(71)m= -173.26	-173.26 -17	73.26	-173.26	-173.26	-17	73.26	-173.26	-173	.26	-173.26	-173.20	6 -173.26	-173.26	•	(71)
Water heating g	gains (Tab	le 5)													
(72)m= 165.32	161.98 15	55.04	145.61	139.48	13	30.86	123.53	132	.92	136.26	146.02	2 157.05	161.99		(72)
Total internal	gains =					(66)n	n + (67)m	+ (68	3)m +	(69)m + (7	70)m +	(71)m + (72)	m		
(73)m= 2138.15	2121.18 20	)29.82	1887.79	1736.43	16	08.83	1540.68	156	3.7	1651.46	1793.8	2 1950.08	2074		(73)
6. Solar gains	:														
Solar gains are ca		•			and	associa	ated equa	tions	to con	vert to the	e applic	able orientat	on.		
Orientation: A		tor				Flux				g_ bla ch		FF Tabla Ga		Gains	
	able 6d	_	m²		,	Tab	le 6a		Ta	ble 6b		Table 6c		(W)	
Northeast 0.9x	0.77	×	2.3	4	x	11	.51	x		0.63	×	0.7	=	16.46	(75)
Northeast 0.9x	0.77	×	3.3	6	×	11	.51	x		0.63	×	0.7	=	35.46	(75)
Northeast 0.9x	0.77	x	1.4	1	x	11	.51	x		0.63	×	0.7	=	9.85	(75)
Northeast 0.9x	0.77	×	1.8	3	x	11	.51	x		0.63	×	0.7	=	12.87	(75)
Northeast 0.9x	0.77	×	2.4	1	x	11	.51	x		0.63	×	0.7	=	8.44	(75)
Northeast 0.9x	0.77	x	2.4	2	x	11	.51	x		0.63	×	0.7	=	17.02	(75)
Northeast 0.9x	0.77	x	1.8	1	x	11	.51	x		0.63	×	0.7	=	6.37	(75)
Northeast 0.9x	0.77	x	2.3	4	x	23	8.55	x		0.63	×	0.7	=	33.69	(75)
Northeast 0.9x	0.77	x	3.3	6	x	23	8.55	x		0.63	×	0.7	=	72.56	(75)
Northeast 0.9x	0.77	×	1.4	4	x	23	8.55	x		0.63	×	0.7	=	20.16	(75)
Northeast 0.9x	east 0.9x 0.77 x 1.83						8.55	x		0.63	×	0.7	=	26.35	(75)
Northeast 0.9x	0.77	x	2.4	4	x	23	8.55	x		0.63	x	0.7	=	17.28	(75)

Northeast 0.9x	0.77	] ×	2.42	x	23.55	) ×	0.63	x	0.7	=	34.84	(75)
Northeast 0.9x	0.77	^   x	1.81	x	23.55	^   x	0.63	x	0.7		13.03	](75)
Northeast 0.9x	0.77	] ^ ] x	2.34	x	41.13	^   x	0.63	x	0.7	=	58.82	(75)
Northeast 0.9x	0.77	x	3.36	x	41.13	x	0.63	x	0.7	=	126.69	(75)
Northeast 0.9x	0.77	」 ] ×	1.4	x	41.13	]   x	0.63	x	0.7	=	35.19	(75)
Northeast 0.9x	0.77	]   x	1.83	x	41.13	   x	0.63	x	0.7	=	46	(75)
Northeast 0.9x	0.77	]   x	2.4	x	41.13	」 】 ×	0.63	x	0.7	=	30.17	](75)
Northeast 0.9x	0.77	x	2.42	x	41.13	x	0.63	x	0.7	=	60.83	](75)
Northeast 0.9x	0.77	x	1.81	x	41.13	x	0.63	x	0.7	=	22.75	(75)
Northeast 0.9x	0.77	x	2.34	x	67.8	×	0.63	x	0.7	=	96.97	(75)
Northeast 0.9x	0.77	x	3.36	x	67.8	×	0.63	x	0.7	=	208.86	(75)
Northeast 0.9x	0.77	x	1.4	x	67.8	x	0.63	x	0.7	=	58.02	(75)
Northeast 0.9x	0.77	×	1.83	x	67.8	x	0.63	x	0.7	=	75.83	(75)
Northeast 0.9x	0.77	x	2.4	x	67.8	×	0.63	x	0.7	=	49.73	(75)
Northeast 0.9x	0.77	x	2.42	x	67.8	×	0.63	x	0.7	=	100.28	(75)
Northeast 0.9x	0.77	x	1.81	x	67.8	x	0.63	x	0.7	=	37.5	(75)
Northeast 0.9x	0.77	×	2.34	x	89.77	×	0.63	x	0.7	=	128.39	(75)
Northeast 0.9x	0.77	x	3.36	×	89.77	x	0.63	x	0.7	=	276.53	(75)
Northeast 0.9x	0.77	<b>x</b>	1.4	x	89.77	x	0.63	x	0.7	=	76.81	(75)
Northeast 0.9x	0.77	x	1.83	x	89.77	] ×	0.63	x	0.7	=	100.41	(75)
Northeast 0.9x	0.77	<b>x</b>	2.4	x	89.77	<b>x</b>	0.63	×	0.7	=	65.84	(75)
Northeast 0.9x	0.77	<b>x</b>	2.42	×	89.77	x	0.63	x	0.7	=	132.78	(75)
Northeast 0.9x	0.77	x	1.81	x	89.77	×	0.63	×	0.7	=	49.65	(75)
Northeast 0.9x	0.77	x	2.34	×	97.5	x	0.63	x	0.7	=	139.45	(75)
Northeast 0.9x	0.77	x	3.36	x	97.5	x	0.63	x	0.7	=	300.36	(75)
Northeast 0.9x	0.77	×	1.4	x	97.5	×	0.63	x	0.7	=	83.43	(75)
Northeast 0.9x	0.77	x	1.83	x	97.5	×	0.63	x	0.7	=	109.06	(75)
Northeast 0.9x	0.77	x	2.4	x	97.5	×	0.63	x	0.7	=	71.51	(75)
Northeast 0.9x	0.77	x	2.42	x	97.5	×	0.63	x	0.7	=	144.22	(75)
Northeast 0.9x	0.77	x	1.81	x	97.5	x	0.63	x	0.7	=	53.93	(75)
Northeast 0.9x	0.77	x	2.34	x	92.98	x	0.63	x	0.7	=	132.99	(75)
Northeast 0.9x	0.77	×	3.36	x	92.98	×	0.63	x	0.7	=	286.43	(75)
Northeast 0.9x	0.77	×	1.4	x	92.98	×	0.63	x	0.7	=	79.56	(75)
Northeast 0.9x	0.77	x	1.83	x	92.98	×	0.63	x	0.7	=	104	(75)
Northeast 0.9x	0.77	×	2.4	x	92.98	×	0.63	x	0.7	=	68.2	(75)
Northeast 0.9x	0.77	×	2.42	x	92.98	x	0.63	x	0.7	=	137.53	(75)
Northeast 0.9x	0.77	×	1.81	x	92.98	×	0.63	x	0.7	=	51.43	(75)
Northeast 0.9x	0.77	x	2.34	x	75.42	×	0.63	x	0.7	=	107.87	(75)
Northeast 0.9x	0.77	x	3.36	x	75.42	×	0.63	x	0.7	=	232.33	(75)
Northeast 0.9x	0.77	×	1.4	x	75.42	×	0.63	x	0.7	=	64.54	(75)
Northeast 0.9x	0.77	×	1.83	X	75.42	×	0.63	X	0.7	=	84.36	(75)

		1		1		1				1		
Northeast 0.9x	0.77	X	2.4	X	75.42	X	0.63	x	0.7	=	55.32	(75)
Northeast 0.9x	0.77	x	2.42	X	75.42	X	0.63	x	0.7	=	111.56	(75)
Northeast 0.9x	0.77	x	1.81	x	75.42	X	0.63	x	0.7	=	41.72	(75)
Northeast 0.9x	0.77	x	2.34	x	51.24	X	0.63	x	0.7	=	73.29	(75)
Northeast 0.9x	0.77	x	3.36	x	51.24	x	0.63	x	0.7	=	157.86	(75)
Northeast 0.9x	0.77	x	1.4	x	51.24	x	0.63	x	0.7	=	43.85	(75)
Northeast 0.9x	0.77	x	1.83	x	51.24	x	0.63	x	0.7	=	57.32	(75)
Northeast 0.9x	0.77	x	2.4	x	51.24	x	0.63	x	0.7	=	37.59	(75)
Northeast 0.9x	0.77	x	2.42	x	51.24	x	0.63	x	0.7	=	75.8	(75)
Northeast 0.9x	0.77	x	1.81	x	51.24	x	0.63	x	0.7	=	28.35	(75)
Northeast 0.9x	0.77	x	2.34	x	29.6	x	0.63	x	0.7	=	42.33	(75)
Northeast 0.9x	0.77	x	3.36	x	29.6	x	0.63	x	0.7	=	91.18	(75)
Northeast 0.9x	0.77	x	1.4	x	29.6	x	0.63	x	0.7	=	25.33	(75)
Northeast 0.9x	0.77	x	1.83	x	29.6	x	0.63	x	0.7	=	33.11	(75)
Northeast 0.9x	0.77	x	2.4	x	29.6	x	0.63	x	0.7	=	21.71	(75)
Northeast 0.9x	0.77	x	2.42	x	29.6	x	0.63	x	0.7	=	43.78	(75)
Northeast 0.9x	0.77	x	1.81	x	29.6	x	0.63	x	0.7	=	16.37	(75)
Northeast 0.9x	0.77	x	2.34	×	14.52	x	0.63	x	0.7	=	20.77	(75)
Northeast 0.9x	0.77	<b>x</b>	3.36	x	14.52	<b>x</b>	0.63	x	0.7	=	44.75	(75)
Northeast 0.9x	0.77	x	1.4	x	14.52	×	0.63	x	0.7	=	12.43	(75)
Northeast 0.9x	0.77	<b>x</b>	1.83	x	14.52	x	0.63	x	0.7	=	16.25	(75)
Northeast 0.9x	0.77	<b>x</b>	2.4	×	14.52	X	0.63	x	0.7	=	10.65	(75)
Northeast 0.9x	0.77	<b>x</b>	2.42	x	14.52	x	0.63	×	0.7	=	21.48	(75)
Northeast 0.9x	0.77	x	1.81	x	14.52	x	0.63	x	0.7	=	8.03	(75)
Northeast 0.9x	0.77	x	2.34	x	9.36	x	0.63	x	0.7	=	13.39	(75)
Northeast 0.9x	0.77	x	3.36	x	9.36	x	0.63	x	0.7	=	28.84	(75)
Northeast 0.9x	0.77	x	1.4	x	9.36	x	0.63	x	0.7	=	8.01	(75)
Northeast 0.9x	0.77	x	1.83	x	9.36	x	0.63	x	0.7	=	10.47	(75)
Northeast 0.9x	0.77	x	2.4	x	9.36	x	0.63	x	0.7	=	6.87	(75)
Northeast 0.9x	0.77	x	2.42	x	9.36	x	0.63	x	0.7	=	13.85	(75)
Northeast 0.9x	0.77	x	1.81	x	9.36	x	0.63	x	0.7	=	5.18	(75)
Southeast 0.9x	0.77	x	1.28	x	37.39	x	0.63	x	0.7	=	29.25	(77)
Southeast 0.9x	0.77	x	2.38	x	37.39	x	0.63	x	0.7	=	54.39	(77)
Southeast 0.9x	0.77	x	1.28	x	63.74	x	0.63	x	0.7	=	49.86	(77)
Southeast 0.9x	0.77	x	2.38	x	63.74	x	0.63	x	0.7	=	92.72	(77)
Southeast 0.9x	0.77	×	1.28	x	84.22	×	0.63	x	0.7	=	65.89	(77)
Southeast 0.9x	0.77	x	2.38	x	84.22	x	0.63	x	0.7	=	122.51	(77)
Southeast 0.9x	0.77	×	1.28	x	103.49	×	0.63	x	0.7	=	80.97	(77)
Southeast 0.9x	0.77	×	2.38	x	103.49	×	0.63	x	0.7	=	150.55	(77)
Southeast 0.9x	0.77	×	1.28	×	113.34	×	0.63	x	0.7	=	88.67	(77)
Southeast 0.9x	0.77	x	2.38	x	113.34	x	0.63	x	0.7	=	164.87	(77)

Southeast 0.9x	0.77		4.00		445.04		0.00	v	0.7	1	00.04	
Southeast 0.9x	0.77	×	1.28	×	115.04	x	0.63	x	0.7	=	90.01	(77)
Southeast 0.9x	0.77	×	2.38	×	115.04	x	0.63	x	0.7	=	167.36	(77)
Southeast 0.9x	0.77	X	1.28	X	112.79	x	0.63	x	0.7	=	88.24	(77)
Southeast 0.9x	0.77	x	2.38	X	112.79	x	0.63	x	0.7	=	164.08	(77)
Southeast 0.9x	0.77	x	1.28	x	105.34	x	0.63	x	0.7	=	82.42	(77)
Southeast 0.9x	0.77	x	2.38	×	105.34	x	0.63	x	0.7	=	153.24	(77)
Southeast 0.9x	0.77	x	1.28	X	92.9	x	0.63	x	0.7	=	72.68	(77)
Southeast 0.9x	0.77	x	2.38	X	92.9	x	0.63	x	0.7	=	135.14	(77)
Southeast 0.9x	0.77	×	1.28	x	72.36	x	0.63	x	0.7	=	56.61	(77)
Southeast 0.9x	0.77	X	2.38	X	72.36	x	0.63	x	0.7	=	105.27	(77)
	0.77	x	1.28	X	44.83	x	0.63	x	0.7	=	35.07	(77)
Southeast 0.9x	0.77	x	2.38	X	44.83	x	0.63	x	0.7	=	65.21	(77)
Southeast 0.9x	0.77	x	1.28	X	31.95	x	0.63	x	0.7	=	25	(77)
Southeast 0.9x	0.77	X	2.38	X	31.95	X	0.63	x	0.7	=	46.48	(77)
Southwest <sub>0.9x</sub>	0.77	X	3.36	X	37.39		0.63	x	0.7	=	230.08	(79)
Southwest <sub>0.9x</sub>	0.77	x	3.36	X	37.39		0.63	x	0.7	=	230.08	(79)
Southwest <sub>0.9x</sub>	0.77	x	3.36	x	37.39		0.63	x	0.7	=	230.08	(79)
Southwest <sub>0.9x</sub>	0.77	x	3.36	×	37.39		0.63	x	0.7	=	191.73	(79)
Southwest0.9x	0.77	x	3.36	x	63.74		0.63	x	0.7	=	392.22	(79)
Southwest0.9x	0.77	x	3.36	x	63.74		0.63	x	0.7	=	392.22	(79)
Southwest0.9x	0.77	x	3.36	X	63.74		0.63	x	0.7	=	392.22	(79)
Southwest0.9x	0.77	x	3.36	x	63.74		0.63	x	0.7	=	326.85	(79)
Southwest0.9x	0.77	x	3.36	x	84.22		0.63	x	0.7	=	518.25	(79)
Southwest <sub>0.9x</sub>	0.77	x	3.36	x	84.22		0.63	x	0.7	=	518.25	(79)
Southwest <sub>0.9x</sub>	0.77	x	3.36	x	84.22		0.63	x	0.7	=	518.25	(79)
Southwest <sub>0.9x</sub>	0.77	x	3.36	x	84.22		0.63	x	0.7	=	431.87	(79)
Southwest <sub>0.9x</sub>	0.77	x	3.36	x	103.49		0.63	x	0.7	=	636.85	(79)
Southwest <sub>0.9x</sub>	0.77	x	3.36	x	103.49		0.63	x	0.7	=	636.85	(79)
Southwest <sub>0.9x</sub>	0.77	x	3.36	x	103.49		0.63	x	0.7	=	636.85	(79)
Southwest0.9x	0.77	x	3.36	x	103.49		0.63	x	0.7	=	530.71	(79)
Southwest <sub>0.9x</sub>	0.77	x	3.36	x	113.34		0.63	x	0.7	=	697.45	(79)
Southwest <sub>0.9x</sub>	0.77	x	3.36	x	113.34		0.63	x	0.7	=	697.45	(79)
Southwest0.9x	0.77	x	3.36	x	113.34		0.63	x	0.7	=	697.45	(79)
Southwest0.9x	0.77	x	3.36	x	113.34		0.63	x	0.7	=	581.21	(79)
Southwest <sub>0.9x</sub>	0.77	x	3.36	x	115.04		0.63	x	0.7	=	707.96	(79)
Southwest <sub>0.9x</sub>	0.77	x	3.36	x	115.04		0.63	x	0.7	=	707.96	(79)
Southwest <sub>0.9x</sub>	0.77	x	3.36	x	115.04		0.63	x	0.7	=	707.96	(79)
Southwest <sub>0.9x</sub>	0.77	x	3.36	x	115.04		0.63	x	0.7	=	589.97	(79)
Southwest <sub>0.9x</sub>	0.77	x	3.36	x	112.79		0.63	x	0.7	=	694.1	(79)
Southwest <sub>0.9x</sub>	0.77	x	3.36	x	112.79		0.63	x	0.7	=	694.1	(79)
Southwest <sub>0.9x</sub>	0.77	x	3.36	x	112.79		0.63	x	0.7	=	694.1	(79)

