Outline Application

NW Bicester Planning Application 1

Energy Statement



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NW Bicester

Energy Statement

Application 1: Land to the North of the Railway Line and A4095 Lords Lane and West of B4100 Banbury Road, surrounding Lords Farm and Hawkwell Farm, Bicester, Oxfordshire

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A2Dominion

NW Bicester

Energy Statement

Strategic Review - Energy

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1 Introduction

This Energy Statement has been prepared by Hyder Consulting Ltd in support of the outline planning **Application 1** of the North West (NW) Bicester development.

The proposed energy strategy has been guided by the following key principles:

- To meet all relevant local and national planning policy
- To be an exemplar in sustainability (whilst maintaining technical and financial viability)
- To adopt a fabric first approach to ensure that carbon emission reductions are secured for the lifetime of the development
- To mitigate adverse impacts on the surrounding environment.
- To be flexible so as to provide longevity to any proposed strategy within an evolving climate.
- To ensure the successful integration with the rest of the NW Bicester development.

The NW Bicester development is intended to provide a new form of sustainable community within Cherwell District, and to extend the benefits of this community to the existing town of Bicester. The first part of the NW Bicester development was the Exemplar Site development located in the northwest part which is currently under construction.

The statement provides a summary of the relevant planning policy and Building Regulations requirements to which Application 1 will be constructed. The statement then establishes a baseline assessment of the predicted energy demands and associated carbon emissions (based upon current Building Regulations 2013) before investigating the potential means of achieving the developments energy reduction and carbon emission targets.

Whilst this Energy Statement is specifically relevant to Application 1, it needs to be considered in the context of the energy strategy for the wider NW Bicester Development.

2 Preferred Strategic Approach

This statement, prepared on behalf of A2Dominion, progresses the options outlined within the Masterplan Energy Strategy (ref: Report No. 5022-UA005241-UE21R-01) relative to this Application. The masterplan and related documents set out the spatial vision to provide up to 6000 new homes at NW Bicester and were prepared in accordance with Planning Policy Statement: Eco-Towns A Supplement to Planning Policy Statement 1 (July 2009).

The Masterplan Energy Strategy identified various combined technology approaches to achieve the true zero carbon target - defined in the PPS1 Eco towns supplement as "over a year the net carbon dioxide emissions from all energy use within the buildings on the eco-town development as a whole are zero or below" (Policy ET7.1). The Masterplan Energy Strategy recognised that whilst certain technologies may go a considerable way to meeting demands and creating carbon savings; no one technology can fulfil the site's total energy demand and carbon reduction target. Therefore a combined technology solution will be required.

The strategic options considered within the Masterplan Energy Strategy were focused on achieving true zero carbon through predominantly on-site technology rather than any significant reliance on off-site/off-set allowable solutions. However, whilst a preferred approach was identified it was recognised that further optimisation of the available technical solutions would continue as detailed design progresses; such as refinement of available roof area for PV, selection and sizing of CHP engines and associated thermal store to optimise delivery of the thermal demand carbon emission reductions. The preferred strategic approach to enable the true zero carbon target to be met for the NW Bicester development was identified as follows:

- Enhanced fabric energy efficiency standards,
- Site wide District Heat Network (DHN) providing all thermal demand across the site; linked to Energy Centres,
- On-site Energy Centres that include Low Zero Carbon (LZC) technologies that will meet thermal demands and provide sufficient carbon emissions reduction to meet zero carbon target; in combination with,
- Roof mounted PV optimised relative to layout and building design.

The approach was selected because:

- Technically it can achieve the true zero carbon target (i.e. delivering carbon emission savings relative to both regulated and unregulated emissions).
- Ability to be delivered entirely on-site and therefore not have any reliance on any third party agreements.
- Experience of delivering a similar solution, utilising DHN and Energy Centre with LZC, on the first phase Exemplar site of NW Bicester.
- Ability to deliver homes that maintain a traditional design approach.
- Inclusion of a DHN within the preferred option enables future proofing relative to new technology (which can be plugged into the energy centres) and/or potential connection to waste heat from the Ardley Energy from Waste (EfW) facility.

3 Development Overview

The proposals, within a total site area of 154.82 hectares, can be summarised as follows:

- Retention of the existing storage building adjacent to Bucknall Road;
- Provision of up to 2,600 new homes (Use Class C3) across 66.97 hectares of net residential land, to include up to 250 homes to be provided on an 'Extra Care' basis (Use Class C3);
- 1.02 hectares of land to accommodate commercial uses (falling within Use Classes A1-A5, B1 and B2) within a new local centre;
- 0.47 hectares of land to accommodate social and community facilities (Use Class D1) including a community hall;
- 2.22 hectares of land to accommodate a new two form entry primary school and playing fields;
- 0.88 hectares of land to accommodate an extension to the primary school approved as part of the Exemplar (LPA reference 10/01780/HYBRID);
- Provision of 67.26 hectares of green infrastructure (circa 45% of the total site area) excluding school playing fields but including 4 hectares to be offered to the Council as a burial ground, 2 hectares of allotments and 1 hectare of community farm;
- 0.2 hectares of land to accommodate an energy centre where on-site energy will be generated through low carbon technology such as a biomass boiler and/ or biomass or gas Combined Heat and Power plant ('CHP');
- Quantum and tenure split of affordable homes to be determined through viability assessment;
- New homes to be constructed to achieve a minimum of Code for Sustainable Homes Level 5;
- All residential units to be designed to Lifetime Homes standards;
- Commercial buildings constructed to achieve BREEAM 'excellent';
- Development as a whole to be 'true' zero carbon (taking in to account regulated and unregulated energy as defined in the PPS1 Supplement) to be achieved through a range of measures including high performance building fabric, reduced energy consumption, renewable and low carbon energy generation;
- Water Treatment Works to be provided on-site subject to technical considerations;
- Retention of the majority of existing trees and hedgerows and provision of strategic landscaping;
- Adoption of a range of measures to encourage a net gain in biodiversity;
- New roads, cycle routes and pedestrian footpaths including the partial realignment of Bucknell Road with routes designed to give priority to buses, cyclists and pedestrians.

3.1 Development Schedule

The following tables provide a summary of the anticipated development schedule of the site which have been used as the basis for energy demand and carbon emission calculation throughout this report.

Table 3.1 Propos	ed Residentia	al Units		
Dwelling Type	Total Units	Unit Area (m ²)	Total Unit Area (m ²)	No. of Occupants "N" SAP box 42
1 Bed Apartment	320	62.66	20,051	1.87
2 Beds House (Mid Terrace)	1,060	83.00	87,980	2.64
3 Beds House (Semi Detached)	827	97.54	80,666	2.76
4 Beds House (End Terrace)	281	113.34	31,849	2.85
5 Beds House (Detached)	109	150.00	16,350	2.89
Total	2600		236,896	

Table 3.1 Proposed Residential Units

Table 3.2: Proposed Non-Residential Units

Building Type	Total Area	GIA (m ²)
Primary School	46,400	14,700
A2 Business Hub	4,00	360
B1 Commercial business	5,000	3500
B2 Commercial business	2,300	885.5
Nursery	1,000	500
Large Community hall on two floors	2,210	1271
1 adult learning rooms	115	57.5
2 neighbourhood police rooms	185	92.5
1 early intervention centre storage rooms	45	22.5
visitor centre room	1,150	575
Retail and restaurant	2,500	1,250
Energy Production	2,000	400
Total		23,614

NW Bicester Application 1 — Energy Statement

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4 Planning Policy Requirements and Targets

4.1 Introduction

This section provides a summary of the relevant national, regional and local policy relative to energy and carbon emission reduction. Current and future Building Regulations and the Government's approach to delivering zero carbon homes are also summarised. This is intended as an overview of the key policy and regulatory requirements that need to be met and considered as part of the scheme.

In addition, the aspirations of the client are highlighted to provide a concise and consolidated view of the targets that the scheme seeks to meet as it develops out.

The policy landscape around Climate Change has been rapidly moving with many new policies and changes to existing policy over the last number of years which will influence the way in which the energy strategy for the scheme may come forward. It is also safe to suggest that policy will continue to evolve over the period in which the development progresses; and therefore maintaining flexibility in any strategy is crucial to facilitating continued sustainable development.

4.2 National Planning and Policy Requirements

The Climate Change Act (2008)

The Climate Change Act 2008 introduced a legally binding target to reduce the UK's greenhouse gas (GHG) emissions to at least 80 per cent below 1990 levels by 2050. It also provides for a Committee on Climate Change (CCC) which sets out carbon budgets binding on the Government for 5 year periods.

In Budget 2009 the first three carbon budgets were announced which set out a binding 34% CO₂ reduction by 2020 and the Government has now proposed that the fourth carbon budget will be a 50% CO₂ reduction by 2025. The CCC also produces annual reports to monitor progress in meeting these carbon budgets. As a result of the Climate Change Act, a raft of policy at national and local level has been developed aimed at reducing carbon emissions.

The levels of the first three carbon budgets were set in fiscal budget 2009 at the "interim" level recommended by the CCC prior to global agreement on emissions reductions. The carbon budgets require a reduction in greenhouse gas emissions of 34%, against 1990 levels, by 2020. The fourth carbon budget level was set in June 2011. The carbon budget for the 2023–2027 budgetary period is 1,950,000,000 tonnes of carbon dioxide equivalent.

UK Low Carbon Transition Plan (2009)

The previous Government launched the UK Low Carbon Transition Plan on 15th July 2009. The Plan includes the Renewable Energy Strategy (white paper) and Low Carbon Industrial Strategy. The UK Low Carbon Transition Plan is a Government white paper that sets out policies required to ensure that the UK meets its legally binding commitment to reduce carbon emissions by 34% by 2020. Policies contained in the documents include:

- Getting 40% of our electrical energy from low and zero carbon sources by 2020
- Rolling out smart meters in every home by 2020

National Planning Policy Framework

The National Planning Policy Framework was published on 27 March 2012 and sets out the Government's planning policies for England and how these are expected to be applied. It sets out the Government's requirements for the planning system only to the extent that it is relevant, proportionate and necessary to do so. It provides a framework within which local people and their accountable councils can produce their own distinctive local and neighbourhood plans, which reflect the needs and priorities of their communities.

As of 27th March 2013 (12 months from the day of publication), Annex 1 of the NPPF confirms that due weight should be given to relevant policies in existing plans according to their degree of consistency with the NPPF (the closer the policies in the plan to the policies in the Framework, the greater the weight that may be given). It also confirms that, from the day of publication, decision-takers may also give weight to relevant policies in emerging plans according to:

- the stage of preparation of the emerging plan (the more advanced the preparation, the greater the weight that may be given);
- the extent to which there are unresolved objections to relevant policies (the less significant the unresolved objections, the greater the weight that may be given); and
- the degree of consistency of the relevant policies in the emerging plan to the policies in the NPPF (the closer the policies in the emerging plan to the policies in the NPPF, the greater the weight that may be given).

The NPPF was designed to make the planning system more user friendly and transparent. The framework's primary objective is sustainable development, focussing on the 3 pillars of sustainability: planning for prosperity (Economic), planning for people (Social) and planning for places (Environmental).

At the heart of the NPPF is a presumption in favour of sustainable development. The NPPF identifies 12 principles that should be at the core of land use planning; these include:

 "support the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change, and encourage the reuse of existing resources, including conversion of existing buildings, and encourage the use of renewable resources (for example, by the development of renewable energy)".

Further guidance within the NPPF is given under the heading "Meeting the challenge of climate change, flooding and coastal change"; including:

- supporting the delivery of renewable and low carbon energy infrastructure; and
- reduce greenhouse gas emissions

4.3 Planning Policy Statement 1 Eco town supplement

NW Bicester (NWB) is identified in the supplement to PPS1 entitled 'The Planning Policy Statement: Eco-Towns A Supplement to Planning Policy Statement 1' (July 2009) as one of four locations for an Eco Town. The principle of the development is supported by Cherwell District Council ('the Council') and the land to the north west of Bicester ('the Site') is identified in the emerging Local Plan as the area within which a development following eco-town principles and the standards in PPS1 Supplement could be developed. It is anticipated that the current Government will cancel the current PPS Supplement in due course. Notwithstanding, the requirements of the Supplement to PPS1 will be carried over by Cherwell (subject to review and amendments as necessary) into the Local Plan. The Council has already set out its policy position in respect of NWB in the emerging Local Plan and granted planning permission for the Exemplar Phase of NWB for 393 new homes, local facilities and land for a primary school.

The PPS 1 Eco-town supplement defines zero carbon under paragraph ET 7.1 as:

"over a year the net carbon dioxide emissions from all energy use within the buildings on the eco-town development as a whole are zero or below".

Paragraph ET 7.2 of PPS 1 Eco-town provides further clarification and states

"This standard will take effect in accordance with a phased programme to be submitted with the planning application. It excludes embodied carbon and emissions from transport but includes all buildings – not just houses but also commercial and public sector buildings which are built as part of the eco-town development. The calculation of net emissions will take account of:

- a) emissions associated with the use of locally produced energy
- emissions associated with production of energy imported from centralised energy networks, taking account of the carbon intensity of those imports as set out in the Government's Standard Assessment Procedure, and
- c) emissions displaced by exports of locally produced energy to centralised energy networks where that energy is produced from a plant (1) whose primary purpose is to support the needs of the eco town and (2) has a production capacity reasonably related to the overall energy requirement of the eco town."

The Town and Country Planning Association (TCPA) guidance for the development of energy efficient and zero carbon strategies for eco-towns, December 2009, encourage eco-towns to follow best practice to achieve zero carbon as Exemplar developments.

4.4 Building Regulations (Part L)

As part of the British Governments commitment to cutting carbon emissions by 80%, compared to 1990 levels (by 2050) the government is escalating Building Regulations requirements to reduce carbon emissions within the built environment. The government's proposed trajectory for Building Regulations Part L1A (Conservation of fuel and power in new dwellings) was outlined within Building a Greener Future: A Policy Statement (2007). This outlines the reductions in 'regulated' carbon emissions compared to a Building Regulations (2006) baseline outline in table 3.1 below:

Table 4.1 Carbon reduction improvement compared to Building Regulations 2006

Building type	Part L 2010	Part L 2013	Part L 2016	Part L 2018	Part L 2019
Domestic	25%	30%	Zero Carbon	Zero Carbon	Zero Carbon
Non – domestic	25%	32%	Further improvement	Zero Carbon	Zero Carbon

The latest Building Regulations (2013) came into effect on the 6th April 2014. As outlined above the principal aim for Part L 2013 is to:

- Provide a meaningful step towards the UK Government commitment to zero carbon standards for homes by 2016
- Drive innovation in the right direction
- Aid learning to deliver zero carbon homes.

The methodology for demonstrating compliance combines the carbon emission measure $(kgCO_2/m^2/year)$ calculated for the dwelling, with a 'new' requirement to consider the fabric energy efficiency (FEE) $(kWh/m^2/year)$ of the building envelope. The process of demonstrating compliance uses the calculated carbon emission rate for the building in question and compares this to a target carbon emission rate, also calculated specifically for that building. In Part L terminology, the Dwelling Emission Rate (DER) must be less than the Target Emission Rate (TER). This approach is familiar from Part L 2010.

However, all residential dwellings in NW Bicester will come forward beyond 2016. Likewise, most non-residential (commercial and community etc.) buildings are expected to come forward post 2019. Therefore, the vast majority of buildings will need to achieve Zero Carbon, as defined by the Zero Carbon Homes policy, which represents the exemplar standard for the energy performance of dwellings.

Given the relatively minor reduction between 2010 and 2013 (6% for domestic and 9% nondomestic) the anticipated jump to zero carbon represents a major step change and will almost certainly require additional updates to Part L and how it is implemented. The traditional approach of building regulations is to assess the performance of a building considering only the energy use of the building and only those technologies attached to it and so directly affecting its carbon performance. If this approach were taken to zero carbon buildings it would rely on, extremely expensive, small scale renewable electricity generation. Inevitably this would mean that around half would not be able to meet the target and many of those that could meet the target would be economically unviable.

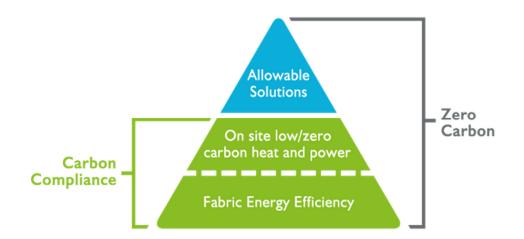
4.5 Achieving Zero Carbon

It was announced in the 2011 Budget 'The Plan for Growth' document, that a 'Zero Carbon Home' requires a 100% reduction in regulated energy (heating, hot water and fixed electrical items – pumps, fans, lights) over Building Regulations 2006. Therefore, emissions from cooking or from appliances such as computers and televisions are excluded from the definition.

The Government's commitment to achieving Zero Carbon Homes is based on the following hierarchical approach to achieving zero carbon targets:

- 1. Mandatory Fabric Energy Efficiency (FEE) Level To ensure energy efficiency by energy efficient building design.
- 2. Mandatory onsite Carbon Compliance Level To ensure energy efficiency by energy efficient building design and to reduce carbon emissions through on-site low carbon and renewable energy technologies and near-site heat networks.
- 3. Mitigate the remaining carbon emissions through use of 'Allowable Solutions'.

Figure 4.1: Showing approach to achieving Zero Carbon homes.



In February 2011 recommendations for national minimum standards of Carbon Compliance – the onsite reductions of emissions – were developed by a Zero Carbon Hub led Task Group. The Task Group found that the proposal from July 2009, to tighten the Carbon Compliance standard by 70% (equivalent to 6 kg $CO_2(eq)/m^2/year$), may not be achievable in all cases. In addition, it was felt that the previous method of calculating carbon compliance level was confusing and now suggest that an absolute limit in terms of CO_2 emissions per m² floor area per annum be the measure used. These are provided in Table 3.2 below.

Built Form	Fabric Standard (kWh/m ² /yr)	Carbon Compliance (kgCO ₂ /m ² /yr)	
Detached houses	46	10	
Semi-detached houses	46	11	
End of terrace	46	11	
Mid terrace	39	11	
Apartment block	39	14	

Table 4.2: Proposed approach to achieving Zero Carbon homes

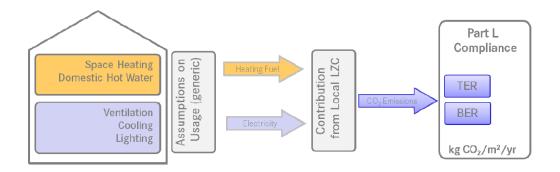
In addition, the task group are set to review and establish the Carbon Compliance limit for higher apartment blocks but the work is still ongoing.

The equivalent definition of 'Zero Carbon' for non-domestic buildings has not progressed to the same level as that of dwellings. However it is expected that a similar framework (energy efficiency, on-site carbon compliance and allowable solutions) will be developed to ensure 'Zero Carbon' is achieved by 2019 (2018 for public sector buildings) for non-domestic buildings.

4.5.1 True Zero Carbon

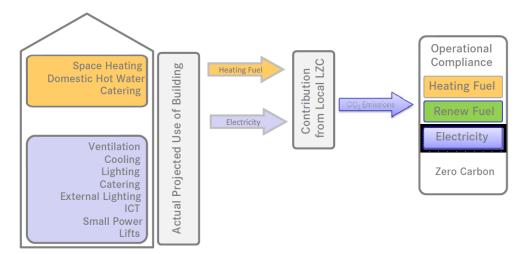
To reach True Zero Carbon, further consideration is needed regarding the operational carbon performance of the development over and above that described above in the standard regulatory approaches of building regulations. This approach recognises that the regulatory view of carbon and energy performance in buildings (see below) only represents a proportion of the actual "in use" energy consumption and carbon emissions.

Figure 4.2: The "regulated carbon emissions" arising from Part L of the building regulations



In addition to the regulatory considerations above, the operation of buildings will include other energy consuming elements and may also be used in a different manner to the standard assumptions made in respect of regulatory compliance – as presented below.





4.5.2 Allowable Solutions

Allowable solutions have been introduced to offer flexibility and options to offset remaining emissions (beyond carbon compliance), when other on-site options are not considered technically and commercially feasible. Therefore, allowable solutions are likely to become central to the overall policy of ensuring that achieving zero carbon is affordable and can be achieved.

However, the Government has not yet defined the scope or price of allowable solutions. It is also unclear as to how allowable solutions may be delivered. The Zero Carbon Hub (Allowable Solutions for Tomorrows New Homes, June 2011)) announced its proposals for a framework for allowable solutions. This was further refined within the Zero Carbon Strategies for Tomorrow's New Homes report released in February 2013.

According to these proposals, the initial choice for developers will be either:

 To pay into a carbon fund (Type 1 Allowable Solution). Here the payments from developers would be accumulated and the fund manager will take responsibility for investing in suitable Allowable Solutions projects - a wide range of carbon-saving projects could qualify as Allowable Solutions. It is expected that Local Planning Authorities will have the option to set up carbon funds and may establish local priorities for particular Allowable Solutions. 2. To invest in carbon-saving projects associated directly with their own developments (Type 2 Allowable Solution).

The range of potential Allowable Solutions can be split into the following options:

- On-site allowable options This might include measures such as smart appliances, site-based heat storage, electricity storage, waste management systems, LED street lights, flexible demand systems, etc
- 2. Near-site allowable options This might include measures such as retrofitting low/zero carbon technologies to communal buildings, creation of local sustainable energy projects/infrastructure such as district heating or wind turbines, communal waste management, local energy storage, electric vehicle charging, etc.
- 3. Off-site allowable options This might include measures such as investing in energy from waste plants, low carbon electricity generation, district heating pipe-work, low carbon cooling, energy storage, flexible demand projects to counterbalance intermittent renewable energy provision, etc.

Allowable solutions will have been designed to deliver the residual carbon emissions equal to that emitted by any new development. It is understood that the developers would pay an allowable solutions provider to deliver the required reductions. Recent DCLG consultation document discusses potential price cap strategy; of which some options would encourage competition between allowable solution providers ensuring that money is invested in the most cost-effective solutions. At present, a price cap has not been defined, however the DCLG consultation document proposes costs of between £36/tCO2 to £90/tCO2; which can make considerable difference to the total cost of achieving zero carbon and the final energy strategy for the development.

Based on the available information, it can be concluded that allowable solutions may be an important part in achieving a developments zero carbon target. Again, the extent to which allowable solutions may be implemented within the development will be determined in the detail design stage of the development, since it will then be possible to establish more accurate energy demands for the buildings.

At this stage, the option to consider the future incorporation of "Allowable Solutions" in the resulting energy strategy is inconsistent with the overall strategy and client aspiration to achieve True Zero Carbon through onsite solutions. It is therefore considered inappropriate for this stage in the design of the development.

4.6 Local Policy

The existing Cherwell Local Plan (1996) saved polices do not specifically consider energy and carbon emissions. The emerging Cherwell Local Plan 2006 – 2031, that was submitted to the Secretary of State for Examination in Public on 31st January 2014, includes policies on energy and carbon emissions however these are not yet adopted.

4.7 Code for Sustainable Homes

To strengthen the sustainability requirements of new dwellings, the Government launched the Code for Sustainable Homes (CSH or 'the Code') in 2006 to operate in parallel to the Building Regulations for energy use for new residential development (Approved Document Part L1A).

CSH sets out the national standard for sustainable design and construction of new homes. The Code includes sections under a number of different sustainability issues which includes; energy use in a home, materials used in the construction and the effect on biodiversity. The Code also addresses issues such as water use within each dwelling, surface water and flooding, health and wellbeing and pollution issues. This document only considers the energy/carbon aspect of the Code.

As discussed above, Part L of the Building Regulations (Conservation of fuel and power) will progressively become more stringent and will eventually require all new dwellings built from 2016 onwards to achieve "zero carbon" status.

The Code for Sustainable Homes (CSH) was introduced as a voluntary measure to provide a comprehensive assessment of the sustainability of a new home and replaced the Eco-Homes methodology. In terms of carbon emissions CSH Level 5 equals a 100% improvement over 2010 Building Regulations (this would equate to circa 20% improvement from 2013 Building Regulations) approximately. The original programme was for all new homes to meet 'Zero carbon' from 2016. The Code Level relates to; compliance with mandatory minimum standards for waste, material, and surface water run-off as well as energy and potable water consumption.

In meeting True Zero Carbon the NW Bicester Development will surpass the energy requirements of CSH Level 5.

4.8 BREEAM

BREEAM (Building Research Establishment's Environmental Assessment Method) is a standard assessment method established by the Building Research Establishment (BRE), used to assess the environmental impact of non-domestic buildings. Overall BREEAM is similar to the Code and covers a range of issues and credits which are awarded where a building achieves a benchmark performance. Like the Code, BREEAM is a voluntary standard although central government and some planning authorities require compliance.

The BRE periodically updates BREEAM and the latest version of BREEAM New Construction came into force in May 2014. The latest version imposes more demanding standards and energy/carbon requirements than the previous standard. Because BRE have applied previous best practice carbon standards before the government has fully decided how to address the future carbon performance of nondomestic buildings, it is likely that the requirements will need to be changed again in the future to align with Part L (2013 and 2016) requirements.

BREEAM (2014) has the following mandatory energy requirements:

- Excellent: Energy Performance Ratio for New Construction of 0.375
- Outstanding: Energy Performance Ratio for New Construction of 0.60

4.9 Summary of Policy Requirements

The various policy and regulations requirements are summarised in table 3.4 below:

Table 4.4: Summary of Application 1 Energy Requirements

Policy	Document	Requirement
Policy Bicester 1 – NW Bicester Eco-Town	Emerging Cherwell Local Plan 2006-2031	True Zero Carbon CSH Level 5 BREEAM Excellent
CSH Level 5 – Ene 1 Dwelling Emission Rate	CSH 2010 Technical Note	100% improvement on 2010 Building Regulations
BREEAM Excellent	BREEAM New Construction 2014	Energy Performance Ratio (EPR _{NC}) of 0.375 (6 credits) or higher.
Building Regulations	Building Regulations 2016 (anticipated)	Zero Carbon from regulated energy

5 Methodology

The carbon dioxide emissions have been calculated by utilising the Building Regulations standards for domestic units; for non-domestic units an estimation has been made using the available benchmarks:

- Residential units: The Government's Standard Assessment Procedure (SAP) for Energy Rating of Dwellings.
- Non-domestic units: Chartered Institute of Building Services Engineers (CIBSE) Energy Benchmark TM 46 - 2008

5.1 Residential Emissions Calculation Methodology

The Target Emissions Rates (TER) for residential units of the proposed development were taken from the SAP (The Government's Standard Assessment Procedure for Energy Rating of Dwellings) assessment performed by using the Stroma FSAP software version 2012.

A sample set of dwellings were selected with the intention of demonstrating the potential energy demands of the proposed residential units. The following dwelling types have been modelled, with the range of dwelling geometries for each type to cater for the worst case:

- Town Centre 1 Bed Apartment (Ground Floor)
- 2 Beds House (Mid Terrace)
- 3 Beds House (Semi Detached)
- 4 Beds House (End Terrace)
- 5 Beds House (Detached)

The above dwellings have been modelled by using SAP software to estimate the TER emissions and energy demands which are covered by Part L of the Building Regulations, known as regulated emissions including space heating, hot water, ventilation, lighting, pumps and fans.

The unregulated emissions i.e. appliances and cooking have been estimated by utilising the SAP methodology formula below.

- A. Calculate the non-regulated carbon emissions (appliances & cooking) by:
 - i. For elec oven, elec hob:

{275 + (55 x N) + 207.8 x (N x TFA)^{0.4714}} x 0.527

ii. For elec oven, gas hob:

{137.5 + (27.5 x N) + 207.8 x (N x TFA)^{0.4714}} x 0.527 + {280.5 + (48.15 x N)} x 0.227

iii. For gas oven, gas hob:

 $\{481 + (96.3 \times N)\} \times 0.227 + \{207.8 \times (N \times TFA)^{0.4714}\} \times 0.527$

Where N = number of occupants, defined in SAP2009 (Table 1b) by:

The emissions have been calculated based upon an assumption that all houses will use electric appliances in order to reduce infrastructure costs associated with gas pipework. The above formula has been taken from Carbon Compliance Zero Carbon Hub's document, Modelling 2016 using SAP 2009 Technical Guide.

5.2 Non-Residential Emissions Calculation Methodology

The Chartered Institute of Building Services Engineers (CIBSE) describes the statutory building energy benchmarks prepared to complement the Operational Rating procedure developed by the Department of Communities and Local Government (CLG) for Display Energy Certificates (EPC) for use in England, Wales and Northern Ireland.

CIBSE carried out various studies and develops the benchmark proposals based upon CIBSE Guide F and Energy Consumption guide ECG19. There are currently 29 benchmark categories listed under this document, which also sets the energy consumption benchmarks of a typical building type. The benchmarks are expressed in terms of delivered energy used per unit of floor area, (i.e. kWh/m²) for both electrical and fossil fuel of energy use. This generally covers lighting, heating, cooling, appliances, standard IT and small tea rooms/spaces.

The following non-domestic units have been used to estimate the energy demands on the basis of their gross internal area,

- A1 Shops Retail shops etc.
- A2 Business Hubs
- A3 Food & Drink Restaurants/ Café
- B1 Business Office/ Light Industrial
- B2 to B8 Commercial
- D2 Assembly & Leisure
- Schools & education establishments
- Public Buildings

The above building classification has been used to estimate the target emissions under Building Regulations 2013. At this outline stage this is the best practice approach which can be adopted to demonstrate the carbon emissions and proposed improvements. These predicted energy demands and emissions have been used for estimation purposes, however, it is recognised that more detailed energy modelling will be undertaken at later design stage when building detailed designs have been formalised.

6 Baseline Energy Demand and Carbon Emission

In order to establish the approximate baseline energy demand (both thermal and electrical) for the development, an energy model has been produced. The assessment of the energy performance of the proposed design solution is based on the energy consumption of 'notional' domestic and non-domestic buildings on site which are compliant with Part L 2013 Building Regulations.

The residential energy demand was calculated using information regarding regulated energy consumption abstracted from a series of sample Standard Assessment Procedure (SAP) reports developed to provide typical residential dwelling types to develop preliminary energy benchmarks for domestic buildings. The assumptions on which the SAP calculations have been undertaken are as follows:

- Roof sizes are estimated as the exact roof dimensions are not available;
- Quantities and dimensions of openings (windows and doors) for each dwelling type are estimated;
- The differing types of openings and their dimensions are assumed to be the same for all dwelling types;
- Cooling is assumed not to be provided to any of the dwellings;
- Natural ventilation
- All internal and external lighting used throughout the dwellings is energy efficient.

A conservative approach has been adopted in the assumptions made for the purposes of the SAP calculations. This approach gives a degree of comfort since neither the worst case or best-case scenario is used and therefore incorporates an element of flexibility.

The energy consumption for space heating, hot water and electricity for lighting, pumps and fans per m² have been determined and derived from sample SAPs for each typical dwelling (see Appendix B). The average energy consumption for space heating, hot water and electricity for lighting per m² was calculated which is used as an energy benchmark for the energy demand assessment of each dwelling type.

Given that this is an outline planning application, there is still some uncertainty about the energy needs of the future occupants of non-domestic buildings. Without knowing the occupants or precise uses of the proposed units, it is difficult to accurately predict the energy demand. As such, standard benchmarks taken from CIBSE publication TM46 2008 and Guide F have been used to estimate as far as possible non-domestic energy use but there are a couple of issues with this approach. Firstly, there are multiple benchmarks for B1-B2 uses with wide differences between chilled and standard units and, secondly, the benchmarks are intended to be representative of the UK building stock as a whole and so tend to estimate higher heat demand than would typically be required for new buildings. This approach will tend to overestimate the overall energy demand.

Therefore, the non-domestic energy benchmarks, which reflect Part L 2013 Building Regulations and have been determined by assuming that the CIBSE TM46 and GUIDE F energy benchmarks, are reflective of energy consumption of 2006 Part L compliant buildings and so have been reduced by 10% to obtain the energy demand for non-domestic buildings. These benchmarks were used in the energy model to determine the baseline energy demand.

The following tables provide a summary of the energy demand and carbon emission relative to anticipated accommodation schedule of Application 1 of the NW Bicester development. The tables provide the baseline energy demand and carbon emission values based upon meeting Building Regulations 2013.

Table 6.1Residential - Baseline Energy Demand and Carbon Emission (Building
Regulations 2013)

Residential Buildings	BR2013 Building Demand	BR2013 Building Emissions
Total Regulated Electricity	1,228,290.70 kWh	637,483 kgCO2
Total Regulated Fossil Gas	14,141,912.46 kWh	3,054,653 kgCO2
Sub Total Regulated	15,370,203.16 kWh	3,692,136 kgCO2
Total Un-regulated Electricity	8,144,414 kWh	4,226,951 kgCO2
Total Un-regulated Gas	-	-
Sub Total Un-regulated	8,144,414 kWh	4,226,951 kgCO2
TOTAL	23,514,617 kWh	7,919,087 kgCO2

Table 6.2Non - Residential - Baseline Energy Demand and Carbon Emission (BuildingRegulations 2013)

The below table provides a summary of the total energy demand and carbon emission for Application 1 of the proposed NW Bicester Development.

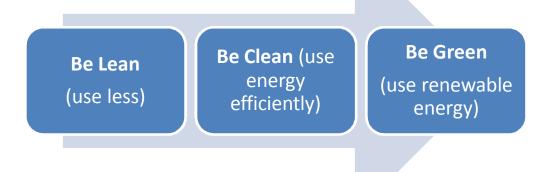
Table 6.3All Buildings - Baseline Energy Demand and Carbon Emission (Building
Regulations 2013)

Total Regulated Electricity Total Regulated Gas	1,957,739 kWh 15,796,893 kWh	1,016,066 kgCO2 3,412,129 kgCO2
Sub Total Regulated Total Un-regulated Electricity	17,754,632 kWh 8,946,005 kWh	4,428,195 kgCO2 4,642,977 kgCO2
Total Un-regulated Gas Sub Total Un-regulated	937,125 kWh 9,883,130 kWh	202,419 kgCO2 4,845,396 kgCO2
TOTAL	27,637,762 kWh	9,273,591 kgCO2

Strategic Approach and Carbon Reduction Targets

This report considers the strategic energy approach that may be adopted at the site to meet policy and regulatory requirements as well as client aspirations. The strategies considered follow the energy hierarchy outlined below:

- 1. **Be Lean:** Use less energy. Minimise energy demand through efficient design and the incorporation of passive measures;
- 2. **Be Clean:** Supply energy efficiently. Reduce energy consumption through use of low-carbon technology; and
- 3. Be Green: Use renewable energy systems.



The first principle stresses the primacy of seeking to reduce energy consumption. Within the built environment this comprises adopting energy efficiency measures in both the design and construction of new buildings. The second principle addresses the 'clean' supply of energy issue. This will require 'decarbonising' and improving efficiency in the generation and distribution of energy. The third principle comprises the use of 'green' energy systems. These are renewable sources of energy with low or zero carbon emissions and include, amongst others, solar generated heat and power, wind energy and biomass.

7.1 Energy Efficiency Measures (Be Lean)

7.1.1 Approach

7

The 'Be Lean' approach seeks to minimise energy use through demand reduction and passive measures, such as maximising insulation and use of natural ventilation, which minimise the use of energy and utilise energy more effectively (e.g. energy efficient lighting). The NW Bicester development will adopt appropriate future proofed building standards to ensure energy efficiency is the first priority in achieving its carbon reduction and sustainability objectives.

A range of measures to reduce carbon emissions and increase resilience to climate change can be incorporated into building design; some of these are outlined below.

Table 7.1	Building	Energy	Efficiency	Measures
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Passive Design	Technology
Air tightness	"A" rated appliances
Insulation	Automatic controls and monitoring
Reduce thermal bridging	Energy management systems
Solar shading	Energy efficient lighting
Use of natural daylight	High performance glazing
Natural ventilation	Energy efficient systems
	Energy enicient systems

Passive design is the process of best employing the conventional elements of construction to reduce energy consumption and to maximise the use of the natural elements such as daylight, sunlight and natural ventilation. The simplest and most effective method of achieving carbon reduction is often initially through the passive measures proposed above (and in section 7.2 below).

The development is proposed to be designed to utilise natural daylight in all the habitable spaces for the health and wellbeing of the building occupants. All the domestic units will incorporate suitable window sizes relative to living spaces and bedrooms. This will allow the development to achieve good daylighting standards as well as controlling solar gains. The careful choice of glazing and window U values will maintain the solar gain and also minimise the solar intensity to reduce potential overheating impact.

The development is also intended to incorporate high efficiency lighting throughout. The proposed target is to provide 100% of all light fittings as low energy lighting, and will accommodate the compact fluorescent or fluorescent luminaires only.

Real time energy monitors will be provided to each building to enable residents and occupiers to understand and adapt their energy use;. These monitors may be combined with systems that also enable real time passenger information in relation to public transport serving the development.

7.2 Fabric Energy Efficiency Standards (FEES)

The FEES of a building is a performance standard to measure the heating and cooling demands of the building and is measured in kWh/m²/year. As mentioned previously the baseline has been considered to demonstrate compliance with current 2013 Building Regulations. However, due to the anticipated build out period for this development, it is reasonable to consider how the development may be future proofed relative to the 2016 Building Regulations and zero carbon building requirements. As such appropriate FEES criteria have been adopted in accordance with the FEES targets identified in Table 4.2 (see Appendix C).

The heat loss of building elements is dependent upon their U-value. The lower the U-value the better the level of insulation which will improve the thermal performance of the building and help to reduce the CO₂ emissions due to reduced space heating demands. The proposed residential units will incorporate high levels of insulation and high efficiency glazing.

Another cause of heat loss is air infiltration / permeability. In 'leaky' buildings the heat loss can occur through wind, internal / external pressure difference, stack effect etc. However, the careful design of appropriate air tightness can significantly reduce heat loss and save energy. The table

below provides the breakdown of proposed U values and air tightness to attain the FEES targets.

Property Type	Floor (W/m2.K)	Wall (W/m2.K)	Roof (W/m2.K)	Window (W/m2.K)	Door (W/m2.K)	Air perm (m3/h.m2)
1 Bed Apartment	0.15	0.20	-	1.2	1.1	5.0
2 Beds House	0.15	0.20	0.11	1.2	1.1	5.0
3 Beds House	0.15	0.20	0.11	1.2	1.1	5.0
4 Beds House	0.15	0.18	0.10	1.2	1.1	4.5
5 Beds House	0.15	0.18	0.10	1.2	1.1	4.5

Table 7.2 Proposed U Value and Air Tightness

Attaining these U Values and air tightness will be a significant improvement upon existing Building Regulations, and will enable the following FEES to be achieved for each dwelling type. This will future proof the build quality of this development and enable true zero carbon targets to be achieved.

Table 7.3	Fabric Energy Efficiency Standard (FEES) results for each building type
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Property Type	FEES (kWh/m²/yr)	ZCH FEES (kWh/m²/yr)
1 Bed Apartment	38.5	39
2 Beds House	38.6	39
3 Beds House	41.78	46
4 Beds House	40.09	46
5 Beds House	44.6	46

Climate Change Adaptation

The balance between ensuring good insulation and air tightness to minimise heat loss in the winter months and potential overheating in the summer months need to be carefully considered.

Adopting the ZCH recommended FEE standards ensures a highly efficient fabric capable of reducing the need for heating in the winter months through the minimisation of heat loss and protects the building against future temperature increases, and potential cooling requirements, through appropriate air tightness and ventilation standards.

7.3 Reduced Energy Demand and Carbon Emissions

The standards described in this section have been incorporated within the design and result in energy demand reduction of regulated energy and carbon emissions savings. The table below gives the breakdown of energy consumption and carbon emissions for space heating, hot water, lighting, pumps and fans (regulated energy) for domestic buildings and non-domestic units.

Table 7.4 All Buildings – Enhanced FEE Energy Demand and Carbon Emissions

	Enhanced FEE	Enhanced FEE
All Buildings	Demand	Emissions
Total Regulated Electricity	1,960,497 kWh	1,017,498 kgCO2
Total Regulated Gas	14,203,671 kWh	3,067,993 kgCO2
Sub Total Regulated	16,164,167 kWh	4,085,491 kgCO2
B'Regs 2013 Baseline	17,754,632 kWh	4,396,947 kgCO2
Total Un-regulated Electricity	8,946,005 kWh	4,642,977 kgCO2
Total Un-regulated Gas	937,125 kWh	202,419 kgCO2
Sub Total Un-regulated	9,883,130 kWh	4,845,396 kgCO2
TOTAL	26,047,297 kWh	8,930,886 kgCO2
B'Regs 2013 Baseline	27,637,762 kWh	9,273,591 kgCO2
B'Regs 2010 (+6%)		9,865,522 kgCO2

By adopting enhanced fabric efficiency standards in all residential dwellings, the total energy demand across the site is reduced by **6%**. This reduces the sites carbon emission by 3.7% over Building Regulations (2013) and 32% over Building Regulations (2006).

13,154,029 kgCO2

B'Regs 2006 (+25%)

8 Low and Zero Carbon Technology (Be Clean and Be Green)

8.1 Introduction

After the initial savings through energy efficiency measures, the next step in a sustainable energy strategy is the consideration of 'onsite' low carbon (be clean) and renewable energy (be green); referred to as low and zero carbon (LZC) technology.

Utilising energy generated locally (onsite) reduces energy lost through transmission and distribution, and can often take advantage of more advanced generating technologies that combine to provide energy more efficiently. Local generation, or decentralised generation, is produced on a smaller scale nearer to the point of consumption and can offer a number of benefits, including:

- Using generated energy more efficiently by reducing distribution losses
- Contributing to security of energy supply by increasing local energy production
- Increasing reliability of supply providing the opportunity to operate 'on or off grid'
- Reducing carbon emissions through more efficient use of fossil fuels and greater use of locally generated renewable energy
- Provides the opportunity to create stronger links between energy production and consumption.
- Can be linked to fund complementary programmes of work, such as retrofitting microgeneration equipment in existing housing stock.
- Provides a visible message of commitment to sustainable energy

Zero carbon or renewable energy comes from harnessing natural energy flows from the sun, wind, or rain. Many such as solar, wind and hydro, directly produce energy and do no emit any carbon dioxide in the process. Others such as biomass, use solar energy to grow renewable plant material that can subsequently be used for energy. Examples here are wood, straw, etc. However, biomass use still generates carbon dioxide when it is burnt. The difference being that this carbon is only that taken from the atmosphere when the plant grew. This is unlike carbon emissions from fossil fuels that are essentially new to the atmosphere, causing increases in atmospheric carbon dioxide levels and climate change. Therefore, when used to replace fossil fuels, biomass leads to a net reduction in carbon emissions; particularly where local supply chains can provide a sustainable supply of biomass.

Of the available renewable energy technologies, some are 'intermittent' in nature, such as solar and wind. Others such as biomass, ground source heat pumps and anaerobic digestion can service baseload duties.

The table below identifies the energy generation technologies and approaches considered.

Table 8.1 LZC Technologies

Macro Solutions	Micro Solutions
(typically district scale or larger)	(typically building related)
Anaerobic Digestion CHP	Air source heat pumps
Biomass heat, biomass power (CHP)	Ground source heat pumps
Energy from Waste CHP	Solar Thermal (building mounted)
Gas CHP	Solar Photovoltaic (building mounted)
Large scale PV array	Wind energy (building mounted)
Large scale wind energy	

8.2 Preferred Approach

As discussed in section 2, the preferred approach to delivering the energy and carbon reduction consists of the following:

- Enhanced fabric energy efficiency
- Site wide District Heat Network providing all thermal demand across the site
- LZC technology sited within an Energy Centre providing hot water to the DHN and power.
- Thermal demand regulated by inclusion of thermal stores
- Percentage of residential and non-residential roof space to be used for Solar PV (orientated in southerly direction)

8.2.1 District Heat Network and Thermal Stores

A District Heat Network (DHN) is a network of insulated pipes used to deliver heat, in the form of hot water or steam, from the point of generation to the end user. They provide the means to transport heat efficiently provided distances do not become too far. A DHN enables heat to be delivered to point of use from a centralised location.

DHN tend to be installed in areas of medium to high density living and work better where there is a constant thermal demand; which is often achieved in mixed use developments, such as NW Bicester, where there is both day time and night time heat demand.

Inclusion of a thermal store(s) is proposed for Application 1 to regulate the heat demand. This will enable the hot water generated by the Gas CHP and boilers to be buffered, stored and released into the distribution network as needed.

8.2.2 LZC Technology: Gas CHP

It is proposed to utilise Gas Combined Heat and Power (CHP) engines as the lead engine(s) within the Energy Centre; as this integrates the production of usable heat and power (electricity), in one single, highly efficient process. CHP generates electricity and produce usable heat at the same time. Gas-fired reciprocating engines have intake, compression, power,

and exhaust cycles. In the intake phase, as the piston moves down in its cylinder, the intake valve opens, and the upper portion of the cylinder fills with fuel and air. When the piston returns upward in the compression cycle, the spark plug emits a spark to ignite the fuel-air mixture. This controlled reaction, or "burn," forces the piston down, thereby turning the crank shaft and producing power. Reciprocating engines can be used in a variety of applications because of their small size, low unit cost, and useful thermal output. They offer low capital cost, easy start-up, proven reliability, good load-following characteristics, and heat recovery potential.

The proposed Gas CHP for Application 1 has been sized to meet 90% of the thermal demand, allowing for maintenance and downtime. The CHP will be sized to avoid significant heat dumping. The remaining thermal demands (10%) will be met by highly efficient conventional gas boilers.

This solution also contributes to meeting the electrical needs of the development at the same time, however further LZC technology will be required to meet the True Zero Carbon target.

8.2.3 Solar PV

It is proposed that the remaining carbon reductions required to achieve the True Zero Carbon Target will be achieved through the provision of roof mounted Solar PV.

Solar- Photovoltaic (PV) systems convert energy from the photons within sunlight into electricity through the aid of photocells; made of semi-conductor material, usually Germanium or Silicon. PV systems are suitable for any type of building but they require significant unshaded south facing space as even a small shadow may significantly reduce output.

The maximum total annual solar radiation is usually at an orientation due south and at a tilt from the horizontal equal to the latitude of the site minus approximately 20 degrees. The latitude of Bicester is 51.9 degrees. Therefore 32 degrees is the optimal tilt in Bicester, south facing.

8.3 Reduced Energy Demand and Carbon Emissions

Following the FEES enhancements the remaining carbon reductions required for Application 1 are 8,930,886 kgCO₂.

According to the CIBSE CHP calculation method a GAS CHP driven DHN to meet 90% of the thermal demands will reduce the carbon emissions as follows:

Table 8.2 CIBSE Method Calculations

Total Emissions without CHP	8,728	tonnes
	8,728,467	kgCO2
Thermal Emissions (H X Hf - gas emissions)	3,067,993	kgCO2
Thermal Demand (H)	14,203,671	kWh
Electricity Emissions (P X Pf - electric emissions)	5,660,474	kgCO2
Electricity Demand (P)	10,906,502	kWh
Without CHP		

Without CHP

With CHP

	2,644	tonnes
Total Emissions with CHP	2,643,718	kgCO2
(P-P _{CHP})X electricity fuel factor	- 741,156	kgCO2
(P-P _{CHP}) Elect. (Demand - Generation)	- 1,428,047	kWh
Electricity Generated from CHP (P _{CHP})	12,334,549	kWh
$(F_{CHP} \: X \: E_{f,CHP})$ - Gas fuel X fuel factor	3,260,252	kgCO2
F_{CHP} - Gas Fuel to run CHP	15,093,758	kWh
[(H-H _{CHP})/ŋ,boiler X E _{f,boiler}]	124,622.183	kgCO2
(H-H _{CHP}) Heat (Demand - Generation)	576,955	kWh
Heat Generation from CHP (H_{CHP})	13,626,716	kWh
Thermal Demand (H)	14,203,671	kWh
Electricity Demand (P)	10,906,502	kWh

The Gas CHP will therefore reduce the carbon emissions by approximately **6,084,750 KgCO**₂. This leaves a further reduction 2,846,136 KgCO₂ to be achieved through the provision of roof mounted solar PV.

To calculate the Solar PV requirements the following general assumptions have been made:

- Annual PV output per kWp: 850.00 kWh/year
- PV peak output: 1.41 kWp at 850 kWh
- Typical PV Area per kWp: 10.00 m²

The following assumptions have been made for the residential aspect:

- Total Available Roof Area: 121,736 m² (as per SAP calculations)
- % Roof with PV installed: 35%
- Total PV area: 42,607 m²

The following assumptions have been made for the commercial aspect:

- Total Available Roof Area: 11,132 m²
- % Roof with PV installed: 40%
- Total PV area: 4,452 m²

Based on these assumptions the following calculations can be made:

Table 8.2: Building Mounted Solar PV

All Buildings	Enhanced FEE Emissions
Remaining Emissions	2,846,136 kgCO2
Solar PV generation	- 2,927,243 kgCO2

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Sub Total

- 81,107 kgCO2

The above table demonstrates that the provision of solar PV to 35% of the available residential roof space (i.e. circa half of traditional south facing roof) and 40% of the available commercial roof space would achieve an approximate reduction of 2,927,243 KgCO₂. This exceeds the required reduction of 2,846,136 to achieve True Zero Carbon.

9 Phasing of Gas CHP instalment

There are a number of parameters which need to be considered in order to agree upon a proposed phasing strategy for the implementation of the site wide requirement to achieve True Zero Carbon. Parameters to consider include (but not limited to) the following:

- Gas CHP engine(s)
 - o Sizing
 - o Efficiency
 - o Capital Cost
- Build out rate
- Spatial Distribution
 - Existing 'Exemplar' energy centre
 - \circ $\;$ Location and direction of build out

9.1 Gas CHP

The energy centre for Application 1 will comprise (worst case scenario):

- To serve circa up to 2600 homes plus non-domestic
- Flue height circa 18m (estimation based on previous modelling AQA for Exemplar site)
- Indicative CHP Engines sizes Either:
 - o 2 x E850 CHP engines;
 - Electrical Output: 853 kW
 - Electrical Efficiency: 42.8%
 - Heat Output: 891 kW
 - Thermal Efficiency: 44.7%
 - Overall efficiency (LHV): 87.5%

or

- o 4 x E425 CHP engines
 - Electrical Output: 430 kW
 - Electrical Efficiency: 38.5
 - Heat Output: 468 kW
 - Thermal Efficiency: 41.8
 - Overall efficiency (LHV): 80.4%

• Plus supporting gas boilers

Please refer to appendix A for detailed datasheets for the two Gas CHP engine sizes provided above.

9.2 Build Out Rate

The DHN will be installed as the new road network is constructed, which will facilitate connection. The Energy Centre will be one of the first infrastructure elements to be constructed; however, temporary portable gas boiler units may be utilised to enable building to receive heat/hot water in the short term.

As identified above the smaller CHP engines are slightly less efficient than the larger engines but represent a lower capital cost. This would therefore enable the CHP engines to be installed more readily as the development progresses and achieve true Zero Carbon on a 'per 500 homes' basis. The larger engines would increase this to every 1000 homes.

At a construction rate of circa 250 homes a year the site would there be achieving the True Zero Carbon target every 2 years respectively. However, further optimisation may improve this ratio.

9.3 Spatial Distribution

9.3.1 Connection to existing Exemplar Energy Centre

The Application 1 area adjoins the already consented Exemplar site; within which 1 of the 3 energy centres proposed at NW Bicester is located. The 'Exemplar' site consists of 393 dwellings however the Gas CHP engine within the energy centre is capable of providing heat to up to 1100 homes. This therefore provides an 'opportunity' to connect up to 707 homes of the proposed dwellings within Application 1 to the existing energy centre.

The DHN will be constructed alongside all new infrastructure and therefore the 707 homes connected to the Exemplar Energy Centre will be capable of achieving true zero carbon as they are built out. Whether this is the first 707 homes within Application 1 to be constructed will depend upon the agreed phasing and build out schedule.

The energy centre for Application 1 will therefore need to provide sufficient heat and power for the remaining 1900 dwellings and commercial buildings.

9.3.2 Location and Direction of Build Out

As identified above; build out may occur outward from the location of the Energy Centre(s), including the already consented Exemplar site Energy Centre. The DHN will be installed as the new road network is constructed, which will facilitate connection to buildings.

10 Summary

This energy statement has been prepared to ensure that Application 1 of the NW Bicester development meets the applicant's sustainability aspirations and key development priorities, Building Regulations requirements and planning targets. The following local and national energy requirements were deemed relevant:

Policy	Document	Requirement
Policy Bicester 1 – NW Bicester Eco-Town	Emerging Cherwell Local Plan 2006-2031	True Zero Carbon CSH Level 5
		BREEAM Excellent
CSH Level 5 – Ene 1 Dwelling Emission Rate	CSH 2010 Technical Note	100% improvement on 2010 Building Regulations
BREEAM Excellent	BREEAM New Construction 2014	Energy Performance Ratio (EPR _{NC}) of 0.375 (6 credits) or higher.
Building Regulations	Building Regulations 2016 (anticipated)	Zero Carbon from regulated energy

The proposed strategy follows the energy hierarchy principles outlined below:

- 1. **Be Lean:** Use less energy. Minimise energy demand through efficient design and the incorporation of passive measures;
- 2. **Be Clean:** Supply energy efficiently. Reduce energy consumption through use of low-carbon technology; and
- 3. **Be Green:** Use renewable energy systems.

The standards outlined within this statement surpass the FEES set by the ZCH and result in reduced energy demand and carbon emissions. The table below gives the breakdown of energy consumption and carbon emissions for space heating, hot water, lighting, pumps and fans (regulated energy) for domestic buildings and non-domestic units.

Enhanced FEE	Enhanced FEE
Demand	Emissions
1,960,497 kWh	1,017,498 kgCO2
14,203,671 kWh	3,067,993 kgCO2
16,164,167 kWh	4,085,491 kgCO2
17,754,632 kWh	4,396,947 kgCO2
8,946,005 kWh	4,642,977 kgCO2
937,125 kWh	202,419 kgCO2
9,883,130 kWh	4,845,396 kgCO2
26,047,297 kWh	8,930,886 kgCO2
	Demand 1,960,497 kWh 14,203,671 kWh 16,164,167 kWh 17,754,632 kWh 8,946,005 kWh 937,125 kWh 9,883,130 kWh

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Following the FEES enhancements the remaining carbon reductions required for Application 1 are 8,930,886 kgCO₂.

Installing a GAS CHP driven DHN to meet 90% of the thermal demands will reduce the carbon emissions by approximately **6,084,750 KgCO**₂. This leaves a further reduction of 2,846,136 KgCO₂ to be achieved through the provision of roof mounted solar PV.

The provision of solar PV to 35% of the available residential roof space (i.e. circa half of traditional south facing roof) and 40% of the available commercial roof space would achieve an approximate reduction of 2,927,243 KgCO₂. This exceeds the required reduction of 2,846,136 to achieve True Zero Carbon.

10.1 Summary of requirements and response

The strategy outlined within this statement achieves the True Zero Carbon target through predominantly on-site technology rather than any significant reliance on off-site/off-set allowable solutions. However, whilst a preferred approach is identified it is recognised that further optimisation of the available technical solutions will continue as detailed design progresses; such as refinement of available roof area for PV, selection and sizing of CHP engines and associated thermal store to optimise delivery of the thermal demand carbon emission reductions.

The table below provides a summary of the development requirements and the current proposals to address them.

Policy	Requirement	Application 1 Proposals
Policy Bicester 1 – NW Bicester Eco-Town	True Zero Carbon CSH Level 5 BREEAM Excellent	True Zero Carbon CSH Level 5 BREEAM Excellent
CSH Level 5 – Ene 1 Dwelling Emission Rate	100% improvement on 2010 Building Regulations	100% improvement on 2010 Building Regulations
BREEAM Excellent	Energy Performance Ratio (EPR _{NC}) of 0.375 (6 credits) or higher.	Energy Performance Ratio (EPR _{NC}) of 0.375 (6 credits) or higher.
Building Regulations	Zero Carbon from regulated energy	Zero Carbon from regulated energy

Appendices

Appendix A: Gas CHP Datasheets

Technical Datasheet E850 250NOx L33 Natural Gas CHP Unit



Energy Balance and Part Load Data @ 0.95PF		Units	100%	75%	50%
Electrical Output	(+/-3%)	kW	853	640	426
Electrical Efficiency (Net)	(+/-5%)	%	41.5%	40.3%	38.2%
Heat Output	(+/-10%)	kW	931	733	530
Thermal Efficiency (Net)	(+/-8%)	%	45.3%	46.2%	47.5%
Fuel Input (Net)	(+/-5%)	kW	2053	1588	1116
Total Efficiency (Net)	(+/-8%)	%	86.9%	86.4%	85.7%
Heat Output from Jacket Water	(+/-8%)	kW	462	341	236
Heat Output from Exhaust Gas @ Outlet Temp.	(+/-8%)	kW	469	392	294
Aftercooler Heat Output	(+/-8%)	kW	51	41	30
Radiated Heat Output	(+/-8%)	kW	37	28	20
Combustion Air Flow (30 C, 100 kPa, 30% RH)	(+/-5%)	m³/h	3937	2968	2032
Fuel Mass Flow (ρ = 0.75kg/Nm³)	(+/-5%)	kg/h	154.0	119.1	83.7
Fuel Volume Flow (LHV = 10kWh/Nm³)	(+/-5%)	Nm3/h	205.3	158.8	111.6
Exhaust Mass Flow (Wet)	(+/-5%)	kg/h	4737	3574	2449
Exhaust Volume Flow @ Outlet Temp.	(+/-5%)	m³/h	5276	3981	2728

Engine Details

Lingine Details	
Manufacturer	MTU
Model	AoE 8V4000L33
Fuel Type	Natural Gas
Min. Methane Number	80
Cylinders	8
Aspiration	Turbocharged
Speed	1500
Aftercooler	Yes
Hot Water Details	
Max. Water In/Out Temp	78/89°C
Max. Water Flow Rate* I	20.77
Max. Glycol Content	30
Connection Size	100
Flange Type	PN16
Pressure Loss**	TBC
Max. Test Pressure	9.75
* Assuming Cp = 4.21 kJ/kg·K and ρ = 968.55 kg/m ³	5.75
** Pressure loss figures stated are at max. water flow rate. Internal unit only.	
Pressure loss ingures stated are at max, water now rate, internal unit only.	
Exhaust Details	
Connection Size mm	450
Flange Type	PN10
Outlet Temp	120
Max. Allowable Backpressure Pa	TBC
Ventilation Details	
Ventilation Rate*** m^3/s	5.37
Max. Air Inlet Temp	35
Max. Air Outlet Temp °C	50
Enclosure Pressure Drop	твс
*** Vent rate is stated at max. air outlet temp, 100kPa	TDC
Vent rate is stated at max, air outlet temp, 100kPa	
Aftercooler Details	
Max. Water Inlet Temp °C	40
Water Flow Rate I/s	6.11
Connection Size mm	65
Flange Type	PN16
Pressure Loss	70
Max. Test Pressure Bar	6
Etherland Church Constant	10

Ethylene Glycol Content %

Generator Details

Manufacturer	Stamford
Model	PE734C-312
Туре	Synchronous
Rating kVA	1445
Voltage	400
Phase	3
Frequency	50
Protection Class	IP23
Rated Power Factor PF	0.8
Xd Dir. Axis Synchronous	2.76
X'd Dir. Axis Transient	0.17
X"d Dir. Axis Sub-Transient	0.12
T" Sub-Transient Time Const	0.01
T'do O.C Field Time Const	2.23
CHP Protection Device A/Ph	твс
Indicative Client Protection Device A/Ph	твс
Current Per Phase @ 0.8PF	1528
Current Per Phase @ 0.95PF A	1296
Efficiency @ 0.8PF	96.2%
Efficiency @ 0.95PF%	90.2 <i>%</i> 96.9%
•	
Indicative Main Cable Size ^a ⁺ mm ²	TBC
Indicative Earth Cable Size ^b + mm ²	TBC
^a 4-Core XLPE/SWA/PVC to BS5467, Max 50 meters.	
^b 1-Core 6491B to BS7211, Max 50 meters.	
\dagger Sizes and lengths based on IET 17TH Edition BS7671, Installation method 31.	
Fuel Details	
Connection Size mm	80
Flange Type	PN16
Min/Max. Supply Pressure mbar	120/300
, ,,,	,
Emissions @ 5% O2	
NOx mg/Nm ³	250
CO	1000
NOx (With Catalyst)	N/A
CO (With Catalyst)	ТВС
Weight Details	
Enclosure (Dry) STD/PREM kg	ТВС/ТВС
Container (Dry) STD/PREM	TBC/TBC
Noise Data	
Enclosure SPL @ 1m SN/LN dB(A)	70/65
	70/65
Container SPL @ 1m SN/LN dB(A)	75/65

NB: Output figures are based on operation at ISO 3046 conditions with the exception of exhaust output, which is quoted to 120°C, figures are stated from manufacturer's declared performance figures subject to the manufacturer's tolerances and subject to change without notice. Values for de-rated units are estimates only. Energy balance data assumes perfect combustion. All information detailed is for guidance only and is subject to change without notice due to our commitment to continuous improvement all values should be confirmed with ENER-G Combined Power Ltd on a project specific basis.

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Technical Datasheet E425 Natural Gas CHP Unit



Energy Balance and Part Load Data @ 0.95PF		Units	100%	75%	50%
Electrical Output	(+/-3%)	kW	430	323	215
Electrical Efficiency (Net)	(+/-5%)	%	38.5%	37.4%	34.1%
Heat Output	(+/-10%)	kW	468	394	320
Thermal Efficiency (Net)	(+/-8%)	%	41.8%	45.7%	50.7%
Fuel Input (Net)	(+/-5%)	kW	1119	862	630
Total Efficiency (Net)	(+/-8%)	%	80.3%	83.1%	84.9%
Heat Output from Jacket Water	(+/-8%)	kW	189	161	136
Heat Output from Exhaust Gas @ Outlet Temp.	(+/-8%)	kW	279	233	184
Aftercooler Heat Output	(+/-8%)	kW	67	35	14
Radiated Heat Output	(+/-8%)	kW	66	43	33
Combustion Air Flow (30 C, 100 kPa, 30% RH)	(+/-5%)	m³/h	2048	1578	1154
Fuel Mass Flow (ρ = 0.75kg/Nm³)	(+/-5%)	kg/h	83.9	64.6	47.3
Fuel Volume Flow (LHV = 10kWh/Nm³)	(+/-5%)	Nm3/h	111.9	86.2	63.0
Exhaust Mass Flow (Wet)	(+/-5%)	kg/h	2473	1905	1393
Exhaust Volume Flow @ Outlet Temp.	(+/-5%)	m³/h	2754	2122	1552

Engine Details

Manufacturer	Perkins	
Model	4008-30 TRS1	
Fuel Type	Natural Gas	
Min. Methane Number	75	
Cylinders	8	
Aspiration	Turbocharged	
Speed	1500	
Aftercooler	Yes	
Hot Water Details		
Max. Water In/Out Temp °C	80/90°C	
Max. Water Flow Rate* I/s	11.48	
Max. Glycol Content	30	
Connection Size mm	80	
Flange Type	PN16	
Pressure Loss**	33.7	
Max. Test Pressure	9.75	
* Assuming Cp = 4.21 kJ/kg·K and ρ = 968.55 kg/m ³		
** Pressure loss figures stated are at max. water flow rate. Internal unit only.		
Exhaust Details		
Connection Size mm	250	
Flange Type	230 PN10	
Outlet Temp	120	
Max. Allowable Backpressure	4250	
Ventilation Details		
Connection Size	900	
Ventilation Rate*** m ³ /s	5.48	
Max. Air Inlet Temp	30	
Max. Air Outlet Temp	45	
Enclosure Pressure Drop Pa	240	
*** Vent rate is stated at max. air outlet temp, 100kPa		
Aftercooler Details		
Max. Water Inlet Temp	45	
Water Flow Rate	8.30	
Connection Size	65	
Flange Type	PN16	
Pressure Loss	75	

Max. Test Pressure Bar

Ethylene Glycol Content $\dots\dots\dots\dots\dots$ %

Generator Details

Manufacturer	Stamford
Model	HCI544E-311
Туре	Synchronous
Rating	, 610
Voltage	400
Phase	3
Frequency	50
Protection Class	IP23
Rated Power Factor PF	0.8
Xd Dir. Axis Synchronous	2.88
X'd Dir. Axis Transient	0.15
X"d Dir. Axis Sub-Transient	0.11
T" Sub-Transient Time Const	0.012
T'do O.C Field Time Const	2.5
CHP Protection Device A/Ph	800
Indicative Client Protection Device A/Ph	800 (Adjustable)
Current Per Phase @ 0.8PF A	768
Current Per Phase @ 0.95PF A	654
Efficiency @ 0.8PF	95.3%
Efficiency @ 0.95PF	96.3%
Indicative Main Cable Size a + mm ²	TBC
Indicative Farth Cable Size ^b † mm ²	твс
	IBC
^a 4-Core XLPE/SWA/PVC to BS5467, Max 50 meters.	
^b 1-Core 6491B to BS7211, Max 50 meters.	
+ Sizes and lengths based on IET 17TH Edition BS7671, Installation method	31.
Fuel Details	
Connection Size mm	65
Flange Type	PN16
	-
Min/Max. Supply Pressure mbar	20/50
Emissions @ 5% O2	
NOx mg/Nn	² 400
-	
CO mg/Nn	
NOx (With Catalyst) mg/Nn	
CO (With Catalyst) mg/Nn	າ [°] N/A
Weight Details	
Enclosure (Dry) STD/PREM kg	10500/12500
Container (Dry) STD/PREM kg	TBC/TBC
Noise Data	
Enclosure SPL @ 1m SN/LN dB(A)	70/65
Container SPL @ 1m SN/LN dB(A)	75/65
	, 5, 55

NB: Output figures are based on operation at ISO 3046 conditions with the exception of exhaust output, which is quoted to 120°C, figures are stated from manufacturer's declared performance figures subject to the manufacturer's tolerances and subject to change without notice. Values for de-rated units are estimates only. Energy balance data assumes perfect combustion. All information detailed is for guidance only and is subject to change without notice due to our commitment to continuous improvement all values should be confirmed with ENER-G Combined Power Ltd on a project specific basis.