Southwestb 3x 0.77 x 3.36 x 112.79 0.63 x 0.7 = 578.41 (79) Southwestb 3x 0.77 x 3.36 x 105.34 0.63 x 0.7 = 648.25 (79) Southwestb 3x 0.77 x 3.36 x 105.34 0.63 x 0.7 = 648.25 (79) Southwestb 3x 0.77 x 3.36 x 105.34 0.63 x 0.7 = 648.25 (79) Southwestb 3x 0.77 x 3.36 x 105.34 0.63 x 0.7 = 648.25 (79) Southwestb 3x 0.77 x 3.36 x 102.9 0.63 x 0.7 = 647.7 (79) Southwestb 3x 0.77 x 3.36 x 102.9 0.63 x 0.7 = 647.7 (79) Southwestb 3x 0.77 x 3.36 x 102.9 0.63 x 0.7 = 647.7 (79) Southwestb 3x 0.77 x 3.36 x 102.9 0.63 x 0.7 = 647.6 (79) Southwestb 3x 0.77 x 3.36 x 102.9 0.63 x 0.7 = 647.6 (79) Southwestb 3x 0.77 x 3.36 x 102.9 0.63 x 0.7 = 647.6 (79) Southwestb 3x 0.77 x 3.36 x 102.9 0.63 x 0.7 = 647.6 (79) Southwestb 3x 0.77 x 3.36 x 102.9 0.63 x 0.7 = 647.6 (79) Southwestb 3x 0.77 x 3.36 x 102.9 0.63 x 0.7 = 644.5 (79) Southwestb 3x 0.77 x 3.36 x 122.8 0.63 x 0.7 = 644.5 (79) Southwestb 3x 0.77 x 3.36 x 122.8 0.63 x 0.7 = 644.5 (79) Southwestb 3x 0.77 x 3.36 x 122.8 0.63 x 0.7 = 644.5 (79) Southwestb 3x 0.77 x 3.36 x 448.3 0.63 x 0.7 = 644.5 (79) Southwestb 3x 0.77 x 3.36 x 448.3 0.63 x 0.7 = 644.5 (79) Southwestb 3x 0.77 x 3.36 x 448.3 0.63 x 0.7 = 727.85 (79) Southwestb 3x 0.77 x 3.36 x 448.3 0.63 x 0.7 = 727.85 (79) Southwestb 3x 0.77 x 3.36 x 448.3 0.63 x 0.7 = 727.85 (79) Southwestb 3x 0.77 x 3.36 x 448.3 0.63 x 0.7 = 118.64 (79) Southwestb 3x 0.77 x 3.36 x 448.3 0.63 x 0.7 = 118.64 (79) Southwestb 3x 0.77 x 3.36 x 448.3 0.63 x 0.7 = 118.64 (79) Southwestb 3x 0.77 x 1.37 x 74.78 x 748 x 0.63 x 0.7 = 148.64 (79) Northwestb 3x 0.77 x 1.37 x 74.78 x 748 x 0.63 x 0.7 = 148.64 (79) Northwestb 3x 0.77 x 1.37 x 74.78 x 748 x 0.63 x 0.7 = 148.64 (79) Northwestb 3x 0.77 x 1.37 x 74.78 x 748 x 0.63 x 0.7 = 148.64 (79) Northwestb 3x 0.77 x 1.37 x 74.78 x 748 x 0.63 x 0.7 = 148.64 (79) Northwestb 3x 0.77 x 1.37 x 74.78 x 748 x 0.63 x 0.7 = 148.64 (79) Northwestb 3x 0.77 x 1.37 x 74.78 x 748 x 0.63 x 0.7 = 148.64 (79) Northwestb 3x 0.77 x 1.37 x 74.78 x 748 x 0.63 x 0.7 = 148.64 (79) Northwestb	Southwooto o		1		1		1	[]			1		
Southwest0.9x       0.77       x       3.36       x       105.34       0.63       x       0.77       =       644.25       (79)         Southwest0.9x       0.77       x       3.36       x       105.34       0.63       x       0.77       =       644.25       (79)         Southwest0.9x       0.77       x       3.36       x       92.9       0.63       x       0.77       =       571.67       (79)         Southwest0.9x       0.77       x       3.36       x       92.9       0.63       x       0.77       =       571.67       (79)         Southwest0.9x       0.77       x       3.36       x       92.9       0.63       x       0.77       =       445.31       (79)         Southwest0.9x       0.77       x       3.36       x       72.36       0.63       x       0.77       =       445.31       (79)         Southwest0.9x       0.77       x       3.36       x       72.36       0.63       x       0.77       =       275.65       (79)         Southwest0.9x       0.77       x       3.36       x       444.83       0.63       x       0.77       =       223.			1		1						1		4
Southwest, 0x         0.77         ×         3.36         ×         105.34         0.63         ×         0.77         =         648.25         (19)           Southwest, 0x         0.77         ×         3.36         ×         105.34         0.63         ×         0.77         =         648.25         (19)           Southwest, 0x         0.77         ×         3.36         ×         022.0         0.63         ×         0.77         =         571.67         (19)           Southwest, 0x         0.77         ×         3.36         ×         022.0         0.63         ×         0.77         =         571.67         (19)           Southwest, 0x         0.77         ×         3.36         ×         72.36         0.63         ×         0.77         =         445.31         (19)           Southwest, 0x         0.77         ×         3.36         ×         72.36         0.63         ×         0.77         =         3.44.53         (19)           Southwest, 0x         0.77         ×         3.36         ×         44.83         0.63         ×         0.77         =         275.86         (19)           Southwest, 0x         0.77 <td>L</td> <td>0.77</td> <td>X</td> <td></td> <td>X</td> <td>105.34</td> <td></td> <td>0.63</td> <td>x</td> <td></td> <td>=</td> <td></td> <td>4</td>	L	0.77	X		X	105.34		0.63	x		=		4
Southwesto, sx         0.77         ×         3.36         ×         105.3         ×         0.77         ×         5.40.21         (%)           Southwesto, sx         0.77         ×         3.36         ×         92.9         0.63         ×         0.77         =         5.40.21         (%)           Southwesto, sx         0.77         ×         3.36         ×         92.9         0.63         ×         0.77         =         5.40.21         (%)           Southwesto, sx         0.77         ×         3.36         ×         92.9         0.63         ×         0.77         =         4.45.31         (%)           Southwesto, sx         0.77         ×         3.36         ×         72.36         0.63         ×         0.77         =         4.45.31         (%)           Southwesto, sx         0.77         ×         3.36         ×         72.36         0.63         ×         0.77         =         4.45.31         (%)           Southwesto, sx         0.77         ×         3.36         ×         4.483         0.63         ×         0.77         =         2275.85         (%)           Southwesto, sx         0.77         ×	L	0.77	X	3.36	X			0.63	x	0.7	=	648.25	4
Southwesto,sx         0.77         ×         3.36         ×         0.25         0.63         ×         0.77         =         571.67         (7)           Southwesto,sx         0.77         ×         3.36         ×         029         0.63         ×         0.77         =         571.67         (7)           Southwesto,sx         0.77         ×         3.36         ×         029         0.63         ×         0.77         =         445.31         (7)           Southwesto,sx         0.77         ×         3.36         ×         72.36         0.63         ×         0.77         =         445.31         (7)           Southwesto,sx         0.77         ×         3.36         ×         72.36         0.63         ×         0.77         =         445.31         (7)           Southwesto,sx         0.77         ×         3.36         ×         44.83         0.63         ×         0.77         =         275.85         (7)           Southwesto,sx         0.77         ×         3.36         ×         44.83         0.63         ×         0.77         =         275.85         (7)           Southwesto,sx         0.77         ×	L	0.77	X	3.36	x	105.34		0.63	x	0.7	=	648.25	(79)
Southwesto sx         0.77         x         3.36         x         92.9         0.63         x         0.77         =         571.67         (79)           Southwesto sx         0.77         x         3.36         x         92.9         0.63         x         0.77         =         571.67         (79)           Southwesto sx         0.77         x         3.36         x         92.9         0.63         x         0.77         =         446.33         (79)           Southwesto sx         0.77         x         3.36         x         72.36         0.63         x         0.77         =         445.31         (79)           Southwesto sx         0.77         x         3.36         x         72.36         0.63         x         0.77         =         445.31         (79)           Southwesto sx         0.77         x         3.36         x         44.83         0.63         x         0.77         =         275.65         (79)           Southwesto sx         0.77         x         3.36         x         44.83         0.63         x         0.77         =         229.87         (79)           Southwesto sx         0.77	Ļ	0.77	x	3.36	x	105.34		0.63	x	0.7	=	540.21	(79)
Southwesto 3x         0.77         x         3.36         x         92.9         0.63         x         0.77         =         571.67         (7)           Southwesto 3x         0.77         x         3.36         x         92.9         0.63         x         0.77         =         445.31         (79)           Southwesto 3x         0.77         x         3.36         x         72.36         0.63         x         0.7         =         445.31         (79)           Southwesto 3x         0.77         x         3.36         x         72.36         0.63         x         0.7         =         445.31         (79)           Southwesto 3x         0.77         x         3.36         x         72.36         0.63         x         0.7         =         275.85         (79)           Southwesto 3x         0.77         x         3.36         x         44.83         0.63         x         0.7         =         275.85         (79)           Southwesto 3x         0.77         x         3.36         x         31.35         0.63         x         0.7         =         198.61         (79)           Southwesto 3x         0.77         <	Ļ	0.77	x	3.36	x	92.9		0.63	x	0.7	=	571.67	(79)
Southwesto 3x       0.77       x       3.36       x       72.36       0.63       x       0.77       =       446.33       (79)         Southwesto 3x       0.77       x       3.36       x       72.36       0.63       x       0.77       =       445.31       (79)         Southwesto 3x       0.77       x       3.36       x       72.36       0.63       x       0.77       =       445.31       (79)         Southwesto 3x       0.77       x       3.36       x       72.36       0.63       x       0.77       =       445.31       (79)         Southwesto 3x       0.77       x       3.36       x       44.83       0.63       x       0.77       =       275.85       (79)         Southwesto 3x       0.77       x       3.36       x       44.83       0.63       x       0.77       =       275.85       (79)         Southwesto 3x       0.77       x       3.36       x       44.83       0.63       x       0.77       =       196.61       (79)       275.85       (79)       204.84       (79)       196.61       (79)       204.84       (81)       0.63       x       0.77	L	0.77	x	3.36	x	92.9		0.63	x	0.7	=	571.67	(79)
Southwestory         Orr         x         3.36         x         72.36         Ors         x         0.100         x         1.100         1.1000         1.100         1.100	Southwest <sub>0.9x</sub>	0.77	x	3.36	x	92.9		0.63	x	0.7	=	571.67	(79)
Southwestors         Orr         x         3.36         x         72.36         0.63         x         0.77         z         4.45.31         (79)           Southwestors         0.77         x         3.36         x         72.36         0.63         x         0.77         =         445.31         (79)           Southwestors         0.77         x         3.36         x         72.36         0.63         x         0.77         =         445.31         (79)           Southwestors         0.77         x         3.36         x         44.83         0.63         x         0.77         =         227.65         (79)           Southwestors         0.77         x         3.36         x         44.83         0.63         x         0.77         =         227.65         (79)           Southwestors         0.77         x         3.36         x         44.83         0.63         x         0.77         =         229.87         (79)           Southwestors         0.77         x         3.36         x         31.95         0.63         x         0.77         =         196.61         (79)           Southwestors         0.77         <	Southwest <sub>0.9x</sub>	0.77	x	3.36	x	92.9		0.63	x	0.7	=	476.39	(79)
Southwestors         0.77         ×         3.36         ×         72.36         0.63         ×         0.77         =         3.46         ?         72.36         0.63         ×         0.77         =         3.71.09         (79)           Southwestors         0.77         ×         3.36         ×         72.36         0.63         ×         0.77         =         275.85         (79)           Southwestors         0.77         ×         3.36         ×         44.83         0.63         ×         0.77         =         275.85         (79)           Southwestors         0.77         ×         3.36         ×         44.83         0.63         ×         0.77         =         275.85         (79)           Southwestors         0.77         ×         3.36         ×         44.83         0.63         ×         0.77         =         229.87         (79)           Southwestors         0.77         ×         3.36         ×         31.95         0.63         ×         0.77         =         196.61         (79)           Southwestors         0.77         ×         3.36         ×         31.95         0.63         ×         0.77 <td>Southwest0.9x</td> <td>0.77</td> <td>x</td> <td>3.36</td> <td>x</td> <td>72.36</td> <td></td> <td>0.63</td> <td>x</td> <td>0.7</td> <td>=</td> <td>445.31</td> <td>(79)</td>	Southwest0.9x	0.77	x	3.36	x	72.36		0.63	x	0.7	=	445.31	(79)
Southwesto.9x         0.77         ×         3.36         ×         72.36         0.63         ×         0.77         =         371.09         (79)           Southwesto.9x         0.77         ×         3.36         ×         44.83         0.63         ×         0.77         =         275.85         (79)           Southwesto.9x         0.77         ×         3.36         ×         44.83         0.63         ×         0.77         =         275.85         (79)           Southwesto.9x         0.77         ×         3.36         ×         44.83         0.63         ×         0.77         =         275.85         (79)           Southwesto.9x         0.77         ×         3.36         ×         31.95         0.63         ×         0.77         =         196.61         (79)           Southwesto.9x         0.77         ×         3.36         ×         31.95         0.63         ×         0.77         =         196.61         (79)           Southwesto.9x         0.77         ×         3.36         ×         11.51         ×         0.63         ×         0.77         =         196.61         (79)           Southwesto.9x	Southwest0.9x	0.77	x	3.36	x	72.36		0.63	x	0.7	=	445.31	(79)
Southwesto.9x $0.77$ x $3.36$ x $44.83$ $0.63$ x $0.77$ = $275.85$ (79)         Southwesto.9x $0.77$ x $3.36$ x $44.83$ $0.63$ x $0.77$ = $275.85$ (79)         Southwesto.9x $0.77$ x $3.36$ x $44.83$ $0.63$ x $0.77$ = $2275.85$ (79)         Southwesto.9x $0.77$ x $3.36$ x $44.83$ $0.63$ x $0.7$ = $229.87$ (79)         Southwesto.9x $0.77$ x $3.36$ x $31.95$ $0.63$ x $0.7$ = $196.61$ (79)         Southwesto.9x $0.77$ x $3.36$ x $31.95$ $0.63$ x $0.7$ = $196.61$ (79)         Southwesto.9x $0.77$ x $3.36$ x $31.95$ $0.63$ x $0.7$ = $196.61$ (79)         Northwesto.9x $0.77$ x $1.37$ x $11.37$	Southwest <sub>0.9x</sub>	0.77	x	3.36	x	72.36		0.63	x	0.7	=	445.31	(79)
Southwesto $g_X$ 0.77       x       3.36       x       44.83       0.63       x       0.77       =       275.85       (79)         Southwesto $g_X$ 0.77       x       3.36       x       44.83       0.63       x       0.77       =       275.85       (79)         Southwesto $g_X$ 0.77       x       3.36       x       44.83       0.63       x       0.77       =       229.87       (79)         Southwesto $g_X$ 0.77       x       3.36       x       31.95       0.63       x       0.77       =       196.61       (79)         Southwesto $g_X$ 0.77       x       3.36       x       31.95       0.63       x       0.7       =       196.61       (79)         Southwesto $g_X$ 0.77       x       3.36       x       31.95       0.63       x       0.7       =       168.4       (81)         Northwesto $g_X$ 0.77       x       1.37       x       11.51       x       0.63       x       0.7       =       16.67       (81)         Northwest $g_X$ 0.77       x       1.37       x       67.8       0.63       x       0.7 <td>Southwest0.9x</td> <td>0.77</td> <td>x</td> <td>3.36</td> <td>x</td> <td>72.36</td> <td></td> <td>0.63</td> <td>x</td> <td>0.7</td> <td>=</td> <td>371.09</td> <td>(79)</td>	Southwest0.9x	0.77	x	3.36	x	72.36		0.63	x	0.7	=	371.09	(79)
Southwest0.9x $0.77$ x $3.36$ x $44.83$ $0.63$ x $0.77$ = $275.85$ $(79)$ Southwest0.9x $0.77$ x $3.36$ x $31.95$ $0.63$ x $0.77$ = $229.87$ $(79)$ Southwest0.9x $0.77$ x $3.36$ x $31.95$ $0.63$ x $0.77$ = $196.61$ $(79)$ Southwest0.9x $0.77$ x $3.36$ x $31.95$ $0.63$ x $0.77$ = $196.61$ $(79)$ Southwest0.9x $0.77$ x $3.36$ x $31.95$ $0.63$ x $0.7$ = $196.61$ $(79)$ Southwest0.9x $0.77$ x $1.37$ x $23.55$ $x$ $0.63$ x $0.7$ = $196.61$ $(79)$ Northwest0.9x $0.77$ x $1.37$ x $73.8$ $0.63$ x $0.7$ $=       56.77 61         Northwest0.9x       0.77       x       1.37 $	Southwest0.9x	0.77	x	3.36	x	44.83		0.63	x	0.7	=	275.85	(79)
Southwest0.sx $0.77$ x $3.36$ x $44.83$ $0.63$ x $0.7$ = $229.87$ $79$ Southwest0.sx $0.77$ x $3.36$ x $31.95$ $0.63$ x $0.7$ = $196.61$ $79$ Southwest0.sx $0.77$ x $3.36$ x $31.95$ $0.63$ x $0.7$ = $196.61$ $79$ Southwest0.sx $0.77$ x $3.36$ x $31.95$ $0.63$ x $0.7$ = $196.61$ $79$ Southwest0.sx $0.77$ x $3.36$ x $31.95$ $0.63$ x $0.7$ = $196.61$ $79$ Northwest0.sx $0.77$ x $1.37$ x $23.55$ $x$ $0.63$ x $0.7$ = $34.44$ $61$ Northwest0.sx $0.77$ x $1.37$ $x$ $67.8$ $x$ $0.63$ x $0.7$ = $56.77$ $61$ Northwest0.sx $0.77$ x $1.37$ <	Southwest0.9x	0.77	x	3.36	x	44.83		0.63	x	0.7	=	275.85	(79)
Southwestory         0.77         ×         0.36         ×         0.19         0.63         ×         0.77         ×         0.86         7         =         196.61         79           Southwestory         0.77         ×         3.36         ×         31.95         0.63         ×         0.77         =         196.61         (79)           Southwestory         0.77         ×         3.36         ×         31.95         0.63         ×         0.77         =         196.61         (79)           Southwestory         0.77         ×         3.36         ×         31.95         0.63         ×         0.77         =         196.61         (79)           Southwestory         0.77         ×         1.37         ×         11.51         ×         0.63         ×         0.77         =         197.2         (81)           Northwestory         0.77         ×         1.37         ×         67.8         ×         0.63         ×         0.77         =         34.44         (81)           Northwestory         0.77         ×         1.37         ×         97.5         ×         0.63         ×         0.77         =         51.7	Southwest <sub>0.9x</sub>	0.77	x	3.36	x	44.83		0.63	x	0.7	=	275.85	(79)
Southwesto 9:       0.77       x       3.36       x       31.95       0.63       x       0.77       =       196.61       (79)         Southwesto 9:       0.77       x       3.36       x       31.95       0.63       x       0.77       =       196.61       (79)         Southwesto 9:       0.77       x       3.36       x       31.95       0.63       x       0.77       =       196.61       (79)         Northwesto 9:       0.77       x       1.37       x       11.51       x       0.63       x       0.77       =       196.61       (79)         Northwesto 9:       0.77       x       1.37       x       11.51       x       0.63       x       0.77       =       19.72       (61)         Northwesto 9:       0.77       x       1.37       x       67.8       x       0.63       x       0.77       =       56.77       (61)         Northwesto 9:       0.77       x       1.37       x       89.77       x       0.63       x       0.77       =       75.17       (61)         Northwesto 9:       0.77       x       1.37       x       97.5       x <t< td=""><td>Southwest<sub>0.9x</sub></td><td>0.77</td><td>x</td><td>3.36</td><td>x</td><td>44.83</td><td></td><td>0.63</td><td>x</td><td>0.7</td><td>=</td><td>229.87</td><td>(79)</td></t<>	Southwest <sub>0.9x</sub>	0.77	x	3.36	x	44.83		0.63	x	0.7	=	229.87	(79)
Southwesto 9, 0.77       x       3.36       x       3195       0.63       x       0.7       =       196.61       (79)         Southwesto 9, 0.77       x       3.36       x       3195       0.63       x       0.7       =       186.61       (79)         Northwesto 9, 0.77       x       1.37       x       11.51       x       0.63       x       0.7       =       183.84       (79)         Northwesto 9, 0.77       x       1.37       x       23.55       x       0.63       x       0.7       =       19.72       (81)         Northwesto 9, 0.77       x       1.37       x       67.8       x       0.63       x       0.7       =       56.77       (81)         Northwesto 9, 0.77       x       1.37       x       89.77       x       0.63       x       0.7       =       75.17       (81)         Northwesto 9, 0.77       x       1.37       x       97.5       x       0.63       x       0.7       =       81.65       (81)         Northwesto 9, 0.77       x       1.37       x       97.5       x       0.63       x       0.7       =       63.15       (81) <td>Southwest0.9x</td> <td>0.77</td> <td>x</td> <td>3.36</td> <td>X</td> <td>31.95</td> <td></td> <td>0.63</td> <td>x</td> <td>0.7</td> <td>=</td> <td>196.61</td> <td>(79)</td>	Southwest0.9x	0.77	x	3.36	X	31.95		0.63	x	0.7	=	196.61	(79)
Southwest 0.9x       0.77       x       3.36       x       31.95       0.63       x       0.77       =       163.84       (79)         Northwest 0.9x       0.77       x       11.37       x       11.51       x       0.63       x       0.77       =       9.64       (81)         Northwest 0.9x       0.77       x       1.37       x       41.13       x       0.63       x       0.77       =       19.72       (81)         Northwest 0.9x       0.77       x       1.37       x       41.13       x       0.63       x       0.77       =       19.72       (81)         Northwest 0.9x       0.77       x       1.37       x       67.8       x       0.63       x       0.77       =       56.77       (81)         Northwest 0.9x       0.77       x       1.37       x       97.5       x       0.63       x       0.77       =       81.65       (81)         Northwest 0.9x       0.77       x       1.37       x       97.5       x       0.63       x       0.77       =       81.65       (81)         Northwest 0.9x       0.77       x       1.37       x       <	Southwest0.9x	0.77	<b>x</b>	3.36	x	31.95		0.63	x	0.7	=	196.61	(79)
Northwest 0.9x       0.77       x       1.37       x       11.51       x       0.63       x       0.7       =       9.64       (81)         Northwest 0.9x       0.77       x       1.37       x       23.55       x       0.63       x       0.7       =       19.72       (81)         Northwest 0.9x       0.77       x       1.37       x       41.13       x       0.63       x       0.7       =       34.44       (81)         Northwest 0.9x       0.77       x       1.37       x       67.8       x       0.63       x       0.7       =       34.44       (81)         Northwest 0.9x       0.77       x       1.37       x       67.8       x       0.63       x       0.7       =       56.77       (81)         Northwest 0.9x       0.77       x       1.37       x       92.98       x       0.63       x       0.7       =       81.65       (81)         Northwest 0.9x       0.77       x       1.37       x       51.24       x       0.63       x       0.7       =       63.15       (81)         Northwest 0.9x       0.77       x       1.37       x <td>Southwest<sub>0.9x</sub></td> <td>0.77</td> <td>x</td> <td>3.36</td> <td>x</td> <td>31.95</td> <td></td> <td>0.63</td> <td>x</td> <td>0.7</td> <td>=</td> <td>196.61</td> <td>(79)</td>	Southwest <sub>0.9x</sub>	0.77	x	3.36	x	31.95		0.63	x	0.7	=	196.61	(79)
Northwest 0.9x       0.77       x       1.37       x       23,55       x       0.63       x       0.77       =       19,72       (81)         Northwest 0.9x       0.77       x       1.37       x       41.13       x       0.63       x       0.77       =       34.44       (81)         Northwest 0.9x       0.77       x       1.37       x       67.8       x       0.63       x       0.77       =       56.77       (81)         Northwest 0.9x       0.77       x       1.37       x       89.77       x       0.63       x       0.77       =       75.17       (81)         Northwest 0.9x       0.77       x       1.37       x       97.5       x       0.63       x       0.77       =       81.65       (81)         Northwest 0.9x       0.77       x       1.37       x       92.98       x       0.63       x       0.77       =       63.15       (81)         Northwest 0.9x       0.77       x       1.37       x       75.42       x       0.63       x       0.77       =       42.91       (81)         Northwest 0.9x       0.77       x       1.37 <t< td=""><td>Southwest<sub>0.9x</sub></td><td>0.77</td><td>x</td><td>3.36</td><td>x</td><td>31.95</td><td></td><td>0.63</td><td>x</td><td>0.7</td><td>=</td><td>163.84</td><td>(79)</td></t<>	Southwest <sub>0.9x</sub>	0.77	x	3.36	x	31.95		0.63	x	0.7	=	163.84	(79)
Northwest 0.9x         0.77         x         1.37         x         41.13         x         0.63         x         0.77         =         34.44         (81)           Northwest 0.9x         0.77         x         1.37         x         67.8         x         0.63         x         0.7         =         56.77         (81)           Northwest 0.9x         0.77         x         1.37         x         89.77         x         0.63         x         0.7         =         56.77         (81)           Northwest 0.9x         0.77         x         1.37         x         97.5         x         0.63         x         0.7         =         75.17         (81)           Northwest 0.9x         0.77         x         1.37         x         92.98         x         0.63         x         0.7         =         63.15         (81)           Northwest 0.9x         0.77         x         1.37         x         75.42         x         0.63         x         0.7         =         42.91         (81)           Northwest 0.9x         0.77         x         1.37         x         14.52         0.63         x         0.7         =	Northwest 0.9x	0.77	x	1.37	x	11.51	x	0.63	x	0.7	=	9.64	(81)
Northwest 0.9x       0.77       x       1.37       x       67.8       x       0.63       x       0.7       =       56.77       (81)         Northwest 0.9x       0.77       x       1.37       x       89.77       x       0.63       x       0.7       =       56.77       (81)         Northwest 0.9x       0.77       x       1.37       x       89.77       x       0.63       x       0.7       =       75.17       (81)         Northwest 0.9x       0.77       x       1.37       x       97.5       x       0.63       x       0.7       =       81.65       (81)         Northwest 0.9x       0.77       x       1.37       x       92.98       x       0.63       x       0.7       =       63.15       (81)         Northwest 0.9x       0.77       x       1.37       x       75.42       x       0.63       x       0.7       =       63.15       (81)         Northwest 0.9x       0.77       x       1.37       x       51.24       x       0.63       x       0.7       =       12.16       (81)         Northwest 0.9x       0.77       x       1.37       x <td>Northwest 0.9x</td> <td>0.77</td> <td>x</td> <td>1.37</td> <td>x</td> <td>23.55</td> <td>x</td> <td>0.63</td> <td>x</td> <td>0.7</td> <td>=</td> <td>19.72</td> <td>(81)</td>	Northwest 0.9x	0.77	x	1.37	x	23.55	x	0.63	x	0.7	=	19.72	(81)
Northwest 0.9x       0.77       x       1.37       x       89.77       x       0.63       x       0.77       =       75.17       (81)         Northwest 0.9x       0.77       x       1.37       x       97.5       x       0.63       x       0.7       =       81.65       (81)         Northwest 0.9x       0.77       x       1.37       x       92.98       x       0.63       x       0.7       =       81.65       (81)         Northwest 0.9x       0.77       x       1.37       x       92.98       x       0.63       x       0.7       =       63.15       (81)         Northwest 0.9x       0.77       x       1.37       x       75.42       x       0.63       x       0.7       =       63.15       (81)         Northwest 0.9x       0.77       x       1.37       x       51.24       x       0.63       x       0.7       =       24.79       (81)         Northwest 0.9x       0.77       x       1.37       x       14.52       x       0.63       x       0.7       =       12.16       (81)         Northwest 0.9x       0.77       x       1.37       x </td <td>Northwest 0.9x</td> <td>0.77</td> <td>x</td> <td>1.37</td> <td>x</td> <td>41.13</td> <td>x</td> <td>0.63</td> <td>x</td> <td>0.7</td> <td>=</td> <td>34.44</td> <td>(81)</td>	Northwest 0.9x	0.77	x	1.37	x	41.13	x	0.63	x	0.7	=	34.44	(81)
Northwest 0.9x       0.77       x       1.37       x       97.5       x       0.63       x       0.7       =       81.65       (81)         Northwest 0.9x       0.77       x       1.37       x       92.98       x       0.63       x       0.7       =       81.65       (81)         Northwest 0.9x       0.77       x       1.37       x       92.98       x       0.63       x       0.7       =       77.86       (81)         Northwest 0.9x       0.77       x       1.37       x       75.42       x       0.63       x       0.7       =       63.15       (81)         Northwest 0.9x       0.77       x       1.37       x       51.24       x       0.63       x       0.7       =       42.91       (81)         Northwest 0.9x       0.77       x       1.37       x       29.6       x       0.63       x       0.7       =       12.16       (81)         Northwest 0.9x       0.77       x       1.37       x       14.52       x       0.63       x       0.7       =       12.16       (81)         Northwest 0.9x       0.77       x       1.37       x <td>Northwest 0.9x</td> <td>0.77</td> <td>x</td> <td>1.37</td> <td>x</td> <td>67.8</td> <td>x</td> <td>0.63</td> <td>x</td> <td>0.7</td> <td>=</td> <td>56.77</td> <td>(81)</td>	Northwest 0.9x	0.77	x	1.37	x	67.8	x	0.63	x	0.7	=	56.77	(81)
Northwest 0.9x       0.77       x       1.37       x       92.98       x       0.63       x       0.7       =       77.86       (81)         Northwest 0.9x       0.77       x       1.37       x       75.42       x       0.63       x       0.7       =       63.15       (81)         Northwest 0.9x       0.77       x       1.37       x       51.24       x       0.63       x       0.7       =       63.15       (81)         Northwest 0.9x       0.77       x       1.37       x       51.24       x       0.63       x       0.7       =       42.91       (81)         Northwest 0.9x       0.77       x       1.37       x       29.6       x       0.63       x       0.7       =       24.79       (81)         Northwest 0.9x       0.77       x       1.37       x       29.6       x       0.63       x       0.7       =       12.16       (81)         Northwest 0.9x       0.77       x       1.37       x       9.36       x       0.63       x       0.7       =       7.84       (81)         Rooflights 0.9x       1       x       6.13       x	Northwest 0.9x	0.77	x	1.37	x	89.77	x	0.63	x	0.7	=	75.17	(81)
Northwest $0.9x$ $0.77$ x $1.37$ x $75.42$ x $0.63$ x $0.7$ = $63.15$ (81)Northwest $0.9x$ $0.77$ x $1.37$ x $51.24$ x $0.63$ x $0.7$ = $42.91$ (81)Northwest $0.9x$ $0.77$ x $1.37$ x $29.6$ x $0.63$ x $0.7$ = $24.79$ (81)Northwest $0.9x$ $0.77$ x $1.37$ x $29.6$ x $0.63$ x $0.7$ = $24.79$ (81)Northwest $0.9x$ $0.77$ x $1.37$ x $29.6$ x $0.63$ x $0.7$ = $12.16$ (81)Northwest $0.9x$ $0.77$ x $1.37$ x $9.36$ x $0.63$ x $0.7$ = $12.16$ (81)Northwest $0.9x$ $0.77$ x $1.37$ x $9.36$ x $0.63$ x $0.7$ = $63.26$ (82)Rooflights $0.9x$ $1$ x $6.13$ x $26$ x $0.63$ x $0.7$ = $63.26$ (82)Rooflights $0.9x$ $1$ x $6.13$ x $94$ x $0.63$ x $0.7$ = $228.7$ (82)Rooflights $0.9x$ $1$ x $6.13$ x $190$ x $0.63$ x $0.7$ = $462.27$ (82)Rooflights $0.9x$ $1$ x $6.13$ x $201$ x $0.63$ x $0.7$ = $489.03$ (82)	Northwest 0.9x	0.77	x	1.37	x	97.5	x	0.63	x	0.7	=	81.65	(81)
Northwest 0.9x       0.77       x       1.37       x       51.24       x       0.63       x       0.7       =       42.91       (81)         Northwest 0.9x       0.77       x       1.37       x       29.6       x       0.63       x       0.7       =       42.91       (81)         Northwest 0.9x       0.77       x       1.37       x       29.6       x       0.63       x       0.7       =       24.79       (81)         Northwest 0.9x       0.77       x       1.37       x       14.52       x       0.63       x       0.7       =       12.16       (81)         Northwest 0.9x       0.77       x       1.37       x       9.36       x       0.63       x       0.7       =       7.84       (81)         Northwest 0.9x       0.77       x       6.13       x       26       x       0.63       x       0.7       =       63.26       (82)         Rooflights 0.9x       1       x       6.13       x       54       x       0.63       x       0.7       =       228.7       (82)         Rooflights 0.9x       1       x       6.13       x	Northwest 0.9x	0.77	x	1.37	x	92.98	x	0.63	x	0.7	=	77.86	(81)
Northwest $0.9x$ $0.77$ x $1.37$ x $29.6$ x $0.63$ x $0.7$ = $24.79$ (81)Northwest $0.9x$ $0.77$ x $1.37$ x $14.52$ x $0.63$ x $0.7$ = $12.16$ (81)Northwest $0.9x$ $0.77$ x $1.37$ x $9.36$ x $0.63$ x $0.7$ = $12.16$ (81)Northwest $0.9x$ $0.77$ x $1.37$ x $9.36$ x $0.63$ x $0.7$ = $7.84$ (81)Rooflights $0.9x$ 1x $6.13$ x $26$ x $0.63$ x $0.7$ = $63.26$ (82)Rooflights $0.9x$ 1x $6.13$ x $54$ x $0.63$ x $0.7$ = $131.38$ (82)Rooflights $0.9x$ 1x $6.13$ x $94$ x $0.63$ x $0.7$ = $228.7$ (82)Rooflights $0.9x$ 1x $6.13$ x $150$ x $0.63$ x $0.7$ = $462.27$ (82)Rooflights $0.9x$ 1x $6.13$ x $190$ x $0.63$ x $0.7$ = $462.27$ (82)Rooflights $0.9x$ 1x $6.13$ x $194$ x $0.63$ x $0.7$ = $462.27$ (82)Rooflights $0.9x$ 1x $6.13$ x $194$ x $0.63$ x $0.7$ = $472$ (82)Roofligh	Northwest 0.9x	0.77	x	1.37	x	75.42	x	0.63	x	0.7	=	63.15	(81)
Northwest $0.9x$ $0.77$ x $1.37$ x $14.52$ x $0.63$ x $0.7$ = $12.16$ (81)Northwest $0.9x$ $0.77$ x $1.37$ x $9.36$ x $0.63$ x $0.7$ = $7.84$ (81)Rooflights $0.9x$ 1x $6.13$ x $26$ x $0.63$ x $0.7$ = $63.26$ (82)Rooflights $0.9x$ 1x $6.13$ x $26$ x $0.63$ x $0.7$ = $63.26$ (82)Rooflights $0.9x$ 1x $6.13$ x $54$ x $0.63$ x $0.7$ = $131.38$ (82)Rooflights $0.9x$ 1x $6.13$ x $94$ x $0.63$ x $0.7$ = $228.7$ (82)Rooflights $0.9x$ 1x $6.13$ x $190$ x $0.63$ x $0.7$ = $462.27$ (82)Rooflights $0.9x$ 1x $6.13$ x $201$ x $0.63$ x $0.7$ = $449.03$ (82)Rooflights $0.9x$ 1x $6.13$ x $201$ x $0.63$ x $0.7$ = $449.03$ (82)Rooflights $0.9x$ 1x $6.13$ x $194$ x $0.63$ x $0.7$ = $472$ (82)	Northwest 0.9x	0.77	x	1.37	x	51.24	x	0.63	x	0.7	=	42.91	(81)
Northwest $0.9x$ $0.77$ $x$ $1.37$ $x$ $9.36$ $x$ $0.63$ $x$ $0.7$ $=$ $7.84$ $(81)$ Rooflights $0.9x$ 1 $x$ $6.13$ $x$ $26$ $x$ $0.63$ $x$ $0.7$ $=$ $63.26$ $(82)$ Rooflights $0.9x$ 1 $x$ $6.13$ $x$ $54$ $x$ $0.63$ $x$ $0.7$ $=$ $63.26$ $(82)$ Rooflights $0.9x$ 1 $x$ $6.13$ $x$ $54$ $x$ $0.63$ $x$ $0.7$ $=$ $131.38$ $(82)$ Rooflights $0.9x$ 1 $x$ $6.13$ $x$ $94$ $x$ $0.63$ $x$ $0.7$ $=$ $228.7$ $(82)$ Rooflights $0.9x$ 1 $x$ $6.13$ $x$ $150$ $x$ $0.63$ $x$ $0.7$ $=$ $364.95$ $(82)$ Rooflights $0.9x$ 1 $x$ $6.13$ $x$ $190$ $x$ $0.63$ $x$ $0.7$ $=$ $462.27$ $(82)$ Rooflights $0.9x$ 1 $x$ $6.13$ $x$ $201$ $x$ $0.63$ $x$ $0.7$ $=$ $489.03$ $(82)$ Rooflights $0.9x$ 1 $x$ $6.13$ $x$ $194$ $x$ $0.63$ $x$ $0.7$ $=$ $472$ $(82)$	Northwest 0.9x	0.77	x	1.37	x	29.6	x	0.63	x	0.7	=	24.79	(81)
Rooflights $0.9x$ 1x $6.13$ x $26$ x $0.63$ x $0.7$ = $63.26$ $(82)$ Rooflights $0.9x$ 1x $6.13$ x $54$ x $0.63$ x $0.7$ = $131.38$ $(82)$ Rooflights $0.9x$ 1x $6.13$ x $94$ x $0.63$ x $0.7$ = $228.7$ $(82)$ Rooflights $0.9x$ 1x $6.13$ x $94$ x $0.63$ x $0.7$ = $228.7$ $(82)$ Rooflights $0.9x$ 1x $6.13$ x $150$ x $0.63$ x $0.7$ = $364.95$ $(82)$ Rooflights $0.9x$ 1x $6.13$ x $190$ x $0.63$ x $0.7$ = $462.27$ $(82)$ Rooflights $0.9x$ 1x $6.13$ x $201$ x $0.63$ x $0.7$ = $489.03$ $(82)$ Rooflights $0.9x$ 1x $6.13$ x $194$ x $0.63$ x $0.7$ = $472$ $(82)$	Northwest 0.9x	0.77	x	1.37	x	14.52	x	0.63	x	0.7	=	12.16	(81)
Rooflights $0.9x$ 1x $6.13$ x $54$ x $0.63$ x $0.7$ = $131.38$ $(82)$ Rooflights $0.9x$ 1x $6.13$ x $94$ x $0.63$ x $0.7$ = $228.7$ $(82)$ Rooflights $0.9x$ 1x $6.13$ x $150$ x $0.63$ x $0.7$ = $364.95$ $(82)$ Rooflights $0.9x$ 1x $6.13$ x $190$ x $0.63$ x $0.7$ = $462.27$ $(82)$ Rooflights $0.9x$ 1x $6.13$ x $201$ x $0.63$ x $0.7$ = $489.03$ $(82)$ Rooflights $0.9x$ 1x $6.13$ x $194$ x $0.63$ x $0.7$ = $472$ $(82)$	Northwest 0.9x	0.77	x	1.37	x	9.36	x	0.63	x	0.7	=	7.84	(81)
Rooflights $0.9x$ 1x $6.13$ x $94$ x $0.63$ x $0.7$ = $228.7$ (82)Rooflights $0.9x$ 1x $6.13$ x $150$ x $0.63$ x $0.7$ = $364.95$ (82)Rooflights $0.9x$ 1x $6.13$ x $190$ x $0.63$ x $0.7$ = $462.27$ (82)Rooflights $0.9x$ 1x $6.13$ x $201$ x $0.63$ x $0.7$ = $489.03$ (82)Rooflights $0.9x$ 1x $6.13$ x $194$ x $0.63$ x $0.7$ = $472$ (82)Rooflights $0.9x$ 1x $6.13$ x $194$ x $0.63$ x $0.7$ = $472$ (82)	Rooflights 0.9x	1	x	6.13	x	26	x	0.63	x	0.7	=	63.26	(82)
Rooflights $0.9x$ 1× $6.13$ × $150$ × $0.63$ × $0.7$ = $364.95$ $(82)$ Rooflights $0.9x$ 1× $6.13$ × $190$ × $0.63$ × $0.7$ = $462.27$ $(82)$ Rooflights $0.9x$ 1× $6.13$ × $201$ × $0.63$ × $0.7$ = $489.03$ $(82)$ Rooflights $0.9x$ 1× $6.13$ × $201$ × $0.63$ × $0.7$ = $489.03$ $(82)$ Rooflights $0.9x$ 1× $6.13$ × $194$ × $0.63$ × $0.7$ = $472$ $(82)$	Rooflights 0.9x	1	x	6.13	x	54	x	0.63	x	0.7	=	131.38	(82)
Rooflights $0.9x$ 1       x $6.13$ x $190$ x $0.63$ x $0.7$ = $462.27$ $(82)$ Rooflights $0.9x$ 1       x $6.13$ x $201$ x $0.63$ x $0.7$ = $489.03$ $(82)$ Rooflights $0.9x$ 1       x $6.13$ x $194$ x $0.63$ x $0.7$ = $472$ $(82)$	Rooflights 0.9x	1	x	6.13	x	94	x	0.63	x	0.7	=	228.7	(82)
Rooflights $0.9x$ 1       x       6.13       x       201       x       0.63       x       0.7       =       489.03       (82)         Rooflights $0.9x$ 1       x       6.13       x       194       x       0.63       x       0.7       =       472       (82)	Rooflights 0.9x	1	x	6.13	×	150	x	0.63	x	0.7	=	364.95	(82)
Rooflights $_{0.9x}$ 1 x $_{6.13}$ x $_{194}$ x $_{0.63}$ x $_{0.7}$ = $_{472}$ (82)	Rooflights 0.9x	1	x	6.13	×	190	x	0.63	x	0.7	=	462.27	(82)
	Rooflights 0.9x	1	x	6.13	×	201	x	0.63	x	0.7	=	489.03	(82)
Rooflights 0.9x       1       x       6.13       x       164       x       0.63       x       0.7       =       399.01       (82)	L	1	×	6.13	×	194	x	0.63	x	0.7	=	472	(82)
	Rooflights 0.9x	1	x	6.13	x	164	x	0.63	x	0.7	=	399.01	(82)