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Appendix B: SAP Worksheets – Building Regulations Baseline

			User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 20			Stroma Softwa	re Ver	sion:	11	Versio	n: 1.0.0.28	
		Pr	operty A	Address:	1 Bed 2	2013 Ba	seline			
Address : 1. Overall dwelling dime	ensions:									
			Area	n(m²)		Av. He	iaht(m)		Volume(m ³)	
Ground floor				· ,	(1a) x		.39	(2a) =	149.76	(3a)
Total floor area TFA = (1	la)+(1b)+(1c)+(1d)+(1	e)+(1n)) 62	2.66	(4)					-
Dwelling volume					(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	149.76	(5)
2. Ventilation rate:										_
		secondary	/	other		total			m ³ per hour	,
Number of chimneys	heating	heating 0] + [0] = [0	x 4	40 =	0	(6a)
Number of open flues	0 +	0] + [_	0] = [0	x 2	20 =	0	(6b)
Number of intermittent fa	ans				' Ē	3	x ^	10 =	30	(7a)
Number of passive vents	S					0	× ´	10 =	0	(7b)
Number of flueless gas	fires					0	× 4	40 =	0	(7c)
								Air ch	anges per ho	ur
Infiltration due to chimne	eys, flues and fans =	(6a)+(6b)+(7a	a)+(7b)+(7	7c) =	Г	30	<u> </u>	÷ (5) =	0.2	 (8)
If a pressurisation test has					ontinue fre			. (-)	0.2	
Number of storeys in t	the dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: (J.25 for steel or timbe present, use the value corre				•	uction			0	(11)
deducting areas of open	ings); if equal user 0.35		-							
If suspended wooden	floor, enter 0.2 (unse	aled) or 0.1	1 (seale	d), else	enter 0				0	(12)
If no draught lobby, er									0	(13)
Percentage of window	s and doors draught	stripped							0	(14)
Window infiltration				0.25 - [0.2		-			0	(15)
Infiltration rate				(8) + (10) -					0	(16)
Air permeability value	· ·		•	•		etre of e	nvelope	area	5.5	(17)
If based on air permeab	-					. , .			0.48	(18)
Air permeability value appli Number of sides shelter		as been done	e or a deg	iree air per	meability	s being us	sea			(19)
Shelter factor	eu			(20) = 1 - [0.075 x (1	9)] =			2 0.85	(19)
Infiltration rate incorpora	ating shelter factor			(21) = (18)	x (20) =				0.4	(21)
Infiltration rate modified	-	ed							0.4	
Jan Feb	Mar Apr May	<u> </u>	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind s	peed from Table 7									
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	22)m ÷ 4									
(22a)m= 1.27 1.25	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjust	ed infiltr	ation rat	e (allowi	ing for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m		-			
	0.52	0.5	0.49	0.44	0.43	0.38	0.38	0.37	0.4	0.43	0.45	0.47		
		<i>ctive air</i> al ventila	-	rate for t	he appli	cable ca	se	-						
				endix N, (2	3h) - (23a	a) x Emv (e	equation (N	N5)) other	wise (23h) – (23a)			0	(23a)
				iency in %) = (20u)		l	0	(23b)
			•		Ũ		,			2h)m i (22h) v [/	1 (220)	0	(23c)
a) II (24a)m=	r							TR) (248	0 m = (22)	20)m + (0	230) × [[*]	1 – (23c)	÷ 100]	(24a)
			Ţ		÷	÷	÷	÷	Ŭ	, ,	Ů	0		(210)
(24b)m=				entilation				0 0	0 = (22)	0	230)	0		(24b)
	_			-	_			-	-	0	0	0		(240)
,				ntilation o then (240	•	•				5 x (23h))			
(24c)m=	· ·	0	0	0	0	0	0		0	0	0	0		(24c)
		L ventilatio	L on or wh	l ole hous	e positiv	l	l ventilatio	L on from l	oft	[
,				m = (22k)		•				0.5]				
(24d)m=	0.63	0.63	0.62	0.6	0.59	0.57	0.57	0.57	0.58	0.59	0.6	0.61		(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in boy	(25)					
(25)m=	0.63	0.63	0.62	0.6	0.59	0.57	0.57	-0.57	0.58	0.59	0.6	0.61		(25)
3 40	atlosso	e and he	at loss i	paramete	ar:									_
ELEN		S and ne Gros		Openin		Net Ar	·ea	U-valu		AXU		k-value		A X k
		area		m		A ,n		W/m2		(W/I		kJ/m²·ł		κJ/K
Doors						2	x	1.2	= [2.4				(26)
Windo	ws Type	e 1				2.39	x1,	/[1/(1.4)+	0.04] =	3.17	Fi i			(27)
Windo	ws Type	e 2				2.39	x1/	/[1/(1.4)+	0.04] =	3.17	Fi i			(27)
Windo	ws Type	e 3				0.96		/[1/(1.4)+	0.04] =	1.27	5			(27)
Floor						62.66		0.2	= [12.532				(28)
Walls		60		10.13	2	49.87		0.24		11.97			\exists	(29)
	irea of e	elements		10.10	<u> </u>	122.6		0.24	[11.07	L			(31)
Party v			,							0	—			
						13	×	0	= [0			\dashv	(32)
Party o	-	I roof wind		footivowi	ndowlly	62.66		formula 1	11/1/11	$(a) \cdot 0.041$	L	paragraph		(32b)
				nternal wal			aleu using	normula 1,	/[(1/ 0- valu	ie)+0.04j c	is given in	paragraph	3.2	
Fabric	heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =			[37.68	(33)
Heat c	apacity	Cm = S((Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	9854.9	(34)
Therm	al mass	parame	ter (TMI	- = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
For desi	gn assess	sments wh	ere the de	tails of the	construct	ion are not	t known pr	ecisely the	indicative	e values of	TMP in Ta	able 1f		
		ad of a de										,		
	-		,	culated u	• •		Κ						6.13	(36)
	of therma abric he		are not kr	10wn (36) =	= 0.15 x (3	1)			(33) +	(36) =		1	42.04	(37)
			alculator	d monthly	,						25)m x (5)	l	43.81	(37)
v Gritild	Jan	Feb	Mar	Apr	/ May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	31.27	31.01	30.76	29.59	29.37	28.35	28.35	28.16	28.74	29.37	29.82	30.28		(38)
Heat tr (39)m=	75.08	74.82	74.58	73.4	73.18	72.16	72.16	71.97	(39)m 72.55	= (37) + (3 73.18	73.63	74.09		
				(SAP 9.91)				11.37			Sum(39)1		73.40~~	ae 2 of 38)
Juond		~ v CI 3IU[].	1.0.0.20	(0~ 0.81)	- nup.//ww	www.suomd				- 0 -	()		- raț	<u>10 ~ y</u> r 0 '

Heat los	ss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	· (4)			
(40)m=	1.2	1.19	1.19	1.17	1.17	1.15	1.15	1.15	1.16	1.17	1.18	1.18		
L	r of dou		I						/	Average =	Sum(40)1	.12 /12=	1.17	(40)
		Feb	nth (Tab Mar	, 1	Mov	lup	Jul	Aug	Son	Oct	Nov	Dee		
(41)m=	Jan ³¹	28	31	Apr 30	May 31	Jun 30	31	Aug 31	Sep 30	31	Nov 30	Dec 31		(41)
(41)11-	51	20	51	50	51	50	51	51	50	51	50	51		(++)
4. Wat	er heat	ting ener	rgy requ	irement:								kWh/ye	ear:	
if TFA	۹ > 13.9	ipancy, l 9, N = 1 9, N = 1		: [1 - exp	(-0.0003	849 x (TF	-A -13.9)2)] + 0.()013 x (1	TFA -13		06		(42)
Reduce t	he annua	al average	hot water	usage by		lwelling is	designed	(25 x N) to achieve		se target o	83 f	.03		(43)
Γ	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	r usage ii	n litres per	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m=	91.33	88.01	84.69	81.36	78.04	74.72	74.72	78.04	81.36	84.69	88.01	91.33		
										Total = Su	m(44) ₁₁₂ =		996.3	(44)
Energy c	ontent of	hot water	used - ca	culated m	onthly $= 4$.	190 x Vd,r	n x nm x E	OTm / 3600) kWh/mon	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m=	135.44	118.45	122.23	106.57	102.25	88.24	81.76	93.83	94.95	110.65	120.78	131.16		_
lf instanta	aneous w	ater heati	ng at poin	t of use (no	o hot water	storage).	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =		1306.31	(45)
				15.98	15.34	13.24	12.26		14.24	16.6	10.10	10.67		(46)
(46)m= Water s	20.32 storage	17.77 loss:	18.34	15.98	15.34	13.24	12.20	14.07	14.24	10.0	18.12	19.67		(40)
	-		includir	ng any se	olar or W	/WHRS	storage	within sa	ame ves	sel	· · ·	120		(47)
If comm	nunity h	eating a	ind no ta	ank in dv	velling, e	nter 110	litres in	(47)			l			
		-			-			ombi boil	ers) ente	er '0' in (47)			
Water s	•													
a) If ma	anufact	urer's de	eclared I	oss fact	or is kno	wn (kWł	n/day):				(0		(48)
Temper	rature f	actor fro	m Table	2b							(0		(49)
			-	e, kWh/y				(48) x (49)) =		(0		(50)
•				•	loss fact le 2 (kWl								l	(51)
		-	ee secti			1/1110/08	iy))		(51)
	-	from Ta										0		(52)
Temper	ature f	actor fro	m Table	2b							()		(53)
Energy	lost fro	m water	· storage	, kWh/y	ear			(47) x (51)	x (52) x (53) =)		(54)
Enter (50) or ((54) in (5	55)	-							(0		(55)
Water s	torage	loss cal	culated	for each	month			((56)m = (55) × (41)r	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
	r contains	s dedicate	l d solar sto	nage, (57)	i m = (56)m	x [(50) – (I H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary	, circuit	loss (ar	nual) fro	om Table	3)		(58)
-		•				59)m = ((58) ÷ 36	65 × (41)	m				I	
-							. ,	ng and a		r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)

Combi	loss ca	alculated	for ea	ch	month ((61)m =	(60)) ÷ 36	65 × (41))m						
(61)m=	22.94	20.53	22.42	2	21.35	21.81	2	20.82	21.33	21.64	21.11	22.17	21.85	22.84	1	(61)
Total h	eat rec	uired for	water	he	ating ca	alculated	d fo	r eacl	h month	(62)m =	= 0.85 ×	(45)m -	+ (46)m +	(57)m +	- (59)m + (61)m	
(62)m=	158.37	138.98	144.6	5	127.92	124.06	1	09.05	103.09	115.47	116.05	132.82	2 142.64	154		(62)
Solar DI	-IW input	calculated	using A	ppe	endix G or	Appendi	ĸН	(negati	ve quantity	/) (enter '()' if no sola	ır contrib	ution to wate	er heating)		
(add a	dditiona	al lines if	FGHR	S a	and/or V	WHRS	S ap	plies	, see Ap	pendix	G)		-		•	
(63)m=	0	0	0		0	0		0	0	0	0	0	0	0		(63)
Output	from v	vater hea	ter				-								1	
(64)m=	158.37	138.98	144.6	5	127.92	124.06	1	09.05	103.09	115.47	116.05	132.82	_	154		٦
													ter (annual)		1567.11	(64)
-	r	1	· · · · ·	<u> </u>			—	-		<u> </u>	<u>,</u>	<u> </u>	n + (57)m	<u> </u>] 1	
(65)m=	50.77	44.52	46.25		40.77	39.45		84.54	32.52	36.61	36.85	42.33		49.32]	(65)
					. ,	-	cylii	nder is	s in the o	dwelling	or hot w	ater is	from com	munity h	leating	
5. Int	ternal g	ains (see	e Table	e 5	and 5a):										
Metab		ns (Table					-			<u> </u>				<u> </u>	1	
(22)	Jan	Feb	Ma	-	Apr	May	-	Jun	Jul	Aug	Sep	Oct	Nov	Dec	-	(00)
(66)m=	123.35		123.3		123.35	123.35		23.35	123.35	123.35	123.35	123.35	5 123.35	123.35		(66)
-		s (calcula		- 1			1	-	· · ·		I				1	(07)
(67)m=	42.42	37.68	30.64	-	23.2	17.34	-	4.64	15.82	20.56	27.6	35.04	40.9	43.6	J	(67)
		ains (calc		-		\sim	<u> </u>			· ·		_	L	I	1	(00)
(68)m=			263.8	-	248.91	230.08		12.37	200.54	197.76	204.77	219.7	238.53	256.24	J	(68)
	<u> </u>	s (calcula	r	- 1			-		· · ·	·		_	10.00	40.00	1	(00)
(69)m=	49.39	49.39	49.39	_	49.39	49.39	4	9.39	49.39	49.39	49.39	49.39	49.39	49.39		(69)
•		ans gains	È	e 5	,		-	-							1	(70)
(70)m=	3	3	3		3	3	Ļ	3	3	3	3	3	3	3]	(70)
	<u> </u>	vaporatio	<u> </u>	- T		, ,	-	,						00.00	1	(74)
		-82.23			-82.23	-82.23	-8	82.23	-82.23	-82.23	-82.23	-82.23	-82.23	-82.23	J	(71)
	`	g gains (T		ŕ	50.00	50.00		7.00	40.74	40.0	54.40	50.0	00.07	00.00	1	(70)
(72)m=	68.24	66.25	62.16	2	56.63	53.03	4	7.98	43.71	49.2	51.18	56.9	63.37	66.29]	(72)
		I gains = 468.28	450.1	<i>E</i>	400.05	393.95			353.58	r	+ (69)m +	<u> </u>	(71)m + (72)	459.64	1	(73)
(73)m=	472.23 Iar gair	1	450.1	5	422.25	393.95	13	868.5	303.00	361.04	377.05	405.15	5 436.31	459.64		(73)
			using so	olar	flux from	Table 6a	and	associ	iated equa	itions to c	onvert to th	ne applic	able orienta	tion.		
-		Access F	-		Area			Flu			g_		FF		Gains	
		Table 6d			m²			Tal	ole 6a	٦	able 6b		Table 6c		(W)	
North	0.9x	0.77		x	2.3	9	x	1	0.63	x	0.76	x	0.8	=	10.71	(74)
North	0.9x	0.77		x	2.3	39	x	2	0.32	× [0.76	×	0.8	=	20.46	(74)
North	0.9x	0.77		x	2.3	39	x	3	4.53	× [0.76	×	0.8	=	34.77	(74)
North	0.9x	0.77		x	2.3	39	x	5	5.46	× [0.76	×	0.8	=	55.85	(74)
North	0.9x	0.77		x	2.3	39	x	7	4.72	× [0.76	×	0.8	=	75.24	(74)

North	0.9x	0.77	x	2.3	9	x	79.	99	x	0.7	76	x	0.8		=	80.55	(74)
North	0.9x	0.77	x	2.3	9	x	74.	68	x	0.7	76	x	0.8		=	75.2	(74)
North	0.9x	0.77	x	2.3	9	x	59.	25	x	0.7	76	x	0.8		=	59.66	(74)
North	0.9x	0.77	x	2.3	9	x	41.	52	x	0.7	76] × [0.8		=	41.81	(74)
North	0.9x	0.77	x	2.3	9	x	24.	19	x	0.7	76] × [0.8		=	24.36	(74)
North	0.9x	0.77	x	2.3	9	x	13.	12	x	0.7	76		0.8		=	13.21	(74)
North	0.9x	0.77	x	2.3	9	x	8.8	36	x	0.7	76	Ī × Ī	0.8		=	8.93	(74)
South	0.9x	0.77	x	2.3	39	x	46.	75	x	0.7	76] × [0.8		=	94.16	(78)
South	0.9x	0.77	x	2.3	9	x	76.	57	x	0.7	76] × [0.8		=	154.21	(78)
South	0.9x	0.77	x	2.3	39	x	97.	53	x	0.7	76	Ī × Ī	0.8		=	196.44	(78)
South	0.9x	0.77	x	2.3	39	x	110	.23	x	0.7	76] × [0.8		=	222.01	(78)
South	0.9x	0.77	×	2.3	39	x	114	.87	x	0.7	76] × [0.8		=	231.35	(78)
South	0.9x	0.77	×	2.3	39	x	110	.55	x	0.7	76	i × i	0.8		=	222.65	(78)
South	0.9x	0.77	x	2.3	9	x	108	.01	x	0.7	76	i × i	0.8		=	217.54	(78)
South	0.9x	0.77	x	2.3	9	x	104	.89	x	0.7	76	- × [0.8		=	211.26	(78)
South	0.9x	0.77	x	2.3	9	x	101	.89	x	0.7	76	i × i	0.8		=	205.2	(78)
South	0.9x	0.77	x	2.3	9	x	82.	59	x	0.7	76	i × i	0.8		=	166.33	(78)
South	0.9x	0.77	x	2.3	39	x	55.	42	x	0.7	76	x	0.8		=	111.61	(78)
South	0.9x	0.77	×	2.3	9	x	40	.4	x	0.7	76		0.8		-	81.36	(78)
												1					
Solar	uaine in	watts, ca		l for oac	h month				(83)m	= Sum(74)m	(82)m					
(83)m=	112.81	190.21	256.8	315.19	352.34	-	50.02	337.32	309		<u> </u>	209.13	134.73	96	.82		(83)
		nternal a			- = (73)m									-			
(84)m=	585.04	658.49	706.95	737.44	746.29	7	18.52	690.9	670	.25 65	3.83	614.27	571.03	556	6.46		(84)
7 Me	an inter	nal temp	erature	(heating	seasor	- 											
		during h		, o		<i>.</i>	area fro	om Tab	ole 9	Th1 (°	C)				I	21	(85)
		tor for g	• •			-					0)				l	21	()
otinot	Jan	Feb	Mar	Apr	May	Ť	Jun	Jul	A	ug	Sep	Oct	Nov		Dec		
(86)m=	0.99	0.98	0.95	0.9	0.79	+	0.62	0.45	0.4	<u> </u>	.71	0.91	0.97	-	99		(86)
Maan	interna	l tempera	atura in	livina ar			w stop		I 7 in T	ahla Qr				_			
(87)m=	19.99	20.16	20.39	20.66	20.87	1	i	20.99	20.9).94	20.7	20.3	19	.97		(87)
															-		
1 emp (88)m=	erature 19.92	during h 19.92	19.93	19.94	19.95	-	<u> </u>	rom 1a 19.96	19.9		9.95	19.95	19.94	10	.93		(88)
										90 18	9.95	19.95	19.94	19	.93		(00)
		tor for g		r		-	<u> </u>		<u> </u>					-			
(89)m=	0.98	0.97	0.94	0.87	0.73	(0.53	0.35	0.3	8 0	.62	0.87	0.97	0.	99		(89)
Mean	interna	l temper	ature in	the rest	of dwel	ling	T2 (fol	low ste	eps 3	to 7 in	Table	9c)					
(90)m=	18.62	18.86	19.19	19.57	19.82	1	9.94	19.96	19.9	96 19	9.91	19.62	19.08	18	.59		(90)
						_	_	_	_	_	fL	A = Liv	ng area ÷	(4) =		0.64	(91)
Mean	interna	l tempera	ature (fo	or the wh	ole dwe	ellin	g) = fLA	A x T1	+ (1	– fLA) :	× T2				-		
(92)m=	19.5	19.69	19.96	20.27	20.49	-	<u> </u>	20.62	20.0	<u> </u>	0.57	20.31	19.86	19	.47		(92)

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

	10.25	10 54	10.01	20.42	20.24	20.45	20.47	20.47	20.42	20.46	10.71	10.22		(93)
(93)m=	19.35	19.54	19.81 uromont	20.12	20.34	20.45	20.47	20.47	20.42	20.16	19.71	19.32		(93)
			uirement		o obtair	od at et	on 11 of	Table O	a co tha	t Ti m_('	76)m an	d re-calc	ulato	
			or gains			ieu al si	-p 11 01		J, 50 li la	t 11,111–(r ojin an	u ie-caic	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	:										
(94)m=	0.98	0.96	0.94	0.87	0.76	0.57	0.4	0.43	0.66	0.88	0.96	0.98		(94)
Usefu	ıl gains,	hmGm	W = (94	4)m x (84	4)m									
(95)m=	573.28	635.38	662.2	644.82	564.72	409.48	277.47	290.29	432.18	541.42	549.96	547.33		(95)
	<u> </u>	-	rnal tem			r	r	· · · · · ·					1	
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
						Lm , W =			· ,	-				(07)
	1129.79		992.51	823.46	632.22	422.06	279.23	292.83	458.55	699.49	928.48	1120.06		(97)
						Wh/mont					1)m 272.53	400.44		
(98)m=	414.04	309.35	245.75	128.62	50.22	0	0	0	0	117.61		426.11	1001.00	
								Tota	l per year	(kvvn/year) = Sum(9	8)15,912 =	1964.23	(98)
Space	e heating	g require	ement in	kWh/m ²	/year								31.35	(99)
9a. En	ergy req	luiremer	nts – Indi	vidual h	eating sy	ystems i	ncluding	micro-C	CHP)					
	e heatir	-												
Fracti	ion of sp	ace hea	it from s	econdar	y/supple	mentary	system						0	(201)
Fracti	ion of sp	ace hea	it from m	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fracti	ion of to	tal heatii	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficie	ency of r	nain spa	ace heat	ing syste	em 1								92.9	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heating	a svsterr	n, % –						0	(208)
					· · · ·	3 . 3								(200)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/y	`
Space		Feb		Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/y	`
Space		Feb	Mar	Apr	Мау	Jun	Jul 0	Aug 0	Sep 0	Oct 117.61	Nov 272.53	Dec 426.11	kWh/y	`
·	e heatin 414.04	Feb g require 309.35	Mar ement (c	Apr alculate 128.62	May d above) 50.22	Jun) 0							kWh/y	`
	e heatin 414.04	Feb g require 309.35	Mar ement (c 245.75	Apr alculate 128.62	May d above) 50.22	Jun) 0		0	0	117.61 126.59	272.53 293.36	426.11 458.67	kWh/y	ear
	e heatin 414.04 n = {[(98	Feb g require 309.35)m x (20	Mar ement (c 245.75 4)] + (21	Apr alculate 128.62 0)m } x	May d above) 50.22 100 ÷ (2	Jun) 0 206)	0	0	0	117.61 126.59	272.53 293.36	426.11 458.67	kWh/y 2114.35	ear
(211)m Space	e heating 414.04 n = {[(98 445.69 e heating	Feb g require 309.35)m x (20 332.99 g fuel (s	Mar ement (c 245.75 4)] + (21 264.53 econdar	Apr alculate 128.62 0)m } x 138.45 y), kWh/	May d above 50.22 100 ÷ (2 54.06	Jun) 0 206)	0	0	0	117.61 126.59	272.53 293.36	426.11 458.67		(211)
(211)m Space = {[(98	e heating 414.04 n = {[(98) 445.69 e heating)m x (20	Feb g require 309.35)m x (20 332.99 g fuel (s	Mar ement (c 245.75 4)] + (21 264.53	Apr alculate 128.62 0)m } x 138.45 y), kWh/ (100 ÷ ()	May d above 50.22 100 ÷ (2 54.06 month 208)	Jun) 0 (06) 0	0	0 0 Tota	0 0 I (kWh/yea	117.61 126.59 ar) =Sum(2	272.53 293.36 211) _{15,1012}	426.11 458.67		(211)
(211)m Space	e heating 414.04 n = {[(98) 445.69 e heating)m x (20	Feb g require 309.35)m x (20 332.99 g fuel (s	Mar ement (c 245.75 4)] + (21 264.53 econdar	Apr alculate 128.62 0)m } x 138.45 y), kWh/	May d above 50.22 100 ÷ (2 54.06	Jun) 0 206)	0	0 Tota	0 I (kWh/yea	117.61 126.59 ar) =Sum(2 0	272.53 293.36 211) _{15,1012} 0	426.11 458.67 = 0		(211) (211)
(211)m Space = {[(98	e heating 414.04 n = {[(98) 445.69 e heating)m x (20	Feb g require 309.35)m x (20 332.99 g fuel (so 1)] + (21	Mar ement (c 245.75 4)] + (21 264.53 econdar 14) m } x	Apr alculate 128.62 0)m } x 138.45 y), kWh/ (100 ÷ ()	May d above 50.22 100 ÷ (2 54.06 month 208)	Jun) 0 (06) 0	0	0 Tota	0 0 I (kWh/yea	117.61 126.59 ar) =Sum(2 0	272.53 293.36 211) _{15,1012} 0	426.11 458.67 = 0		(211)
(211)m Space = {[(98 (215)m= Water	e heating 414.04 n = {[(98) 445.69 e heating)m x (20) 0 heating	Feb g require 309.35)m x (20 332.99 g fuel (s 11)] + (2 ⁻ 0	Mar ement (c 245.75 4)] + (21 264.53 econdar 14) m } x 0	Apr alculate 128.62 0)m } x 138.45 y), kWh/ (100 ÷ (: 0	May d above 50.22 100 ÷ (2 54.06 month 208) 0	Jun) 0 (06) 0	0	0 Tota	0 I (kWh/yea	117.61 126.59 ar) =Sum(2 0	272.53 293.36 211) _{15,1012} 0	426.11 458.67 = 0	2114.35	(211) (211)
(211)m Space = {[(98 (215)m= Water	e heating 414.04 $a = \{[(98)]$ 445.69 e heating)m x (20) 0 heating t from wa	Feb g require 309.35)m x (20 332.99 g fuel (s 1)] + (2 ⁻¹ 0	Mar ement (c 245.75 4)] + (21 264.53 econdar 14) m } x 0 ter (calc	Apr alculated 128.62 0)m } x 138.45 y), kWh/ c 100 ÷ (0	May d above 50.22 100 ÷ (2 54.06 month 208) 0	Jun 0 2:06) 0	0	0 Tota 0 Tota	0 I (kWh/yea 0 I (kWh/yea	117.61 126.59 ar) =Sum(2 0 ar) =Sum(2	272.53 293.36 211) _{15,1012} 0 215) _{15,1012}	426.11 458.67 = 0	2114.35	(211) (211)
(211)m Space = {[(98 (215)m= Water Output	e heating 414.04 n = {[(98 445.69 e heating)m x (20 0 heating t from wa 158.37	Feb g require 309.35)m x (20 332.99 g fuel (s 1)] + (2 ⁻¹ 0	Mar ement (c 245.75 4)] + (21 264.53 econdar 14) m } x 0 ter (calc 144.65	Apr alculate 128.62 0)m } x 138.45 y), kWh/ (100 ÷ (: 0	May d above 50.22 100 ÷ (2 54.06 month 208) 0	Jun) 0 (06) 0	0	0 Tota	0 I (kWh/yea	117.61 126.59 ar) =Sum(2 0	272.53 293.36 211) _{15,1012} 0	426.11 458.67 = 0	0	(211) (211) (211)
(211)m Space = {[(98 (215)m= Water Output	e heating 414.04 h = {[(98) 445.69 e heating)m x (20) heating t from wa 158.37 hey of wa	Feb g require 309.35)m x (20 332.99 g fuel (so 11)] + (2 0 138.98 ater hea ater hea	Mar ement (c 245.75 4)] + (21 264.53 econdar 14) m } x 0 ter (calc 144.65 ter	Apr alculate 128.62 0)m } x 138.45 y), kWh/ (100 ÷ (0 ulated al 127.92	May d above 50.22 100 ÷ (2 54.06 month 208) 0 0 200ve) 124.06	Jun 0 006) 0 0 109.05	0 0 103.09	0 Tota 0 Tota 115.47	0 I (kWh/yea 0 I (kWh/yea 116.05	117.61 126.59 ar) =Sum(2 0 ar) =Sum(2 132.82	272.53 293.36 211) _{15,1012} 0 215) _{15,1012} 142.64	426.11 458.67 = 0 =	2114.35	(211) (211) (211) (215)
(211)m Space = {[(98 (215)m= Water Output Efficien (217)m=	e heating 414.04 n = {[(98) 445.69 e heating)m x (20) 0 heating t from wa 158.37 ncy of w 89.17	Feb g require 309.35)m x (20 332.99 g fuel (s 1)] + (2' 0 1) ater hea 138.98 ater hea 89.08	Mar ement (c 245.75 4)] + (21 264.53 econdar 14) m } x 0 ter (calc 144.65 ter 88.92	Apr alculated 128.62 0)m } x 138.45 y), kWh/ 100 ÷ (1 0 ulated al 127.92 88.58	May d above 50.22 100 ÷ (2 54.06 month 208) 0	Jun 0 2:06) 0	0	0 Tota 0 Tota	0 I (kWh/yea 0 I (kWh/yea	117.61 126.59 ar) =Sum(2 0 ar) =Sum(2	272.53 293.36 211) _{15,1012} 0 215) _{15,1012}	426.11 458.67 = 0	0	(211) (211) (211)
(211)m Space = {[(98 (215)m= Water Output Efficien (217)m= Fuel for	e heating 414.04 $a = \{[(98) \\ 445.69$ e heating m x (20) heating t from wa 158.37 ncy of wa 89.17 or water	Feb g require 309.35)m x (20 332.99 g fuel (so 1)] + (2 ⁻¹ 0 l ater hea 138.98 ater hea 89.08 heating,	Mar ement (c 245.75 4)] + (21 264.53 econdar 14) m } x 0 ter (calc 144.65 ter 88.92 kWh/mo	Apr alculated 128.62 0)m } x 138.45 y), kWh/ (100 ÷ (1 0 ulated al 127.92 88.58 onth	May d above 50.22 100 ÷ (2 54.06 month 208) 0 0 200ve) 124.06	Jun 0 006) 0 0 109.05	0 0 103.09	0 Tota 0 Tota 115.47	0 I (kWh/yea 0 I (kWh/yea 116.05	117.61 126.59 ar) =Sum(2 0 ar) =Sum(2 132.82	272.53 293.36 211) _{15,1012} 0 215) _{15,1012} 142.64	426.11 458.67 = 0 =	0	(211) (211) (211) (215)
(211)m Space = {[(98 (215)m= Water Output Efficien (217)m= Fuel fo (219)m	e heating 414.04 $a = \{[(98) \\ 445.69$ e heating m x (20) heating t from wa 158.37 ncy of wa 89.17 or water	Feb g require 309.35)m x (20 332.99 g fuel (so 1)] + (2 ⁻¹ 0 l ater hea 138.98 ater hea 89.08 heating,	Mar ement (c 245.75 4)] + (21 264.53 econdar 14) m } x 0 ter (calc 144.65 ter 88.92	Apr alculated 128.62 0)m } x 138.45 y), kWh/ (100 ÷ (1 0 ulated al 127.92 88.58 onth	May d above 50.22 100 ÷ (2 54.06 month 208) 0 0 200ve) 124.06	Jun 0 006) 0 0 109.05	0 0 103.09	0 Tota 0 Tota 115.47	0 I (kWh/yea 0 I (kWh/yea 116.05	117.61 126.59 ar) =Sum(2 0 ar) =Sum(2 132.82	272.53 293.36 211) _{15,1012} 0 215) _{15,1012} 142.64	426.11 458.67 = 0 =	0	(211) (211) (211) (215)
(211)m Space = {[(98 (215)m= Water Output Efficien (217)m= Fuel fo (219)m	e heating 414.04 1 = {[(98 445.69 e heating)m x (20 0 heating 158.37 ncy of w 89.17 or water 1 = (64)	Feb g require 309.35)m x (20 332.99 g fuel (s 1)] + (2' 0 1)] + (2' 0 1) ater hea 138.98 ater hea 89.08 heating, m x 100	Mar ement (c 245.75 4)] + (21 264.53 econdar 14) m } x 0 ter (calc 144.65 ter 88.92 kWh/mc 0 ÷ (217)	Apr alculated 128.62 0)m } x 138.45 y), kWh/ (100 ÷ (0 ulated al 127.92 88.58 onth m	May d above 50.22 100 ÷ (2 54.06 month 208) 0 0 208) 0 124.06 88.03	Jun 0 :06) 0 :06) 0 109.05 87.3	0 0 103.09 87.3	0 Tota 0 Tota 115.47 87.3	0 I (kWh/yea 0 I (kWh/yea 116.05 87.3	117.61 126.59 ar) = Sum(2) 0 ar) = Sum(2) 132.82 88.5 150.07	272.53 293.36 211) _{15,1012} 0 215) _{15,1012} 142.64 88.99	426.11 458.67 = 0 = 154 89.19	0	(211) (211) (211) (215)
(211)m Space = {[(98 (215)m= Water Output Efficien (217)m= Fuel fo (219)m (219)m=	e heating 414.04 1 = {[(98 445.69 e heating)m x (20 0 heating 158.37 ncy of w 89.17 or water 1 = (64)	Feb g require 309.35)m x (20 332.99 g fuel (s 1)] + (2' 0 1)] + (2' 0 1) ater hea 138.98 ater hea 89.08 heating, m x 100	Mar ement (c 245.75 4)] + (21 264.53 econdar 14) m } x 0 ter (calc 144.65 ter 88.92 kWh/mc 0 ÷ (217)	Apr alculated 128.62 0)m } x 138.45 y), kWh/ (100 ÷ (0 ulated al 127.92 88.58 onth m	May d above 50.22 100 ÷ (2 54.06 month 208) 0 0 208) 0 124.06 88.03	Jun 0 :06) 0 :06) 0 109.05 87.3	0 0 103.09 87.3	0 Tota 0 Tota 115.47 87.3	0 0 I (kWh/yea 116.05 87.3 132.94	117.61 126.59 ar) = Sum(2) 0 ar) = Sum(2) 132.82 88.5 150.07 19a) ₁₁₂ =	272.53 293.36 211) _{15,1012} 0 215) _{15,1012} 142.64 88.99	426.11 458.67 = 0 = 154 89.19 172.66	0	(211) (211) (211) (215) (215) (216) (217) (219)
(211)m Space = {[(98 (215)m= Water Output Efficien (217)m= Fuel fo (219)m= (219)m= Annua	e heating 414.04 $h = \{[(98)$ 445.69 e heating $m \times (20)$ $m \times (20)$ $n \times (20)$	Feb g require 309.35)m x (20 332.99 g fuel (s 11)] + (2 ⁻ 0 1 ater hea 138.98 ater hea 89.08 heating, m x 100 156.02	Mar ement (c 245.75 4)] + (21 264.53 econdar 14) m } x 0 ter (calc 144.65 ter 88.92 kWh/mc 0 ÷ (217)	Apr alculated 128.62 0)m } x 138.45 y), kWh/ (100 ÷ (1) 0 ulated al 127.92 88.58 onth m 144.4	May d above 50.22 100 ÷ (2 54.06 month 208) 0 0 200ve) 124.06 88.03	Jun 0 :06) 0 :06) 0 109.05 87.3	0 0 103.09 87.3	0 Tota 0 Tota 115.47 87.3	0 0 I (kWh/yea 116.05 87.3 132.94	117.61 126.59 ar) = Sum(2) 0 ar) = Sum(2) 132.82 88.5 150.07 19a) ₁₁₂ =	272.53 293.36 211) _{15,1012} 0 215) _{15,1012} 142.64 88.99 160.29	426.11 458.67 = 0 = 154 89.19 172.66	2114.35 0 87.3 1772.88	(211) (211) (211) (215) (215) (216) (217) (219)

Water heating fuel used			1772.88
Electricity for pumps, fans and electric keep-h	ot		
central heating pump:		30	(2300
boiler with a fan-assisted flue		45	(230e
Total electricity for the above, kWh/year	sur	n of (230a)(230g) =	75 (231)
Electricity for lighting			299.68 (232)
10a. Fuel costs - individual heating systems:			
	Fuel kWh/year	Fuel Price (Table 12)	Fuel Cost £/year
Space heating - main system 1	(211) x	3.48 × 0.01	= 73.5794 (240)
Space heating - main system 2	(213) x	0 × 0.01	= 0 (241)
Space heating - secondary	(215) x	13.19 × 0.01	= 0 (242)
Water heating cost (other fuel)	(219)	3.48 × 0.01	= 61.7 (247)
Pumps, fans and electric keep-hot	(231)	13.19 × 0.01	= 9.89 (249)
(if off-peak tariff, list each of (230a) to (230g) s Energy for lighting	separately as applicable a	0.04	
Additional standing charges (Table 12)	(202)	13.19 × 0.01	
			120 (251)
Appendix Q items: repeat lines (253) and (254 Total energy cost (245).	l) as needed .(247) + (250)(254) =		304.7 (255)
11a. SAP rating - individual heating systems			304.7
Energy cost deflator (Table 12)			0.42 (256)
	x (256)] ÷ [(4) + 45.0] =		0.42 (256)
SAP rating (Section 12)			83.42 (258)
12a. CO2 emissions - Individual heating sys	tems including micro-CH	P	
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	456.7 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	382.94 (264)
Space and water heating	(261) + (262) + (263) +	(264) =	839.64 (265)
Electricity for pumps, fans and electric keep-h	ot (231) x	0.519 =	38.93 (267)
Electricity for lighting	(232) x	0.519 =	155.53 (268)
Total CO2, kg/year		sum of (265)(271) =	1034.1 (272)
CO2 emissions per m ²		(272) ÷ (4) =	16.5 (273)
El rating (section 14)			87 (274)
13a Primary Energy			

	Energy kWh/year	Primary factor	P. Energy kWh/year
Space heating (main system 1)	(211) x	1.22 =	2579.51 (261)
Space heating (secondary)	(215) x	3.07 =	0 (263)
Energy for water heating	(219) x	1.22 =	2162.91 (264)
Space and water heating	(261) + (262) + (263) + (264) =		4742.41 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07 =	230.25 (267)
Electricity for lighting	(232) x	0 =	920.02 (268)
'Total Primary Energy	sur	m of (265)(271) =	5892.69 (272)
Primary energy kWh/m²/year	(27	(2) ÷ (4) =	94.04 (273)



			User [Details:						
Assessor Name: Software Name:	Stroma FS	AP 2012		Strom Softwa	are Vei	sion:		Versio	n: 1.0.0.28	
			Property	Address	: 2 Bed 2	2013 Bas	seline			
Address :										
1. Overall dwelling dime	nsions:		۸ro	a(m²)		Av. Hei	abt(m)		Volume(m ³)	
Ground floor					(1a) x			(2a) =	103.75	(3a)
First floor					(1b) x			(2b) =	103.75](3b)
Total floor area TFA = (1a	a)+(1b)+(1c)+	(1d)+(1¤)+ (()	100.70](02)
	a)+(10)+(10)+	(10)+(10)+(83	(4)) . (2o) . (2d) . (20) .	(2n) =		٦
Dwelling volume					(3a)+(3b))+(3c)+(3d)+(3e)+	.(31) =	207.5	(5)
2. Ventilation rate:	main	second	arv	other		total			m ³ per hour	
	heating	heating		other		lotai				-
Number of chimneys	0	+ 0	+	0	=	0	x 4	40 =	0	(6a)
Number of open flues	0	+ 0	+	0] = [0	x 2	20 =	0	(6b)
Number of intermittent fa	ns					3	x 1	0 =	30	(7a)
Number of passive vents					Γ	0	x 1	0 =	0	(7b)
Number of flueless gas fi	res				Ē	0	×4	40 = Air ch	0 anges per hou](7c) I r
Infiltration due to chimney	s, flues and fa	ans = (6a)+(6b)+	-(7a)+(7b)+	(7c) =	Г	30		÷ (5) =	0.14	(8)
If a pressurisation test has b			eed to (17),	otherwise o	continue fr	om (9) to (16)			-
Number of storeys in th	ne dw <mark>elling</mark> (na	5)							0	(9)
Additional infiltration Structural infiltration: 0.	25 for stool o	timbor frame	or 0 25 fo	r macanı	av constr	uction	[(9)-	1]x0.1 =	0	(10)
if both types of wall are pr					•	uction			0	(11)
deducting areas of openir										-
If suspended wooden f		. ,	0.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, ent Percentage of windows									0	(13) (14)
Window infiltration		augin sinpped		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 cubic met	res per h	our per s	quare m	etre of e	nvelope	area	6	(17)
If based on air permeabil	ity value, then	(18) = [(17) ÷ 20]	+(8), otherw	vise (18) = ((16)				0.44	(18)
Air permeability value applie		on test has been a	lone or a de	gree air pe	rmeability	is being us	sed			-
Number of sides sheltere Shelter factor	d			(20) = 1 -	[0 075 x (1	9)1 –			2	(19)
Infiltration rate incorporat	ing shelter fac	tor		(20) = 1 (21) = (18)		0)] –			0.85	(20)
Infiltration rate modified for	-			<u>,-</u> ., = (10	,(_0) -				0.38	(21)
	Mar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp				1				- ••	I	
· · · · · · · · · · · · · · · · · · ·	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		

Wind F	actor (2	22a)m =	(22)m ÷	4									_		
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]		
Adjuste	ed infiltr	ation rat	e (allowi	ing for st	nelter ar	nd wind s	speed) =	(21a) x	(22a)m	-	-	-	_		
	0.48	0.47	0.46	0.42	0.41	0.36	0.36	0.35	0.38	0.41	0.43	0.44			
			-	rate for t	he appli	icable ca	ise	-			-		-		
		al ventila		endix N, (2	(26) = (22)		oquation (I	N5)) otho	nuico (22h) - (220)			(-	(23a)
				iency in %) – (200)			((23b)
			-	-	-					26) m i (1	00h) [/	1 (000)	()	(23c)
a) II (24a)m=				entilation				$\frac{1}{1}$ (24a)	a)m = (2)	$\frac{20}{0}$ + m(d2	23D) × [*	1 - (23C)) ÷ 100]]		(24a)
	-				-	-	-	-	-		÷	0]		(240)
D) II (24b)m=				entilation				0 0	D = (22)	20)m + (2 0	230)	0	1		(24b)
	_				_	-		-		0	0	0	J		(240)
				ntilation o then (24)	•	•				5 x (23h	.)				
(24c)m=	0	0			0						0	0	1		(24c)
		_	, i	l ole hous	-	-		-	-	ů	ů	<u> </u>	J		
,				m = (221)						0.5]					
(24d) <mark>m=</mark>	0.62	0.61	0.61	0.59	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6			(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24l	b) or (24	c) or (24	d) in bo	(25)						
(25)m=	0.62	0.61	0.61	0.59	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6	1		(25)
2 40		o ond bo		noromot	or										
ELEN		S and he Gros		paramet Openin		Net Ar	100	U-val		AXU		k-valu	<u>_</u>	АX	k
		area		m	-	A ,r		W/m2		(W/I	<)	kJ/m ² ·		kJ/k	
Doors						2	x	1.2	=	2.4					(26)
Window	ws Type	e 1				2.39	x1	/[1/(1.4)+	0.04] =	3.17					(27)
Window	ws Type	e 2				2.39	x1	/[1/(1.4)+	0.04] =	3.17					(27)
Window	ws Type	e 3				0.96	x1	/[1/(1.4)+	0.04] =	1.27					(27)
Floor						41.5	x	0.2		8.3					(28)
Walls		83.1	8	10.1	3	73.05		0.24		17.53			= F		(29)
Roof		41.		0		41.5		0.16		6.64](30)
	rea of e	elements				166.1		0.110		0.01	L		L		(31)
Party v						45	x	0		0					(32)
Interna						41.5](32d)
				effective wi nternal wal			lated using	g formula 1	/[(1/U-valı	ıe)+0.04] a	∟ Is given in	paragrapl	L		_
Fabric	heat los	ss, W/K :	= S (A x	U)				(26)(30) + (32) =				45	.65	(33)
Heat c	apacity	Cm = S((Axk)						((28).	(30) + (32	2) + (32a).	(32e) =	1724	4.75	(34)
Therma	al mass	parame	ter (TMI	⊃ = Cm ÷	- TFA) iı	ר kJ/m²K	<u> </u>		Indica	tive Value	: Medium		25		(35)
	-			etails of the	construct	tion are no	t known pi	recisely the	e indicative	e values of	TMP in Ta	able 1f			J
can be u	ised inste	ad of a de	tailed calc	ulation											
Thorm	al brida			culated	using Ar	nendiv I	ĸ						8.3	24	(36)

if detail	s of therma	al bridging	are not kr	nown (36) =	= 0.15 x (3	1)								
Total f	fabric he	at loss							(33) +	(36) =			53.96	(37)
Ventila	ation hea	at loss ca	alculated	d monthly	у				(38)m	= 0.33 × ((25)m x (5)	1	_	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	42.19	41.88	41.57	40.15	39.89	38.65	38.65	38.42	39.13	39.89	40.43	40.99		(38)
Heat t	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (38)m			
(39)m=	96.15	95.84	95.53	94.11	93.85	92.61	92.61	92.38	93.09	93.85	94.39	94.95]	
Heat l	oss para	meter (I	HP)W	/m²K		•	•			Average = = (39)m ÷	Sum(39)1	12 /12=	94.11	(39)
(40)m=		1.15	1.15	1.13	1.13	1.12	1.12	1.11	1.12	1.13	1.14	1.14]	
· ·					I	I			L,	L Average =	Sum(40)1	₁₂ /12=	1.13	(40)
Numb	er of day	/s in mo	nth (Tab	le 1a)						Ŭ				
	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. W	ater hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
											_		1	
	ned occu			/ [1 - evo			-130)2)] + 0.0	1013 v (⁻	TFA -13		52		(42)
	-A £ 13.		+ 1.707	ι - exp	(-0.0000)+3 x (11	A-13.3	<i>[2)</i>] + 0.0	J015 X (11 A - 13	.3)			
								(25 x N)				.93		(43)
		-		usage by r day (all w		-	-	to achieve	a water us	se target o	of			
not mor												1	1	
List	Jan	Feb	Mar	Apr	May	Jun	Jul Tabla 1 a v	Aug	Sep	Oct	Nov	Dec		
	_			ach month										
(44)m=	108.83	104.87	100.91	96.95	93	89.04	89.04	93	96.95	100.91	104.87	108.83		
Energy	content of	hot water	used - ca	lculated mo	onthly $= 4$.	190 x Vd,r	m x nm x D	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		1187.19	(44)
(45)m=	161.39	141.15	145.65	126.98	121.84	105.14	97.43	111.8	113.14	131.85	143.92	156.29		
										Total = Su	m(45) ₁₁₂ =	=	1556.59	(45)
lf instar	ntaneous w	ater heati	ng at poin: •	t of use (no	o hot water	r storage),	enter 0 in	boxes (46) to (61)				1	
(46)m=		21.17	21.85	19.05	18.28	15.77	14.61	16.77	16.97	19.78	21.59	23.44		(46)
	storage		includir	na anv so	olar or M	///HRS	storade	within sa	ame ves	ما		150	1	(47)
	-	. ,		ank in dw			-			301		150	J	(47)
	•	-			-			ombi boil	ers) ente	er '0' in ((47)			
	storage										,			
a) If n	nanufact	urer's de	eclared l	oss facto	or is kno	wn (kWł	n/day):					0]	(48)
Temp	erature f	actor fro	m Table	2b								0	j	(49)
Energ	y lost fro	m watei	· storage	e, kWh/ye	ear			(48) x (49)) =			0	j	(50)
				cylinder l]	. ,
		-		rom Tabl	le 2 (kW	h/litre/da	ay)					0		(51)
	munity h ne factor	-		on 4.3									1	
	erature f			2h								0	4	(52) (53)
					oor			(17) ~ (54)	VV (EQ) ··· (52)		0] 1	(53)
-	y lost irc (50) or (-	e, kWh/ye	ədi			(47) x (51)) X (32) X (55) =		0 0		(54) (55)
	(00) 01		,									0		(00)

Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0	1	(56)
If cylind	er contain	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	lix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Prima	v circuit	loss (ar	nual) fro	om Table	e 3			•		•		0	İ	(58)
	-	loss cal				59)m = ((58) ÷ 36	65 × (41)	m				•	
(mo	dified by	/ factor fi	rom Tab	le H5 if t	here is s	solar wat	er heatii	ng and a	cylinde	r thermo	stat)		_	
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	i loss ca	lculated	for each	month	(61)m =	(60) ÷ 30	65 × (41))m						
(61)m=	23.91	21.48	23.5	22.29	22.67	21.53	21.99	22.43	21.94	23.15	22.82	23.78		(61)
Total h	neat req	uired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	185.29	162.62	169.16	149.27	144.52	126.67	119.42	134.23	135.08	155	166.75	180.07		(62)
Solar D	HW input	calculated	using App	endix G o	· Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (G)			-	_	
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Outpu	t from w	ater hea	ter										_	
(64)m=	185.29	162.62	169.16	149.27	144.52	126.67	119.42	134.23	135.08	155	166.75	180.07		_
								Outp	out from w	ater heate	r (annual)₁	12	1828.07	(64)
Heat g	jains fro	m water	heating	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)n	n] + 0.8 x	x [(46)m	+ (57)m	+ (59)m	1	
(65)m=	59.64	52.3	54.31	47.79	46.18	40.34	37.89	42.78	43.1	49.63	53.56	57.91		(65)
inclu	ude (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	vater is fi	om com	munity h	eating	
5 . In	tern <mark>al g</mark> a	ains (s <mark>ee</mark>	e Ta <mark>ble {</mark>	5 and 5a):									
Metab	<u>olic gair</u>	ns (Table	e <u>5), Wa</u> t	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	151.04	151.04	151.04	151.04	151.04	151.04	151.04	151.04	151.04	151.04	151.04	151.04		(66)
Lightir	ng gains	(calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5				_	
(67)m=	56.67	50.34	40.94	30.99	23.17	19.56	21.13	27.47	36.87	46.82	54.64	58.25		(67)
Applia	nces ga	ins (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5	_	-	_	
(68)m=	336.71	340.2	331.4	312.65	288.99	266.75	251.9	248.4	257.21	275.95	299.61	321.85		(68)
Cookir	ng gains	(calcula	ated in A	ppendix	L, equa	tion L15	or L15a)), also se	e Table	5			_	
(69)m=	52.62	52.62	52.62	52.62	52.62	52.62	52.62	52.62	52.62	52.62	52.62	52.62		(69)
Pumps	s and fa	ns gains	(Table &	5a)										
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losse	s e.g. e\	vaporatio	on (nega	tive valu	es) (Tab	ole 5)								
(71)m=	-100.69	-100.69	-100.69	-100.69	-100.69	-100.69	-100.69	-100.69	-100.69	-100.69	-100.69	-100.69		(71)
Water	heating	gains (T	able 5)											
(72)m=	80.16	77.83	72.99	66.38	62.07	56.03	50.93	57.5	59.87	66.7	74.39	77.84		(72)
Total	internal	gains =				(66)	m + (67)m	n + (68)m -	+ (69)m +	(70)m + (7	1)m + (72)	m	-	
(73)m=	579.51	574.34	551.29	515.99	480.2	448.31	429.93	439.34	459.91	495.44	534.61	563.91		(73)
6 50	lar gain:	s.												

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

Orientation:	Access Fact Table 6d	or	Area m²			Flux Tab	x ole 6a		т	g_ able 6b		Т	FF able 6c			Gains (W)	
North 0.9	0.77	x	2.3	9	x	1(0.63) ×		0.76],	، ۲	0.8		=	10.71	(74)
North 0.9>	0.77	x	2.3	9	x	20	0.32	×		0.76],	۰Ē	0.8		=	20.46	(74)
North 0.9>	0.77	x	2.3	9	x	34	4.53	İ×		0.76],	۰Ī	0.8		=	34.77	(74)
North 0.9>	0.77	x	2.3	9	x	5	5.46	x		0.76	,	۰Ē	0.8		=	55.85	(74)
North 0.9>	0.77	x	2.3	9	x	74	4.72	×		0.76],	۰Ī	0.8		=	75.24	(74)
North 0.9>	0.77	x	2.3	9	x	79	9.99	×		0.76	,	٢Ī	0.8		=	80.55	(74)
North 0.9	0.77	x	2.3	9	x	74	4.68	×		0.76	;	٢Ē	0.8		=	75.2	(74)
North 0.9	0.77	x	2.3	9	x	59	9.25	×		0.76	,	٢Ē	0.8		=	59.66	(74)
North 0.9>	0.77	x	2.3	9	x	4	1.52	×		0.76	,	۰Ē	0.8		=	41.81	(74)
North 0.9>	0.77	×	2.3	9	x	24	4.19	×		0.76],	٠Ē	0.8		=	24.36	(74)
North 0.9>	0.77	×	2.3	9	x	1:	3.12	×		0.76],	٠Ē	0.8		=	13.21	(74)
North 0.9>	0.77	×	2.3	9	x	8	.86	×		0.76] ,	٠Ē	0.8		=	8.93	(74)
South 0.9>	0.77	×	2.3	9	x	40	6.75	×		0.76],	٠Ē	0.8		=	94.16	(78)
South 0.9	0.77	x	2.3	9	x	76	6.57	×		0.76	,	٢Ī	0.8		=	154.21	(78)
South 0.9>	0.77	x	2.3	9	x	9	7.53	×		0.76	,	۰Ī	0.8		=	196.44	(78)
South 0.9>	0.77	x	2.3	9	x	11	0.23	x		0.76)	(0.8		=	222.01	(78)
South 0.9	0.77	×	2.3	9	x	11	4.87	x		0.76)	< [0.8		-	231.35	(78)
South 0.9	0.77	×	2.3	9	x	11	0.55	İ 🖈		0.76)	۰Ē	0.8		=	222.65	(78)
South 0.9	0.77	×	2.3	9	x	10	8.01	j x		0.76)	۰Ī	0.8		=	217.54	(78)
South 0.9	0.77	Τ×	2.3	9	x	10	94.89	x		0.76)	۰Ē	0.8		=	211.26	(78)
South 0.9	0.77	ا× آ	2.3	9	x	10	01.89	×		0.76)	۰Ē	0.8		=	205.2	(78)
South 0.9»	0.77	×	2.3	9	х	8	2.59	×		0.76)	۰Ē	0.8		=	166.33	(78)
South 0.9	0.77	_× آ	2.3	9	x	5	5.42	×		0.76	Ξ,	< [0.8		=	111.61	(78)
South 0.9>	0.77	x	2.3	9	x	4	0.4	x		0.76	,	۰Ē	0.8		=	81.36	(78)
				•				•									
Solar <u>g</u> ains i	n watts, calcu	lated	for eac	n month	<u>۱</u>			(83)r	n = S	um(74)m .	(82)	m					
(83)m= 112.8		56.8	315.19	352.34		50.02	337.32	309	9.22	276.77	209	.13	134.73	96.	.82		(83)
-	- internal and		. ,	. ,	т`											1	
(84)m= 692.3	2 764.55 8	08.1	831.19	832.54	79	98.33	767.25	748	3.56	736.69	704	.57	669.34	660).73		(84)
7. Mean inte	ernal tempera	ature	(heating	seasor	า)												
Temperatur	e during heat	ting p	eriods ir	the liv	ing	area f	rom Tab	ole 9	, Th	1 (°C)						21	(85)
Utilisation fa	actor for gain	s for l	iving are	ea, h1,n	n (s	ee Tal	ble 9a)						-				
Jan	Feb	Mar	Apr	May		Jun	Jul	Α	ug	Sep	0	ct	Nov	D	ec		
(86)m= 0.99	0.98 0	.97	0.94	0.86	(0.69	0.52	0.	55	0.77	0.9	94	0.98	0.9	99		(86)
Mean interr	al temperatu	re in l	living are	ea T1 (f	ollo	w step	os 3 to 7	7 in ⁻	Table	e 9c)							
(87)m= 19.96	5 20.11 2	0.32	20.59	20.82	2	20.96	20.99	20	.99	20.92	20.	64	20.26	19.	.94		(87)
Temperatur	e during heat	ting p	eriods ir	n rest of	f dw	elling	from Ta	able	9, TI	h2 (°C)							
(88)m= 19.95		9.96	19.97	19.98	-	9.99	19.99	r –	.99	19.98	19.	98	19.97	19.	.97		(88)
Utilisation f	actor for gain:	s for i	est of d	velling	h2	m (se	e Table	9a)		I						I	
(89)m= 0.99		0.96	0.91	0.81	-	0.6	0.41	r Ó	44	0.69	0.9	91	0.98	0.9	99		(89)
					_											l	

Mean	interna	l temper	ature in	the rest	of dwell	ing T2 (f	ollow ste	eps 3 to 7	7 in Tabl	e 9c)				
(90)m=	18.6	18.81	19.12	19.5	19.8	19.96	19.98	19.99	19.92	19.58	19.04	18.57		(90)
									f	iLA = Livin	g area ÷ (4	4) =	0.36	(91)
Moon	intorno	Itompor	oturo (fe	or the wh	olo dwo	lling) – f	Ι Λ Ν Τ1	ı (1 fl	A) v T2					
(92)m=	19.09	19.28	19.55	19.9	20.17	20.32	20.35	20.35	20.28	19.97	19.48	19.06		(92)
				internal							10.40	10.00		(02)
(93)m=	18.94	19.13	19.4	19.75	20.02	20.17	20.2	20.2	20.13	19.82	19.33	18.91	l	(93)
			uiremen		LUIUL	20.11	20.2	20.2	20.10	10.02	10.00	10.01		
				mperatu	re obtair	hed at st	en 11 of	Table 9	h so tha	t Ti m–(76)m an	d re-calc	rulate	
				using Ta					o, oo ma	(, it ii,iii–(<i>i</i> 0)iii aii		Julate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hr	1 <u>.</u> 1:					. <u> </u>					
(94)m=	0.99	0.98	0.96	0.91	0.81	0.62	0.43	0.46	0.71	0.91	0.97	0.99		(94)
Usefu	ul gains,	hmGm	, W = (9	4)m x (84	4)m	•					1			
(95)m=	682.01	745.44	771.81	755.05	672.52	495.04	330.69	347.11	520.62	640.17	650.93	652.67		(95)
Montl	hly aver	age exte	rnal terr	perature	from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for me	an interr	al tempe	erature,	Lm , W =	- =[(39)m	x [(93)m	– (96)m					
(97)m=	1407.51	1363.52	1232.5	1020.82	780.56	515.71	333.26	350.85	561.52	864.87	1154.36	1396.92		(97)
Spac	e h <mark>eatin</mark>	g require	ement fo	r each n	honth, k	Wh/mon ⁻	th = 0.02	24 × [(97)m – (95)m] x (4	1)m			
(98)m=	539.78	415.35	342.75	191.35	80.38	0	0	0	0	167.17	362.47	553.72		
								Tota	l per year	(kWh/yeai) = Sum(9	8)15,912 =	2652.97	(98)
Space	e heatin	a require	ement in	1 kWh/m ²	/vear								31.96	(99)
	e heatir		its – inu	ividu <mark>al h</mark>	eatings	ysterns	nciuding	micro-c						
•		•	at from s	econdar	v/supple	mentary	svstem						0	(201)
				nain syst				(202) = 1 ·	- (201) =				1	(202)
	•									(202)1 -				4
			•	main sys				(204) = (2	02) x [1 –	(203)] =			1	(204)
Efficie	ency of I	main spa	ace heat	ing syste	em 1								92.9	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heatin	g systen	ח, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space	e heatin	g require	ement (c	alculate	d above)							-	
	539.78	415.35	342.75	191.35	80.38	0	0	0	0	167.17	362.47	553.72		
(211)m	n = {[(98)m x (20	94)] + (2′	10)m } x	100 ÷ (2	206)								(211)
()	581.03	447.09	368.95	205.98	86.52	, O	0	0	0	179.95	390.17	596.04		
				ļ			1	I Tota	l I (kWh/yea	l ar) =Sum(2	L 211) _{15.1012}	=	2855.73	(211)
Snac	e heatin	a fuel (s	econdar	y), kWh/	month									
•				x 100 ÷ (
(215)m=		0	0	0	0	0	0	0	0	0	0	0		
			1	ļ			1	I Tota	l I (kWh/yea	I ar) =Sum(2	1 215) _{1 5 10 12}	=	0	(215)
Wator	heating	1											-	Ц`́
	-		ter (calc	ulated a	bove)									
	185.29	162.62	169.16	149.27	144.52	126.67	119.42	134.23	135.08	155	166.75	180.07		
Efficie	ncy of w	ater hea	iter			•	•	•					87.3	(216)

(217)m= 89.22 89.15 8	9.02 88.74	88.21	87.3	87.3	87.3	87.3	88.63	89.06	89.25		(217)
Fuel for water heating, kV						1	1	1		1	
$(219)m = (64)m \times 100 \div$ (219)m = 207.68 182.41 19	(217)m 90.01 168.21	163.83	145.1	136.79	153.76	154.73	174.88	187.22	201.76		
	I				Tota	l = Sum(2	19a) ₁₁₂ =	1		2066.38	(219)
Annual totals							k	Wh/year		kWh/year	-
Space heating fuel used,	main system	1								2855.73]
Water heating fuel used										2066.38]
Electricity for pumps, fans	s and electric I	keep-hot	t							_	
central heating pump:									30		(230c)
boiler with a fan-assisted	d flue								45		(230e)
Total electricity for the ab	ove, kWh/yea	r			sum	of (230a).	(230g) =			75	(231)
Electricity for lighting										400.36	(232)
10a. Fuel costs - individu	ual heating sys	stems:									
			Fu kW	el /h/year			Fuel P (Table			Fuel Cost £/year	
Space heating - main sys	tem 1		(211	I) x			3.4	8	x 0.01 =	99.3793	(240)
Space heating - main sys	tem 2		(213	3) x			0		x 0.01 =	0	_ (241)
Space heating - secondar	ry		(215	5) x			13.	19	x 0.01 =	0	(242)
Water heating cost (other	fuel)		(219	9)			3.4	8	x 0.01 =	71.91	(247)
Pumps, fans and electric	keep-hot		(231	I)			13.	19	x 0.01 =	9.89	(249)
(if off-peak tariff, list each Energy for lighting	of (230a) to (2	230g) se	eparately (232		licable a	nd apply	/ fuel prid		ding to 7 x 0.01 =	Table 12a	(250)
Additional standing charg	es (Table 12)									120	(251)
Appendix Q items: repeat	t lines (253) ar	nd (254)	as need	led							-
Total energy cost		. ,	247) + (25		=					353.99	(255)
11a. SAP rating - individ	lual heating sy	stems									
Energy cost deflator (Tab	le 12)									0.42	(256)
Energy cost factor (ECF)		[(255) x	(256)] ÷ [(4) + 45.0]	=					1.16	(257)
SAP rating (Section 12)										83.8	(258)
12a. CO2 emissions – Ir	ndividual heati	ng syste	ems inclu	uding mi	cro-CHP)					
				ergy /h/year			Emiss kg CO2	ion fac 2/kWh	tor	Emissions kg CO2/yea	r
Space heating (main syst	em 1)		(211	I) x			0.2	16	=	616.84	(261)
Space heating (secondar	y)		(215	ō) x			0.5	19	=	0	(263)
Water heating			(219	9) x			0.2	16	=	446.34	(264)
Space and water heating			(261	I) + (262)	+ (263) + (264) =				1063.18	(265)

Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	38.93 (267)
Electricity for lighting	(232) x	0.519 =	207.79 (268)
Total CO2, kg/year		sum of (265)(271) =	1309.89 (272)
CO2 emissions per m ²		(272) ÷ (4) =	15.78 (273)
El rating (section 14)			86 (274)
13a. Primary Energy			
	Energy kWh/year	Primary factor	P. Energy kWh/year
Space heating (main system 1)	(211) x	1.22 =	3483.99 (261)
Space heating (secondary)	(215) x	3.07 =	0 (263)
Energy for water heating	(219) x	1.22 =	2520.99 (264)
Space and water heating	(261) + (262) + (263) + (26	64) =	6004.97 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07 =	230.25 (267)
Electricity for lighting	(232) x	0 =	1229.1 (268)
'Total Primary Energy		sum of (265)(271) =	7464.32 (272)
Primary energy kWh/m²/year		(272) ÷ (4) =	89.93 (273)

Assessor Name:Stroma Number:Software Name:Stroma FSAP 2012Software Version:Version: 1.0.0.28
Property Address: 3 Bed 2013 Baseline
Address :
1. Overall dwelling dimensions:
Area(m²) Av. Height(m) Volume(m³) Ground floor 48.77 (1a) x 2.5 (2a) = 121.92 (3a)
First floor (1b) x (2.5) (2b) = 121.92 (3b)
Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ 97.54 (4)
Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 243.85$ (5)
2. Ventilation rate:
main secondary other total m ³ per hour heating heating
Number of chimneys $0 + 0 = 0$ $x 40 = 0$ (6a)
Number of open flues $0 + 0 + 0 = 0$ $x 20 = 0$ (6b)
Number of intermittent fans $3 \times 10 = 30$ (7a)
Number of passive vents $0 \times 10 = 0$ (7b)
Number of flueless gas fires 0 X 40 = 0 (7c) Air changes per hour
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 30 \div (5) = 0.12$ (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)
Number of storeys in the dwelling (ns)0(9)Additional infiltration $[(9)-1]x0.1 =$ 0(10)
Additional infiltration $[(9)-1]x0.1 = 0$ (10) Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction 0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after
deducting areas of openings); if equal user 0.35
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0
If no draught lobby, enter 0.05, else enter 0 0 (13) Percentage of windows and doors draught stripped 0 (14)
Percentage of windows and doors draught stripped0Window infiltration $0.25 - [0.2 \times (14) \div 100] =$ 0(15)
Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) = 0$ (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area 6 (17)
If based on air permeability value, then $(18) = [(17) \div 20]+(8)$, otherwise $(18) = (16)$ 0.42 (18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used
Number of sides sheltered $(20) = 1 \cdot [0.075 \times (10)] = (10075 \times (10))$
Shelter factor $(20) = 1 - [0.075 \times (19)] =$ 0.85 (20) Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$ (21) (21)
Infiltration rate incorporating shelter factor $(21) = (18) \times (20) = 0.36$ (21)
Infiltration rate modified for monthly wind speed Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Monthly average wind speed from Table 7 (22)m= 5.1 5 4.9 4.4 4.3 3.8 3.7 4 4.3 4.5 4.7

Wind F	actor (2	22a)m =	(22)m ÷	4										
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjust	ed infiltr	ation rat	e (allow	ing for sł	nelter an	d wind s	speed) =	(21a) x	(22a)m					
•	0.46	0.45	0.44	0.4	0.39	0.34	0.34	0.33	0.36	0.39	0.4	0.42		
			-	rate for t	he appli	cable ca	se					 ۱		
		al ventila		endix N, (2	(25) = (22)		acuation (N5)) otho	nuico (22h	(222)		l	0	(23a)
				ciency in %) – (25a)		l	0	(23b)
			-	-	-					2b)m i ((JJ) V [1 – (23c)	0	(23c)
(24a)m=									0			$\frac{1-(230)}{0}$	÷ 100]	(24a)
				entilation	_			I	I					· · · · ·
(24b)m=	r				0						0	0		(24b)
			I tract ver	L ntilation o	I or positiv	L /e input v	I ventilatio	I on from (L		I			
,				then (24d	•	•				.5 × (23k	c)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
				ole hous						-				
	<u> </u>		<u>, </u>)m = (22	,	r Ò	<u>, </u>		·	-				
(24d)m=		0.6	0.6	0.58	0.57	0.56	0.56	0.56	0.56	0.57	0.58	0.59		(24d)
				nter (24a	í ·	<u> </u>	<u> </u>		1 /		0.50			(05)
(25)m=	0.61	0.6	0.6	0.58	0.57	0.56	0.56	0.56	0.56	0.57	0.58	0.59		(25)
3. He	at l <mark>osse</mark>	s and he	eat l <mark>oss</mark>	paramete	er:						_			
ELEN		Gros area		Openin m	-	Net Ar A ,r		U-val W/m2		A X U (W/		k-value kJ/m²⋅k		A X k kJ/K
Doors		urou	()			2.1	×	1.2		2.52			·	(26)
Windo	ws Type	e 1				2.39		L/[1/(1.4)+	0.04] =	3.17	Ξ.			(27)
Windo	ws Type	e 2				2.39		/[1/(1.4)+	0.04] =	3.17				(27)
Windo	ws Type	e 3				1.44		/[1/(1.4)+	0.04] =	1.91				(27)
Windo	ws Type	e 4				1.44		/[1/(1.4)+	0.04] =	1.91	=			(27)
Windo	ws Type	e 5				3.15		/[1/(1.4)+	0.04] =	4.18	=			(27)
Floor						48.77	7 X	0.2		9.75400)1		-	(28)
Walls		125	5	19.1	3	105.8	7 X	0.24		25.41			\dashv	(29)
Roof		48.7	77	0		48.77	7 X	0.16		7.8			\dashv	(30)
Total a	rea of e	lements	, m²	L		222.5	4	L			I			(31)
Party v						25	×	0		0			–	(32)
Interna						48.77	7				I		\dashv	(32d)
		roof wind	ows, use e	effective wi	indow U-va			g formula 1	l/[(1/U-valu	ıe)+0.04] a	L as given in	n paragraph	L 3.2	(```'
				nternal wal	ls and par	titions								
		ss, W/K :		U)				(26)(30				ļ	68.06	(33)
Heat c	apacity	Cm = S((Axk)						((28).	(30) + (3	2) + (32a).	(32e) =	21016.99	(34)