Rooflights 0.9x 1	X 6.	13 ×	116	] x [	0.63	⊐ × Г	0.7		282.23	(82)
Rooflights 0.9x 1		13 X	68	] ^ [ ] x [	0.63		0.7		165.44	(82)
				;		4  -		=		
	;	13 ×	33		0.63		0.7		80.29	(82)
Rooflights 0.9x 1	× 6.	13 ×	21	x	0.63	×	0.7	=	51.09	(82)
		1		(00)	(74)	(00)				
Solar gains in watts, calcul (83)m= 1144.97 2015.08 281		1 1	43.87 4323.02	(83)m = S	um(74)m . 3198.43	(82)m 2332.94	1384.52	970.68	1	(83)
Total gains – internal and				3000.43	3190.43	2332.94	1304.32	970.00	l	(00)
	8.44 5609.49	· · ·	55)111, watts	5444.15	4849.89	4126.76	3334.6	3044.68	I	(84)
(84)m= 3283.12 4136.26 484	0.44 0009.49	0031.4 00	52.7 5003.71	5444.15	4049.09	4120.70	3334.0	3044.00	l .	(04)
7. Mean internal tempera	ture (heating	g season)								
Temperature during heati	ng periods i	n the living a	area from Tal	ble 9, Th	1 (°C)				21	(85)
Utilisation factor for gains	for living ar	ea, h1,m (se	ee Table 9a)							
Jan Feb N	lar Apr	May	Jun Jul	Aug	Sep	Oct	Nov	Dec		
(86)m= 0.99 0.99 0.	98 0.96	0.93 0	0.85 0.73	0.75	0.91	0.97	0.99	1		(86)
Mean internal temperatur	e in living ar	ea T1 (follo	w steps 3 to 7	7 in Tabl	e 9c)					
	.56 19.13		0.39 20.75	20.73	20.2	19.38	18.43	17.91		(87)
	na noriodo i	n root of du	alling from To						ł	
Temperature during heati           (88)m=         19.85         19.86         19	.86 19.89	I I	9.92 19.93	19.93	19.91	19.89	19.88	19.86		(88)
	.00 19.09	19.91	9.92 19.93	19.93	19.91	19.09	19.00	19.00		(00)
Utilisation factor for gains	for rest of c	lwelling, h2,	m (see Table	9a)						
(89)m= 0.99 0.99 0.	98 0.96	0.91	0.8 0.61	0.64	0.88	0.96	0.99	0.99		(89)
Mean internal temperatur	e in the rest	of dwelling	T2 (follow ste	eps 3 to 1	7 in Tabl	e 9c)				
(90)m= 15.55 15.94 16	.65 17.49	18.5 1	9.29 19.75	19.73	19.04	17.86	16.47	15.69		(90)
				•	f	LA = Livin	g area ÷ (4	+) =	0.04	(91)
Mean internal temperatur	o (for the wi	olo dwolling	$T = f \land T $	⊥ (1 _ fl	$\Lambda$ $\times$ T2					
	.73 17.55	T	9.34 19.79	19.77	19.09	17.92	16.55	15.78	1	(92)
Apply adjustment to the n							10.00	10.70	j	(02)
	.73 17.55		9.34 19.79	19.77	19.09	17.92	16.55	15.78		(93)
8. Space heating requirer										
Set Ti to the mean interna		re obtained	at step 11 of	Table 9	n so tha	t Ti m=(	76)m and	d re-calo	ulate	
the utilisation factor for ga					o, oo ina	, (	i ojin an			
Jan Feb M	lar Apr	May .	Jun Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation factor for gains	, hm:		•	•					1	
(94)m= 0.99 0.98 0.	96 0.93	0.87 0	0.77 0.59	0.62	0.84	0.94	0.98	0.99		(94)
Useful gains, hmGm , W	= (94)m x (8	84)m							-	
(95)m= 3238.09 4040.19 465	1.84 5220.07	5253.44 46	38.79 3480.68	3374.29	4061.81	3886.6	3268.31	3007.6		(95)
Monthly average external	temperatur	e from Table	e 8						-	
(96)m= 4.5 5 6	.8 8.7	11.7 1	4.6 16.9	16.9	14.3	10.8	7	4.9		(96)
Heat loss rate for mean ir	nternal temp	erature, Lm	, W =[(39)m	x [(93)m	– (96)m	]			-	
(97)m= 17681.61 17220.57 155	04.1 13412.12	2 10193.8 69	84.18 4226.26	4195.51	7156.9	10788.18	14687.48	16992.57		(97)
Space heating requireme	nt for each r	month, kWh	/month = 0.02	24 x [(97	)m – (95	)m] x (4	1)m		•	
(98)m= 10745.98 8857.21 807	4.08 5898.27	3675.63	0 0	0	0	5134.78	8221.8	10404.82		
				Tota	l per year	(kWh/yeai	) = Sum(98	B) <sub>15,912</sub> =	61012.57	(98)
Space heating requireme	nt in kWh/m	²/year							49.9	(99)
		-							L	