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K

((28)(30) + (32) + (32a)(32e) =	
Indicative Value: Medium	

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f

250

(35)

can be i	used inste	ad of a de	tailed calc	ulation.										
Therm	hermal bridges : $S(L \times Y)$ calculated using Appendix K11.13(36)details of thermal bridging are not known (36) = 0.15 x (31)													
if details	details of thermal bridging are not known (36) = $0.15 \times (31)$ tal fabric heat loss(33) + (36) =entilation heat loss calculated monthly(38)m = $0.33 \times (25)m \times (5)$													
Total f	abric he	at loss							(33) +	(36) =			79.19	(37)
Ventila	ation hea	at loss ca	alculated	monthl	y			ī	(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	48.69	48.36	48.04	46.53	46.25	44.93	44.93	44.69	45.44	46.25	46.82	47.42		(38)
Heat t	ransfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	127.88	127.55	127.23	125.72	125.44	124.12	124.12	123.88	124.63	125.44	126.01	126.61		
										Average =		12 /12=	125.72	(39)
	· · · · · ·	· · · · ·	HLP), W/	/m²K					(40)m	= (39)m ÷	(4)		1	
(40)m=	1.31	1.31	1.3	1.29	1.29	1.27	1.27	1.27	1.28	1.29	1.29	1.3		-
Numb	er of day	/s in moi	nth (Tab	le 1a)						Average =	Sum(40)₁.	12 /12=	1.29	(40)
	Jan	Feb	Mar	Apr	Мау	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 enei	rgy requ	irement:								kWh/ye	ear:	
A			NI										1	(10)
		ipancy, l 9. N = 1		:[1 - exp	(-0.0003	349 x (TF	- A -13.9)2)] + 0.0)013 x (⁻	TFA -13.		72		(42)
	A £ 13.9				(0.000			/_/] · · · ·			- /			
								(25 x N)				3.89		(43)
						fwelling is hot and co		to achieve	a water us	se target o	t			
								0	0.00	Ost	Nau	Dee		
Hot wat	Jan er usage i	Feb	Mar day for ea	Apr ach month	May Vd.m = fa	Jun	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
	-		· ·	1					404.04	405.07	440.40	444.00		
(44)m=	114.28	110.12	105.97	101.81	97.66	93.5	93.5	97.66	101.81	105.97	110.12	114.28	1010.00	
Energy	content of	hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,r	n x nm x E)))))))))))))))))))		Total = Su hth (see Ta			1246.68	(44)
(45)m=	169.47	148.22	152.95	133.35	127.95	110.41	102.31	117.4	118.81	138.46	151.14	164.12		
()										Total = Su			1634.59	(45)
lf instan	taneous w	ater heatii	ng at point	of use (no	o hot water	r storage),	enter 0 in	boxes (46						
(46)m=	25.42	22.23	22.94	20	19.19	16.56	15.35	17.61	17.82	20.77	22.67	24.62		(46)
	storage										-			
-		. ,					-	within sa	ame ves	sel		150		(47)
		-			-	nter 110		. ,		(0) :(47)			
	vise if no storage		not wate	er (this ir	ICIUDES I	nstantar	neous co	ombi boil	ers) ente	er or in (47)			
	•		eclared I	oss facto	or is kno	wn (kWł	n/dav).					0	1	(48)
,			m Table				"day).							(40)
				, kWh/ye	oor			(48) x (49)				0		
			-	-		or is not		(40) × (49)	-			0		(50)
,				•		h/litre/da						0		(51)
If com	munity h	eating s	ee secti	on 4.3										
		from Ta										0		(52)
Tempe	erature f	actor fro	m Table	2b								0		(53)

0.		om water (54) in (5	•	e, kWh/ye	ear			(47) x (51)) x (52) x (53) =	0			(54) (55)
	. ,		,	for each	month			((56)m = (55) × (41)r	m		0		(00)
(56)m=		0	0		0	0	0	0	0	0	0	0	1	(56)
	-	-	-	÷	-	-	-	-	7)m = (56)	-	-		lix H	(00)
(57)m=	0	0	0	0	0		0	0	0	0	0	0		(57)
			_		-	Ů	Ů		Ĵ]	(58)
	-			om Table for each		59)m – ((58) ÷ 36	5 🗸 (41)	m			0		(30)
	•					,	. ,	• •	ı cylindeı	r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	loss ca	Iculated	for each	, month ((61)m =	(60) ÷ 36	65 × (41))m					•	
(61)m=	25.39	22.85	25.1	24.03	24.6	23.5	24.08	24.42	23.77	24.84	24.34	25.3		(61)
Total h	neat req	uired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	, (59)m + (61)m	
(62)m=	194.86	171.07	178.05	157.38	152.55	133.91	126.4	141.82	142.58	163.3	175.48	189.42		(62)
Solar DI	HW input	calculated	using App	endix G or	r Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)	1	
(add a	dditiona	l lines if	FGHRS	and/or \	NWHRS	applies	, see Ap	pendix (G)				_	
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	t from w	ater hea	ter											
(64)m=	194.86	171.07	178.05	157.38	152.55	133.91	126.4	141.82	142.58	163.3	175.48	189.42		
								Outp	out from wa	ater heate	r (annual)₁	12	1926.82	(64)
Heat g	ains fro	m water	heating	, kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (61)m	n] + 0.8 x	(46)m	+ (57)m	+ (59)m]	
(65)m=	62.7	55	57.13	50.34	48.69	42.59	40.04	45.14	45.45	52.25	56.34	60.9		(65)
inclu	ude (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. In	ternal ga	ains (see	e Table 5	5 and 5a):									
Metab	<u>olic gair</u>	s (Table	e 5), Wat	ts						_				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	162.94	162.94	162.94	162.94	162.94	162.94	162.94	162.94	162.94	162.94	162.94	162.94		(66)
Lightin	ig gains	(calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5		-			
(67)m=	56.64	50.31	40.91	30.97	23.15	19.55	21.12	27.45	36.85	46.79	54.61	58.21		(67)
Applia	nces ga	ins (calc	ulated ir	n Append	dix L, eq	uation L	13 or L1	3a), alsc	see Tal	ble 5	-			
(68)m=	376.55	380.46	370.61	349.65	323.19	298.32	281.71	277.8	287.64	308.61	335.07	359.94		(68)
Cookir	ng gains	(calcula	ted in A	ppendix	L, equat	tion L15	or L15a)	, also se	e Table	5				
(69)m=	54.01	54.01	54.01	54.01	54.01	54.01	54.01	54.01	54.01	54.01	54.01	54.01		(69)
Pumps	s and fa	ns gains	(Table \$	5a)	-	-			-		-	-		
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losse	s e.g. ev	aporatic	on (nega	tive valu	es) (Tab	ole 5)					-	-		
(71)m=	-108.62	-108.62	-108.62	-108.62	-108.62	-108.62	-108.62	-108.62	-108.62	-108.62	-108.62	-108.62		(71)
Water	heating	gains (T	able 5)											
(72)m=	84.27	81.84	76.79	69.92	65.45	59.15	53.82	60.67	63.12	70.23	78.25	81.85		(72)
Total i	internal	gains =				(66)	m + (67)m	ı + (68)m +	+ (69)m + ((70)m + (7	1)m + (72))m		
(73)m=	628.78	623.93	599.64	561.87	523.11	488.33	467.96	477.25	498.93	536.94	579.25	611.32		(73)
6. So	lar gains	s:												

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

Orientation:	Access Facto Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North 0.9	0.77	x	2.39	×	10.63	x	0.76	x	0.8	=	21.42	(74)
North 0.9	0.77 0.77	×	1.44	x	10.63	x	0.76	x	0.8	=	12.9	(74)
North 0.9	0.77 0.77	×	2.39	x	20.32	x	0.76	x	0.8	=	40.93	(74)
North 0.9	0.77 0.77	×	1.44	x	20.32	x	0.76	x	0.8	=	24.66	(74)
North 0.9	0.77 0.77	×	2.39	x	34.53	x	0.76	x	0.8	=	69.54	(74)
North 0.9	0.77 0.77	×	1.44	x	34.53	x	0.76	x	0.8	=	41.9	(74)
North 0.9	0.77 0.77	×	2.39	x	55.46	x	0.76	x	0.8	=	111.71	(74)
North 0.9	0.77	×	1.44	x	55.46	x	0.76	x	0.8	=	67.3	(74)
North 0.9	0.77 0.77	×	2.39	×	74.72	x	0.76	x	0.8	=	150.48	(74)
North 0.9	0.77 0.77	×	1.44	x	74.72	x	0.76	x	0.8	=	90.67	(74)
North 0.9	0.77	×	2.39	×	79.99	x	0.76	x	0.8	=	161.09	(74)
North 0.9	0.77 0.77	×	1.44	×	79.99	x	0.76	x	0.8	=	97.06	(74)
North 0.9	0.77	×	2.39	x	74.68	x	0.76	x	0.8	=	150.4	(74)
North 0.9	0.77	×	1.44	×	74.68	x	0.76	x	0.8	=	90.62	(74)
North 0.9	0.77	×	2.39	x	59.25	x	0.76	x	0.8	=	119.32	(74)
North 0.9	0.77	×	1.44	×	59.25	x	0.76	x	0.8	=	71.89	(74)
North 0.9	0.77 0.77	×	2.39	x	41.52	x	0.76	x	0.8	=	83.62	(74)
North 0.9	0.77 0.77	×	1.44	x	41.52	×	0.76	x	0.8	=	50.38	(74)
North 0.9	0.77 X	×	2.39	x	24.19	×	0.76	x	0.8	=	48.72	(74)
North 0.9	0.77 0.77	x	1.44	×	24.19	x	0.76	x	0.8	=	29.35	(74)
North 0.9	0.77 0.77	×	2.39	x	13.12	x	0.76	x	0.8	=	26.42	(74)
North 0.9	0.77 0.77	×	1.44	×	13.12	x	0.76	x	0.8	=	15.92	(74)
North 0.9	0.77	×	2.39	×	8.86	x	0.76	x	0.8	=	17.85	(74)
North 0.9	0.77	×	1.44	x	8.86	х	0.76	x	0.8	=	10.76	(74)
South 0.9	0.77	×	2.39	x	46.75	x	0.76	x	0.8	=	94.16	(78)
South 0.9	0.77	×	1.44	×	46.75	x	0.76	x	0.8	=	28.37	(78)
South 0.9	0.77	×	3.15	×	46.75	x	0.76	x	0.8	=	62.05	(78)
South 0.9	0.77	×	2.39	×	76.57	x	0.76	x	0.8	=	154.21	(78)
South 0.9	0.77	×	1.44	×	76.57	x	0.76	x	0.8	=	46.46	(78)
South 0.9	0.77	×	3.15	×	76.57	x	0.76	x	0.8	=	101.62	(78)
South 0.9	-	×	2.39	x	97.53	x	0.76	x	0.8	=	196.44	(78)
South 0.9	-	×	1.44	×	97.53	x	0.76	x	0.8	=	59.18	(78)
South 0.9		×	3.15	×	97.53	x	0.76	x	0.8	=	129.45	(78)
South 0.9	-	×	2.39	×	110.23	x	0.76	x	0.8	=	222.01	(78)
South 0.9		x	1.44	×	110.23	x	0.76	x	0.8	=	66.88	(78)
South 0.9	-	x	3.15	×	110.23	x	0.76	x	0.8	=	146.31	(78)
South 0.9		x	2.39	×	114.87	x	0.76	x	0.8	=	231.35	(78)
South 0.9		x	1.44	×	114.87	x	0.76	x	0.8	=	69.7	(78)
South 0.9	0.77 0.77	×	3.15	x	114.87	x	0.76	x	0.8	=	152.46	(78)