9a. En	nergy re	quireme	nts – Ind	lividual h	eating s	ystems i	ncluding	micro-C	CHP)					
	e heati	-	at fram -	ooondo-		monter	ovoto					I		
				econdar		mentary	•	(202) = 1 -	- (201) -				0	(201)
				nain syst	. ,			(202) = 1 - (204) =		(203)] -			1	(202)
			•	main sys				(204) = (2	02) <b>x</b> [1 -	(203)] =			1	(204)
	•			ting syste			• 0/						175	(206)
EIIICI	·	<b>1</b>	1 1	ementar		- ·	· · · · ·						0	(208)
Spac	Jan Jan	Feb	Mar	Apr calculate	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/	'year
Spac		8 8857.21	· · ·	1	3675.63	i	0	0	0	5134.78	8221.8	10404.82		
(211)n	n = {[(98	1 3)m x (2(	1 )4)] + (2 <sup>,</sup>	1 10)m } x	I 100 ÷ (2	06)								(211)
()		í	1	3370.44	r – – – – – – – – – – – – – – – – – – –	0	0	0	0	2934.16	4698.17	5945.61		()
			1	1			1	Tota	l (kWh/yea	ar) =Sum(2	2 <b>11)</b> <sub>15,1012</sub>	<i>;</i> =	34864.33	(211)
Spac	e heatir	ng fuel (s	econdar	′y), kWh/	month							I		
	-	01)] + (2	14) m } :	x 100 ÷ (	· · · ·		1							
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
								Tota	ii (kwn/yea	ar) =Sum(2	215) <sub>15,1012</sub>	2	0	(215)
	t from w		ter (calc	ulated a	hove)									
Culpu	291.62	256.65	268.62	239.53	233.81	207.6	198.12	219.13	219.29	248.44	264.3	284.18		
Efficie	ncy of v	vater hea	ater			_		7					175	(216)
(217) <mark>m=</mark>	175	175	175	175	175	175	175	175	175	175	175	175		(217)
		heating )m x 10												
· /	166.64		153.5	136.88	133.61	118.63	113.21	125.22	125.31	141.97	151.03	162.39		
								Tota	I = Sum(2	19a) <sub>112</sub> =			1675.03	(219)
	al totals									k\	Wh/year		kWh/ye	
Space	heating	g fuel us	ed, main	system	1								34864.33	
Water	heating	fuel use	ed										1675.03	
Electri	city for	pumps, f	ans and	electric	keep-ho	t								
centra	al heati	ng pump	:									130		(230c)
Total e	electricit	y for the	above,	kWh/yea	ır			sum	of (230a).	(230g) =			130	(231)
Electri	city for	lighting											1874.19	(232)
10a.	Fuel co	sts - indi	vidual he	eating sy	stems:									
						Fu	el			Fuel P	rice		Fuel Co	st
						k٧	/h/year			(Table	12)		£/year	
Space	heating	g - main	system ?	1		(21	1) x			11.4	46	x 0.01 =	3995.4518186	0046 <mark>(240)</mark>
Space	heating	g - main	system 2	2		(21:	3) x			0		x 0.01 =	0	(241)
Space	heating	g - secor	ndary			(21	5) x			0		x 0.01 =	0	(242)
Water	heating	cost (ot	her fuel)			(219	9)			11.4	46	x 0.01 =	191.96	(247)
Pumps	s, fans a	and elect	tric keep	-hot		(23	1)			11.4	46	x 0.01 =	14.9	(249)

(if off-peak tariff, list each of (230a) to (230g) sepa Energy for lighting	rately as applicable and (232)	d apply fuel price according to 11.46 × 0.01 =	
Additional standing charges (Table 12)			0 (251)
	s needed ') + (250)(254) =		4417.09059294642 (255)
11a. SAP rating - individual heating systems			
Energy cost deflator (Table 12)			0.47 (256)
Energy cost factor (ECF) [(255) × (25 SAP rating (Section 12)	6)] ÷ [(4) + 45.0] =		1.63754669355519 (257)
12a. CO2 emissions – Individual heating systems	s including micro-CHP		77.1562236249051 (258)
		- • • • • •	<u> </u>
	<b>Energy</b> kWh/year	Emission factor kg CO2/kWh	<b>Emissions</b> kg CO2/year
Space heating (main system 1)	(211) x	0.517 =	18024.86 (261)
Space heating (secondary)	(215) x	0 =	0 (263)
Water heating	(219) x	0.517 =	865.99 (264)
Space and water heating	(261) + (262) + (263) + (26	64) =	18890.85 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.517 =	67.21 (267)
Electricity for lighting	(232) x	0.517 =	968.96 (268)
Total CO2, kg/year		sum of (265)(271) =	19927.01 (272)
CO2 emissions per m <sup>2</sup>		(272) ÷ (4) =	16.3 (273)
El rating (section 14)			79 (274)
13a. Primary Energy			
	<b>Energy</b> kWh/year	<b>Primary</b> factor	<b>P. Energy</b> kWh/year
Space heating (main system 1)	(211) x	2.92 =	101803.84 (261)
Space heating (secondary)	(215) x	0 =	0 (263)
Energy for water heating	(219) x	2.92 =	4891.08 (264)
Space and water heating	(261) + (262) + (263) + (26	64) =	106694.92 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	2.92 =	379.6 (267)
Electricity for lighting	(232) x	0 =	5472.65 (268)
'Total Primary Energy		sum of (265)(271) =	112547.16 (272)
Primary energy kWh/m²/year		(272) ÷ (4) =	92.04 (273)

				User D	etails:						
Assessor Name: Software Name:	Stroma FS	AP 200			Strom Softwa	are Vei	rsion:		Versio	on: 1.5.0.69	
		<b>.</b>				7th Am	endment				
Address : 1. Overall dwelling dime	62, Avenue	Road, L	ONDON.	I, NW8 6	6HT						
T. Overall dwelling dime	11510115.			Δre	a(m²)		Ave Hei	iaht(m)		Volume(m <sup>3</sup>	\ \
Basement				<b></b>	· ,	(1a) x	3.	• • •	(2a) =	1223.1	<b>/</b> (3a)
Ground floor				3	19.56	(1b) x	3.	2	(2b) =	1022.59	(3b)
First floor						(1c) x			(2c) =	905.19	(3c)
Second floor						(1d) x	2.		(2d) =	613.93	(3d)
Total floor area TFA = (1a	a)+(1b)+(1c)+	(1d)+(1e	-)+ (1r				2.	0		013.93	(00)
		(10)1(10	.,	1) 1222.77	00042724		)+(3c)+(3d)	T(30)T	(3n) -		
Dwelling volume						(3a) <del>+</del> (3b)	)+(30)+(30)	т(Зе)т	.(31) =	3764.81	(5)
2. Ventilation rate:	main	S	econdai	٠V	other		total			m <sup>3</sup> per hou	r
Number of chimneys	heating		eating	, 」 + 「		7 = Г			40 =	-	_
Number of open flues	0		0	_i ` L	0	」 _ L ヿ ゠ Γ	0		20 =	0	(6a)
Number of intermittent fa	0		0	Т, Г	0		0	_	10 =	0	(6b)
	15					Ļ	13		10 =	130	(7a)
Number of passive vents							0		40 =	0	(7b)
Number of flueless gas fi	res						0	^	40 =	0	(7c)
									Air cł	nanges per ho	ur
Infiltration due to chimney	/s, flues and fa	ans = (6	a)+(6b)+(7	a)+(7b)+(	7c) =	Г	130		÷ (5) =	0.03	(8)
If a pressurisation test has b	een carried out o	r is intende	ed, procee	d to (17), d	otherwise o	continue fr	om (9) to (1	16)			_
Number of storeys in th	ne dwelling (na	5)								0	(9)
Additional infiltration	<b>.</b>							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0. if both types of wall are pr						-	uction			0	(11)
deducting areas of openin			ponung ic	ine great		a (allei					
If suspended wooden f	loor, enter 0.2	(unseal	ed) or 0.	1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ent	er 0.05, else e	enter 0								0	(13)
Percentage of windows	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	oic metre	s per ho	our per so	quare m	etre of er	nvelope	area	10	(17)
If based on air permeabil										0.53	(18)
Air permeability value applie. Number of sides on which		un lest has	s been don	e or a deg	yree air pei	meability	is being us	eu			
Shelter factor					(20) = 1 -	[0.075 x (1	9)] =			2 0.85	(19)
Infiltration rate incorporat	ing shelter fac	tor			(21) = (18)	) x (20) =				0.45	(21)
Infiltration rate modified for	•		ł							<del>_</del>	` ´
Jan Feb	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	

Monthl	y avera	ge wind	speed f	rom Tabl	e 7	-			-	-		-	_		
(22)m=	5.4	5.1	5.1	4.5	4.1	3.9	3.7	3.7	4.2	4.5	4.8	5.1	]		
Wind F	actor (2	22a)m =	(22)m ÷	- 4											
(22a)m=	1.35	1.27	1.27	1.12	1.02	0.98	0.92	0.92	1.05	1.12	1.2	1.27	]		
Adjuste	ed infiltr	ation rate	e (allow	ing for sł	nelter an	d wind s	peed) =	= (21a) x	(22a)m						
	0.61	0.58	0.58	0.51	0.47	0.44	0.42	0.42	0.48	0.51	0.55	0.58			
		<i>ctive air (</i> al ventila	-	rate for t	he appli	cable ca	se	-	-			-	-		(23a)
				endix N, (2	3b) = (23a	a) × Fmv (e	equation	(N5)) , othe	rwise (23b	o) = (23a)			0		(23b)
								m Table 4h		, , ,			0		(23c)
a) If	balance	ed mecha	anical ve	entilation	with he	at recove	ery (M∨	/HR) (24a	a)m = (2	2b)m + (2	23b) × [ˈ	1 – (23c)	-		/
(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0		(	(24a)
b) If	balance	d mecha	anical ve	entilation	without	heat rec	overy (	MV) (24t	)m = (2	2b)m + (2	23b)				
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	]	(	(24b)
,					•	•		on from		E (00h	<b>、</b>				
(24c)m=	0	0 × 0.5	(230),		z) = (23L)			4c) = (22	$\frac{5}{10}$ m + 0	.5 × (230	0	0		(	(24c)
· /	_		<u> </u>					ion from				0			·/
								0.5 + [(2		0.5]		_			
(24d)m=	0.69	0.67	0.67	0.63	0.61	0.6	0.59	0.59	0.61	0.63	0.65	0.67		(	(24d)
Effec	ctive air	change	rate - ei	nter (24a	) or (24k	o) or (24	c) or (2-	4d) in bo	x (25)			-			
(25)m=	0.69	0.67	0.67	0.63	0.61	0.6	0.59	0.59	0.61	0.63	0.65	0.67		(	(25)
3. Hea	at losse	s and he	eat loss	paramete	er:										
ELEN	IENT	Gros area		Openin m		Net Ar A ,r		U-val W/m2		A X U (W/ł	<)	k-value kJ/m²∙l		A X k kJ/K	
Doors	Type 1					3.09	x	1.8	=	5.562				(	(26)
Doors <sup>-</sup>	Type 2					2.4	x	1.8	=	4.32				(	(26)
Doors <sup>-</sup>	Туре З					2.69	x	1.8	=	4.842				(	(26)
Window	ws Type	e 1				3.356	; x	1/[1/( 1.4 )+	0.04] =	4.45				(	(27)
Window	ws Type	2				3.356	; x	1/[1/( 1.4 )+	0.04] =	4.45				(	(27)
Window	ws Type	e 3				3.356	; x	1/[1/( 1.4 )+	0.04] =	4.45				(	(27)
Window	ws Type	94				3.356	; x	1/[1/( 1.4 )+	0.04] =	4.45				(	(27)
Window	ws Type	e 5				2.34	x	1/[1/( 1.4 )+	0.04] =	3.1				(	(27)
Window	ws Type	e 6				3.36	x	1/[1/( 1.4 )+	0.04] =	4.45				(	(27)
Window	ws Type	e 7				1.4	x	1/[1/( 1.4 )+	0.04] =	1.86				(	(27)
Window	ws Type	8 8				1.83	x	1/[1/( 1.4 )+	0.04] =	2.43				(	(27)
Window	ws Type	9				2.4	x	1/[1/( 1.4 )+	0.04] =	3.18				(	(27)
Window	ws Type	e 10				2.42	x	1/[1/( 1.4 )+	0.04] =	3.21				(	(27)
Window	ws Type	e 11				1.81	×	1/[1/( 1.4 )+	0.04] =	2.4				(	(27)

Window	ws Type	9 12				1.28	x1.	/[1/( 1.4 )+	0.04] =	1.7				(27)
Window	ws Type	e 13				1.37	x1.	/[1/( 1.4 )+	0.04] =	1.82				(27)
Window	ws Type	e 14				2.38	x1.	/[1/( 1.4 )+	0.04] =	3.16				(27)
Rooflig	hts					6.13	x	1/[1/(2) + 0	.04] =	12.26				(27b)
Floor T	ype 1					382.2	2 X	0.12	] = [	45.87	Ξr			(28)
Floor T	ype 2					319.5	6 ×	0.12	;	38.35	Ξ ř		$\dashv$	(28)
Walls 7	Гуре1	765	.4	113.9	94	651.4	6 X	0.2	= [	130.29	F F		$\dashv$	(29)
Walls 1	Гуре2	213	.1	11.7	6	201.3	4 X	0.13	= [	26.17	Ξ F		╡ <u>─</u> ─	(29)
Roof 1	Гуре1	62.6	6	6.13	3	56.53	3 X	0.11	= [	6.22	<b>-</b> 7		$\exists$	(30)
Roof 1	Гуре2	158.	87	0		158.8	7 X	0.11		17.48	= F		$\dashv$	(30)
		lements	, m²		1	01.81002	426147		เ		L			(31)
Interna	l wall **					78.84					Г			(32c)
Interna	ıl wall **					77.61	=				Г		$\dashv$	(32c)
Interna	ıl wall **					81.78					Г		$\dashv$	(32c)
Interna	ıl wall **					59.75					Г		$\dashv$	(32c)
Interna	l floor					319.5					Г		$\dashv$	(32d)
Interna	l floor					301.7								(32d)
Interna	l floor					219.2	=					_		(32d)
Interna	l ceiling					319.5	=				È			(32e)
	l ceiling					301.7	=				Г			(32e)
	l ceiling					219.2	=				Ē			(32e)
	-		ows, use e	effective wi	ndow U-va	L		formula 1	/[(1/U-valu	ie)+0.04] a	∟ s given in	paragraph	n 3.2	
					ls and par	titions								
		s, W/K :		U)				(26)(30)					446.25	(33)
		Cm = S(	. ,									(32e) =	92835.64845108	=
		•			,	n kJ/m²K				tive Value:			100	(35)
	0	sments wh ad of a de			construct	ion are not	t known pr	ecisely the	indicative	values of	IMP in Ta	able 1t		
Therma	al bridge	es : S (L	x Y) cal	culated	using Ap	pendix ł	<						285.27	(36)
			are not kn	own (36) =	= 0.15 x (3	1)								_
	abric he									(36) =			731.52	(37)
Ventila			i	I monthly					. ,	= 0.33 × (	, , ,		1	
(00)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(20)
(38)m=	854.9	829.66	829.66	783.49	755.92	743.1	730.92	730.92	762.57	783.49	805.85	829.66		(38)
1		coefficier	· · · · · · · · · · · · · · · · · · ·		· · · · ·					= (37) + (3			1	
(39)m=	1586.43	1561.18	1561.18	1515.01	1487.44	1474.62	1462.44	1462.44	1494.1	1515.01	1537.38	1561.18	4540.0	
Heat Ic	oss para	meter (H	HLP), W	′m²K						Average = = (39)m ÷		12 / 12=	1518.2	(39)
(40)m=	1.3	1.28	1.28	1.24	1.22	1.21	1.2	1.2	1.22	1.24	1.26	1.28	]	
									1	Average =	Sum(40)1.	12 /12=	1.24	(40)
Numbe		/s in moi	i i	, ,				1.	-	-			1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	4	(44)
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)

4. Wa	ter heat	ting ener	rgy requi	irement:								kWh/ye	ear:	
if TF				[1 - exp	(-0.0003	349 x (TF	FA -13.9)	)2)] + 0.0	0013 x ( <sup>-</sup>	TFA -13.		33		(42)
Reduce	the annua	al average	hot water	usage by	5% if the a		designed t	(25 x N) to achieve		se target o		4.29		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage i	n litres per	day for ea		,	ctor from T	Table 1c x	Ŭ,						
(44)m=	158.72	152.95	147.17	141.4	135.63	129.86	129.86	135.63	141.4	147.17	152.95	158.72		
Energy o	content of	hot water	used - cal	culated m	onthly = 4.	190 x Vd,n	m x nm x D	)Tm / 3600		Total = Su oth (see Ta			1731.46	(44)
(45)m=	235.94	206.35	212.94	185.64	178.13	153.71	142.44	163.45	165.4	192.76	210.41	228.49		_
lf instant	taneous w	ater heatii	ng at point	of use (no	o hot water	r storage),	enter 0 in	boxes (46,		Total = Su	m(45) <sub>112</sub> =	=	2275.65	(45)
(46)m=	35.39	30.95	31.94	27.85	26.72	23.06	21.37	24.52	24.81	28.91	31.56	34.27		(46)
	storage		clared la	vec facto	r is know	vn (kWh	/dav).					5		(47)
,			m Table				/uay).					.5		(47)
			storage		aar			(47) x (48)	_			54		(48) (49)
						s not kno		(47) x (40)	-		0.	81		(49)
						age with						0		(50)
		-				litres in bo			h (50)					
								enter '0' in	box (50)					
				om labi	е 2 (кvv	h/litre/da	y)					0		(51)
		from Tal	ble 2a m Table	2h								0		(52) (53)
•					oor			((50) x (51	) y (EQ) y (	(52) -		0		
		54) in (5	storage 5)	, KVVII/yt	al			((50) x (51	) X (32) X	(33) =		0 81		(54) (55)
	. , .	, ,	culated f	or each	month			((56)m = (	55) × (41)ı	m	0.	01		(00)
(56)m=	25.11	22.68	25.11	24.3	25.11	24.3	25.11	25.11	24.3	25.11	24.3	25.11		(56)
· · ·												m Append	ix H	()
(57)m=	25.11	22.68	25.11	24.3	25.11	24.3	25.11	25.11	24.3	25.11	24.3	25.11		(57)
	v circuit	loss (an	nual) fro	m Table							3	60		(58)
	-		,			59)m = (	(58) ÷ 36	65 × (41)	m					()
	•				,		. ,	ng and a		r thermo	stat)			
(59)m=	30.58	27.62	30.58	29.59	30.58	29.59	30.58	30.58	29.59	30.58	29.59	30.58		(59)
Combi	loss ca	lculated	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 requ	uired for	water he	eating ca	alculated	l for eacl	h month	(62)m =	0.85 × (	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	291.62	256.65	268.62	239.53	233.81	207.6	198.12	219.13	219.29	248.44	264.3	284.18	-	(62)
Solar DH	-IW input o	calculated	using App	endix G oı	Appendix	H (negati	ve quantity	/) (enter '0'	' if no sola	r contribut	on to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix G	G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)

Output from water heater															
(64)m= 291.6	2 256.65	268.62	239.	53 233.8	1	207.6	219	.13	219.29	248.4	4 264.3	284.18	-		
	Output from water heater (annual)     2931.3     (64)											(64)			
Heat gains from water heating, kWh/month 0.25 x [0.85 x (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m ]															
(65)m= 123	108.85	115.35	104.	4 103.78 94.22 91.91				98.	89	98.11	108.6	4 113.07	120.52	2	(65)
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating															
5. Internal gains (see Table 5 and 5a):															
Metabolic ga	Metabolic gains (Table 5), Watts														
Jan		Mar	Ap	r Ma	y	Jun	Jul	A	ug	Sep	Oct	Nov	Dec	:	
(66)m= 216.5	8 216.58	216.58	216.	58 216.5	B 1	216.58	216.58	216	.58	216.58	216.5	3 216.58	216.58		(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5															
(67)m= 106.12 94.26 76.66 58.03 43.38 36.62 39.57 51.44 69.04 87.66 102.32 109.07								(67)							
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5															
(68)m= 1035.53 1046.28 1019.2 961.55 888.78 820.39 774.7 763.95 791.03 848.68 921.45 989.84									(68)						
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5															
(69)m= 44.66 44.66 44.66		44.6	6 44.66	· ·		4.66 44.66		66	44.66	44.66	44.66	44.66	7	(69)	
Pumps and fans gains (Table 5a)															
(70)m= 10	10	10	10	10	0 10 10		10	1	0	10	10	10	10		(70)
Losses e.g. evaporation (hegative values) (Table 5)															
(71)m= -173.26 -173.26 -173.26 -173.26 -173.26 -173.26 -173.26 -173.26 -173.26 -173.26 -173.26 -173.26 -173.26										(71)					
Water heating gains (Table 5)															
(72)m= 165.32 161.98 155.04 145.61 139.48						130.86	123.53	132	.92	136.26	146.0	2 157.05	161.99		(72)
Total interna	al gains =					(66)	m + (67)m	1 + (68	B)m +	(69)m + (	70)m +	(71)m + (72)	m	_	
(73)m= 1404.9	95 1400.48	1348.87	1263	16 1169.6	52 1	085.85	1035.78	1046	6.29	1094.31	1180.3	4 1278.78	1358.8	в	(73)
6. Solar gai	ns:											•			
Solar gains are	e calculated u	using sola	ar flux f	om Table 6	a an	d assoc	ated equa	tions	to cor	nvert to the	e applic	able orientat	ion.		
Orientation: Access Factor						Flux Table (		g_ Tabla 6			FF Table 6			Gains	
Table 6d		r 	m²		Table 6		Table 6b		Table 6c			(W)			
Northeast 0.9>	••••	×		2.34	x	11.51		× 0.63		0.63	× 0.7		=	16.46	(75)
Northeast 0.9>	•	×		3.36	x	1	11.51			0.63	×	0.7	=	35.46	(75)
Northeast 0.9	•	×		1.4	x	1	11.51			0.63	×	0.7	=	9.85	(75)
Northeast 0.9>		×		1.83	x	1	11.51			0.63	x	0.7	=	12.87	(75)
Northeast 0.9>	•	×		2.4	x	1	11.51			0.63	×	0.7	=	8.44	(75)
Northeast 0.9>		×		2.42	x	11.51		x		0.63	x	0.7	=	17.02	(75)
Northeast 0.9>	••••	×		1.81	x	11.51		x		0.63	x	0.7	=	6.37	(75)
Northeast 0.9>	0.77	×		2.34	x	23.55		x		0.63	×	0.7	=	33.69	(75)
Northeast 0.9>	0	×		3.36	x	23.55		×		0.63	×	0.7	=	72.56	(75)
Northeast 0.9>	••••	×		1.4	×	23.55		×		0.63	x	0.7	=	20.16	(75)
Northeast 0.9>		×		1.83	×	23.55		×		0.63	x	0.7	=	26.35	(75)
Northeast 0.9	0.77	x		2.4	x	23.55		x		0.63	×	0.7	=	17.28	(75)