South 0.9x 0.77 x 2.238 x 110.55 x 0.76 x 0.8 = 67.07 (76) South 0.9x 0.77 x 1.44 x 110.55 x 0.76 x 0.8 = 67.07 (76) South 0.9x 0.77 x 2.38 x 106.50 x 0.76 x 0.8 = 217.54 (76) South 0.9x 0.77 x 1.44 x 106.61 x 0.76 x 0.8 = 217.54 (76) South 0.9x 0.77 x 1.44 x 104.89 x 0.76 x 0.8 = 217.26 (78) South 0.9x 0.77 x 1.44 x 104.89 x 0.76 x 0.8 = 205.2 (78) South 0.8 0.77 x 2.39 x 101.89 x 0.76 x 0.8 = 205.2 (78) South 0.8 2	South $0.3x$ 0.77 x 1.44 x 110.55 x 0.76 x 0.8 z 146.72 (7) South $0.3x$ 0.77 x 2.39 x 108.01 x 0.76 x 0.8 z 146.72 (7) South $0.3x$ 0.77 x 2.39 x 108.01 x 0.76 x 0.8 z 217.54 (7) South $0.3x$ 0.77 x 1.44 x 108.01 x 0.76 x 0.8 z 146.72 (7) South $0.3x$ 0.77 x 1.44 x 108.01 x 0.76 x 0.8 z 146.53 (7) South $0.3x$ 0.77 x 1.44 x 108.01 x 0.76 x 0.8 z 144.58 (7) South $0.3x$ 0.77 x 1.44 x 108.01 x 0.76 x 0.8 z 211.26 (7) South $0.3x$ 0.77 x 1.44 x 108.01 x 0.76 x 0.8 z 211.27 (7) South $0.3x$ 0.77 x 1.44 x 108.89 x 0.76 x 0.8 z 211.26 (7) South $0.3x$ 0.77 x 1.44 x 101.89 x 0.76 x 0.8 z 211.26 (7) South $0.3x$ 0.77 x 1.44 x 101.89 x 0.76 x 0.8 z 2052 (7) South $0.3x$ 0.77 x 1.44 x 101.89 x 0.76 x 0.8 z 2052 (7) South $0.3x$ 0.77 x 1.44 x 101.89 x 0.76 x 0.8 z 103.22 (7) South $0.3x$ 0.77 x 1.44 x 101.89 x 0.76 x 0.8 z 1052.2 (7) South $0.3x$ 0.77 x 1.44 x 101.89 x 0.76 x 0.8 z 1052.3 (7) South $0.3x$ 0.77 x 1.44 x 101.89 x 0.76 x 0.8 z 106.33 (7) South $0.3x$ 0.77 x 1.44 x 8.259 x 0.76 x 0.8 z 106.33 (7) South $0.3x$ 0.77 x 1.44 x 8.259 x 0.76 x 0.8 z 106.33 (7) South $0.3x$ 0.77 x 1.44 x 8.259 x 0.76 x 0.8 z 100.81 (7) South $0.3x$ 0.77 x 1.44 x 8.259 x 0.76 x 0.8 z 100.81 (7) South $0.3x$ 0.77 x 1.44 x 8.259 x 0.76 x 0.8 z 100.81 (7) South $0.3x$ 0.77 x 1.44 x 8.259 x 0.76 x 0.8 z 100.81 (7) South $0.3x$ 0.77 x 1.44 x 101.89 x 0.76 x 0.8 z 100.81 (7) South $0.3x$ 0.77 x 1.44 x 106.47 x 0.76 x 0.8 z 0.81 z 0.84 z 0.76 x 0.8 z 0.81 z 0.84 z 0.76 x	- · ·			_				_		_ ,				_
South 0.8×0.77 × 1.46 × 110.65 × 0.76 × 0.8 = 1445.72 (78) South 0.8×0.77 × 2.39 × 108.01 × 0.76 × 0.8 = 217.54 (78) South 0.8×0.77 × 1.44 × 108.01 × 0.76 × 0.8 = 217.54 (78) South 0.8×0.77 × 1.44 × 108.01 × 0.76 × 0.8 = 217.54 (78) South 0.8×0.77 × 3.15 × 108.01 × 0.76 × 0.8 = 213.26 (78) South 0.8×0.77 × 2.39 × 104.89 × 0.76 × 0.8 = 205.2 (78) South 0.8×0.77 × 2.39 × 104.89 × 0.76 × 0.8 = 205.2 (78) South 0.8×0.77 × 2.39 × 104.89 × 0.76 × 0.8 = 205.2 (78) South 0.8×0.77 × 2.39 × 101.89 × 0.76 × 0.8 = 205.2 (78) South 0.8×0.77 × 2.39 × 101.89 × 0.76 × 0.8 = 205.2 (78) South 0.8×0.77 × 2.39 × 101.89 × 0.76 × 0.8 = 133.22 (78) South 0.8×0.77 × 2.39 × 101.89 × 0.76 × 0.8 = 135.27 (78) South 0.8×0.77 × 1.44 × 101.89 × 0.76 × 0.8 = 135.27 (78) South 0.8×0.77 × 1.44 × 101.89 × 0.76 × 0.8 = 106.33 (78) South 0.8×0.77 × 1.44 × 101.89 × 0.76 × 0.8 = 106.61 (78) South 0.8×0.77 × 1.44 × 40.4 × 0.76 × 0.8 = 106.61 (78) South 0.8×0.77 × 2.39 × 65.42 × 0.76 × 0.8 = 106.61 (78) South 0.8×0.77 × 1.44 × 40.4 × 0.76 × 0.8 = 433.62 (76) South 0.8×0.77 × 3.15 × 40.4 × 0.76 × 0.8 = 433.62 (76) South 0.8×0.77 × 3.15 × 40.4 × 0.76 × 0.8 = 43.52 (78) South 0.8×0.77 × 3.15 × 40.4 × 0.76 × 0.8 = 43.52 (78) South 0.8×0.77 × 1.44 × 40.4 × 0.76 × 0.8 = 43.52 (78) South 0.8×0.77 × 3.15 × 40.4 × 0.76 × 0.8 = 43.52 (78) South 0.8×0.77 × 3.15 × 40.4 × 0.76 × 0.8 = 43.52 (78) South 0.8×0.77 × 3.15 × 40.4 × 0.76 × 0.8 = 43.52 (78) South 0.8×0.77 × 3.15 × 0.542 × 0.76 × 0.8 = 43.52 (78) South 0.8×0.77 × 3.15 × 40.4 × 0.76 × 0.8 = 43.56 (78) South 0.8×0.77 × 3.15 × 2.59 0.7×0.78 × 0.8 = 43.56 (78) South 0.8×0.77 × 3.55 $0.62 $	South 0.3×0.77 × 3.15 × 110.55 × 0.76 × 0.8 = 146.72 77 South 0.3×0.77 × 2.33 × 108.01 × 0.76 × 0.8 = 217.54 77 South 0.3×0.77 × 1.44 × 108.01 × 0.76 × 0.8 = 217.54 77 South 0.3×0.77 × 3.15 × 108.01 × 0.76 × 0.8 = 211.26 77 South 0.3×0.77 × 3.15 × 108.01 × 0.76 × 0.8 = 143.36 77 South 0.3×0.77 × 2.39 × 104.89 × 0.76 × 0.8 = 143.26 77 South 0.3×0.77 × 2.30 × 108.01 × 0.76 × 0.8 = 211.26 77 South 0.3×0.77 × 2.30 × 101.89 × 0.76 × 0.8 = 103.22 77 South 0.3×0.77 × 3.15 × 104.89 × 0.76 × 0.8 = 103.22 77 South 0.3×0.77 × 3.15 × 101.89 × 0.76 × 0.8 = 103.22 77 South 0.3×0.77 × 2.30 × 101.89 × 0.76 × 0.8 = 106.2 77 South 0.3×0.77 × 2.30 × 101.89 × 0.76 × 0.8 = 106.2 77 South 0.3×0.77 × 2.30 × 101.89 × 0.76 × 0.8 = 106.33 77 South 0.3×0.77 × 2.39 × 82.59 × 0.76 × 0.8 = 106.33 77 South 0.3×0.77 × 2.39 × 82.59 × 0.76 × 0.8 = 100.61 77 South 0.3×0.77 × 1.44 × 82.59 × 0.76 × 0.8 = 100.61 77 South 0.3×0.77 × 1.44 × 82.59 × 0.76 × 0.8 = 33.32 77 South 0.3×0.77 × 1.44 × 85.42 × 0.76 × 0.8 = 33.32 77 South 0.3×0.77 × 1.44 × 85.42 × 0.76 × 0.8 = 33.32 77 South 0.3×0.77 × 1.44 × 85.42 × 0.76 × 0.8 = 33.32 77 South 0.3×0.77 × 1.44 × 85.42 × 0.76 × 0.8 = 33.32 77 South 0.3×0.77 × 1.44 × 85.42 × 0.76 × 0.8 = 33.32 77 South 0.3×0.77 × 1.44 × 35.42 × 0.76 × 0.8 = 33.32 77 South 0.3×0.77 × 1.44 × 35.42 × 0.76 × 0.8 = 33.32 77 South 0.3×0.77 × 1.44 × 35.44 0.44 × 0.76 × 0.8 = 33.32 77 South 0.3×0.77 × 1.44 × 35.44 0.44 × 0.76 × 0.8 = 33.32 77 South 0.3×0.77 × 1.44 × 35.44 0.44 × 0.76 × 0.8 = 33.32 77 South 0.3×0.77 × 3.15 × 10.42 90.26 0.95 0.74 0.8 0.96 0.96 0.96 0.97 0.98 0.96 0.97 0.98 0.96 0.91 0.97 0.98 0.96 0.91	South	0.9x	0.77	×	2.39	×	110.55	×	0.76	x	0.8	=	222.65	(78)
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South 0.92 0.77 × 3.15 × 108.01 × 0.76 × 0.8 = 1143.38 (78) South 0.92 0.77 × 2.39 × 104.88 × 0.76 × 0.8 = 633.64 (78) South 0.92 0.77 × 1.44 × 104.88 × 0.76 × 0.8 = 633.64 (78) South 0.92 0.77 × 1.44 × 104.88 × 0.76 × 0.8 = 61.82 (78) South 0.92 0.77 × 1.44 × 101.88 × 0.76 × 0.8 = 61.82 (78) South 0.92 0.77 × 1.44 × 82.59 × 0.76 × 0.8 = 61.82 (78) South 0.92 0.77 × 1.44 × 55.42 × 0.76 × 0.8 = 61.93 (78) South 0.92	South 0.9 0.77 × 0.15 × 0.076 × 0.8 = 143.36 (7 South 0.9 0.77 × 2.39 × 104.89 × 0.76 × 0.8 = 211.26 (78 South 0.9 0.77 × 1.44 × 104.89 × 0.76 × 0.8 = 211.26 (78 South 0.9 0.77 × 1.44 × 104.89 × 0.76 × 0.8 = 108.22 (78 0.8 = 108.22 (78 0.8 = 108.22 77 South 0.9 0.77 × 1.14 × 101.89 × 0.76 × 0.8 = 108.23 178 South 0.9 0.77 × 1.144 × 82.59 × 0.76 × 0.8 = 109.61 77 South 0.9 0.77 × 1.44 × 65.42 × 0.76 × 0.8 = <t< td=""><td>South</td><td>0.9x</td><td>0.77</td><td>x</td><td>2.39</td><td>×</td><td>108.01</td><td>x</td><td>0.76</td><td>x</td><td>0.8</td><td>=</td><td>217.54</td><td>(78)</td></t<>	South	0.9x	0.77	x	2.39	×	108.01	x	0.76	x	0.8	=	217.54	(78)
South 0.36 0.77 \times 2.38 \times 104.88 \times 0.76 \times 0.8 $=$ 211.26 (78) South 0.36 0.77 \times 2.38 \times 104.88 \times 0.76 \times 0.8 $=$ 213.26 (78) South 0.36 0.77 \times 3.15 \times 104.88 \times 0.76 \times 0.8 $=$ 193.22 (78) South 0.36 0.77 \times 2.38 \times 101.88 \times 0.76 \times 0.8 $=$ 265.2 (73) South 0.36 0.77 \times 2.39 \times 101.89 \times 0.76 \times 0.8 $=$ 265.2 (73) South 0.36 0.77 \times 2.39 \times 101.89 \times 0.76 \times 0.8 $=$ 265.2 (78) South 0.36 0.77 \times 2.315 \times 101.89 \times 0.76 \times 0.8 $=$ 61.82 (79) South 0.36 0.77 \times 1.44 \times 101.89 \times 0.76 \times 0.8 $=$ 61.82 (79) South 0.36 0.77 \times 3.15 \times 101.89 \times 0.76 \times 0.8 $=$ 135.23 (79) South 0.36 0.77 \times 3.15 \times 32.59 \times 0.76 \times 0.8 $=$ 100.61 (78) South 0.36 0.77 \times 1.44 \times 82.59 \times 0.76 \times 0.8 $=$ 100.61 (78) South 0.36 0.77 \times 2.39 \times 55.42 \times 0.76 \times 0.8 $=$ 100.61 (78) South 0.36 0.77 \times 2.39 \times 55.42 \times 0.76 \times 0.8 $=$ 111.61 (79) South 0.36 0.77 \times 2.315 \times 55.42 \times 0.76 \times 0.8 $=$ 33.62 (78) South 0.36 0.77 \times 2.315 \times 55.42 \times 0.76 \times 0.8 $=$ 33.62 (78) South 0.36 0.77 \times 2.315 \times 55.42 \times 0.76 \times 0.8 $=$ 33.62 (78) South 0.36 0.77 \times 3.15 \times 40.4 \times 0.76 \times 0.8 $=$ 63.82 (78) South 0.36 0.77 \times 3.15 \times 40.4 \times 0.76 \times 0.8 $=$ 63.82 (78) South 0.36 0.77 \times 3.15 \times 40.4 \times 0.76 \times 0.8 $=$ 63.82 (78) South 0.36 0.77 \times 3.15 40.4 \times 0.76 \times 0.8 $=$ 63.82 (78) South 0.36 0.77 \times 3.15 40.4 \times 0.76 \times 0.8 $=$ 63.82 (78) South 0.36 0.77 \times 3.15 1.44 \times $0.56.54$ 0.54 0.56 0.8 0.8 $=$ 0.8 0.8 0.8 0.76 0.8 0.8 0.8 0.77 0.8 0.8 0.77 0.8 0.8 0.77 0.8 0.8 0.77 0.8 0.8 0.77 0.8 0.8 0.77 0.8 0.8 0.77 0.8 0.8 0.77 0.8 0.8 0.77 0.8 0.8 0.77 0.8 0.8 0.77 0.8 0.8 0	South 0.10 1.41 1.44 $1.04.89$ 1.76 1.63 1.63 $1.64.87$ South 0.5x 0.77 x 1.44 x 104.89 x 0.76 x 0.8 $=$ 211.26 (78) South 0.5x 0.77 x 1.44 x 104.89 x 0.76 x 0.8 $=$ 211.26 (78) South 0.5x 0.77 x 1.44 x 101.89 x 0.76 x 0.8 $=$ 61.82 (78) South 0.5x 0.77 x 1.44 x 101.89 x 0.76 x 0.8 $=$ 61.82 78 South 0.5x 0.77 x 1.44 x 82.59 x 0.76 x 0.8 $=$ 109.61 77 South 0.5x 0.77 x 1.44 x 82.59 x 0.76 x 0.8 $=$ 11.61 78 0.8 $=$	South	0.9x	0.77	x	1.44	x	108.01	x	0.76	x	0.8	=	65.53	(78)
South 0.5 0.77 × 1.44 × 104.89 × 0.76 × 0.8 = 63.4 (78) South 0.5 0.77 × 1.44 × 104.89 × 0.76 × 0.8 = 139.22 (78) South 0.5 0.77 × 1.44 × 101.89 × 0.76 × 0.8 = 135.23 (78) South 0.5 0.77 × 1.44 × 101.89 × 0.76 × 0.8 = 135.23 (78) South 0.5 0.77 × 1.44 × 101.89 × 0.76 × 0.8 = 135.23 (78) South 0.5 0.77 × 1.44 × 101.89 × 0.76 × 0.8 = 135.23 (78) South 0.5 0.77 × 1.44 × 82.59 × 0.76 × 0.8 = 136.23 (78) South 0.5 0.77 × 1.44 × 82.59 × 0.76 × 0.8 = 109.61 (78) South 0.5 0.77 × 1.44 × 82.59 × 0.76 × 0.8 = 109.61 (78) South 0.5 0.77 × 1.44 × 55.42 × 0.76 × 0.8 = 109.61 (78) South 0.5 0.77 × 1.44 × 55.42 × 0.76 × 0.8 = 133.62 (78) South 0.5 0.77 × 1.44 × 55.42 × 0.76 × 0.8 = 33.62 (78) South 0.5 0.77 × 1.44 × 55.42 × 0.76 × 0.8 = 33.62 (78) South 0.5 0.77 × 1.44 × 40.4 × 0.76 × 0.8 = 411.61 (78) South 0.5 0.77 × 1.44 × 40.4 × 0.76 × 0.8 = 43.62 (78) South 0.5 0.77 × 1.44 × 40.4 × 0.76 × 0.8 = 43.62 (78) South 0.5 0.77 × 1.44 × 40.4 × 0.76 × 0.8 = 43.62 (78) South 0.5 0.77 × 1.44 × 40.4 × 0.76 × 0.8 = 43.62 (78) South 0.5 0.77 × 1.44 × 40.4 × 0.76 × 0.8 = 43.62 (78) South 0.5 0.77 × 1.44 × 40.4 × 0.76 × 0.8 = 43.62 (78) South 0.5 0.77 × 1.44 × 40.4 × 0.76 × 0.8 = 43.62 (78) South 0.5 0.77 × 1.44 × 40.4 × 0.76 × 0.8 = 43.62 (78) South 0.5 0.77 × 1.44 × 40.4 × 0.76 × 0.8 = 43.62 (78) South 0.5 0.77 × 1.44 × 40.4 × 0.76 × 0.8 = 43.62 (78) South 0.5 0.77 × 1.44 × 40.4 × 0.76 × 0.8 = 43.62 (78) South 0.5 0.77 × 1.44 × 40.4 × 0.76 × 0.8 = 43.62 (78) South 0.5 0.77 × 1.44 × 40.4 × 0.76 × 0.8 = 43.62 (78) South 0.5 0.77 × 1.44 × 1.40.4 × 0.76 × 0.8 = 43.62 (78) South 0.5 0.77 × 1.44 × 1.40.4 × 0.76 × 0.8 = 43.62 (78) South 0.5 0.77 × 1.44 × 1.40.4 × 0.76 × 0.8 = 43.62 (78) South 0.5 0.77 × 0.5 0.8 0.8 0.47 0.51 0.54 0.35 0.39 0.58 0.99 (8) Mean internal and solar (84)m = (73)m + (83)m, watts (8)m 118.3 198.5 198.5 198.6 198.6 198.5 198.6 198.5 198.6 198	South 0.9* 0.77 × 1.44 × 104.89 × 0.76 × 0.8 = 0.8.64 77 South 0.9* 0.77 × 1.44 × 104.89 × 0.76 × 0.8 = 0.8.64 77 South 0.9* 0.77 × 1.315 × 104.89 × 0.76 × 0.8 = 0.8.77 South 0.9* 0.77 × 1.44 × 101.89 × 0.76 × 0.8 = 0.8.77 South 0.9* 0.77 × 1.44 × 101.89 × 0.76 × 0.8 = 0.8.77 South 0.9* 0.77 × 1.44 × 101.89 × 0.76 × 0.8 = 0.8.77 South 0.9* 0.77 × 1.44 × 101.89 × 0.76 × 0.8 = 0.8.77 South 0.9* 0.77 × 1.44 × 101.89 × 0.76 × 0.8 = 0.8.8 = 0.9.8 South 0.9* 0.77 × 1.44 × 101.89 × 0.76 × 0.8 = 0.8.8 = 0.9.8 South 0.9* 0.77 × 1.44 × 82.59 × 0.76 × 0.8 = 0.9.8 South 0.9* 0.77 × 1.44 × 82.59 × 0.76 × 0.8 = 0.9.8 South 0.9* 0.77 × 1.44 × 62.59 × 0.76 × 0.8 = 0.9.1176 South 0.9* 0.77 × 1.44 × 65.42 × 0.76 × 0.8 = 0.9.1176 South 0.9* 0.77 × 1.44 × 65.42 × 0.76 × 0.8 = 0.9.1176 South 0.9* 0.77 × 1.44 × 65.42 × 0.76 × 0.8 = 0.9.1176 South 0.9* 0.77 × 1.44 × 65.42 × 0.76 × 0.8 = 0.9.1176 South 0.9* 0.77 × 1.44 × 65.42 × 0.76 × 0.8 = 0.9.1176 South 0.9* 0.77 × 1.44 × 65.42 × 0.76 × 0.8 = 0.9.1176 South 0.9* 0.77 × 1.44 × 65.42 × 0.76 × 0.8 = 0.9.1176 South 0.9* 0.77 × 1.44 × 65.42 × 0.76 × 0.8 = 0.9.1676 South 0.9* 0.77 × 1.44 × 65.42 × 0.76 × 0.8 = 0.9.1676 South 0.9* 0.77 × 1.44 × 65.42 × 0.76 × 0.8 = 0.9.1676 South 0.9* 0.77 × 0.9 × 0.17 × 0.90 × 0.90 × 0.99 0.99 0.99 0.99 0.9	South	0.9x	0.77	x	3.15	x	108.01	x	0.76	x	0.8	=	143.36	(78)
South 0.9 0.77 x 0.15 x 104.89 x 0.76 x 0.8 = 139.22 (78) South 0.9 0.77 x 0.315 x 104.89 x 0.76 x 0.8 = 205.2 (78) South 0.9 0.77 x 1.44 x 101.89 x 0.76 x 0.8 = 61.82 (78) South 0.9 0.77 x 0.315 x 101.89 x 0.76 x 0.8 = 61.82 (78) South 0.9 0.77 x 0.315 x 101.89 x 0.76 x 0.8 = 105.23 (78) South 0.9 0.77 x 0.315 x 0.82 9 x 0.76 x 0.8 = 109.61 (78) South 0.9 0.77 x 0.315 x 0.82 9 x 0.76 x 0.8 = 109.61 (78) South 0.9 0.77 x 0.315 x 0.82 9 x 0.76 x 0.8 = 109.61 (78) South 0.9 0.77 x 0.315 x 0.82 9 x 0.76 x 0.8 = 109.61 (78) South 0.9 0.77 x 0.315 x 0.82 9 x 0.76 x 0.8 = 109.61 (78) South 0.9 0.77 x 0.315 x 0.82 9 x 0.76 x 0.8 = 109.61 (78) South 0.9 0.77 x 0.315 x 0.82 9 x 0.76 x 0.8 = 109.61 (78) South 0.9 0.77 x 0.315 x 0.85 0.76 x 0.8 = 109.61 (78) South 0.9 0.77 x 0.315 x 0.76 x 0.8 = 109.61 (78) South 0.9 0.77 x 0.44 x 0.76 x 0.8 = 109.61 (78) South 0.9 0.77 x 0.44 x 0.76 x 0.8 = 109.61 (78) South 0.9 0.77 x 0.315 x 0.85 0.76 x 0.8 = 33.62 (78) South 0.9 0.77 x 0.315 x 0.85 0.77 x 0.8 = 4.451 (78) South 0.9 0.77 x 0.77 x 0.44 x 0.76 x 0.8 = 33.62 (78) South 0.9 0.77 x 0.77 x 0.44 x 0.76 x 0.8 = 4.451 (78) South 0.9 0.77 x 0.77 x 0.44 x 0.76 x 0.8 = 4.451 (78) South 0.9 0.77 x 0.77 x 0.44 x 0.76 x 0.8 = 4.451 (78) South 0.9 0.77 x 0.77 x 0.44 x 0.76 x 0.8 = 4.451 (78) South 0.9 0.77 x 0.77 x 0.44 x 0.76 x 0.8 = 4.451 (78) South 0.9 0.77 x 0.77 x 0.41 x 0.76 x 0.8 = 4.451 (78) South 0.9 0.77 x 0.77 x 0.41 x 0.76 x 0.8 = 4.451 (78) South 0.9 0.77 x 0.77 x 0.41 x 0.76 x 0.8 = 4.451 (78) South 0.9 0.77 x 0.77 x 0.41 x 0.76 x 0.8 = 4.451 (78) South 0.9 0.77 x 0.77 x 0.41 x 0.76 x 0.8 = 4.451 (78) South 0.9 0.77 x 0.77 x 0.41 x 0.77 x 0.42 (84) South 0.9 0.77 0.80 0.48 0.48 0.47 0.50 0.74 0.90 0.98 0.99 (84) Mean internal temperature in living area from Table 9, Th1 (°C) (6)m 19.8 0.88 0.94 0.98 0.98 0.98 0.99 0.99 0.99 0.99 0.99	South 0.9 0.77 × 3.15 × 100.89 × 0.76 × 0.8 = 100.22 76 South 0.9 0.77 × 2.30 × 101.89 × 0.76 × 0.8 = 100.22 76 South 0.9 0.77 × 1.44 × 101.89 × 0.76 × 0.8 = 61.82 78 South 0.9 0.77 × 1.44 × 101.89 × 0.76 × 0.8 = 166.33 78 South 0.9 0.77 × 1.44 × 82.59 × 0.76 × 0.8 = 100.81 77 South 0.9 0.77 × 1.35 × 55.42 × 0.76 × 0.8 = 111.61 78 South 0.9 0.77 × 1.44 × 55.42 × 0.76 × 0.8 = 43.62 78 South 0.9	South	0.9x	0.77	×	2.39	×	104.89	x	0.76	x	0.8	=	211.26	(78)
South 0.9 0.7 × 2.39 × 101.89 × 0.76 × 0.8 = 262.7 (3) South 0.9 0.77 × 2.39 × 101.89 × 0.76 × 0.8 = 61.82 (73) South 0.9 0.77 × 3.15 × 101.89 × 0.76 × 0.8 = 61.82 (73) South 0.9 0.77 × 3.15 × 101.89 × 0.76 × 0.8 = 61.82 (73) South 0.9 0.77 × 1.44 × 82.59 × 0.76 × 0.8 = 60.11 (73) South 0.9 0.77 × 3.15 × 82.59 × 0.76 × 0.8 = 60.11 (73) South 0.9 0.77 × 3.15 × 82.59 × 0.76 × 0.8 = 60.11 (73) South 0.9 0.77 × 3.15 × 82.59 × 0.76 × 0.8 = 60.11 (73) South 0.9 0.77 × 1.44 × 55.42 × 0.76 × 0.8 = 109.61 (73) South 0.9 0.77 × 1.44 × 55.42 × 0.76 × 0.8 = 133.62 (74) South 0.9 0.77 × 1.44 × 55.42 × 0.76 × 0.8 = 41.36 (75) South 0.9 0.77 × 1.44 × 55.42 × 0.76 × 0.8 = 41.36 (75) South 0.9 0.77 × 1.44 × 0.76 × 0.8 = 41.36 (75) South 0.9 0.77 × 1.44 × 0.44 × 0.76 × 0.8 = 41.36 (75) South 0.9 0.77 × 1.44 × 0.44 × 0.76 × 0.8 = 44.51 (74) South 0.9 0.77 × 3.15 × 40.4 × 0.76 × 0.8 = 44.51 (74) South 0.9 0.77 × 3.15 × 40.4 × 0.76 × 0.8 = 44.51 (74) South 0.9 0.77 × 1.44 × 0.44 × 0.76 × 0.8 = 44.51 (74) South 0.9 0.77 × 1.44 × 0.44 × 0.76 × 0.8 = 44.51 (74) South 0.9 0.77 × 1.44 × 0.44 × 0.76 × 0.8 = 44.51 (74) South 0.9 0.77 × 1.44 × 0.44 × 0.76 × 0.8 = 44.51 (74) South 0.9 0.77 × 1.44 × 0.44 × 0.76 × 0.8 = 44.51 (74) South 0.9 0.77 × 1.44 × 0.44 × 0.76 × 0.8 = 44.51 (74) South 0.9 0.77 × 1.44 × 0.44 × 0.76 × 0.8 = 44.51 (74) South 0.9 0.77 × 1.44 × 0.44 × 0.76 × 0.8 = 44.51 (74) South 0.9 0.77 × 1.44 × 0.44 × 0.76 × 0.8 = 44.51 (74) South 0.9 0.77 × 1.44 × 0.44 × 0.76 × 0.8 = 44.51 (74) South 0.9 0.77 × 0.51 (74) 0.9 0.8 0.51 (74) 0.9 0.8 0.52 (75) South 0.9 0.77 × 0.51 (74) 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9	South 0.9x 0.77 × 2.39 × 101.89 × 0.76 × 0.8 = 205.2 77 South 0.9x 0.77 × 1.44 × 101.89 × 0.76 × 0.8 = 205.2 77 South 0.9x 0.77 × 1.44 × 101.89 × 0.76 × 0.8 = 205.2 77 South 0.9x 0.77 × 1.44 × 101.89 × 0.76 × 0.8 = 116.23 77 South 0.9x 0.77 × 2.39 × 82.59 × 0.76 × 0.8 = 116.33 77 South 0.9x 0.77 × 1.44 × 62.59 × 0.76 × 0.8 = 109.61 77 South 0.9x 0.77 × 1.44 × 65.42 × 0.76 × 0.8 = 109.61 77 South 0.9x 0.77 × 2.39 × 65.42 × 0.76 × 0.8 = 111.61 77 South 0.9x 0.77 × 1.44 × 65.42 × 0.76 × 0.8 = 111.61 77 South 0.9x 0.77 × 1.44 × 65.42 × 0.76 × 0.8 = 111.61 77 South 0.9x 0.77 × 1.44 × 65.42 × 0.76 × 0.8 = 113.61 77 South 0.9x 0.77 × 1.44 × 65.42 × 0.76 × 0.8 = 33.62 77 South 0.9x 0.77 × 1.44 × 65.42 × 0.76 × 0.8 = 33.62 77 South 0.9x 0.77 × 1.44 × 65.42 × 0.76 × 0.8 = 33.62 77 South 0.9x 0.77 × 1.44 × 0.76 × 0.8 = 33.62 77 South 0.9x 0.77 × 1.44 × 0.76 × 0.8 = 33.62 77 South 0.9x 0.77 × 1.44 × 0.76 × 0.8 = 413.66 78 South 0.9x 0.77 × 3.15 × 40.4 × 0.76 × 0.8 = 43.36 77 South 0.9x 0.77 × 3.15 × 40.4 × 0.76 × 0.8 = 43.36 77 South 0.9x 0.77 × 3.15 × 40.4 × 0.76 × 0.8 = 43.36 77 South 0.9x 0.77 × 3.15 × 40.4 × 0.76 × 0.8 = 43.36 77 South 0.9x 0.77 × 1.44 × 0.76 × 0.8 = 43.36 77 South 0.9x 0.77 × 0.15 × 0.16 77 South 0.9x 0.77 × 0.15 × 40.4 × 0.76 × 0.8 = 43.36 77 South 0.9x 0.77 × 0.15 × 0.17 × 0.16 840.37 799.42 (94 South 0.9x 0.77 × 0.15 × 0.11 0.74 0.93 0.98 0.99 Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 66 Utilisation factor for gains for rist of dwelling from Table 9, Th1 (°C) (67)m 19.79 0.98 0.26 20.58 20.82 20.98 20.99 20.91 20.59 20.13 19.75 (97 Temperature during heating periods in the living area for Table 9.74 0.93 0.98 0.99 Mean internal temperature in living area for Table 9.74 0.93 0.98 0.99 Mean internal temperature in the rest of dwelling from Table 9. Th2 (°C) (69)m 0.99 0.97 0.95 0.88 0.74 0.54 0.35 0.39 0.65 0.9 0.97 0.99 (69	South	0.9x	0.77	x	1.44	×	104.89	x	0.76	x	0.8	=	63.64	(78)
South 0.9 0.77 × 1.44 × 101.89 × 0.76 × 0.8 = 616.2 (7) South 0.9 0.77 × 1.44 × 101.89 × 0.76 × 0.8 = 616.3 (7) South 0.9 0.77 × 1.44 × 82.59 × 0.76 × 0.8 = 106.3 (7) South 0.9 0.77 × 1.44 × 82.59 × 0.76 × 0.8 = 100.61 (7) South 0.9 0.77 × 1.44 × 82.59 × 0.76 × 0.8 = 50.11 (7) South 0.9 0.77 × 1.44 × 82.59 × 0.76 × 0.8 = 100.61 (7) South 0.9 0.77 × 1.44 × 56.42 × 0.76 × 0.8 = 111.61 (7) South 0.9 0.77 × 1.44 × 56.42 × 0.76 × 0.8 = 33.62 (7) South 0.9 0.77 × 1.44 × 56.42 × 0.76 × 0.8 = 33.62 (7) South 0.9 0.77 × 1.44 × 56.42 × 0.76 × 0.8 = 33.62 (7) South 0.9 0.77 × 1.44 × 40.4 × 0.76 × 0.8 = 33.62 (7) South 0.9 0.77 × 1.44 × 40.4 × 0.76 × 0.8 = 33.62 (7) South 0.9 0.77 × 1.44 × 40.4 × 0.76 × 0.8 = 44.5 (7) South 0.9 0.77 × 1.44 × 40.4 × 0.76 × 0.8 = 44.5 (7) South 0.9 0.77 × 1.44 × 40.4 × 0.76 × 0.8 = 53.62 (7) South 0.9 0.77 × 1.44 × 40.4 × 0.76 × 0.8 = 53.62 (7) South 0.9 0.77 × 1.44 × 40.4 × 0.76 × 0.8 = 53.62 (7) South 0.9 0.77 × 1.44 × 40.4 × 0.76 × 0.8 = 53.62 (7) South 0.9 0.77 × 1.44 × 40.4 × 0.76 × 0.8 = 53.62 (7) South 0.9 0.77 × 1.44 × 40.4 × 0.76 × 0.8 = 53.62 (7) South 0.9 0.77 × 1.44 × 40.4 × 0.76 × 0.8 = 53.62 (7) South 0.9 0.77 × 1.44 × 40.4 × 0.76 × 0.8 = 53.62 (7) South 0.9 0.77 × 1.44 × 40.4 × 0.76 × 0.8 = 53.62 (7) South 0.9 0.77 × 1.44 × 40.4 × 0.76 × 0.8 = 53.62 (7) South 0.9 0.77 × 1.44 × 40.4 × 0.76 × 0.8 = 53.62 (7) South 0.9 0.77 × 1.44 × 40.4 × 0.76 × 0.8 = 53.62 (7) South 0.9 0.9 0.9 0.9 0.9 0.9 0.9 (9) Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9. Th1 (°C) 21 (6) Utilisation factor for gains for living area, h1, m (see Table 9a) (6) 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9	South $0.9x$ 0.77 × 1.44 × 101.89 × 0.76 × 0.8 = 152.2 77 South $0.9x$ 0.77 × 3.15 × 101.89 × 0.76 × 0.8 = 166.33 78 South $0.9x$ 0.77 × 2.39 × 82.59 × 0.76 × 0.8 = 166.33 78 South $0.9x$ 0.77 × 1.44 × 82.59 × 0.76 × 0.8 = 100.61 77 South $0.9x$ 0.77 × 3.15 × 82.59 × 0.76 × 0.8 = 100.61 77 South $0.9x$ 0.77 × 3.15 × 82.59 × 0.76 × 0.8 = 100.61 77 South $0.9x$ 0.77 × 3.15 × 82.59 × 0.76 × 0.8 = 111.61 78 South $0.9x$ 0.77 × 2.39 × 55.42 × 0.76 × 0.8 = 111.61 78 South $0.9x$ 0.77 × 2.39 × 55.42 × 0.76 × 0.8 = 111.61 78 South $0.9x$ 0.77 × 2.39 × 55.42 × 0.76 × 0.8 = 111.61 78 South $0.9x$ 0.77 × 1.44 × 6542 × 0.76 × 0.8 = 133.62 78 South $0.9x$ 0.77 × 1.44 × 6542 × 0.76 × 0.8 = 131.6 78 South $0.9x$ 0.77 × 1.44 × 6542 × 0.76 × 0.8 = 24.51 78 South $0.9x$ 0.77 × 1.44 × 40.4 × 0.76 × 0.8 = 24.51 78 South $0.9x$ 0.77 × 3.15 × 40.4 × 0.76 × 0.8 = 24.51 78 South $0.9x$ 0.77 × 3.15 × 40.4 × 0.76 × 0.8 = 24.51 78 South $0.9x$ 0.77 × 3.15 × 40.4 × 0.76 × 0.8 = 24.51 78 South $0.9x$ 0.77 × 3.15 × 40.4 × 0.76 × 0.8 = 24.51 78 South $0.9x$ 0.77 × 3.15 × 40.4 × 0.76 × 0.8 = 24.51 78 South $0.9x$ 0.77 × 3.15 × 40.4 × 0.76 × 0.8 = 24.51 78 South $0.9x$ 0.77 × 3.15 × 40.4 × 0.76 × 0.8 = 24.51 78 South $0.9x$ 0.77 × 3.15 × 40.4 × 0.76 × 0.8 = 24.51 78 South $0.9x$ $0.9x$ 0.9 $0.$	South	0.9x	0.77	x	3.15	×	104.89	x	0.76	x	0.8	=	139.22	(78)
South 0.9x 0.77 x 3.15 x 101.89 x 0.76 x 0.8 = 105.23 (78) South 0.9x 0.77 x 2.39 x 82.59 x 0.76 x 0.8 = 50.11 (78) South 0.9x 0.77 x 1.44 x 82.59 x 0.76 x 0.8 = 50.11 (78) South 0.9x 0.77 x 1.44 x 82.59 x 0.76 x 0.8 = 100.61 (78) South 0.9x 0.77 x 2.39 x 55.42 x 0.76 x 0.8 = 101.61 (78) South 0.9x 0.77 x 1.44 x 55.42 x 0.76 x 0.8 = 111.61 (78) South 0.9x 0.77 x 1.44 x 55.42 x 0.76 x 0.8 = 133.62 (78) South 0.9x 0.77 x 1.44 x 55.42 x 0.76 x 0.8 = 33.62 (78) South 0.9x 0.77 x 1.44 x 55.42 x 0.76 x 0.8 = 33.62 (78) South 0.9x 0.77 x 1.44 x 55.42 x 0.76 x 0.8 = 43.38 (76) South 0.9x 0.77 x 1.44 x 40.4 x 0.76 x 0.8 = 43.28 (78) South 0.9x 0.77 x 1.44 x 40.4 x 0.76 x 0.8 = 63.62 (78) South 0.9x 0.77 x 3.15 x 40.4 x 0.76 x 0.8 = 63.62 (78) South 0.9x 0.77 x 3.15 x 40.4 x 0.76 x 0.8 = 63.62 (78) South 0.9x 0.77 x 3.15 x 40.4 x 0.76 x 0.8 = 63.62 (78) South 0.9x 0.77 x 1.44 x 40.4 x 0.76 x 0.8 = 63.62 (78) South 0.9x 0.77 x 1.44 x 40.4 x 0.76 x 0.8 = 63.62 (78) South 0.9x 0.77 x 1.44 x 40.4 x 0.76 x 0.8 = 63.62 (78) South 0.9x 0.77 x 1.44 x 40.4 x 0.76 x 0.8 = 63.62 (78) South 0.9x 0.77 x 1.44 x 1.44 x 40.4 x 0.76 x 0.8 = 63.62 (78) South 0.9x 0.77 x 1.44 x 40.4 x 0.76 x 0.8 = 63.62 (78) South 0.9x 0.77 x 1.44 x 1.44 x 40.4 x 0.76 x 0.8 = 63.62 (78) South 0.9x 0.77 x 1.44 x 40.4 x 0.76 x 0.8 = 63.62 (78) South 0.9x 0.77 x 1.44 x 40.4 x 0.76 x 0.8 = 63.62 (78) South 0.9x 0.77 x 1.44 x 40.4 x 0.76 x 0.8 = 63.62 (78) South 0.9x 0.77 x 1.44 x 40.4 x 0.76 x 0.8 = 63.62 (78) South 0.9x 0.77 x 1.44 x 40.4 x 0.76 x 0.8 = 63.62 (78) South 0.9x 0.77 x 1.44 x 40.4 x 0.76 x 0.8 = 63.62 (78) South 0.9x 0.77 x 1.44 x 40.4 x 0.76 x 0.8 = 63.62 (78) South 0.9x 0.77 x 1.44 x 40.4 x 0.76 x 0.8 = 63.62 (78) South 0.9x 0.77 x 1.44 x 40.4 x 0.76 x 0.8 = 63.62 (78) South 0.9x 0.97 0.98 0.96 0.91 0.8 0.80 0.63 0.47 0.51 0.51 0.51 0.41 1.68 0.57 0.58 (88) Mean internal temperature in living area, 11. (see Table 9a) (89)m 0.99 0.97 0.95 0.88 0.74 0.54 0.35 0.39 0.65 0.9 0.97 0.99 (89) Mean internal temperatur	South 0.9x 0.77 × 0.15 × 0101.89 × 0.76 × 0.8 = 135.23 77 South 0.9x 0.77 × 0.15 × 0.18.9 × 0.76 × 0.8 = 135.23 77 South 0.9x 0.77 × 0.144 × 82.59 × 0.76 × 0.8 = 146.33 78 South 0.9x 0.77 × 0.144 × 82.59 × 0.76 × 0.8 = 1008.61 78 South 0.9x 0.77 × 0.144 × 82.59 × 0.76 × 0.8 = 1008.61 78 South 0.9x 0.77 × 0.23 × 0.542 × 0.76 × 0.8 = 111.161 77 South 0.9x 0.77 × 0.23 × 0.542 × 0.76 × 0.8 = 33.62 78 South 0.9x 0.77 × 0.444 × 0.542 × 0.76 × 0.8 = 33.62 78 South 0.9x 0.77 × 0.444 × 0.542 × 0.76 × 0.8 = 33.62 78 South 0.9x 0.77 × 0.444 × 0.542 × 0.76 × 0.8 = 43.86 78 South 0.9x 0.77 × 0.444 × 0.76 × 0.8 = 43.86 78 South 0.9x 0.77 × 0.444 × 0.76 × 0.8 = 43.86 78 South 0.9x 0.77 × 0.444 × 0.76 × 0.8 = 43.86 78 South 0.9x 0.77 × 0.8 = 43.86 78 South 0.9x 0.99 0.98 0.99 (80 Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) (89)m 0.99 0.97 0.95 0.88 0.74 0.54 0.35 0.39 0.85 0.9 0.97 0.99 (89 Mean internal temperature in living area 11 (follow steps 3 to 7 in Table 9C) (89)m 0.99 0.97 0.95 0.88 0.74 0.54 0.35 0.39 0.65 0.9 0.97 0.99 (89 Mean internal temperature in t	South	0.9x	0.77	x	2.39	×	101.89	x	0.76	x	0.8	=	205.2	(78)
South $0.3x$ 0.77 x 2.39 x 82.59 x 0.76 x 0.8 $=$ 166.33 (78) South $0.9x$ 0.77 x 1.44 x 82.59 x 0.76 x 0.8 $=$ 109.61 (78) South $0.9x$ 0.77 x 1.44 x 82.59 x 0.76 x 0.8 $=$ 109.61 (78) South $0.9x$ 0.77 x 2.39 x 55.42 x 0.76 x 0.8 $=$ 111.61 (78) South $0.9x$ 0.77 x 2.39 x 55.42 x 0.76 x 0.8 $=$ 111.61 (78) South $0.9x$ 0.77 x 2.39 x 55.42 x 0.76 x 0.8 $=$ 111.61 (78) South $0.9x$ 0.77 x 2.39 x 55.42 x 0.76 x 0.8 $=$ 111.61 (78) South $0.9x$ 0.77 x 2.39 x 40.4 x 0.76 x 0.8 $=$ 111.61 (78) South $0.9x$ 0.77 x 2.39 x 40.4 x 0.76 x 0.8 $=$ 41.36 (78) South $0.9x$ 0.77 x 2.39 x 40.4 x 0.76 x 0.8 $=$ 41.36 (78) South $0.9x$ 0.77 x 2.39 x 40.4 x 0.76 x 0.8 $=$ 41.57 (78) South $0.9x$ 0.77 x 3.15 x 40.4 x 0.76 x 0.8 $=$ 24.51 (78) South $0.9x$ 0.77 x 3.15 x 40.4 x 0.76 x 0.8 $=$ 24.51 (78) South $0.9x$ 0.77 x 3.15 x 40.4 x 0.76 x 0.8 $=$ 24.51 (78) South $0.9x$ 0.77 x 3.15 x 40.4 x 0.76 x 0.8 $=$ 24.51 (78) South $0.9x$ 0.77 x 3.15 x 40.4 x 0.76 x 0.8 $=$ 24.51 (78) South $0.9x$ 0.77 x 3.15 x 40.4 x 0.76 x 0.8 $=$ 24.51 (78) South $0.9x$ 0.77 x 3.15 x 40.4 x 0.76 x 0.8 $=$ 24.51 (78) South $0.9x$ 0.77 x 3.15 x 40.4 x 0.76 x 0.8 $=$ 24.51 (78) South $0.9x$ 0.77 x 3.15 x 0.45 0.84 59 67.45 605.34 536.24 404.12 261.12 188.1 (83) Total gains - internal and solar (84)m = (73)m + (83)m $watts$ (84)m 47.68 991.8 1096.16 1176.09 127.77 1182.93 1135.41 1082.59 1035.17 941.06 840.37 79.42 $(84)Ham internal temperature (heating season)Temperature during heating periods in the living area from Table 9, Th1 (°C)(86)m$ 199 0.98 $0.$	South $0.3x$ 0.77 x 2.39 x 0.76 x 0.8 = 166.33 77 South $0.9x$ 0.77 x 1.44 x 82.59 x 0.76 x 0.8 = 166.33 77 South $0.9x$ 0.77 x 1.44 x 82.59 x 0.76 x 0.8 = 109.61 773 South $0.9x$ 0.77 x 2.39 x 55.42 x 0.76 x 0.8 = 111.61 773 South $0.9x$ 0.77 x 1.44 55.42 x 0.76 x 0.8 = 73.55 776 x 0.8 = 24.51 778 3.62 40.4 x 0.76 x 0.8 = 34.67 36.53 36	South	0.9x	0.77	x	1.44	×	101.89	x	0.76	×	0.8	=	61.82	(78)
South $0.x$ 0.77 x 1.44 x 82.59 x 0.76 x 0.8 $=$ 50.11 77 South $0.9x$ 0.77 x 3.15 x 82.59 x 0.76 x 0.8 $=$ 109.61 77 South $0.9x$ 0.77 x 2.39 x 55.42 x 0.76 x 0.8 $=$ 111.61 77 South $0.9x$ 0.77 x 1.44 x 55.42 x 0.76 x 0.8 $=$ 33.62 77 South $0.9x$ 0.77 x 1.44 x 0.76 x 0.8 $=$ 24.51 77 South $0.9x$ 0.77 x 1.44 x 0.76 x 0.8 $=$ 24.51 77 South $0.9x$ 0.77 x 3.15 40.4 x 0.76 x 0.8 13.62 778	South $0.9x$ 0.77 x 1.44 x 82.59 x 0.76 x 0.8 = 50.11 77 South $0.9x$ 0.77 x 3.15 x 82.59 x 0.76 x 0.8 = 100.61 77 South $0.9x$ 0.77 x 2.39 x 55.42 x 0.76 x 0.8 = 111.61 77 South $0.9x$ 0.77 x 1.44 x 5542 x 0.76 x 0.8 = 73.55 773 South $0.9x$ 0.77 x 2.39 x 40.4 x 0.76 x 0.8 = 24.51 776 South $0.9x$ 0.77 x 3.15 40.4 x 0.76 x 0.8 = 24.51 778 Solar gains internal temporature for each month (63)m= 3m(74)m(62)m $(63)m = 3m(74)m(62)m$ $(78)m = 3m(74)m(62)m$ $(78)m = 3m(74)m(62)m$ </td <td>South</td> <td>0.9x</td> <td>0.77</td> <td>x</td> <td>3.15</td> <td>×</td> <td>101.89</td> <td>x</td> <td>0.76</td> <td>×</td> <td>0.8</td> <td>=</td> <td>135.23</td> <td>(78)</td>	South	0.9x	0.77	x	3.15	×	101.89	x	0.76	×	0.8	=	135.23	(78)
South $0.3 \times 0.77 \times 0.15 \times 0.25 \times 0.76 \times 0.8 = 0.000 (76)$ South $0.5 \times 0.77 \times 0.315 \times 0.5542 \times 0.76 \times 0.8 = 0.000 (76)$ South $0.5 \times 0.77 \times 0.315 \times 0.542 \times 0.76 \times 0.8 = 0.000 (76)$ South $0.5 \times 0.77 \times 0.315 \times 0.542 \times 0.76 \times 0.8 = 0.000 (76)$ South $0.5 \times 0.77 \times 0.315 \times 0.542 \times 0.76 \times 0.8 = 0.000 (76)$ South $0.5 \times 0.77 \times 0.315 \times 0.542 \times 0.76 \times 0.8 = 0.000 (76)$ South $0.5 \times 0.77 \times 0.315 \times 0.542 \times 0.76 \times 0.8 = 0.000 (76)$ South $0.5 \times 0.77 \times 0.315 \times 0.8 = 0.000 (76)$ South $0.5 \times 0.77 \times 0.315 \times 0.8 = 0.000 (76)$ South $0.5 \times 0.77 \times 0.144 \times 0.76 \times 0.8 = 0.000 (76)$ South $0.5 \times 0.77 \times 0.144 \times 0.76 \times 0.8 = 0.000 (76)$ South $0.5 \times 0.77 \times 0.144 \times 0.76 \times 0.8 = 0.000 (76)$ South $0.5 \times 0.77 \times 0.144 \times 0.76 \times 0.8 = 0.000 (76)$ South $0.5 \times 0.77 \times 0.144 \times 0.76 \times 0.8 = 0.000 (76)$ South $0.5 \times 0.77 \times 0.144 \times 0.76 \times 0.8 = 0.000 (76)$ South $0.5 \times 0.77 \times 0.144 \times 0.76 \times 0.8 = 0.000 (76)$ South $0.5 \times 0.77 \times 0.144 \times 0.76 \times 0.8 = 0.000 (76)$ South $0.5 \times 0.77 \times 0.144 \times 0.76 \times 0.8 = 0.000 (76)$ South $0.5 \times 0.77 \times 0.8 = 0.000 (76)$ South $0.5 \times 0.77 \times 0.8 = 0.000 (76)$ South $0.5 \times 0.77 \times 0.8 = 0.000 (77)$ South $0.5 \times 0.77 \times 0.8 = 0.000 (76)$ South $0.5 \times 0.77 \times 0.8 = 0.000 (77)$ South $0.5 \times 0.77 \times 0.8 = 0.000 (76)$ South $0.5 \times 0.8 = 0.000 (77)$ South $0.5 \times 0.77 \times 0.8 = 0.000 (76)$ South $0.5 \times 0.8 = 0.000 (77)$ South $0.5 \times 0.000 (77) \times 0.000 (77)$ South $0.5 \times 0.000 (77) \times 0.000 (77)$ South $0.5 \times 0.000 (77) \times 0.000 (77)$ South $0.5 \times 0.000 (77) \times 0.000 (77)$ South $0.5 \times 0.000 (77) \times 0.000 (77) \times 0.000 (77) (78) (78)$ Mean internal temperature in living area from Table 9, Th1 (°C) (21) (65) Utilisation factor for gains for inving area 11 (follow steps 3 to 7 in Table 9c) (67) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88) Mean internal temperature in the rest of dwelling from Table 9, 10.000 (10, 10, 10, 10, 10, 10, 10, 10, 10, 10,	South 0.5x 0.77 x 3.15 x 0.76 x 0.8 = 109.61 77 South 0.5x 0.77 x 2.39 x 55.42 x 0.76 x 0.8 = 111.61 78 South 0.5x 0.77 x 1.44 x 55.42 x 0.76 x 0.8 = 111.61 78 South 0.9x 0.77 x 1.44 x 55.42 x 0.76 x 0.8 = 111.61 78 South 0.9x 0.77 x 1.44 x 55.42 x 0.76 x 0.8 = 73.55 78 South 0.9x 0.77 x 1.44 x 40.4 x 0.76 x 0.8 = 24.51 78 South 0.9x 0.77 x 3.15 40.4 x 0.76 x 0.8 = 24.51 178 South 0.9x 0.77 x	South	0.9x	0.77	×	2.39	×	82.59	x	0.76		0.8	=	166.33	(78)
South 0.5×0.77 x 2.39 x 55.42 x 0.76 x 0.8 = 111.61 (73) South 0.5×0.77 x 1.44 x 55.42 x 0.76 x 0.8 = 33.62 (78) South 0.5×0.77 x 1.44 x 55.42 x 0.76 x 0.8 = 33.62 (78) South 0.5×0.77 x 1.44 x 40.4 x 0.76 x 0.8 = 33.62 (78) South 0.5×0.77 x 2.39 x 40.4 x 0.76 x 0.8 = 41.36 (73) South 0.9×0.77 x 2.39 x 40.4 x 0.76 x 0.8 = 24.51 (78) South 0.9×0.77 x 1.44 x 40.4 x 0.76 x 0.8 = 24.51 (78) South 0.9×0.77 x 1.44 x 40.4 x 0.76 x 0.8 = 24.51 (78) South 0.9×0.77 x 3.15 40.4 x 0.76 x 0.8 = 24.51 (78) South 0.9×0.77 x 3.15 40.4 x 0.76 x 0.8 = 24.51 (78) South 0.9×0.77 x 3.15 40.4 x 0.76 x 0.8 = 24.51 (78) South 0.9×0.77 x 3.15 40.4 x 0.76 x 0.8 = 24.51 (78) Solar gains in watts, calculated for each month (8)m = Sum(74)m(62)m (83)m = 215.3 367.83 496.51 614.22 694.65 694.59 607.45 603.44 536.24 404.12 261.12 188.1 (83) Total gains = internal and solar (84)m = (73)m + (83)m, watts (84)m = 847.68 991.8 1096.14 1176.09 1217.77 1182.93 1135.41 1082.59 1035.17 941.06 840.37 799.42 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a) Mean internal temperature in living area 11 (follow steps 3 to 7 in Table 9c) (87)m = 19.79 19.99 20.26 20.58 20.82 20.96 20.99 20.99 20.91 20.59 20.13 19.75 (87)Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) $(88)m = 19.83 19.83 19.84 19.85 19.85 19.86 19.86 19.86 19.86 19.85 19.85 19.84 (88)Utilisation factor for gains for rest of dwelling from Table 9, 1h2 (°C)(89)m = 0.99 0.97 0.95 0.88 0.74 0.54 0.35 0.39 0.65 0.9 0.97 0.99 (89)Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)$	South 0.9k 0.77 × 2.39 × 55.42 × 0.76 × 0.8 = 111.61 (70 South 0.9k 0.77 × 1.44 × 55.42 × 0.76 × 0.8 = 33.62 (70 South 0.9k 0.77 × 1.44 × 55.42 × 0.76 × 0.8 = 33.62 (70 South 0.9k 0.77 × 1.44 × 55.42 × 0.76 × 0.8 = 41.36 (70 South 0.9k 0.77 × 2.39 × 40.4 × 0.76 × 0.8 = 41.36 (70 South 0.9k 0.77 × 2.39 × 40.4 × 0.76 × 0.8 = 41.36 (70 South 0.9k 0.77 × 1.44 × 40.4 × 0.76 × 0.8 = 41.36 (70 South 0.9k 0.77 × 1.44 × 40.4 × 0.76 × 0.8 = 41.36 (70 South 0.9k 0.77 × 1.44 × 40.4 × 0.76 × 0.8 = 41.36 (70 South 0.9k 0.77 × 3.15 × 40.4 × 0.76 × 0.8 = 24.51 (76 South 0.9k 0.77 × 3.15 × 40.4 × 0.76 × 0.8 = 53.62 (78 South 0.9k 0.77 × 3.15 × 40.4 × 0.76 × 0.8 = 53.62 (78 Solar gains in watts, calculated for each month (83)m = 5um(74)m(82)m (83)m = 218.9 367.89 496.51 614.22 694.65 694.59 667.45 605.34 536.24 404.12 261.12 188.1 (83 Total gains - internal and solar (84)m = (73)m + (83)m, watts (84)m = 847.68 991.8 1096.14 1176.09 1217.77 1182.93 1135.41 1082.59 1035.17 941.06 840.37 799.42 (84 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85 Wean internal temperature in living area 11 (follow steps 3 to 7 in Table 9c) (67)m = 19.79 19.99 20.26 20.58 20.82 20.99 20.99 20.91 20.59 20.13 19.75 (87 Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m = 19.83 19.84 19.85 19.85 19.86 19.86 19.85 19.85 19.85 19.84 (88 Utilisation factor for gains for rest of dwelling from Table 9, Th2 (°C) (89)m = 0.99 0.97 0.95 0.88 0.74 0.54 0.35 0.39 0.65 0.9 0.97 0.99 (89 Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	South	0.9x	0.77	×	1.44	×	82.59	x	0.76		0.8	=	50.11	(78)
South 0.9* 0.77 x 1.44 x 55.42 x 0.76 x 0.8 = 33.62 (78) South 0.9* 0.77 x 3.15 55.42 x 0.76 x 0.8 = 33.62 (78) South 0.9* 0.77 x 2.39 x 40.4 x 0.76 x 0.8 = 81.36 (78) South 0.9* 0.77 x 2.39 x 40.4 x 0.76 x 0.8 = 81.36 (78) South 0.9* 0.77 x 3.15 40.4 x 0.76 x 0.8 = 24.51 (76) South 0.9* 0.77 x 3.15 40.4 x 0.76 x 0.8 = 24.51 (78) South 0.9* 0.77 x 3.15 40.4 x 0.76 x 0.8 = 24.51 (78) South 0.9* 0.77 x 3.15 <td>South 0.9x 0.77 x 1.44 x 55.42 x 0.76 x 0.8 = 33.62 77 South 0.9x 0.77 x 3.15 x 55.42 x 0.76 x 0.8 = 33.62 77 South 0.9x 0.77 x 2.39 x 40.4 x 0.76 x 0.8 = 81.36 77 South 0.9x 0.77 x 3.15 x 40.4 x 0.76 x 0.8 = 24.51 77 South 0.9x 0.77 x 3.15 x 40.4 x 0.76 x 0.8 = 24.51 77 South 0.9x 0.77 x 3.15 x 40.4 x 0.76 x 0.8 = 24.51 77 South 0.9x 0.77 x 3.15 x 40.4 x 0.76 x 0.8 = 24.51 77 31.5 x 0.76</td> <td>South</td> <td>0.9x</td> <td>0.77</td> <td>×</td> <td>3.15</td> <td>×</td> <td>82.59</td> <td>x</td> <td>0.76</td> <td></td> <td>0.8</td> <td>=</td> <td>109.61</td> <td>(78)</td>	South 0.9x 0.77 x 1.44 x 55.42 x 0.76 x 0.8 = 33.62 77 South 0.9x 0.77 x 3.15 x 55.42 x 0.76 x 0.8 = 33.62 77 South 0.9x 0.77 x 2.39 x 40.4 x 0.76 x 0.8 = 81.36 77 South 0.9x 0.77 x 3.15 x 40.4 x 0.76 x 0.8 = 24.51 77 South 0.9x 0.77 x 3.15 x 40.4 x 0.76 x 0.8 = 24.51 77 South 0.9x 0.77 x 3.15 x 40.4 x 0.76 x 0.8 = 24.51 77 South 0.9x 0.77 x 3.15 x 40.4 x 0.76 x 0.8 = 24.51 77 31.5 x 0.76	South	0.9x	0.77	×	3.15	×	82.59	x	0.76		0.8	=	109.61	(78)
South 0.97 x 3.15 55.42 x 0.76 x 0.8 = 73.55 178 South 0.9x 0.77 x 2.39 x 40.4 x 0.76 x 0.8 = 81.36 (78) South 0.9x 0.77 x 1.44 x 40.4 x 0.76 x 0.8 = 81.36 (78) South 0.9x 0.77 x 3.15 40.4 x 0.76 x 0.8 = 24.51 (78) South 0.9x 0.77 x 3.15 40.4 x 0.76 x 0.8 = 63.62 (78) South 0.9x 0.77 x 3.15 40.4 x 0.76 x 0.8 = 63.62 (78) South 0.9x 0.77 x 3.15 40.4 x 0.76 x 0.8 3.62 (78) South 0.9x 0.77 x 3.15 10.4 0.76 60.8	South 0.9x 0.77 × 3.15 × 55.42 × 0.76 × 0.8 = 73.55 778 South 0.9x 0.77 × 3.15 × 65.42 × 0.76 × 0.8 = 73.55 778 South 0.9x 0.77 × 3.15 × 40.4 × 0.76 × 0.8 = 24.51 778 South 0.9x 0.77 × 3.15 × 40.4 × 0.76 × 0.8 = 24.51 778 South 0.9x 0.77 × 3.15 × 40.4 × 0.76 × 0.8 = 24.51 778 South 0.9x 0.77 × 3.15 × 40.4 × 0.76 × 0.8 = 53.62 778 Solar gains in watts, calculated for each month (63)m = Sun(74)m(82)m (83)m = 218.9 367.88 496.51 614.22 694.65 694.59 667.45 605.34 536.24 404.12 261.12 188.1 (63) Total gains – internal and solar (84)m = (73)m + (83)m, watts (84)m = 847.68 991.8 1096.14 1176.09 1217.77 1182.93 1135.41 1082.59 1035.17 941.06 840.37 799.42 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a) 1.3n Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m = 0.99 0.98 0.96 0.91 0.8 0.63 0.47 0.51 0.74 0.93 0.98 0.99 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m = 19.79 19.99 20.26 20.58 20.82 20.99 20.99 20.91 20.59 20.13 19.75 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (89)m = 0.99 0.97 0.95 0.88 0.74 0.54 0.35 0.39 0.65 0.9 0.97 0.99 (86) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	South	0.9x	0.77	×	2.39	×	55.42] x	0.76		0.8	=	111.61	(78)
South 0.9x 0.77 x 2.39 x 40.4 x 0.76 x 0.8 = 81.36 (78) South 0.9x 0.77 x 1.44 x 40.4 x 0.76 x 0.8 = 81.36 (78) South 0.9x 0.77 x 3.15 40.4 x 0.76 x 0.8 = 24.51 (78) South 0.9x 0.77 x 3.15 40.4 x 0.76 x 0.8 = 24.51 (78) South 0.9x 0.77 x 3.15 40.4 x 0.76 x 0.8 = 24.51 (78) South 0.9x 0.77 x 3.15 40.4 x 0.76 x 0.8 = 24.51 (78) South 0.9x 0.77 x 3.15 40.4 x 0.76 x 0.8 = 24.51 (78) South 0.9x 0.91 0.9x 0.91 0.9	South $0.3x$ 0.77 x 2.39 x 40.4 x 0.76 x 0.8 $=$ 81.36 (78 South $0.9x$ 0.77 x 1.44 x 40.4 x 0.76 x 0.8 $=$ 24.51 (78 South $0.9x$ 0.77 x 3.15 x 40.4 x 0.76 x 0.8 $=$ 24.51 (78 South $0.9x$ 0.77 x 3.15 x 40.4 x 0.76 x 0.8 $=$ 24.51 (78 South $0.9x$ 0.77 x 3.15 x 40.4 x 0.76 x 0.8 $=$ 24.51 (78 South $0.9x$ 0.77 x 3.15 x 40.4 x 0.76 x 0.8 $=$ 24.51 (78 South $0.9x$ 0.77 x 3.15 x 40.4 x 0.76 x 0.8 $=$ 24.51 (78 Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83)m = 218.9 367.89 496.51 614.22 694.68 694.59 667.45 605.34 536.24 404.12 261.12 188.1 Total gains - internal and solar (84)m = (73)m + (83)m, watts (84)m = 847.68 991.8 1096.14 1176.09 1217.77 1182.93 1135.41 1082.59 1035.17 941.06 840.37 799.42 (84 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85 Utilisation factor for gains for living area, h1,m (see Table 9a) (86)m = <u>19.99 0.98 0.96 0.91 0.8 0.63 0.47 0.51 0.74 0.93 0.98 0.99 (86 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m = <u>19.79 19.99 20.26 20.58 20.82 20.96 20.99 20.99 20.91 20.59 20.13 19.75 (87 Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m = <u>19.83</u> 19.83 19.84 19.85 19.85 19.86 19.86 19.86 19.86 19.85 19.85 19.84 (88) Utilisation factor for gains for rest of dwelling h2,m (see Table 9a) (89)m = <u>0.99 0.97 0.95 0.88 0.74 0.54 0.35 0.39 0.65 0.9 0.97 0.99 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)</u></u></u>	South	0.9x	0.77	×	1.44	×	55.42	x	0.76		0.8	=	33.62	(78)
South 0.9x 0.77 x 1.44 x 40.4 x 0.76 x 0.8 = 24.51 (78) South 0.9x 0.77 x 3.15 40.4 x 0.76 x 0.8 = 24.51 (78) South 0.9x 0.77 x 3.15 40.4 x 0.76 x 0.8 = 24.51 (78) South 0.9x 0.77 x 3.15 40.4 x 0.76 x 0.8 = 24.51 (78) Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m 0.8 = 53.62 (78) Total gains - internal and solar (84)m = (73)m + (83)m, watts (84)m = 847.68 991.8 1096.14 1176.09 1217.77 1182.93 1135.41 1082.59 1035.17 941.06 840.37 799.42 (84) Chean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area 11 (follow steps 3	South $0.9x$ 0.77 \times 1.44 \times 40.4 \times 0.76 \times 0.8 $=$ 24.51 $(78$ South $0.9x$ 0.77 \times 3.15 40.4 \times 0.76 \times 0.8 $=$ 24.51 $(78$ South $0.9x$ 0.77 \times 3.15 40.4 \times 0.76 \times 0.8 $=$ 24.51 $(78$ South $0.9x$ 0.77 \times 3.15 40.4 \times 0.76 \times 0.8 $=$ 53.62 (78) Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (82)m (82)m (82)m (81)m = 53.62 404.12 261.12 188.1 (83) Total gains - internal and solar (84)m = (73)m + (83)m, watts (84)m = 847.68 991.8 1096.14 1176.09 121.77 1182.93 1135.41 1082.59 1035.17 941.06 840.37 799.42 (84 Chean internal temperature (heating paces an 1, m (see Table 9a)	South	0.9x	0.77	×	3.15	×	55.42	x	0.76	x	0.8	=	73.55	(78)
South $0.9x$ 0.77 x 3.15 x 40.4 x 0.76 x 0.8 = 53.62 (78) Solar gains in watts, calculated for each month (63)m = $5un(74)m$ (82)m (83)m = 218.9 367.88 496.51 614.22 694.65 694.59 667.45 605.34 536.24 (04.12 261.12 188.1) Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m = 847.68 991.8 1096.14 1176.09 1217.77 1182.93 1135.41 1082.59 1035.17 941.06 840.37 799.42 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (65) Utilisation factor for gains for living area, h1,m (see Table 9a) (86)m = 0.99 0.98 0.96 0.91 0.8 0.63 0.47 0.51 0.74 0.93 0.98 0.99 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m = 19.79 19.99 20.26 20.58 20.82 20.98 20.99 20.91 20.59 20.13 19.75 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m = 19.83 19.83 19.84 19.85 19.86 19.86 19.86 19.86 19.85 19.85 19.84 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m = 0.99 0.97 0.95 0.88 0.74 0.54 0.35 0.39 0.65 0.9 0.97 0.99 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	South $0.9x$ 0.77 x 3.15 40.4 x 0.76 x 0.8 = 53.62 (78 Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83)m = 218.9 367.88 496.51 614.22 694.65 694.59 667.45 605.34 536.24 404.12 261.12 188.1 (83) Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m = 847.68 991.8 1096.14 1176.09 1217.77 1182.93 1135.41 1082.59 1035.17 941.06 840.37 799.42 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a) (86)m = 0.99 0.98 0.96 0.91 0.8 0.63 0.47 0.51 0.74 0.93 0.98 0.99 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m = 19.79 19.99 20.26 20.58 20.82 20.96 20.99 20.99 20.91 20.59 20.13 19.75 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m = 19.83 19.83 19.84 19.85 19.85 19.86 19.86 19.86 19.86 19.85 19.85 19.84 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m = 0.99 0.97 0.95 0.88 0.74 0.54 0.35 0.39 0.65 0.9 0.97 0.99 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	South	0.9x	0.77		2.39	x	40.4] x	0.76	x	0.8		81.36	(78)
Solar gains in watts, calculated for each month (63)m = Sum(74)m(82)m (83)m = 218.9 367.88 496.51 614.22 694.65 604.59 667.45 605.34 536.24 404.12 261.12 188.1 (83) Total gains - internal and solar (84)m = (73)m + (83)m, watts (84)m = 847.68 991.8 1096.14 1176.09 1217.77 1182.93 1135.41 1082.59 1035.17 941.06 840.37 799.42 (84) Colspan=1 Colspan=1 640.12 261.12 188.1 (83) Colspan=1 640.12 261.12 188.1 (83) Colspan=1 Colspan=1 /b>	Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83)m = 218.9 367.88 496.51 614.22 694.65 694.59 667.45 605.34 536.24 404.12 261.12 188.1 (83)m Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 847.68 991.8 1096.14 1176.09 1217.77 1182.93 1135.41 1082.59 1035.17 941.06 840.37 799.42 (84 Constant solar (84)m = (73)m + (83)m , watts (84)m= 847.68 991.8 1096.14 1176.09 1217.77 1182.93 1135.41 1082.59 1035.17 941.06 840.37 799.42 (84 Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85 Utilisation factor for gains for living area 11 (follow steps 3 to 7 in Table 9c) (86)m= 0.99 0.98 0.96 0.91 0.8 0.63 0.47 0.51 0.74 0.93 0.99 (86 Mean internal temperature in living area 11 (follow steps 3 to 7 in Table 9c) (87)m= 19.79 19.85 19.86 19.86	South	0.9x	0.77	×	1.44	x	40.4	i 🖌	0.76	×	0.8		24.51	(78)
(83)m= 218.9 367.88 496.51 614.22 694.65 694.59 667.45 605.34 536.24 404.12 261.12 188.1 (83) Total gains - internal and solar (84)m = (73)m + (83)m , watts (84)m= 847.68 991.8 1096.14 1176.09 1217.77 1182.93 1135.41 1082.59 1035.17 941.06 840.37 799.42 (84) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a) (86)m= 0.99 0.98 0.96 0.91 0.8 0.63 0.47 0.51 0.74 0.93 0.98 0.99 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (67)m= 19.79 19.99 20.26 20.58 20.82 20.99 20.91 20.59 20.13 19.75 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.86 19.86 19.86 19.85 19.85 19.84 (88) Utilisation factor for gains	$ \begin{array}{c} (83)m = & 218.9 & 367.88 & 496.51 & 614.22 & 694.65 & 694.59 & 667.45 & 605.34 & 536.24 & 404.12 & 261.12 & 188.1 \\ \hline \end{tabular}{thermal and solar (84)m} = (73)m + (83)m , watts \\ (84)m = & 847.68 & 991.8 & 1096.14 & 1176.09 & 1217.77 & 1182.93 & 1135.41 & 1082.59 & 1035.17 & 941.06 & 840.37 & 799.42 \\ \hline \end{tabular}{thermal temperature during heating periods in the living area from Table 9, Th1 (°C) & 21 & (84) \\ \hline \end{tabular}{thermal temperature during heating periods in the living area from Table 9, Th1 (°C) & 21 & (85) \\ \hline \end{tabular}{thermal temperature during heating periods in the living area from Table 9, Th1 (°C) & 21 & (85) \\ \hline \end{tabular}{thermal temperature in fiving area, h1,m (see Table 9a)} \\ \hline \end{tabular}{thermal temperature in living area T1 (follow steps 3 to 7 in Table 9c) \\ \hline \end{tabular}{thermal temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) \\ \hline \end{tabular}{thermal temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) \\ \hline \end{tabular}{thermal temperature in the rest of dwelling, h2,m (see Table 9a) \\ \hline \end{tabular}{thermal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) \\ \hline \end{tabular}{thermal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) \\ \hline \end{tabular}{thermal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) \\ \hline \end{tabular}{thermal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) \\ \hline \end{tabular}{thermal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) \\ \hline \end{tabular}{thermal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) \\ \hline \end{tabular}{thermal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) \\ \hline \end{tabular}{thermal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) \\ \hline \end{tabular}{thermal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) \\ \hline \end{tabular}{thermal temperature in $	South	0.9x	0.77	۲×	3.15	×	40.4	x	0.76	x	0.8	=	53.62	(78)
(83)m= 218.9 367.88 496.51 614.22 694.65 694.59 667.45 605.34 536.24 404.12 261.12 188.1 (83) Total gains - internal and solar (84)m = (73)m + (83)m , watts (84)m= 847.68 991.8 1096.14 1176.09 1217.77 1182.93 1135.41 1082.59 1035.17 941.06 840.37 799.42 (84) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a) (86)m= 0.99 0.98 0.96 0.91 0.8 0.63 0.47 0.51 0.74 0.93 0.98 0.99 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (67)m= 19.79 19.99 20.26 20.58 20.82 20.99 20.91 20.59 20.13 19.75 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.86 19.86 19.86 19.85 19.85 19.84 (88) Utilisation factor for gains	$ \begin{array}{c} (83)m = & 218.9 & 367.88 & 496.51 & 614.22 & 694.65 & 694.59 & 667.45 & 605.34 & 536.24 & 404.12 & 261.12 & 188.1 \\ \hline \end{tabular}{thermal and solar (84)m} = (73)m + (83)m , watts \\ (84)m = & 847.68 & 991.8 & 1096.14 & 1176.09 & 1217.77 & 1182.93 & 1135.41 & 1082.59 & 1035.17 & 941.06 & 840.37 & 799.42 \\ \hline \end{tabular}{thermal temperature during heating periods in the living area from Table 9, Th1 (°C) & 21 & (84) \\ \hline \end{tabular}{thermal temperature during heating periods in the living area from Table 9, Th1 (°C) & 21 & (85) \\ \hline \end{tabular}{thermal temperature during heating periods in the living area from Table 9, Th1 (°C) & 21 & (85) \\ \hline \end{tabular}{thermal temperature in fiving area, h1,m (see Table 9a)} \\ \hline \end{tabular}{thermal temperature in living area T1 (follow steps 3 to 7 in Table 9c) \\ \hline \end{tabular}{thermal temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) \\ \hline \end{tabular}{thermal temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) \\ \hline \end{tabular}{thermal temperature in the rest of dwelling, h2,m (see Table 9a) \\ \hline \end{tabular}{thermal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) \\ \hline \end{tabular}{thermal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) \\ \hline \end{tabular}{thermal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) \\ \hline \end{tabular}{thermal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) \\ \hline \end{tabular}{thermal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) \\ \hline \end{tabular}{thermal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) \\ \hline \end{tabular}{thermal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) \\ \hline \end{tabular}{thermal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) \\ \hline \end{tabular}{thermal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) \\ \hline \end{tabular}{thermal temperature in $				7				-				_		
Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 847.68 991.8 1096.14 1176.09 1217.77 1182.93 1135.41 1082.59 1035.17 941.06 840.37 799.42 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.99 0.98 0.96 0.91 0.8 0.63 0.47 0.51 0.74 0.93 0.98 0.99 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.79 19.99 20.26 20.58 20.92 20.99 20.91 20.59 20.13 19.75 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.83 19.84 19.85 19.86 19.86 19.86 19.85 19.84 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.99	Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 847.68 991.8 1096.14 1176.09 1217.77 1182.93 1135.41 1082.59 1035.17 941.06 840.37 799.42 (84 Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 847.68 991.8 1096.14 1176.09 1217.77 1182.93 1135.41 1082.59 1035.17 941.06 840.37 799.42 (84 Total gains – internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85 Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.99 0.98 0.96 0.91 0.8 0.63 0.47 0.51 0.74 0.93 0.98 0.99 (86 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.79 19.99 20.26 20.58 20.82 20.99 20.91 20.59 20.13 19.75 (87 Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.83 19.84<	Solar g	ains in	watts, calcu	ulated	for each mon	th		(83)m	n = Sum(74)m .	(82)m				
(84)m= 847.68 991.8 1096.14 1176.09 1217.77 1182.93 1135.41 1082.59 1035.17 941.06 840.37 799.42 (84) 7. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a) Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.99 0.98 0.96 0.91 0.8 0.63 0.47 0.51 0.74 0.93 0.98 0.99 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87) (87)m= 19.79 19.99 20.26 20.82 20.99 20.99 20.91 20.59 20.13 19.75 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88) (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.99 0.97 0.99 0.89 0.89 <td>(84)m= 847.68 991.8 1096.14 1176.09 1217.77 1182.93 1135.41 1082.59 1035.17 941.06 840.37 799.42 (84 C. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.99 0.96 0.91 0.8 0.63 0.47 0.51 0.74 0.93 0.98 0.99 (86 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.79 19.99 20.26 20.58 20.92 20.99 20.91 20.59 20.13 19.75 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.83 19.84 19.85 19.86 19.86 19.86 19.85 19.84 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.99 0.97 0.99 0.89 0.89 0.65</td> <td>(83)m=</td> <td>218.9</td> <td>367.88 49</td> <td>96.51</td> <td>614.22 694.6</td> <td>5 6</td> <td>94.59 667.45</td> <td>605</td> <td>.34 536.24</td> <td>404.12</td> <td>2 261.12</td> <td>188.1</td> <td></td> <td>(83)</td>	(84)m= 847.68 991.8 1096.14 1176.09 1217.77 1182.93 1135.41 1082.59 1035.17 941.06 840.37 799.42 (84 C. Mean internal temperature (heating season) Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.99 0.96 0.91 0.8 0.63 0.47 0.51 0.74 0.93 0.98 0.99 (86 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.79 19.99 20.26 20.58 20.92 20.99 20.91 20.59 20.13 19.75 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.83 19.84 19.85 19.86 19.86 19.86 19.85 19.84 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.99 0.97 0.99 0.89 0.89 0.65	(83)m=	218.9	367.88 49	96.51	614.22 694.6	5 6	94.59 667.45	605	.34 536.24	404.12	2 261.12	188.1		(83)
Constant for the stress of the second for the second	Construct for the first for the living area from Table 9, Th1 (°C) 21 (85) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 0.99 0.98 0.96 0.91 0.8 0.63 0.47 0.51 0.74 0.93 0.98 0.99 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.79 19.99 20.26 20.58 20.82 20.99 20.99 20.91 20.59 20.13 19.75 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (87)m= 19.79 19.83 19.84 19.85 19.86 19.86 19.86 19.85 19.85 19.84 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.99 0.97 0.95 0.88 0.74 0.54 0.35 0.39 0.65 0.9 0.97 0.99 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	Total ga	ains – i	nternal and	solar	(84)m = (73)r	n + (83)m , watts	•						
Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a) (86)m= Oct Nov Dec 0.99 0.98 0.96 0.91 0.8 0.63 0.47 0.51 0.74 0.93 0.98 0.99 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.79 19.99 20.26 20.58 20.82 20.99 20.99 20.91 20.59 20.13 19.75 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.83 19.84 19.85 19.86 19.86 19.86 19.85 19.85 19.84 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.99 0.97 0.99 0.89 0.54 0.35 0.39 0.65 0.9 0.97 0.99 (89) Mare themperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 0.99 0.98 0.96 0.91 0.8 0.63 0.47 0.51 0.74 0.93 0.98 0.99 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.79 19.99 20.26 20.58 20.82 20.99 20.99 20.91 20.59 20.13 19.75 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.83 19.84 19.85 19.86 19.86 19.86 19.85 19.85 19.84 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.99 0.97 0.99 0.88 0.74 0.54 0.35 0.39 0.65 0.9 0.97 0.99 (89) Mark Mark Mark Mark Mark Mark Mark Mark	(84)m=	847.68	991.8 10	96.14	1176.09 1217.7	7 1	182.93 1135.41	1082	2.59 1035.17	941.06	840.37	799.42		(84)
Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a) (86)m= Oct Nov Dec 0.99 0.98 0.96 0.91 0.8 0.63 0.47 0.51 0.74 0.93 0.98 0.99 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.79 19.99 20.26 20.58 20.82 20.99 20.99 20.91 20.59 20.13 19.75 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.83 19.84 19.85 19.86 19.86 19.86 19.85 19.85 19.84 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.99 0.97 0.99 0.89 0.54 0.35 0.39 0.65 0.9 0.97 0.99 (89) Mare themperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	Temperature during heating periods in the living area from Table 9, Th1 (°C) 21 (85) Utilisation factor for gains for living area, h1,m (see Table 9a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 0.99 0.98 0.96 0.91 0.8 0.63 0.47 0.51 0.74 0.93 0.98 0.99 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.79 19.99 20.26 20.58 20.82 20.99 20.99 20.91 20.59 20.13 19.75 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.83 19.84 19.85 19.86 19.86 19.86 19.85 19.85 19.84 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.99 0.97 0.99 0.88 0.74 0.54 0.35 0.39 0.65 0.9 0.97 0.99 (89) Mark Mark Mark Mark Mark Mark Mark Mark	7. Mea	an intei	rnal tempera	ature (heating seaso	on)							- 	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.99 0.98 0.96 0.91 0.8 0.63 0.47 0.51 0.74 0.93 0.98 0.99 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.79 19.99 20.26 20.58 20.82 20.99 20.99 20.91 20.59 20.13 19.75 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.83 19.84 19.85 19.86 19.86 19.86 19.85 19.84 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.99 0.97 0.99 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) 0.97 0.99 (89)	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (86)m= 0.99 0.98 0.96 0.91 0.8 0.63 0.47 0.51 0.74 0.93 0.98 0.99 (86 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.79 19.99 20.26 20.58 20.82 20.99 20.99 20.91 20.59 20.13 19.75 (87 Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.83 19.84 19.85 19.86 19.86 19.86 19.85 19.85 19.84 (88 Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.99 0.97 0.99 (89 (89)m= 0.99 0.97 0.95 0.88 0.74 0.54 0.35 0.39 0.65 0.9 0.97 0.99 (89							area from Tal	ble 9	, Th1 (°C)				21	(85)
(86)m= 0.99 0.98 0.96 0.91 0.8 0.63 0.47 0.51 0.74 0.93 0.98 0.99 (86) Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.79 19.99 20.26 20.58 20.82 20.99 20.99 20.91 20.59 20.13 19.75 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.83 19.84 19.85 19.86 19.86 19.86 19.85 19.85 19.84 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.99 0.97 0.95 0.88 0.74 0.54 0.35 0.39 0.65 0.9 0.97 0.99 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	(86)m= 0.99 0.98 0.96 0.91 0.8 0.63 0.47 0.51 0.74 0.93 0.98 0.99 (86 Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.79 19.99 20.26 20.58 20.82 20.99 20.99 20.91 20.59 20.13 19.75 (87 Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.83 19.84 19.85 19.86 19.86 19.86 19.85 19.85 19.84 (88 Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.99 0.97 0.95 0.88 0.74 0.54 0.35 0.39 0.65 0.9 0.97 0.99 (89 Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (89 0.99 0.97 0.99 (89	Utilisa	tion fac	ctor for gain	s for li	ving area, h1,	m (s	ee Table 9a)]
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) $(87)m=$ 19.79 19.99 20.26 20.58 20.82 20.99 20.99 20.99 20.91 20.59 20.13 19.75 (87)Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) $(88)m=$ 19.83 19.84 19.85 19.85 19.86 19.86 19.86 19.85 19.85 19.84 (88)Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) $(89)m=$ 0.99 0.97 0.95 0.88 0.74 0.54 0.35 0.39 0.65 0.9 0.97 0.99 Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 19.79 19.99 20.26 20.58 20.82 20.99 20.99 20.99 20.91 20.59 20.13 19.75 (87 Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.83 19.84 19.85 19.86 19.86 19.86 19.85 19.85 19.84 (88 Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.99 0.97 0.95 0.88 0.74 0.54 0.35 0.39 0.65 0.9 0.97 0.99 (89 Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	Γ	Jan	Feb	Mar	Apr Ma	y	Jun Jul	A	ug Sep	Oct	Nov	Dec		
(87)m= 19.79 19.99 20.26 20.58 20.82 20.99 20.99 20.91 20.59 20.13 19.75 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.83 19.84 19.85 19.86 19.86 19.86 19.85 19.85 19.84 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.99 0.97 0.95 0.88 0.74 0.54 0.35 0.39 0.65 0.9 0.97 0.99 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	(87)m= 19.79 19.99 20.26 20.58 20.82 20.99 20.99 20.91 20.59 20.13 19.75 (87 Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.83 19.84 19.85 19.86 19.86 19.86 19.85 19.85 19.84 (88 Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.99 0.97 0.95 0.88 0.74 0.54 0.35 0.39 0.65 0.9 0.97 0.99 (89 Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	(86)m=	0.99	0.98 0	0.96	0.91 0.8		0.63 0.47	0.5	51 0.74	0.93	0.98	0.99		(86)
(87)m= 19.79 19.99 20.26 20.58 20.82 20.99 20.99 20.91 20.59 20.13 19.75 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.83 19.84 19.85 19.86 19.86 19.86 19.85 19.85 19.84 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.99 0.97 0.95 0.88 0.74 0.54 0.35 0.39 0.65 0.9 0.97 0.99 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	(87)m= 19.79 19.99 20.26 20.58 20.82 20.99 20.99 20.91 20.59 20.13 19.75 (87 Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.83 19.84 19.85 19.86 19.86 19.86 19.85 19.85 19.84 (88 Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.99 0.97 0.95 0.88 0.74 0.54 0.35 0.39 0.65 0.9 0.97 0.99 (89 Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	Mean	interna	l temperatu	ire in l	iving area T1	(follo	w steps 3 to 3	7 in T	able 9c)		•			
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.83 19.84 19.85 19.86 19.86 19.86 19.85 19.85 19.84 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.99 0.97 0.95 0.88 0.74 0.54 0.35 0.39 0.65 0.9 0.97 0.99 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) 1000000000000000000000000000000000000	Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 19.83 19.84 19.85 19.86 19.86 19.86 19.85 19.85 19.84 (88 Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.99 0.97 0.95 0.88 0.74 0.54 0.35 0.39 0.65 0.9 0.97 0.99 (89 Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (89 10.85 10.85 10.85 10.90 0.97 0.99 0.97 0.97 0.97 0.97	-		- ·			<u>`</u>	i	1	<u> </u>	20.59	20.13	19.75		(87)
(88)m= 19.83 19.83 19.84 19.85 19.85 19.86 19.86 19.86 19.85 19.85 19.84 (88) Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.99 0.97 0.95 0.88 0.74 0.54 0.35 0.39 0.65 0.9 0.97 0.99 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (89) (89) (89) (89) (80)	(88)m= 19.83 19.84 19.85 19.85 19.86 19.86 19.86 19.85 19.85 19.84 (88 Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.99 0.97 0.95 0.88 0.74 0.54 0.35 0.39 0.65 0.9 0.97 0.99 (89 Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) (89 (90 (90) (90) (90) (90) (89	Tomp	aratura		ting n			ulling from T				1			
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.99 0.97 0.95 0.88 0.74 0.54 0.35 0.39 0.65 0.9 0.97 0.99 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) 0.97 0.99 0.97 0.97 <td>Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.99 0.97 0.95 0.88 0.74 0.54 0.35 0.39 0.65 0.9 0.97 0.99 (89 Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) 10000 10000 1000 10000<!--</td--><td>· -</td><td></td><td><u> </u></td><td>_</td><td></td><td>_</td><td><u> </u></td><td>1</td><td><u> </u></td><td>19.85</td><td>19.85</td><td>19 84</td><td></td><td>(88)</td></td>	Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a) (89)m= 0.99 0.97 0.95 0.88 0.74 0.54 0.35 0.39 0.65 0.9 0.97 0.99 (89 Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) 10000 10000 1000 10000 </td <td>· -</td> <td></td> <td><u> </u></td> <td>_</td> <td></td> <td>_</td> <td><u> </u></td> <td>1</td> <td><u> </u></td> <td>19.85</td> <td>19.85</td> <td>19 84</td> <td></td> <td>(88)</td>	· -		<u> </u>	 _		_	<u> </u>	1	<u> </u>	19.85	19.85	19 84		(88)
(89)m= 0.99 0.97 0.95 0.88 0.74 0.54 0.35 0.39 0.65 0.9 0.97 0.99 (89) Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) 0.97 0.99 0.99 0.97 0.99 0.99 0.99 0.91 <td>(89)m= 0.99 0.97 0.95 0.88 0.74 0.54 0.35 0.39 0.65 0.9 0.97 0.99 (89 Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) 0.97 0.99 0.97 0.97 0.99<td>L</td><td></td><td>I</td><td></td><td></td><td></td><td></td><td></td><td>10.00</td><td>10.00</td><td>10.00</td><td>10.04</td><td></td><td>(00)</td></td>	(89)m= 0.99 0.97 0.95 0.88 0.74 0.54 0.35 0.39 0.65 0.9 0.97 0.99 (89 Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) 0.97 0.99 0.97 0.97 0.99 <td>L</td> <td></td> <td>I</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>10.00</td> <td>10.00</td> <td>10.00</td> <td>10.04</td> <td></td> <td>(00)</td>	L		I						10.00	10.00	10.00	10.04		(00)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	г		<u> </u>			· · · ·	` I	T Ó			0.07	0.00		(00)
		(89)m=	0.99	0.97 (1.95	0.88 0.74		0.54 0.35	0.3	0.65	0.9	0.97	0.99		(69)
(90)m= 18.26 18.55 18.93 19.38 19.69 19.84 19.86 19.86 19.79 19.41 18.77 18.21 (90)	(90)m= 18.26 18.55 18.93 19.38 19.69 19.84 19.86 19.86 19.79 19.41 18.77 18.21 (90	г		т <u>'</u> т				<u> </u>	r –	I	,			I	
		(90)m=	18.26	18.55 1	8.93	19.38 19.69		19.84 19.86	19.						
$fLA = Living area \div (4) = 0.31$ (91)	$fLA = Living area \div (4) = 0.31$ (91									f	LA = Liv	ing area ÷ (4	+) =	0.31	(91)