Northeast 0.9x	0.77	1 🗸	0.40		00.55		0.00	v	0.7	1_1	24.04	(75)
Northeast 0.9x	0.77	X X	2.42	X	23.55	X	0.63	X	0.7	=	34.84	=
Northeast 0.9x	0.77	X X	1.81	x	23.55	X	0.63	x	0.7	=	13.03	(75)
Northeast 0.9x	0.77	) × ] v	2.34	X	41.13	X	0.63	X	0.7	=	58.82	(75)
Northeast 0.9x	0.77	) × ]	3.36	x	41.13	x	0.63	x	0.7	=	126.69	(75)
Northeast 0.9x	0.77	] × ]	1.4	X	41.13	X	0.63	x	0.7	=	35.19	(75)
Northeast 0.9x	0.77	X X	1.83	X	41.13	X	0.63	X	0.7	=	46	(75)
Northeast 0.9x	0.77	] × ]	2.4	X	41.13	X	0.63	X	0.7	=	30.17	(75)
Northeast 0.9x	0.77	) × ] v	2.42	X	41.13	X	0.63	X	0.7	=	60.83	(75)
Northeast 0.9x	0.77	] × ] v	1.81	X	41.13	X	0.63	X	0.7	=	22.75	(75)
Northeast 0.9x	0.77	] × ]	2.34	X	67.8	X	0.63	X	0.7	=	96.97	(75)
Northeast 0.9x	0.77	) × 1 v	3.36	X	67.8	X	0.63	X	0.7	=	208.86	(75)
Northeast 0.9x	0.77	] × ]	1.4	X	67.8	X	0.63	X	0.7	=	58.02	(75)
Northeast 0.9x	0.77	X X	1.83	x	67.8	X	0.63	x	0.7	=	75.83	(75)
Northeast 0.9x	0.77	) × 1 v	2.4	X	67.8	X	0.63	X	0.7	=	49.73	(75)
Northeast 0.9x	0.77	] × ]	2.42	X	67.8	X	0.63	X	0.7	=	100.28	(75)
Northeast 0.9x	0.77	] × ]	1.81	x	67.8	X	0.63	x	0.7	=	37.5	(75)
Northeast 0.9x	0.77	」× 1 ×	2.34	X	89.77	X	0.63	X	0.7	=	128.39	(75)
Northeast 0.9x	0.77	X	3.36		89.77	×	0.63	X	0.7		276.53	(75)
Northeast 0.9x	0.77	] × ] v	1.4	X	89.77	x	0.63	X	0.7	=	76.81	(75)
Northeast 0.9x	0.77	] × ] ×	1.83	x	89.77		0.63	X	0.7	=	100.41	(75) (75)
Northeast 0.9x	0.77	J X 1 V	2.4		89.77	×	0.63	X	0.7	=	65.84	4
Northeast 0.9x	0.77	] × ] v	2.42	X	89.77	X	0.63	X	0.7	=	132.78	(75) (75)
Northeast 0.9x	0.77	] × ] v	1.81	X	89.77	x	0.63	x x	0.7	-	49.65	(75)
Northeast 0.9x	0.77	] × ] ×	2.34 3.36	× ×	97.5 97.5	x	0.63	×	0.7	-	139.45 300.36	(75)
Northeast 0.9x		」 ^ ] ×	L	x		x		x		=	83.43	(75)
Northeast 0.9x	0.77	] ^ ] x	1.4	x	97.5 97.5	x	0.63	x	0.7	-	109.06	(75)
Northeast 0.9x	0.77	] ^ ] x	2.4	x	97.5	x	0.63	x	0.7	=	71.51	(75)
Northeast 0.9x	0.77	) ^ ] x	2.42	x	97.5	x	0.63	x	0.7	=	144.22	(75)
Northeast 0.9x	0.77	) ^ ] x	1.81	x	97.5	x	0.63	x	0.7	=	53.93	(75)
Northeast 0.9x	0.77	) ^   x	2.34	x	92.98	x	0.63	x	0.7	=	132.99	(75)
Northeast 0.9x	0.77	) ^   x	3.36	x	92.98	x	0.63	x	0.7	=	286.43	(75)
Northeast 0.9x	0.77	」 】 ×	1.4	x	92.98	x	0.63	x	0.7	=	79.56	(75)
Northeast 0.9x	0.77	」 】 x	1.83	x	92.98	x	0.63	x	0.7	=	104	(75)
Northeast 0.9x	0.77	」 】 x	2.4	x	92.98	x	0.63	x	0.7	=	68.2	(75)
Northeast 0.9x	0.77	」 】 x	2.42	x	92.98	x	0.63	x	0.7	=	137.53	(75)
Northeast 0.9x	0.77	] x	1.81	x	92.98	x	0.63	x	0.7	=	51.43	(75)
Northeast 0.9x	0.77	] x	2.34	x	75.42	x	0.63	x	0.7	=	107.87	(75)
Northeast 0.9x	0.77	」 】 ×	3.36	x	75.42	x	0.63	x	0.7	=	232.33	(75)
Northeast 0.9x	0.77	x	1.4	x	75.42	x	0.63	x	0.7	=	64.54	(75)
Northeast 0.9x	0.77	x	1.83	x	75.42	x	0.63	x	0.7	=	84.36	(75)
L		L		I		I			L	1		<b>_</b> ` ′

Northeast 0.9x		1		۱		1				1 1		
L	0.77	×	2.4	×	75.42	X 	0.63	X	0.7	=	55.32	(75)
Northeast 0.9x	0.77	×	2.42	X	75.42	X	0.63	x	0.7	=	111.56	(75)
Northeast 0.9x	0.77	X	1.81	X	75.42	X 	0.63	x	0.7	=	41.72	(75)
Northeast 0.9x	0.77	X	2.34	X	51.24	X	0.63	x	0.7	=	73.29	(75)
Northeast 0.9x	0.77	X	3.36	X	51.24	X	0.63	x	0.7	=	157.86	(75)
Northeast 0.9x	0.77	X	1.4	X	51.24	X	0.63	x	0.7	=	43.85	(75)
Northeast 0.9x	0.77	X	1.83	X	51.24	X	0.63	x	0.7	=	57.32	(75)
Northeast 0.9x	0.77	X	2.4	x	51.24	×	0.63	x	0.7	=	37.59	(75)
Northeast 0.9x	0.77	×	2.42	X	51.24	×	0.63	x	0.7	=	75.8	(75)
Northeast 0.9x	0.77	x	1.81	x	51.24	X	0.63	x	0.7	=	28.35	(75)
Northeast 0.9x	0.77	x	2.34	x	29.6	X	0.63	x	0.7	=	42.33	(75)
Northeast 0.9x	0.77	x	3.36	x	29.6	x	0.63	x	0.7	=	91.18	(75)
Northeast 0.9x	0.77	x	1.4	x	29.6	×	0.63	x	0.7	=	25.33	(75)
Northeast 0.9x	0.77	x	1.83	x	29.6	x	0.63	x	0.7	=	33.11	(75)
Northeast 0.9x	0.77	x	2.4	×	29.6	x	0.63	x	0.7	=	21.71	(75)
Northeast 0.9x	0.77	x	2.42	x	29.6	x	0.63	x	0.7	=	43.78	(75)
Northeast 0.9x	0.77	x	1.81	x	29.6	x	0.63	x	0.7	=	16.37	(75)
Northeast 0.9x	0.77	x	2.34	X	14.52	x	0.63	x	0.7	=	20.77	(75)
Northeast 0.9x	0.77	x	3.36	х	14.52	x	0.63	x	0.7	=	44.75	(75)
Northeast 0.9x	0.77	x	1.4	x	14.52	×	0.63	×	0.7	=	12.43	(75)
Northeast 0.9x	0.77	x	1.83	X	14.52	x	0.63	x	0.7	=	16.25	(75)
Northeast 0.9x	0.77	<b>x</b>	2.4	×	14.52	х	0.63	x	0.7	=	10.65	(75)
Northeast 0.9x	0.77	x	2.42	x	14.52	x	0.63	x	0.7	=	21.48	(75)
Northeast 0.9x	0.77	x	1.81	×	14.52	x	0.63	x	0.7	=	8.03	(75)
Northeast 0.9x	0.77	x	2.34	x	9.36	x	0.63	x	0.7	=	13.39	(75)
Northeast 0.9x	0.77	x	3.36	x	9.36	x	0.63	x	0.7	=	28.84	(75)
Northeast 0.9x	0.77	x	1.4	x	9.36	x	0.63	x	0.7	=	8.01	(75)
Northeast 0.9x	0.77	x	1.83	x	9.36	x	0.63	x	0.7	=	10.47	(75)
Northeast 0.9x	0.77	x	2.4	x	9.36	x	0.63	x	0.7	=	6.87	(75)
Northeast 0.9x	0.77	x	2.42	x	9.36	x	0.63	x	0.7	=	13.85	(75)
Northeast 0.9x	0.77	x	1.81	x	9.36	x	0.63	x	0.7	=	5.18	(75)
Southeast 0.9x	0.77	x	1.28	x	37.39	x	0.63	x	0.7	=	29.25	(77)
Southeast 0.9x	0.77	x	2.38	x	37.39	x	0.63	x	0.7	=	54.39	(77)
Southeast 0.9x	0.77	x	1.28	x	63.74	x	0.63	x	0.7	=	49.86	(77)
Southeast 0.9x	0.77	x	2.38	x	63.74	x	0.63	x	0.7	=	92.72	(77)
Southeast 0.9x	0.77	<b>x</b>	1.28	×	84.22	×	0.63	x	0.7	=	65.89	(77)
Southeast 0.9x	0.77	x	2.38	x	84.22	×	0.63	x	0.7	=	122.51	(77)
Southeast 0.9x	0.77	x	1.28	x	103.49	<b>x</b>	0.63	x	0.7	=	80.97	(77)
Southeast 0.9x	0.77	x	2.38	×	103.49	×	0.63	x	0.7	=	150.55	(77)
Southeast 0.9x	0.77	×	1.28	×	113.34	×	0.63	x	0.7	=	88.67	(77)
Southeast 0.9x	0.77	x	2.38	x	113.34	x	0.63	x	0.7	=	164.87	(77)

Southeast 0.9x	0.77	1	4.00		445.04		0.00	v	0.7	1_1	00.04	7(77)
Southeast 0.9x	0.77	×	1.28	X	115.04	x	0.63	x	0.7	=	90.01	(77)
Southeast 0.9x	0.77	×	2.38	×	115.04	x	0.63	x	0.7	=	167.36	(77)
Southeast 0.9x	0.77	X X	1.28	x	112.79	X	0.63	x	0.7	=	88.24	(77)
Southeast 0.9x	0.77	X X	2.38	X	112.79	x	0.63	x	0.7	=	164.08	(77)
Southeast 0.9x	0.77	X	1.28	x	105.34	x	0.63	x	0.7	=	82.42	(77)
Southeast 0.9x	0.77	×	2.38	×	105.34	x	0.63	x	0.7	=	153.24	(77)
Southeast 0.9x	0.77	X	1.28	X	92.9	X	0.63	x	0.7	=	72.68	(77)
Southeast 0.9x	0.77	X	2.38	X	92.9	X	0.63	x	0.7	=	135.14	(77)
L	0.77	X	1.28	X	72.36	X	0.63	x	0.7	=	56.61	(77)
Southeast 0.9x	0.77	X	2.38	X	72.36	x	0.63	x	0.7	=	105.27	(77)
Southeast 0.9x	0.77	×	1.28	X	44.83	x	0.63	x	0.7	=	35.07	(77)
L	0.77	X	2.38	X	44.83	x	0.63	x	0.7	=	65.21	(77)
Southeast 0.9x	0.77	X	1.28	X	31.95	X	0.63	x	0.7	=	25	(77)
Southeast 0.9x	0.77	X	2.38	X	31.95	X	0.63	x	0.7	=	46.48	(77)
Southwest <sub>0.9x</sub>	0.77	X	3.36	X	37.39		0.63	x	0.7	=	230.08	(79)
Southwest <sub>0.9x</sub>	0.77	×	3.36	X	37.39		0.63	x	0.7	=	230.08	(79)
Southwest <sub>0.9x</sub>	0.77	×	3.36	X	37.39		0.63	x	0.7	=	230.08	(79)
Southwest0.9x	0.77	×	3.36	X	37.39		0.63	x	0.7	=	191.73	(79)
Southwest0.9x	0.77	x	3.36	х	63.74		0.63	x	0.7	=	392.22	(79)
Southwest0.9x	0.77	×	3.36	x	63.74		0.63	×	0.7	=	<b>3</b> 92.22	(79)
Southwest0.9x	0.77	×	3.36	X	63.74		0.63	x	0.7	=	<b>3</b> 92.22	(79)
Southwest <sub>0.9x</sub>	0.77	x	3.36	x	63.74		0.63	x	0.7	=	<mark>3</mark> 26.85	(79)
Southwest <sub>0.9x</sub>	0.77	x	3.36	x	84.22		0.63	x	0.7	=	518.25	(79)
Southwest0.9x	0.77	x	3.36	x	84.22		0.63	x	0.7	=	5 <mark>18.25</mark>	(79)
Southwest <sub>0.9x</sub>	0.77	x	3.36	x	84.22		0.63	x	0.7	=	518.25	(79)
Southwest <sub>0.9x</sub>	0.77	x	3.36	x	84.22		0.63	x	0.7	=	431.87	(79)
Southwest <sub>0.9x</sub>	0.77	×	3.36	x	103.49		0.63	x	0.7	=	636.85	(79)
Southwest <sub>0.9x</sub>	0.77	x	3.36	x	103.49		0.63	x	0.7	=	636.85	(79)
Southwest <sub>0.9x</sub>	0.77	x	3.36	x	103.49		0.63	x	0.7	=	636.85	(79)
Southwest0.9x	0.77	x	3.36	x	103.49		0.63	x	0.7	=	530.71	(79)
Southwest <sub>0.9x</sub>	0.77	x	3.36	x	113.34		0.63	x	0.7	=	697.45	(79)
Southwest <sub>0.9x</sub>	0.77	×	3.36	x	113.34		0.63	x	0.7	=	697.45	(79)
Southwest0.9x	0.77	x	3.36	x	113.34		0.63	x	0.7	=	697.45	(79)
Southwest <sub>0.9x</sub>	0.77	x	3.36	x	113.34		0.63	x	0.7	=	581.21	(79)
Southwest <sub>0.9x</sub>	0.77	x	3.36	x	115.04		0.63	x	0.7	=	707.96	(79)
Southwest0.9x	0.77	×	3.36	×	115.04		0.63	x	0.7	=	707.96	(79)
Southwest0.9x	0.77	×	3.36	x	115.04		0.63	x	0.7	=	707.96	(79)
Southwest0.9x	0.77	×	3.36	x	115.04		0.63	x	0.7	=	589.97	(79)
Southwest0.9x	0.77	×	3.36	x	112.79		0.63	x	0.7	=	694.1	(79)
Southwest0.9x	0.77	×	3.36	×	112.79		0.63	x	0.7	=	694.1	(79)
Southwest <sub>0.9x</sub>	0.77	×	3.36	x	112.79		0.63	x	0.7	=	694.1	(79)

Southwest0.9x       0.77       x       3.36       x       105.34       0.63       x       0.77       =       648.25       (7         Southwest0.9x       0.77       x       3.36       x       105.34       0.63       x       0.77       =       648.25       (7         Southwest0.9x       0.77       x       3.36       x       105.34       0.63       x       0.77       =       648.25       (7         Southwest0.9x       0.77       x       3.36       x       105.34       0.63       x       0.77       =       648.25       (7         Southwest0.9x       0.77       x       3.36       x       105.34       0.63       x       0.77       =       540.21       (7         Southwest0.9x       0.77       x       3.36       x       92.9       0.63       x       0.77       =       571.67       (7         Southwest0.9x       0.77       x       3.36       x       92.9       0.63       x       0.77       =       476.39       (7         Southwest0.9x       0.77       x       3.36       x       72.36       0.63       x       0.77       =       445.31	Southwesto.9x	0.77												
Southwest0.9x       0.77       x $3.36$ x $105.34$ $0.63$ x $0.7$ = $648.25$ (7)         Southwest0.9x       0.77       x $3.36$ x $105.34$ $0.63$ x $0.7$ = $648.25$ (7)         Southwest0.9x       0.77       x $3.36$ x $105.34$ $0.63$ x $0.7$ = $648.25$ (7)         Southwest0.9x       0.77       x $3.36$ x $92.9$ $0.63$ x $0.7$ = $571.67$ (7)         Southwest0.9x $0.77$ x $3.36$ x $92.9$ $0.63$ x $0.7$ = $571.67$ (7)         Southwest0.9x $0.77$ x $3.36$ x $92.9$ $0.63$ x $0.7$ $=       571.67       (7)         Southwest0.9x       0.77       x       3.36       x       72.36 0.63       x       0.7 =       445.31       (7)       50.63 0.7 =       445.31 (7) 50.63 0.7 =$	Southwoote		] 1		1		] 1				]		(79)	
Southwest0, 9x       0.77       x       3.36       x       105.34       0.63       x       0.77       =       648.25       (7)         Southwest0, 9x       0.77       x       3.36       x       105.34       0.63       x       0.77       =       540.21       (7)         Southwest0, 9x       0.77       x       3.36       x       92.9       0.63       x       0.77       =       571.67       (7)         Southwest0, 9x       0.77       x       3.36       x       92.9       0.63       x       0.77       =       571.67       (7)         Southwest0, 9x       0.77       x       3.36       x       92.9       0.63       x       0.77       =       571.67       (7)         Southwest0, 9x       0.77       x       3.36       x       92.9       0.63       x       0.77       =       445.31       (7)         Southwest0, 9x       0.77       x       3.36       x       72.36       0.63       x       0.77       =       445.31       (7)         Southwest0, 9x       0.77       x       3.36       x       72.36       0.63       x       0.77       =       275.			1		X		]				=		(79)	
Southwest0,9x $0.77$ x $3.36$ x $105.34$ $0.63$ x $0.7$ $=$ $540.21$ (7)         Southwest0,9x $0.77$ x $3.36$ x $92.9$ $0.63$ x $0.7$ $=$ $571.67$ (7)         Southwest0,9x $0.77$ x $3.36$ x $92.9$ $0.63$ x $0.7$ $=$ $571.67$ (7)         Southwest0,9x $0.77$ x $3.36$ x $92.9$ $0.63$ x $0.7$ $=$ $571.67$ (7)         Southwest0,9x $0.77$ x $3.36$ x $92.9$ $0.63$ x $0.7$ $=$ $476.39$ (7)         Southwest0,9x $0.77$ x $3.36$ x $72.36$ $0.63$ $x$ $0.7$ $=$ $445.31$ (7) $5000000000000000000000000000000000000$			1 1		1		]				1		(79)	
Southwest0.9x $0.77$ x $3.36$ x $92.9$ $0.63$ x $0.7$ = $571.67$ (7)         Southwest0.9x $0.77$ x $3.36$ x $92.9$ $0.63$ x $0.7$ = $571.67$ (7)         Southwest0.9x $0.77$ x $3.36$ x $92.9$ $0.63$ x $0.7$ = $571.67$ (7)         Southwest0.9x $0.77$ x $3.36$ x $92.9$ $0.63$ x $0.7$ = $571.67$ (7)         Southwest0.9x $0.77$ x $3.36$ x $92.9$ $0.63$ x $0.7$ = $445.31$ (7)         Southwest0.9x $0.77$ x $3.36$ x $72.36$ $0.63$ x $0.7$ = $445.31$ (7)         Southwest0.9x $0.77$ x $3.36$ x $72.36$ $0.63$ x $0.7$ = $445.31$ (7)         Southwest0.9x $0.77$ x $3.36$ x $44.83$ $0.63$		0.77	X	3.36	X	105.34	]	0.63	X	0.7	=	648.25	(79)	
Southwesto.9x $0.77$ x $0.63$ x $0.77$ xSouthwesto.9x $0.77$ x $3.36$ $92.9$ $0.63$ x $0.77$ zSouthwesto.9x $0.77$ x $3.36$ $92.9$ $0.63$ x $0.77$ zSouthwesto.9x $0.77$ x $3.36$ $72.36$ $0.63$ x $0.77$ zSouthwesto.9x $0.77$ x $3.36$ $72.36$ $0.63$ x $0.77$ zSouthwesto.9x $0.77$ x $3.36$ $x$ $0.63$ $x$ $0.77$ $z$ Southwesto.9x $0.77$ $x$ $3.36$ $x$ $44.83$ $0.63$ $x$ $0.77$ $z$ $3.36$ $x$ $0.63$ $x$ $0.77$ $z$ $3.36$ $x$ $44.83$ $0.63$ $x$ $0.77$ $z$ <th colspan<="" td=""><td></td><td>0.77</td><td>X</td><td>3.36</td><td>X</td><td>105.34</td><td></td><td>0.63</td><td>X</td><td>0.7</td><td>=</td><td>540.21</td><td>(79)</td></th>	<td></td> <td>0.77</td> <td>X</td> <td>3.36</td> <td>X</td> <td>105.34</td> <td></td> <td>0.63</td> <td>X</td> <td>0.7</td> <td>=</td> <td>540.21</td> <td>(79)</td>		0.77	X	3.36	X	105.34		0.63	X	0.7	=	540.21	(79)
Southwesto,9x       0.77       x       3.36       x       92.9       0.63       x       0.7       =       571.67       (7         Southwesto,9x       0.77       x       3.36       x       92.9       0.63       x       0.7       =       476.39       (7         Southwesto,9x       0.77       x       3.36       x       92.9       0.63       x       0.7       =       476.39       (7         Southwesto,9x       0.77       x       3.36       x       72.36       0.63       x       0.7       =       445.31       (7         Southwesto,9x       0.77       x       3.36       x       72.36       0.63       x       0.7       =       445.31       (7         Southwesto,9x       0.77       x       3.36       x       72.36       0.63       x       0.7       =       445.31       (7         Southwesto,9x       0.77       x       3.36       x       44.83       0.63       x       0.7       =       275.85       (7         Southwesto,9x       0.77       x       3.36       x       44.83       0.63       x       0.7       =       275.85       (7		0.77	×	3.36	X	92.9	]	0.63	X	0.7	=	571.67	(79)	
Southwest0.9x $0.77$ x $3.36$ x $92.9$ $0.63$ x $0.77$ Southwest0.9x $0.77$ x $3.36$ x $72.36$ $0.63$ x $0.77$ $445.31$ $(7)$ Southwest0.9x $0.77$ x $3.36$ x $72.36$ $0.63$ x $0.77$ $445.31$ $(7)$ Southwest0.9x $0.77$ x $3.36$ x $72.36$ $0.63$ x $0.77$ $445.31$ $(7)$ Southwest0.9x $0.77$ x $3.36$ x $72.36$ $0.63$ $x$ $0.77$ $x$ $3.36$ $x$ $72.36$ $0.63$ $x$ $0.77$ $x$ $3.36$ $x$ $445.31$ $(7)$ Southwest0.9x $0.77$ $x$ $3.36$ $x$ $44.83$ $0.63$ $x$ $0.77$ $x$ $3.36$ $x$														