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

(92)m= 18.73	18.99	19.34	19.75	20.04	20.18	20.21	20.21	20.14	19.78	19.19	18.68		(92)
Apply adjust	ment to t	he mear	interna	l temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m= 18.58	18.84	19.19	19.6	19.89	20.03	20.06	20.06	19.99	19.63	19.04	18.53		(93)
8. Space hea	ating req	uirement	i .										
Set Ti to the			•		ned at st	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the utilisation	1	1			i .	i							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fa		1	r	0.75	0.55					0.07			(04)
(94)m= 0.98	0.97	0.94	0.87	0.75	0.55	0.38	0.41	0.66	0.89	0.97	0.99		(94)
Useful gains	1	<u> </u>		ŕ	054 70	400.00	449.0	000.0	005.05	040.50	700.74		(05)
(95)m= 833.44	959.57		1024.96	907.6	651.79	426.23	448.3	682.9	835.85	813.56	788.71		(95)
Monthly ave	1 · · · ·	ì	r <u> </u>	1	1	100			40.0	7.4			(00)
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rat	1	1	· · · ·	1	1	<u> </u>		r , ,	r				(07)
(97)m= 1825.99						429.12	452.92	733.79	1132.33		1814.8		(97)
Space heatin	T	1	r		1	1	r	<u> </u>	<u> </u>				
(98)m= 738.46	550.16	436.66	230.25	88.94	0	0	0	0	220.58	497.06	763.41		- 1.
							Tota	l per year	(kWh/year	[.]) = Sum(9	8)15,912 =	3525.53	(98)
Space heatir	ng requir	ement in	kWh/m²	²/year							_	36.14	(99)
9a. Energy re	quiremer	nts – Ind	ividual h	eating s	vstems i	ncluding	micro-	CHP)					
Space heati								\					
Fraction of s	-	at from s	econdar	y/supple	mentary	y system						0	(201)
Fraction of s	pace hea	at from n	nain syst	em(s)			(202) = 1	- (201) =		_		1	(202)
Fraction of to							(204) = (2		(203)1 -				(204)
							(201) - (2	02) ~ [.	(200)] -			1	
Efficiency of												92.9	(206)
Efficiency of	seconda	ry/suppl	ementar	y heating	g system	n, %				_		0	(208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
Space heatir	ng require	ement (c	alculate	d above))								
738.46	550.16	436.66	230.25	88.94	0	0	0	0	220.58	497.06	763.41		
(211)m = {[(98	3)m x (20)4)] + (21	I0)m } x	100 ÷ (2	206)	-							(211)
794.9	592.21	470.03	247.85	95.73	0	0	0	0	237.44	535.05	821.76		
			1	1	1		Tota	l I (kWh/yea	ar) =Sum(2	211) _{15,1012}	=	3794.97	(211)
Space heatir	na fuel (s	econdar	v) k\//h/	month							l		
= {[(98)m x (2	•		• • •										
(215)m= 0	0	0		0	0	0	0	0	0	0	0		
							Tota	l I (kWh/yea	l ar) =Sum(2	215) _{15.1012}	=	0	(215)
Water heatin	~								, , , , , , , , , , , , , , , , , , ,	/ 15,1012		Ū	
Output from w	-	ter (calc	ulated a	hove)									
194.86		178.05	157.38	152.55	133.91	126.4	141.82	142.58	163.3	175.48	189.42		
Efficiency of v			I		I	I	I		I			87.3	(216)
(217)m= 89.34	89.27	89.13	88.83	88.24	87.3	87.3	87.3	87.3	88.78	89.21	89.37	01.0	(217)
				00.24	07.0	01.5	01.0	57.5	00.70	00.21	00.07		()
Fuel for water $(219)m = (64)$													
(219)m = 218.1	191.63	199.76	177.17	172.88	153.39	144.78	162.46	163.32	183.95	196.71	211.95		
	1	I	1	I	1	1	I Tota	l = Sum(2	19a) _{1 12} =	I		2176.11	(219)
								•	112		l		(=.0)