							, <u> </u>						<b>-</b>
Rooflights 0.9x	1	×	6.1		×	116		0.63		0.7	=	282.23	(82)
Rooflights 0.9x	1	x	6.1	3	×	68		0.63		0.7	=	165.44	(82)
Rooflights 0.9x	1	x	6.1	3	×	33	×	0.63		0.7	=	80.29	(82)
Rooflights 0.9x	1	x	6.1	3	x	21	x	0.63	x	0.7	=	51.09	(82)
Solar gains in w	· · ·					- 4000.00	<u>rí</u>	Sum(74)m .	<u> </u>	400450	070.00		(02)
(83)m= 1144.97			3721.7	4294.97	4443.8		3880.45	3198.43	2332.94	1384.52	970.68		(83)
Total gains – in			. ,	· ,	· ,		4000 7/	4000 74	0540.00	0000.0	0000 50	l	(84)
(84)m= 2549.92	3415.57	4167.49	4984.86	5464.59	5529.7.	2 5358.8	4926.74	4292.74	3513.28	2663.3	2329.56		(04)
7. Mean intern	al tempe	erature	(heating	season	)								
Temperature of	during he	eating p	eriods ir	n the livir	ng area	from Tal	ble 9, Tl	h1 (°C)				21	(85)
Utilisation fact	or for gai	ins for li	iving are	ea, h1,m	(see T	able 9a)						1	
Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m= 1	0.99	0.99	0.97	0.94	0.87	0.76	0.78	0.93	0.98	1	1		(86)
Mean internal	temperat	ture in l	iving are	ea T1 (fo	ollow st	eps 3 to 7	7 in Tab	le 9c)					
(87)m= 17.71	17.98	18.47	19.05	19.76	20.34	20.72	20.69	20.14	19.3	18.34	17.81		(87)
Temperature of	durina he	ating p	eriods ir	rest of	dwellin	a from Ta	able 9. T	- [h2 (°C)	-	-	-		
(88)m= 19.85	19.86	19.86	19.89	19.91	19.92	19.93	19.93	19.91	19.89	19.88	19.86		(88)
	or for goi		not of d	volling	h 2 m (a								
Utilisation fact	0.99	0.98	0.97	0.92	0.83		9a) 0.68	0.9	0.98	0.99	1		(89)
										0.33			(00)
Mean internal	· ·						<u> </u>	_	<u> </u>				(00)
(90)m= 15.41	15.8	16.52	17.37	18.41	19.23	19.72	19.7	18.96	17.74	16.34	15.55		(90)
									rla = livin	ig area ÷ (4	4) =	0.04	(91)
Mean internal	temperat	ture (fo	r the wh	ole dwe	lling) =	$fLA \times T1$	+ (1 – f	LA) × T2					
(92)m= 15.5	15.89	16.6	17.44	18.46	19.28	19.76	19.74	19.01	17.81	16.42	15.64		(92)
Apply adjustm	ent to the	e mean	internal		ature fr	om Table	T	ere appro	opriate		•	1	
(93)m= 15.5	15.89	16.6	17.44	18.46	19.28	19.76	19.74	19.01	17.81	16.42	15.64		(93)
8. Space heat													
Set Ti to the m the utilisation f					ed at s	tep 11 of	Table 9	b, so tha	t Ti,m=(	76)m an	d re-calc	culate	
Jan	Feb	Mar	Apr	May	Jun	Jul		Sep	Oct	Nov	Dec		
Utilisation fact				iviay	Jun	Jui	Aug	Sep			Dec		
(94)m= 0.99	0.98	0.97	0.94	0.89	0.79	0.63	0.65	0.86	0.96	0.99	0.99		(94)
Useful gains, ł													
(95)m= 2529.46		4040.87	4703.9	4858.72	4375.5	3351.01	3223.86	3707.06	3361.09	2630.21	2313.63		(95)
Monthly avera	ae exterr	nal tem	perature	e from Ta	able 8	_ <b>I</b>				I			
(96)m= 4.5	5	6.8	8.7	11.7	14.6	16.9	16.9	14.3	10.8	7	4.9		(96)
Heat loss rate	for mear	n intern	al tempe	erature,	L Lm,W	=[(39)m	x [(93)n	n– (96)m	1	1			
(97)m= 17451.8 1			· ·		1			7038.74		14482.85	16770.01		(97)
Space heating	requirer	ment for	r each m	nonth, k\	Nh/mo	-1000	24 x [(97	7)m – (95	j)m] x (4	1)m		l de la constante de	
(98)m= 11102.23	9164.94 8	8378.47	6146.86	3871.58	0	0	0	0	5397.32	8533.9	10755.54		
<b>-</b>							Tot	al per year	(kWh/yea	r) = Sum(9	8)15,912 =	63350.85	(98)
Space heating	ı reauirer	nent in	kWh/m²	/vear								51.81	(99)
	,			,									

9a. Energy requiren	nents – Inc	lividual h	eating sy	ystems i	ncluding	micro-C	CHP)					
Space heating:			. /							I		
Fraction of space I				mentary	•		(204)				0	(201)
Fraction of space h		-	. ,			$(202) = 1 \cdot$		(202)]			1	(202)
Fraction of total he	•	-				(204) = (2	02) <b>x</b> [1 –	(203)] =			1	(204)
Efficiency of main	-	• •			<i></i>					·	175	(206)
Efficiency of secon		1		g system	· · · · · · · · · · · · · · · · · · ·	· · · · · ·					0	(208)
Jan Fe		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWł	n/year
Space heating req	`	1	i Ó	0	0	0	0	5397.32	8533.9	10755.54		
(211)m = {[(98)m x					Ů	Ů	Ů	0001102		10100101		(211)
6344.13 5237	1	1	2212.33	0	0	0	0	3084.18	4876.51	6146.02		(211)
II			<u> </u>		ļ	Tota	l (kWh/yea	ar) =Sum(2	2 <b>11)</b> <sub>15,1012</sub>		36200.4	9 (211)
Space heating fue	(seconda	ry), kWh	/month									
= {[(98)m x (201)] +	(214) m }	x 100 ÷ (	(208)		i	1	i			i		
(215)m= 0 0	0	0	0	0	0	0	0	0	0	0		
						Tota	l (kWh/yea	ar) =Sum(2	215) <sub>15,10</sub> 12	2=	0	(215)
Water heating	optor (ople	ulated a	(hour)									
Output from water h		239.53	233.81	207.6	198.12	219.13	219.29	248.44	264.3	284.18		
Efficiency of water h	eater										175	(216)
(217)m= 175 175	175	175	175	175	175	175	175	175	175	175		(217)
Fuel for water heating												
(219)m = (64)m x (219)m = 166.64 146.0		136.88	133.61	118.63	113.21	125.22	125.31	141.97	151.03	162.39	1	
						Tota	I = Sum(2	19a) <sub>112</sub> =		ļ	1675.03	3 (219)
Annual totals								k\	Nh/year	r	kWh/y	vear
Space heating fuel	used, mair	n system	1								36200.4	9
Water heating fuel u	sed										1675.03	3
Electricity for pumps	, fans and	l electric	keep-ho	t								
central heating pur	np:									130		(230c)
Total electricity for t	ne above,	kWh/yea	ar			sum	of (230a).	(230g) =			130	(231)
Electricity for lightin	9										1874.19	(232)
12a. CO2 emissior	ıs – Indivio	dual heat	ting syste	ems inclu	uding mi	cro-CHF	)					
				En	ergy			Emiss	ion fac	tor	Emissi	ons
					/h/year			kg CO2			kg CO2	
Space heating (mai	n system 1	)		(21	1) x			0.51	17	=	18715.6	5 (261)
Space heating (sec	ondary)			(21	5) x			0		=	0	(263)
Water heating				(219	9) x			0.51	17	=	865.99	(264)
Space and water he	ating			(26	1) + (262)	+ (263) + (	264) =				19581.6	4 (265)
Electricity for pumps	, fans and	l electric	keep-ho	t (23 <sup>-</sup>	1) x			0.51	17	=	67.21	(267)

(232) x Electricity for lighting = 968.96 (268) 0.517 sum of (265)...(271) = Total CO2, kg/year (272) 20617.81 **Dwelling CO2 Emission Rate** (272) ÷ (4) = (273) 16.86 El rating (section 14) (274) 78



				User D	etails:						
Assessor Name: Software Name:	Stroma FS	AP 200		roperty	Stroma Softwa Address:	are Ver	sion:	t	Versic	on: 1.5.0.69	
Address :	62, Avenue	Road, L	ONDON	, NW8 6	6HT						
1. Overall dwelling dime	ensions:										
-					a(m²)		Ave He		-	Volume(m <sup>3</sup> )	
Basement				3	82.22	(1a) x	3	.2	(2a) =	1223.1	(3a)
Ground floor				3	19.56	(1b) x	3	.2	(2b) =	1022.59	(3b)
First floor				3	01.73	(1c) x	;	3	(2c) =	905.19	(3c)
Second floor				2	19.26	(1d) x	2	.8	(2d) =	613.93	(3d)
Total floor area TFA = (1	a)+(1b)+(1c)+	(1d)+(1e	)+(1r	12	222.77	(4)					
Dwelling volume						(3a)+(3b)	)+(3c)+(3d)	)+(3e)+	.(3n) =	3764.81	(5)
2. Ventilation rate:											
	main heating		econdai eating	У	other		total			m <sup>3</sup> per hou	r
Number of chimneys	0	+	0	+	0	] = [	0	X	40 =	0	(6a)
Number of open flues	0	] + [	0	<u>]</u> + [	0	] = [	0	x	20 =	0	(6b)
Number of intermittent fa	ans			- 7			3	x	10 =	30	(7a)
Number of passive vents	3					Ē	0	X	10 =	0	(7b)
Number of flueless gas f	ires					Ē	0	x ·	40 =	0	(7c)
									Air ch	anges per ho	ur
Infiltration due to chimne	•						30		÷ (5) =	0.01	(8)
If a pressurisation test has b Number of storeys in t			d, procee	d to (17), (	otherwise d	ontinue fro	om (9) to (1	16)		0	(9)
Additional infiltration		,						[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel o	r timber f	rame or	0.35 fo	r masonr	y constr	uction			0	(11)
if both types of wall are p deducting areas of openi			oonding to	the great	er wall area	a (after					
If suspended wooden	•		ed) or 0.	1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	nter 0.05, else	enter 0								0	(13)
Percentage of window	s and doors dr	aught st	ripped							0	(14)
Window infiltration					0.25 - [0.2					0	(15)
Infiltration rate			_		(8) + (10) ·					0	(16)
Air permeability value,					•		etre of ei	nvelope	area	10	(17)
If based on air permeabi Air permeability value applie							is heina us	ed		0.51	(18)
Number of sides on which			20011 001		9.00 uli pel	ousinty I	is boing us			2	(19)
Shelter factor					(20) = 1 - [	0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorpora	ting shelter fac	tor			(21) = (18)	x (20) =				0.43	(21)
Infiltration rate modified	for monthly wir	nd speed					·			1	
Jan Feb	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		

Monthl	y avera	ge wind	speed f	rom Tabl	e 7								_	
(22)m=	5.4	5.1	5.1	4.5	4.1	3.9	3.7	3.7	4.2	4.5	4.8	5.1		
Wind F	actor (2	22a)m =	(22)m ÷	4										
(22a)m=	1.35	1.27	1.27	1.12	1.02	0.98	0.92	0.92	1.05	1.12	1.2	1.27		
Adjuste	ed infiltr	ation rat	e (allow	ing for sh	nelter an	d wind s	peed) =	= (21a) x	(22a)m					
	0.58	0.55	0.55	0.49	0.44	0.42	0.4	0.4	0.45	0.49	0.52	0.55		
		<i>ctive air</i> al ventila	•	rate for t	he appli	cable ca	se			-			0	(23a)
				endix N, (2	3b) = (23a	ı) × Fmv (e	equation (	N5)) , othe	rwise (23	b) = (23a)			0	(23b)
lf bala	anced wit	h heat reco	overy: effic	iency in %	allowing for	or in-use f	actor (froi	n Table 4h	) =				0	(23c)
a) If	balance	ed mecha	anical ve	entilation	with hea	at recove	əry (MV	HR) (24a	a)m = (2	2b)m + (	23b) × [	1 – (23c)	÷ 100]	
(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If	balance	ed mecha	anical ve	entilation	without	heat rec	covery (	MV) (24b	)m = (2	2b)m + (	23b)			
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
,						•		on from o			,			
	. ,		r`´´		, ,		r È		ŕ	).5 × (23b				(24c)
(24c)m=			0		0	0			0	0	0	0	_	(240)
					· ·			on from I 0.5 + [(2		( 0.5]				
(24d)m=	0.67	0.65	0.65	0.62	0.6	0.59	0.58	0.58	0.6	0.62	0.63	0.65		(24d)
Effe	ctive air	change	rate - er	nter ( <mark>24a</mark>	) or (24b	o) or (24	c) or (24	ld) in bo	(25)			-		
(25)m=	0.67	0.65	0.65	0.62	0.6	0.59	0.58	0.58	0.6	0.62	0.63	0.65		(25)
3. He	at losse	s and he	eat loss	paramete	er:									-
ELEN	IENT	Gros area		Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/I	<b>&lt;</b> )	k-value kJ/m²⋅ł		A X k kJ/K
Doors						1.85	x	2	=	3.7				(26)
Windov	WS					303.84	25 <mark>×</mark>	1/[1/(2)+	0.04] =	562.67				(27)
Floor T	ype 1					382.2	2 X	0.25	=	95.56				(28)
Floor T	ype 2					319.5	6 ×	0.25	=	79.89				(28)
Walls		978	.5	305.6	9	672.8	1 X	0.35	=	235.48				(29)
Roof 7	Гуре1	62.6	66	0		62.66	3 X	0.16	=	10.03				(30)
Roof 7	Гуре2	158.	87	0		158.8	7 X	0.16	=	25.42	$\Box$ [			(30)
Total a	rea of e	elements	, m²			1901.8	31							(31)
Interna	ıl wall *'	r				78.84	Ļ				[			(32c)
Interna	ıl wall *'	r				77.61					[			(32c)
Interna	ıl wall *'	r				81.78	3				[			(32c)
Interna	ıl wall *'	•				59.75	5				[			(32c)
Interna	l floor					319.5	6				[			(32d)
Interna	l floor					301.7	3				[			(32d)

Interna	al floor					219.2	6				Γ			(32d)
Interna	al ceiling					319.5	6				Ē			(32e)
Interna	al ceiling					301.7	3				Γ			(32e)
Interna	al ceiling					219.2	6				Ē			(32e)
	ndows and de the area						ated using	formula 1	/[(1/U-valı	ıe)+0.04] a	as given in	paragraph	3.2	
Fabric	heat los	s, W/K =	= S (A x	U)				(26)(30)	+ (32) =				1012.74	(33)
Heat o	capacity	Cm = S(	Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	80003.904	(34)
Therm	al mass	parame	ter (TMF	- = Cm -	÷ TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
	ign assess used instea				construct	ion are noi	t known pr	ecisely the	e indicative	e values of	TMP in Te	able 1f		
Therm	al bridge	es : S (L	x Y) cal	culated	using Ap	pendix l	<						209.2	(36)
	s of therma		are not kn	10wn (36) =	= 0.15 x (3	1)								_
	abric he									(36) =			1221.94	(37)
Ventila	ation hea			i	Í	l .	I	Γ.	· · ·	· · · · ·	25)m x (5)	_	l	
(00)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(20)
(38)m=	832.25	809.45	809.45	767.76	742.87	731.28	720.28	720.28	748.87	767.76	787.96	809.45		(38)
	ransfer o									= (37) + (3				
(39)m=	2054.2	2031.4	2031.4	1989.71	1964.81	1953.23	1942.23	1942.23	1970.82		2009.9	2031.4	4000 50	(39)
Heat l	oss para	meter (H	HLP), W	/m²K						average = = (39)m ÷	Sum(39) <sub>1.</sub> (4)	12 / 1 <b>Z</b> =	1992.58	(39)
(40)m=	1.68	1.66	1.66	1.63	1.61	1.6	1.59	1.59	1.61	1.63	1.64	1.66		
										Average =	Sum(40)1.	12 /12=	1.63	(40)
Numb	er of day													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(44)
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ater heat	ing ener	gy requ	irement:								kWh/ye	ear:	
	ned occu											33		(42)
	<sup>-</sup> A > 13.9 -A £ 13.9	,	+ 1.76 x	: [1 - exp	(-0.0003	849 x (TF	FA -13.9	)2)] + 0.0	0013 x (	TFA -13.	.9)			
	l averag	,	ater usad	ae in litre	es per da	av Vd.av	erage =	(25 x N)	+ 36		144	1.29		(43)
Reduce	the annua	al average	hot water	usage by	5% if the c	welling is	designed			se target o				
not mor	e that 125			r	ater use, i I	not and co. I	· · · · ·						I	
Hot wat	Jan er usage ii	Feb	Mar day for or	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
			-		i		·	1	444.4	4 47 47	450.05	450.70		
(44)m=	158.72	152.95	147.17	141.4	135.63	129.86	129.86	135.63	141.4	147.17	152.95 m(44) <sub>112</sub> =	158.72	1731.46	(44)
Energy	content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	m x nm x D	0Tm / 3600			ables 1b, 1		1731.40	(++)
(45)m=	235.94	206.35	212.94	185.64	178.13	153.71	142.44	163.45	165.4	192.76	210.41	228.49		_
lf instar	ntaneous w	ater heatii	ng at point	t of use (no	o hot wate	r storage),	enter 0 in	boxes (46		Total = Su	m(45) <sub>112</sub> =		2275.65	(45)
(46)m=	35.39	30.95	31.94	27.85	26.72	23.06	21.37	24.52	24.81	28.91	31.56	34.27		(46)
	storage							•		•	·			
a) If m	anufactu	urer's de	clared lo	oss facto	or is knov	vn (kWh	/day):					0		(47)

Tempe	erature f	actor fro	m Table	e 2b								0		(48)
Energy	y lost fro	om water	storage	e, kWh/ye	ear			(47) x (48)	) =			0	1	(49)
			2	nder loss									1	
			,	ng any s		0		•			1:	50		(50)
	-	-		n dwelling,					have (50)					
				nis includes			,	enter 0 m	DOX (50)				1	
		-		rom Tab	le 2 (kW	h/litre/da	iy)				0.	02		(51)
		from Ta										93	1	(52)
		actor fro									0.	54		(53)
•••			-	e, kWh/ye	ear			((50) x (51	1) x (52) x	(53) =		44	1	(54)
	. , .	54) in (5		<b>f</b>				((50))			1.	44		(55)
vvater			culated	for each	montn			((56)m = (	(55) × (41)	m			1	
(56)m=	44.53	40.22	44.53	43.09	44.53	43.09	44.53	44.53	43.09	44.53	43.09	44.53		(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	ix H	
(57)m=	44.53	40.22	44.53	43.09	44.53	43.09	44.53	44.53	43.09	44.53	43.09	44.53	I	(57)
Primar	y circuit	loss (ar	nual) fr	om Table	e 3						6	10	1	(58)
Primar	y circuit	loss cal	culated	for each	month (	59)m = (	(58) ÷ 36	65 × (41)	m					
(mo	dified by	factor f	rom Tab	ole H5 if t	here is s	solar wat	er heati	ng and a	a cylinde	r thermo	stat)			
(59)m=	51.81	46.79	51.81	50.14	51.81	50.14	51.81	51.81	50.14	51.81	50.14	51.81		(59)
Combi	loss ca	lculated	for each	n 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	leat reg	uired for	water h	i eating ca	alculated	for eac	n month	(62)m =	0.85 x (	(45)m +	(46)m +	(57)m +	(59)m + (6 <sup>-</sup>	1)m
(62)m=	332.27	293.36	309.27	278.87	274.46	246.94	238.77	259.78	258.63	289.09	303.64	324.83		(62)
		L calculated	using Apr	l pendix G ol	L Appendix	H (negativ		I v) (enter '0	l Vif no sola	r contribut	<u> </u>	er heating)		
				and/or \		-						5/		
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	t from w	ı ater hea	ı ter	1		1								
(64)m=	332.27	293.36	309.27	278.87	274.46	246.94	238.77	259.78	258.63	289.09	303.64	324.83	1	
(- )											r (annual)1		3409.93	(64)
Heat a	ains fro	m water	heating	, kWh/m	onth 0.2	5 v [0 85	v (15)m							` `
(65)m=	· · · · · ·	138.22	147.87	136.31	136.3	125.69	124.43	131.42	129.58	141.16	144.54	153.04	· J	(65)
· · /													opting	()
				of (65)m	-	synnaer is	s in the t	uwening	of not w		om com	munity n	eating	
5. In	ternal ga	ains (see	e l able :	5 and 5a	):									
Metab		ns (Table										_	1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	(22)
(66)m=	216.58	216.58	216.58	216.58	216.58	216.58	216.58	216.58	216.58	216.58	216.58	216.58		(66)
-	g gains	(calcula	ted in A	ppendix	L, equat	ion L9 oi	r L9a), a	lso see	Table 5				I	
(67)m=	156.94	139.39	113.36	85.82	64.15	54.16	58.52	76.07	102.1	129.64	151.31	161.3	I	(67)
Applia	nces ga	ins (calc	ulated in	n Appeno	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5	-			
(68)m=	1035.53	1046.28	1019.2	961.55	888.78	820.39	774.7	763.95	791.03	848.68	921.45	989.84	I	(68)
Cookir	ng gains	(calcula	ted in A	ppendix	L, equat	tion L15	or L15a	), also se	ee Table	5				
(69)m=	44.66	44.66	44.66	44.66	44.66	44.66	44.66	44.66	44.66	44.66	44.66	44.66	1	(69)
Pumps	and fa	ns gains	(Table	5a)	•	•								
(70)m=	10	10	10	, 10	10	10	10	10	10	10	10	10	1	(70)
	L	ļ	I	I	I	I		ļ	ļ	ļ	ļ			

Losses	s e.g. e	vaporatio	n (nega	tive valu	es) (Ta	ble	5)									
(71)m=	-173.26	-173.26	-173.26	-173.26	-173.26	-1	73.26	-173.26	-173	.26	-173.26	-173.26	6 -173.26	-173.26		(71)
Water	heating	gains (T	able 5)	-												
(72)m=	209.03	205.69	198.75	189.32	183.19	1	74.57	167.24	176	.63	179.97	189.73	200.76	205.7		(72)
Total i	nterna	l gains =				_	(66)	m + (67)n	n + (68	3)m +	(69)m + (	70)m + (	(71)m + (72)	)m		
(73)m=	1499.47	1489.33	1429.28	1334.66	1234.1	1	147.1	1098.44	1114	4.63	1171.08	1266.02	2 1371.49	1454.82		(73)
	lar gain															
-			-			and			ations			e applica	able orientat	tion.	0	
Orienta		Access F Table 6d	actor	Area m²			Flu Tal	x ble 6a			g_ able 6b	-	FF Table 6c		Gains (W)	
East	0.9x	1	x	303	.84	x	1	9.87	×		0.72	] × [	0.7	=	2108.95	(76)
East	0.9x	1	x	303	.84	x	3	8.52	x		0.72		0.7	=	4087.74	(76)
East	0.9x	1	x	303	.84	x	6	1.57	x		0.72		0.7	=	6533.53	(76)
East	0.9x	1	x	303	.84	x	g	1.41	x		0.72		0.7	=	9700.74	(76)
East	0.9x	1	x	303	.84	x	1	11.22	x		0.72	_ × [	0.7	=	11803.04	(76)
East	0.9x	1	x	303	.84	x	1	16.05	x		0.72	<b>x</b>	0.7	=	12315.87	(76)
East	0.9x	1	x	303	.84	x	1	12.64	x		0.72	x	0.7		11953.95	(76)
East	0.9x	1	x	303	.84	x	g	8.03	x		0.72	x	0.7		10403.79	(76)
East	0.9x	1	×	303	.84	x		73.6	] ×		0.72	x	0.7	=	7811.1	(76)
East	0.9x	1	x	303	.84	x	4	6.91	] x		0.72	x	0.7	=	4978.1	(76)
East	0.9x	1	x	303	.84	x	2	4.71	<b>_</b> x		0.72	× [	0.7	=	2621.97	(76)
East	0.9x	1	x	303	.84	x	1	6.39	x		0.72	× [	0.7	=	1739.68	(76)
	1	watts, ca		i i i i i i i i i i i i i i i i i i i		- T		-	<u> </u>		ım(74)m .		-	1		(22)
		4087.74							1040	3.79	7811.1	4978.1	2621.97	1739.68		(83)
10tar g (84)m=		internal a		(04)III = 11035.41	. ,	<u>`</u>			1151	0 42	0002 10	6244.4	2 2002 46	3194.49		(84)
				I		_	+02.97	13032.39	1151	0.42	0902.10	0244.1.	5 5993.40	5194.49		(04)
		rnal temp								-	(20)					
		during h	• •			-			ole 9	, I h 1	(°C)				21	(85)
Utilisa	r	ctor for ga				ТÌ –		, 			San	Oct	Nov	Dee		
(86)m=	Jan 1	гер 1	Mar 0.99	Apr 0.97	May 0.9	-	Jun 0.77	Jul 0.57	0.6	ug 33	Sep 0.92	Oct 0.99	Nov 1	Dec 1		(86)
												0.00				(00)
Mean (87)m=	18.88	al temperation 19.11	19.53	living are	ea 11 († 20.54	-	w ste	ps 3 to 7 20.96	( in 1 20.	- T	9C) 20.65	20	19.3	18.93		(87)
						-						20	19.5	10.95		(07)
	r	during h		r		-			<u> </u>	-	. ,	10.0	10.50	40.57		(00)
(88)m=	19.56	19.57	19.57	19.6	19.61	1	9.62	19.63	19.	63	19.61	19.6	19.59	19.57		(88)
	r	ctor for g		-		-			ŕ				-	1		
(89)m=	1	1	0.99	0.96	0.86	(	0.66	0.4	0.4	15	0.85	0.99	1	1		(89)
Mean	interna	al temper		1	of dwel	ling	T2 (f	ollow ste	eps 3	to 7	in Tabl	e 9c)	_			
(90)m=	17.65	17.88	18.31	18.82	19.3	1	9.55	19.62	19.	62	19.41	18.8	18.08	17.7		(90)
											f	LA = Liv	ing area ÷ (	4) =	0.04	(91)
Mean	interna	al temper	ature (fo	or the wh	ole dwe	ellin	g) = fl	_A × T1	+ (1	– fL/	A) × T2		-i			
(92)m=	17.7	17.93	18.36	18.87	19.35	·	19.6	19.67	19.	67	19.46	18.85	18.13	17.75		(92)

Apply	adjustn	nent to t	he mear	n interna	l temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	17.7	17.93	18.36	18.87	19.35	19.6	19.67	19.67	19.46	18.85	18.13	17.75		(93)
8. Sp	ace hea	ting requ	uirement	t										
				mperatui using Ta		ed at ste	ep 11 of	Table 9t	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	u ains, hm	. ·	· · ·			5						
(94)m=	1	1	0.99	0.95	0.85	0.65	0.41	0.45	0.84	0.98	1	1		(94)
Usefu	l gains,	hmGm	, W = (94	4)m x (84	4)m									
(95)m=	3606.82	5564.66	7874.57	10519.98	11051.81	8801.43	5288.22	5232.05	7553.31	6141.07	3988.89	3193.51		(95)
Month	nly aver	age exte	rnal tem	perature	e from Ta	able 8								
(96)m=	4.5	5	6.8	8.7	11.7	14.6	16.9	16.9	14.3	10.8	7	4.9		(96)
Heat	loss rate	e for me	an interr	al tempe	erature,	Lm , W =	=[(39)m x	x [(93)m·	– (96)m	]				
(97)m=	27107.43	26275.18	23473.32	20226.2	15039.69	9771.44	5388.64	5381.36	10168.74	16009.26	22378.56	26110.32		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k\	Nh/mont	h = 0.02	4 x [(97)	)m – (95	)m] x (4 <sup>-</sup>	1)m			
(98)m=	17484.46	13917.47	11605.47	6988.48	2966.98	0	0	0	0	7341.93	13240.56	17050.11		
								Tota	l per year	(kWh/year	) = Sum(98	8)15,912 =	90595.46	(98)
Space	e heatin	a reauire	ement in	kWh/m²	²/vear								74.09	(99)
						votomo i	ooluding	mioro	חחי					
			ns – mu	ividual h	eating s	ystems i								
	e heatir on of sp	-	at from s	econdar	y/supple	mentary	system						0.1	(201)
Fracti	ion of sp	ace hea	t from n	nain syst	em(s)			(202) = 1 -	- (201) =				0.9	(202)
Fracti	on of to	tal heati	ng from	main sys	stem 1			(204) = (20	02) × [1 –	(203)] =		·	0.9	(204)
Efficie	encv of i	nain spa	ace heat	ing syste	em 1								78.9	(206)
				ementar		a system	0 %				1		100	(208)
Linoid	-		· · ·	<u> </u>	1			Δ	0	0.1		Du		
Creat	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
•		<u> </u>	· · ·	alculate 6988.48	· · · · · · · · · · · · · · · · · · ·	0	0	0	0	7244 02	13240.56	17050 11		
							0	0	0	7541.95	13240.50	17050.11		
(211)m				10)m } x	· · · · ·	· ·								(211)
	19944.25	15875.45	13238.18	7971.65	3384.39	0	0	0	0		15103.3			<b>-</b>
								lota	I (KVVN/yea	ar) = Sum(2)	211) <sub>15,1012</sub>	=	103340.83	(211)
•		•		y), kWh/										
				( 100 ÷ (	<u> </u>									
(215)m=	1748.45	1391.75	1160.55	698.85	296.7	0	0	0	0	734.19	1324.06			<b>-</b>
								lota	I (KVVh/yea	ar) = Sum(2)	215) <sub>15,1012</sub>	-	9059.55	(215)
	heating													
Output				ulated a		040.04	000 77	050 70	050.00	000.00	202.04	224.02		
<b>F</b> #isis	332.27	293.36	309.27	278.87	274.46	246.94	238.77	259.78	258.63	289.09	303.64	324.83		
	-	ater hea	1										68.8	(216)
(217)m=		78.64	78.57	78.41	77.83	68.8	68.8	68.8	68.8	78.42	78.61	78.66		(217)
		-	kWh/mo (217) ÷ (											
. ,	422.41	373.07	393.63	355.65	352.62	358.92	347.05	377.59	375.91	368.66	386.24	412.95		
		-				-			I = Sum(2'				4524.72	(219)
										114				(=)

Annual totals		kWh/year	kWh/year
Space heating fuel used, main system 1			103340.83
Space heating fuel used, secondary			9059.55
Water heating fuel used			4524.72
Electricity for pumps, fans and electric keep-hot			
central heating pump:		130	(230c)
boiler with a fan-assisted flue		45	(230e)
Total electricity for the above, kWh/year	sum of (230a)	(230g) =	175 (231)
Electricity for lighting			2771.63 (232)
12a. CO2 emissions - Individual heating systems	including micro-CHP		
	<b>Energy</b> kWh/year	Emission factor kg CO2/kWh	<b>Emissions</b> kg CO2/year
Space heating (main system 1)	(211) x	0.194 =	20048.12 (261)
Space heating (secondary)	(215) x	0.422 =	3823.13 (263)
Water heating	(219) x	0.194 =	877.8 (264)
Space and water heating	(261) + (262) + (263) + (264) =		24749.05 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.422 =	73.85 (267)
Electricity for lighting	(232) x	0.422 =	1169.63 (268)
Total CO2, kg/year TER =	sum	of (265)…( <del>271) =</del>	25992.52 (272) 22.64 (273)

# **Predicted Energy Assessment**

62, Avenue Road LONDON NW8 6HT

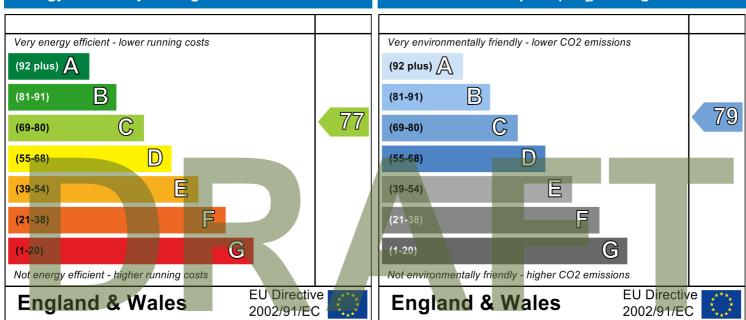
Dwelling type: Date of assessment: Produced by: Total floor area: Detached House 08 December 2011 Stroma Certification 1222.77 m<sup>2</sup>

Environmental Impact (CO<sub>2</sub>) Rating

This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2009 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.

#### **Energy Efficiency Rating**



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be. The environmental impact rating is a measure of a home's impact on the environment in terms of carbonn dioxide (CO2) emissions. The higher the rating the less impact it has on the environment.