Annual totals Space heating fuel used, main system 1			kWh/yo	ear	kWh/year 3794.97	7
Water heating fuel used						
Electricity for pumps, fans and electric keep-hot					2176.11	
				00	1	(2200)
central heating pump:				30		(230c)
boiler with a fan-assisted flue		oum of (220o)	(220a) -	45		(230e) T(004)
Total electricity for the above, kWh/year		sum of (230a).	(230g) =		75	(231)
Electricity for lighting					400.11	(232)
10a. Fuel costs - individual heating systems:						
	Fuel kWh/year		Fuel Price (Table 12)		Fuel Cost £/year	
Space heating - main system 1	(211) x		3.48	x 0.01 =	132.0649	(240)
Space heating - main system 2	(213) x		0	x 0.01 =	0	(241)
Space heating - secondary	(215) x		13.19	x 0.01 =	0	(242)
Water heating cost (other fuel)	(219)		3.48	x 0.01 =	75.73	(247)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	9.89	(249)
(if off-peak tariff, list each of (230a) to (230g) sepa Energy for lighting	arately as applica (232)	able and apply	y fuel price act	cording to T	Fable 12a 52.77	(250)
Additional standing charges (Table 12) Appendix Q items: repeat lines (253) and (254) as	s needed				120	(251)
	7) + (250)(254) =				390.46	(255)
11a. SAP rating - individual heating systems						
Energy cost deflator (Table 12)					0.42	(256)
	56)] ÷ [(4) + 45.0] =				1.15	(257)
SAP rating (Section 12)					83.95	(258)
12a. CO2 emissions – Individual heating system	s including micro	-CHP				
	Energy kWh/year		Emission f kg CO2/kW		Emissions kg CO2/yea	
Space heating (main system 1)	(211) x		0.216	=	819.71	(261)
Space heating (secondary)	(215) x		0.519		0	(263)
Water heating	(219) x		0.216		470.04	(264)
Space and water heating	(261) + (262) + (2	263) + (264) =	-	_	1289.75	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519] =	38.93	(267)
Electricity for lighting	(232) x		0.519] =	207.66	(268)
Total CO2, kg/year		sum c	of (265)(271) =	-	1536.33	(272)
CO2 emissions per m ²		(272)	÷ (4) =		15.75	(273)

El rating (section 14)				86	(274)
13a. Primary Energy					
	Energy kWh/year	Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211) x	1.22	=	4629.86	(261)
Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	1.22	=	2654.85	(264)
Space and water heating	(261) + (262) + (263) + (26	(4) =		7284.71	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	230.25	(267)
Electricity for lighting	(232) x	0	=	1228.34	(268)
'Total Primary Energy		sum of (265)(271) =		8743.3	(272)
Primary energy kWh/m²/year		(272) ÷ (4) =		89.64	(273)



				User D	etails:						
Assessor Name: Software Name:	Stroma Number:Stroma FSAP 2012Software Version:Version									on: 1.0.0.28	
Property Address: 4 Bed 2013 Baseline											
Address :											
1. Overall dwelling dimer	nsions:			_							
Ground floor					a(m²)		Av. Hei			Volume(m ³)	
				5	6.67	(1a) x	2	2.5	(2a) =	141.68	(3a)
First floor				5	6.67	(1b) x	2	2.5	(2b) =	141.68	(3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+	·(1n) 11	13.34	(4)					
Dwelling volume						(3a)+(3b))+(3c)+(3d)+(3e)+	.(3n) =	283.35	(5)
2. Ventilation rate:											1
2. Vontilation rate.	main		ondar	у	other		total			m ³ per hour	
Number of chimneys	heating	nea	ating 0] + [0] = [0	x 4	40 =	0	(6a)
Number of open flues	0	」 」 + 「	0	」 <u>「</u>	0	」 <u>「</u> 」 = 「	0	x 2	20 =	0] (6b)
Number of intermittent fan			0		0				10 =]`´
	13						3			30	(7a)
Number of passive vents							0		10 =	0	(7b)
Number of flueless gas fires 0 × 40 = 0 (7c) Air changes per hour]
Infiltration due to chimney							30		÷ (5) =	0.11	(8)
If a pressurisation test has be			proceed	d to (17), c	otherwise o	continue fro	om (9) to (16)			1
Number of storeys in the Additional infiltration	e aw <u>eiling</u> (ns)						[(0).	-1]x0.1 =	0	(9) (10)
Structural infiltration: 0.2	25 for steel or	timber fra	ime or	0.35 for	masonr	v constr	uction	[(0)	1,0.1 -	0	(11)
if both types of wall are pre]()
deducting areas of opening			1) ~ ~ 0	1 (222)	d) alaa	ontor O					1
If suspended wooden floud lf no draught lobby, enter		•	a) or 0.	r (seale	ia), eise	enter 0				0	(12) (13)
Percentage of windows			pped							0	(13)
Window infiltration		agin on p	pou		0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate					(8) + (10)	+ (11) + (1	2) + (13) +	+ (15) =		0	(16)
Air permeability value, o	50, expresse	d in cubic	metre	s per ho	our per so	quare m	etre of e	nvelope	area	5	(17)
If based on air permeabilit	y value, then	(18) = [(17)	÷ 20]+(8	3), otherwi	se (18) = (16)				0.36	(18)
Air permeability value applies		n test has be	een don	e or a deg	gree air pei	rmeability	is being us	sed			-
Number of sides sheltered Shelter factor					(20) = 1 -	Ο 075 x (1	9)] –			2	(19)
Infiltration rate incorporati	na shelter fact	or			(20) = (18)		0)] –			0.85	(20)
Infiltration rate modified fo	•				() - (10)	, , (20) -				0.3	(21)
r	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	· _ I			201		200				I	
· · · · · · · · · · · · · · · · · · ·	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		

Wind F	actor (2	2a)m =	(22)m ÷	4											
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]		
Adjuste	ed infiltra	ation rat	e (allowi	ing for sl	nelter an	nd wind s	speed) =	(21a) x	(22a)m						
	0.39	0.38	0.37	0.33	0.33	0.29	0.29	0.28	0.3	0.33	0.34	0.36			
			-	rate for t	he appli	cable ca	ise					•			
	echanica			endix N, (2	3h) - (23a	a) x Emv (e	equation (N5)) othe	rwise (23h) – (23a)			0		
				iency in %) = (200)			0		
			•	entilation	•				,	2h)m + (23h) x [[/]	1 – (23c)	0 ∴ 1001) (23	()
(24a)m=	0	0		0	0	0				0		0]	(24	a)
	balance	d mech	ı anical ve	ntilation	without	I heat red	L Coverv (I	I MV) (24b	(22)	1 2b)m + ()	1 23b)		1		
(24b)m=		0	0	0	0	0	0	0	0	0	0	0]	(24	b)
c) If	whole h	ouse ex	tract ver	ntilation of	or positiv	/e input v	ventilatio	on from o	outside				1		
i	if (22b)n	ר < 0.5 א	(23b), t	then (24	c) = (23b	o); other	wise (24	c) = (22	o) m + 0.	5 × (23b))	-	_		
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24	c)
,				ole hous		•				0.51					
ا =(24d)		n = 1, tn 0.57	en (24d) 0.57	m = (221	0.55	0.54	(4a)m =	0.5 + [(2	2b)m² x	0.5	0.56	0.56		(24	d)
				nter (24a			L	4		0.00	0.50	0.50		(1	ľ
(25)m=	0.57	0.57	0.57	0.56	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.56	1	(25)
															<u> </u>
				paramet											
ELEN	IENT	Gros area		Openin m		Net Ar A ,r		U-val W/m2		A X U (W/I	K)	k-value kJ/m²-l		A X k kJ/K	
Doors						2	×			2.4				(26)
Windov	ws Type	e 1				2.39		/[1/(1.4)+	0.04] =	3.17	=			(27)
Windov	ws Type	2				2.39		/[1/(1.4)+	0.04] =	3.17				(27)
Windov	ws Type	3				1.44		/[1/(1.4)+	0.04] =	1.91	=			(27)
Windov	ws Type	e 4				0.96		/[1/(1.4)+	0.04] =	1.27	=			(27)
Windov	ws Type	5				1.44		/[1/(1.4)+	0.04] =	1.91	=			(27)
Windov	ws Type	6				3.15		/[1/(1.4)+	0.04] =	4.18	=			(27)
Floor						56.67	7 X	0.15		8.5005				(28)
Walls		113.	52	20		93.52	2 X	0.2		18.7	= i		- -	(29)
Roof		56.6	67	0		56.67	7 X	0.11		6.23	= i		- -	(30)
Total a	rea of e	lements	, m²			226.8	6		I					(31)
Party v	vall					50	×	0	= [0				(32	
				effective wi nternal wal			lated using	g formula 1	 //[(1/U-valu	ie)+0.04] a	as given in	paragraph	1 3.2		
			= S (A x		s and par			(26)(30)) + (32) =				59	.7 (33)
	apacity		•	,					((28)	.(30) + (32	2) + (32a).	(32e) =	1387		
			. ,	⊃ = Cm ÷	- TFA) ir	ר kJ/m²K			Indica	tive Value	: Medium		25		
													Parata		

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f

can be ι	ised inste	ad of a de	tailed calc	ulation.										
Therm	al bridge	es : S (L	x Y) cal	culated	using Ap	pendix l	<						11.34	(36)
if details of thermal bridging are not known (36) = $0.15 \times (31)$														
Total fabric heat loss (33) + (36) =												71.04	(37)	
Ventilation heat loss calculated monthly $(38)m = 0.33 \times (25)m \times (5)$														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	53.71	53.44	53.18	51.93	51.7	50.61	50.61	50.41	51.04	51.7	52.17	52.66		(38)
Heat transfer coefficient, W/K (39)m = (37) + (38)m														
(39)m=	124.75	124.48	124.22	122.98	122.74	121.66	121.66	121.45	122.08	122.74	123.21	123.71		
Average = Sum(39) ₁₁₂ /12=											122.97	(39)		
Heat loss parameter (HLP), W/m ² K (40)m = $(39)m \div (4)$														
(40)m=	1.1	1.1	1.1	1.08	1.08	1.07	1.07	1.07	1.08	1.08	1.09	1.09		_
Average = $Sum(40)_{112}/12 =$ 1.08(40)Number of days in month (Table 1a)												(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)
		<u> </u>			<u> </u>								1	
4. Water heating energy requirement: kWh/year:														
													1	
		ipancy, l A N – 1		[1 - exp	(-0.0003	849 x (TF	-13 Q)2)] + 0.0)013 x (⁻	TFA -13		83		(42)
	A £ 13.9		1.70 /		(0.0000	,45 X (11	A 10.5	/2/] 1 0.0		11 A 10.	.5)			
Annua	l averag	e hot wa	ater usag	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		106	6.84		(43)
				usage by . r day (all w				to achieve	a water us	se target o	f		·	
notmore														
1 lat	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
HOL WAL	-		day lor ea	ach month	vu,m = 1a			· ·						
(44)m=	117.52	113.25	108.97	104.7	100.43	96.15	96.15	100.43	104.7	108.97	113.25	117.52		-
Energy o	content of	hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,r	n x nm x D) Tm / 3600			m(44) ₁₁₂ = ables 1b, 1		1282.05	(44)
(45)m=	174.28	152.43	157.29	137.13	131.58	113.54	105.21	120.74	122.18	142.39	155.43	168.78		
										Total = Su	m(45) ₁₁₂ =		1680.97	(45)
lf instant	taneous w	ater heatii	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46,) to (61)					
(46)m=	26.14	22.86	23.59	20.57	19.74	17.03	15.78	18.11	18.33	21.36	23.31	25.32		(46)
	storage		الم ماريما					ithin or					1	
-		. ,					-	within sa	ame ves	sei		180		(47)
	•	•		nk in dw	•			(47) mbi boil	ore) onto	or 'O' in (47)			
	storage		not wate	51 (1115 11	iciuues i	nstantai					47)			
	-		eclared I	oss facto	or is kno	wn (kWł	n/day):				1.	51		(48)
Tempe	erature f	actor fro	m Table	2b			• /					54		(49)
				, kWh/ye	ear			(48) x (49)	=			82		(50)
			-	cylinder l		or is not		(-, ·· (· ·)			0.	02	1	(00)
		-		om Tabl	e 2 (kW	h/litre/da	ıy)					0		(51)
	•	-	ee secti	on 4.3									1	
		from Ta		Oh								0		(52)
Temperature factor from Table 2b												(53)		

Energy lost from water storage, kWh/year Enter (50) or (54) in (55)								(47) x (51)) x (52) x (53) =		0 82		(54) (55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)ı	m			1	
(56)m=	25.28	22.83	25.28	24.46	25.28	24.46	25.28	25.28	24.46	25.28	24.46	25.28		(56)
		s dedicate	l d solar sto	l orage, (57)	I m = (56)m	x [(50) – (I [H11)] ÷ (50	0), else (5 ⁻	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	25.28	22.83	25.28	24.46	25.28	24.46	25.28	25.28	24.46	25.28	24.46	25.28		(57)
Primar	v circuit	loss (ar	nual) fro	om Table								0		(58)
		``	,			59)m = ((58) ÷ 36	65 × (41)	m					
(mo	dified by	factor f	rom Tab	le H5 if t	here is s	solar wat	ter heatir	ng and a	cylinde	r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi loss calculated for each month (61)m = (60) \div 365 × (41)m														
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	neat req	uired for	water h	eating ca	alculated	l for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)r	n
(62)m=	222.82	196.27	205.83	184.1	180.12	160.52	153.75	169.27	169.15	190.93	202.4	217.32		(62)
Solar DI	HW input	calculated	using App	endix G o	r Appendix	: H (negati	ve quantity	v) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	NWHRS	applies	, see Ap	pendix (G)				I	
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	t from w	ater hea	ter											
(64)m=	222.82	196.27	205.83	184.1	180.12	160.52	153.75	169.27	169.15	190.93	202.4	217.32		_
									out from wa				2252.49	(64)
Heat g	ains fro	m water	heating	, kWh/m	onth 0.2		× (45)m	+ (61)m	1] + 0.8 x	(<mark>(46)</mark> m	+ (57)m	+ (59)m]	
(65)m=	96.78	85.76	91.13	83.17	82.58	75.33	73.82	78.98	78.2	86.18	89.26	94.95		(65)
inclu	ude (57)	m in cal	culation	of (65)m	only if c	ylinder i	s in the c	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Int	ternal ga	ains (see	e Table 5	5 and 5a):									
Metab	olic gair		<u>e 5), Wat</u>	ts									1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(22)
				170.01				170.01		170.01	170.01	170.01	l	(66)
-	<u> </u>	· · · · · · · · · · · · · · · · · · ·	· · · ·	· · · · · · · · · · · · · · · · · · ·	· · ·	i	r L9a), a I		· · · · · ·		1		1	(07)
(67)m=	64.34	57.15	46.47	35.18	26.3	22.2	23.99	31.19	41.86	53.15	62.03	66.13	l	(67)
••		r È	r	r	· ·	r	13 or L1	, .	-	1	1		l	(00)
(68)m=	412.35		405.84	382.89	353.91	326.68	308.48	304.2	314.99	337.94	366.92	394.15		(68)
	<u> </u>	<u>`</u>		 i	· · ·	r	or L15a)						l	(00)
(69)m=	54.83	54.83	54.83	54.83	54.83	54.83	54.83	54.83	54.83	54.83	54.83	54.83		(69)
	r	<u> </u>	(Table (<u>, </u>					-		<u> </u>	-	1	(70)
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
		· ·	· · ·	tive valu	<u>, , ,</u>	· · · · · · · · · · · · · · · · · · ·	1				1		l	
(71)m=		-113.34		-113.34	-113.34	-113.34	-113.34	-113.34	-113.34	-113.34	-113.34	-113.34		(71)
		gains (1	, <u> </u>	1	I .					· · · ·	I		l	
(72)m=	130.08	127.61	122.49	115.52	111	104.63	99.21	106.15	108.62	115.83	123.97	127.62	l	(72)
		gains =	i		oc	· · ·)m + (67)m		i .	· · ·	1	i	l	
(73)m=	721.27	715.89	689.31	648.1	605.71	568.01	546.19	556.05	579.96	621.42	667.42	702.41		(73)
0. 50	lar gains	5.												

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

Orientation	Access Factor Table 6d	or	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North 0.	9x 0.77	×	2.39	×	10.63	x	0.76	x	0.7	=	18.74	(74)
North 0.	9x 0.77	×	1.44	x	10.63	x	0.76	x	0.7	=	11.29	(74)
North 0.	9x 0.77	×	2.39	×	20.32	x	0.76	x	0.7	=	35.81	(74)
North 0.	9x 0.77	×	1.44	×	20.32	x	0.76	x	0.7	=	21.58	(74)
North 0.	9x 0.77	x	2.39	x	34.53	x	0.76	x	0.7	=	60.85	(74)
North 0.	9x 0.77	×	1.44	x	34.53	x	0.76	x	0.7	=	36.66	(74)
North 0.	9x 0.77	×	2.39	x	55.46	x	0.76	x	0.7	=	97.74	(74)
North 0.	9 x 0.77	×	1.44	x	55.46	x	0.76	x	0.7	=	58.89	(74)
North 0.	9x 0.77	×	2.39	x	74.72	x	0.76	x	0.7	=	131.67	(74)
North 0.	9x 0.77	×	1.44	x	74.72	x	0.76	x	0.7	=	79.33	(74)
North 0.	9x 0.77	×	2.39	x	79.99	x	0.76	x	0.7	=	140.96	(74)
North 0.	9x 0.77	×	1.44	x	79.99	x	0.76	x	0.7	=	84.93	(74)
North 0.	9x 0.77	×	2.39	x	74.68	x	0.76	x	0.7	=	131.6	(74)
North 0.	9x 0.77	×	1.44	×	74.68	x	0.76	x	0.7	=	79.29	(74)
North 0.	9x 0.77	×	2.39	×	59.25	x	0.76	x	0.7	=	104.41	(74)
North 0.	9x 0.77] ×	1.44	×	59.25	x	0.76	x	0.7	=	62.91	(74)
North <mark>0</mark> .	9x 0.77] ×	2.39	x	41.52	x	0.76	x	0.7	=	73.16	(74)
North 0.	9x 0.77] ×	1.44	x	41.52	×	0.76	x	0.7	=	44.08	(74)
North 0.	9x 0.77	x	2.39	X	24.19	x	0.76	x	0.7	=	42.63	(74)
North 0.	9x 0.77	×	1.44	×	24.19	x	0.76	x	0.7	=	25.68	(74)
North 0.	9x 0.77] ×	2.39	x	13.12	x	0.76	x	0.7	=	23.12	(74)
North 0.	9x 0.77	×	1.44	x	13.12	x	0.76	x	0.7	=	13.93	(74)
North 0.	9x 0.77	×	2.39	x	8.86	x	0.76	x	0.7	=	15.62	(74)
	9x 0.77	×	1.44	x	8.86	x	0.76	x	0.7	=	9.41	(74)
	9x 0.77	×	2.39	x	46.75	x	0.76	x	0.7	=	41.19	(78)
	9x 0.77	×	1.44	x	46.75	x	0.76	x	0.7	=	49.64	(78)
	9x 0.77	×	3.15	x	46.75	x	0.76	x	0.7	=	54.29	(78)
	9x 0.77	×	2.39	x	76.57	x	0.76	x	0.7	=	67.47	(78)
	9x 0.77	×	1.44	x	76.57	x	0.76	x	0.7	=	81.3	(78)
	9x 0.77	×	3.15	x	76.57	х	0.76	x	0.7	=	88.92	(78)
	9x 0.77	×	2.39	x	97.53	x	0.76	x	0.7	=	85.94	(78)
	9x 0.77	×	1.44	x	97.53	x	0.76	x	0.7	=	103.56	(78)
	9x 0.77	×	3.15	x	97.53	x	0.76	x	0.7	=	113.27	(78)
	9x 0.77	×	2.39	×	110.23	x	0.76	x	0.7	=	97.13	(78)
	9x 0.77	×	1.44	x	110.23	x	0.76	x	0.7	=	117.05	(78)
	9x 0.77	×	3.15	×	110.23	x	0.76	x	0.7	=	128.02	(78)
	9x 0.77	×	2.39	×	114.87	x	0.76	x	0.7	=	101.22	(78)
	9x 0.77	×	1.44	×	114.87	x	0.76	x	0.7	=	121.97	(78)
South 0.	9x 0.77	×	3.15	×	114.87	x	0.76	X	0.7	=	133.4	(78)

	-													
South	0.9x	0.77	x	2.3	9	x	110.55	×	0.76	x	0.7	=	97.41	(78)
South	0.9x	0.77	x	1.4	4	x	110.55	×	0.76	x	0.7	=	117.38	(78)
South	0.9x	0.77	x	3.1	5	x [110.55	x	0.76	x	0.7	=	128.38	(78)
South	0.9x	0.77	x	2.3	9	x	108.01	×	0.76	x	0.7	=	95.17	(78)
South	0.9x	0.77	x	1.4	4	x [108.01	x	0.76	x	0.7	=	114.69	(78)
South	0.9x	0.77	x	3.1	5	x [108.01	x	0.76	x	0.7	=	125.44	(78)
South	0.9x	0.77	x	2.3	9	x [104.89	x	0.76	x	0.7	=	92.43	(78)
South	0.9x	0.77	x	1.4	4	x	104.89	x	0.76	x	0.7	=	111.38	(78)
South	0.9x	0.77	x	3.1	5	x	104.89	x	0.76	x	0.7	=	121.82	(78)
South	0.9x	0.77	x	2.3	9	x [101.89	×	0.76	x	0.7	=	89.78	(78)
South	0.9x	0.77	×	1.4	4	x [101.89	×	0.76	x	0.7	=	108.18	(78)
South	0.9x	0.77	x	3.1	5	x [101.89	×	0.76	x	0.7	=	118.32	(78)
South	0.9x	0.77	x	2.3	9	x [82.59	×	0.76	x	0.7	=	72.77	(78)
South	0.9x	0.77	x	1.4	4	x [82.59	x	0.76	x	0.7	=	87.69	(78)
South	0.9x	0.77	×	3.1	5	x	82.59	×	0.76	×	0.7	=	95.91	(78)
South	0.9x	0.77	×	2.3	9	x [55.42	×	0.76	×	0.7	=	48.83	(78)
South	0.9x	0.77	x	1.4	4	x [55.42	x	0.76	x	0.7	=	58.84	(78)
South	0.9x	0.77	x	3.1	5	×	55.42	x	0.76	x	0.7	=	64.36	(78)
South	0.9x	0.77	×	2.3	9	x	40.4	1 x	0.76	x	0.7	=	35.6	(78)
South	0.9x	0.77	×	1.4	4	x	40.4	i 🖍	0.76	x	0.7	=	42.89	(78)
South	0.9x	0.77	×	3.1	5	x	40.4	1 × 1	0.76	x	0.7	=	46.92	(78)
Solar g	gains in	watts, cale	culated	for each	n month			(83)m	= Sum(74)m	<mark>(8</mark> 2)m				
(83)m=	189.06	322.27	445.07	564.15	647.64	6	624.21	559	.95 485.61	356.9	5 226.41	161.87		(83)
Total g	jains – i	nternal an	d solar	(84)m =	: (73)m ·	+ (8	33)m, watts	•						
(84)m=	910.33	1038.16 1	134.38	1212.25	1253.36	12	19.01 1170.4	111	1065.58	978.3	7 893.83	864.28		(84)
7. Me	an inter	nal tempe	rature	(heating	season)								
Temp	erature	during he	ating p	eriods in	the livi	ng a	area from Ta	ıble 9,	Th1 (°C)				21	(85)
Utilis	ation fac	tor for gai	ns for l	iving are	a, h1,m	ı (se	ee Table 9a)							
	Jan	Feb	Mar	Apr	May		Jun Jul	A	ug Sep	Oct	Nov	Dec		
(86)m=	0.99	0.98	0.96	0.91	0.8	C	0.62 0.45	0.4	9 0.73	0.93	0.98	0.99		(86)
Mear	interna	l temperat	ture in l	iving are	ea T1 (fo	ollo	w steps 3 to	7 in T	able 9c)	-	-			
(87)m=	20.01	<u> </u>	20.41	20.68	20.88	-	0.98 21	20.9	/	20.69	20.3	19.98		(87)
Tomr			ating p	ariode in	rost of	L dw	elling from T		 . Th2 (°C)					
(88)m=	20	20	20	20.01	20.01	-	0.02 20.02	20.0	<u> </u>	20.01	20.01	20.01		(88)
							I							
Utilisa (89)m=	r	<u> </u>	- i	- i		1	m (see Table	<u> </u>	0 0.65	0.0	0.00	0.00	l	(89)
1091[]]=	0.99	0.98	0.95	0.89	0.74		0.53 0.35	0.3	9 0.65	0.9	0.98	0.99		(09)
Mear	r	<u> </u>	- 1	1		<u> </u>	T2 (follow st			<u> </u>	<u> </u>		l	
	interna 18.71	<u> </u>	ture in t 19.27	he rest of 19.65	of dwelli 19.91	<u> </u>	T2 (follow st	20.0	02 19.98	19.68	19.13 /ing area ÷ (4	18.66	0.4	(90)

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

(92)m=	19.22	19.43	19.72	20.06	20.29	20.39	20.41	20.41	20.36	20.08	19.6	19.18		(92)
Apply	adjustr	nent to t	he mean	internal	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	19.07	19.28	19.57	19.91	20.14	20.24	20.26	20.26	20.21	19.93	19.45	19.03		(93)
8. Sp	ace hea	ting requ	uirement											
Set T	i to the i	mean int	ernal ter	nperatur	e obtair	ned at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the ut	tilisation	factor fo	or gains	using Ta	ble 9a									
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	r		ains, hm	:										
(94)m=	0.99	0.97	0.95	0.88	0.75	0.55	0.38	0.42	0.66	0.9	0.97	0.99		(94)
	<u> </u>		, W = (94	<u> </u>	<u>,</u>									
(95)m=	898.5		1075.62		941.9	671.92	443.46	465.82	708.4	879.46	870.5	855.38		(95)
	<u> </u>	<u> </u>	rnal tem			i	i		i					
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
	r	1	i	· ·		Lm , W =	-· /	<u> </u>	<u>, </u>					(07)
(97)m=	1843.2	1790.59			1036.4	686.49	445.05	468.54	746.25	1145.33		1835.08		(97)
-		r i				Wh/mont								
(98)m=	702.86	523.29	408.12	204.22	70.31	0	0	0	0	197.81	468.51	728.9		
								Tota	l per year	(kWh/year) = Sum(9	8)15,912 =	3304.01	(98)
Space	e heatin	g require	ement in	kWh/m²	/year								29.15	(99)
9a. En	ergy rec	uiremer	nts – Indi	ividual h	eating s	ystems i	ncluding	micro-	CHP)					
Spac	e heatir	ng:												
		-	t from se	econdar	/supple	mentary	system					[0	(201)
Fracti	ion of sp	ace hea	t from m	nain syst	em(s)			(202) = 1 -	– (201) =		_	j	1	(202)
Fracti	ion of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficie	ency of I	main spa	ace heat	ina svste	m 1							Ì		
Efficie	anov of a												90.3	(206)
		seconda				g system	n, %					l	90.3	(206) (208)
	Jan	seconda Feb	ry/supple	ementar	y heatin	g system Jun		Aug	Sep	Oct	Nov	Dec	0	(208)
Space	Jan	Feb	ry/supple Mar	ementar Apr	y heatin May	Jun	n, % Jul	Aug	Sep	Oct	Nov	Dec		(208)
Space	Jan	Feb	ry/supple	ementar Apr	y heatin May	Jun		Aug 0	Sep 0	Oct 197.81	Nov 468.51	Dec 728.9	0	(208)
-	Jan e heatin 702.86	Feb g require 523.29	ry/supple Mar ement (c 408.12	Apr alculated 204.22	y heating May d above 70.31	Jun) 0	Jul						0	(208) ar
-	Jan e heatin 702.86	Feb g require 523.29	ry/supple Mar ement (c	Apr alculated 204.22	y heating May d above 70.31	Jun) 0	Jul						0	(208)
-	Jan e heatin 702.86 n = {[(98	Feb g require 523.29)m x (20	ry/supple Mar ement (c 408.12 4)] + (21	Apr alculated 204.22 0)m } x	y heatin May d above 70.31 100 ÷ (2	Jun) 0 206)	Jul	0	0	197.81 219.05	468.51 518.83	728.9 807.2	0 kWh/yea	(208) ar (211)
(211)m	Jan e heatin 702.86 n = {[(98 778.36	Feb g require 523.29)m x (20 579.5	ry/supple Mar ement (c 408.12 4)] + (21 451.96	Apr alculated 204.22 0)m } x 226.15	y heatin May d above 70.31 100 ÷ (2 77.86	Jun) 0 206)	Jul	0	0	197.81 219.05	468.51 518.83	728.9 807.2	0	(208) ar
(211)m Space	Jan e heatin 702.86 n = {[(98 778.36	Feb g require 523.29)m x (20 579.5 g fuel (s	ry/supple Mar ement (c 408.12 4)] + (21 451.96 econdar	Apr alculated 204.22 0)m } x 226.15 y), kWh/	y heating May d above 70.31 100 ÷ (2 77.86 month	Jun) 0 206)	Jul	0	0	197.81 219.05	468.51 518.83	728.9 807.2	0 kWh/yea	(208) ar (211)
(211)m Space = {[(98	Jan e heatin 702.86 n = {[(98 778.36 e heatin)m x (20	Feb g require 523.29)m x (20 579.5 g fuel (s	ry/supple Mar ement (c 408.12 4)] + (21 451.96	Apr alculated 204.22 0)m } x 226.15 y), kWh/	y heating May d above 70.31 100 ÷ (2 77.86 month	Jun) 0 206)	Jul	0	0	197.81 219.05	468.51 518.83	728.9 807.2	0 kWh/yea	(208) ar (211)
(211)m Space	Jan e heatin 702.86 n = {[(98 778.36 e heatin)m x (20	Feb g require 523.29)m x (20 579.5 g fuel (s 01)] + (2	ry/supple Mar ement (c 408.12 4)] + (21 451.96 econdar 14) m } x	ementar Apr alculated 204.22 0)m } x 226.15 y), kWh/ x 100 ÷ (;	y heatin May d above 70.31 100 ÷ (2 77.86 month 208)	Jun) 0 06) 0	Jul 0 0	0 Tota 0	0 I (kWh/yea	197.81 219.05 ar) =Sum(2 0	468.51 518.83 211) _{15.1012} 0	728.9 807.2 = 0	0 kWh/yea	(208) ar (211) (211)
(211)m Space = {[(98 (215)m=	Jan e heatin 702.86 n = {[(98 778.36 e heatin)m x (20	Feb g require 523.29)m x (20 579.5 g fuel (s 01)] + (21 0	ry/supple Mar ement (c 408.12 4)] + (21 451.96 econdar 14) m } x	ementar Apr alculated 204.22 0)m } x 226.15 y), kWh/ x 100 ÷ (;	y heatin May d above 70.31 100 ÷ (2 77.86 month 208)	Jun) 0 06) 0	Jul 0 0	0 Tota 0	0 0 I (kWh/yea	197.81 219.05 ar) =Sum(2 0	468.51 518.83 211) _{15.1012} 0	728.9 807.2 = 0	0 kWh/yea 3658.92	(208) ar (211)
(211)m Space = {[(98 (215)m= Water	Jan e heatin 702.86 n = {[(98 778.36 e heatin)m x (20 0 heating	Feb g require 523.29)m x (20 579.5 g fuel (s 01)] + (2 0	ry/supple Mar ement (c 408.12 (4)] + (21 (451.96 econdar) 14) m } x 0	Apr alculated 204.22 0)m } x 226.15 y), kWh/ x 100 ÷ (2 0	y heatin May d above 70.31 100 ÷ (2 77.86 month 208) 0	Jun) 0 06) 0	Jul 0 0	0 Tota 0	0 I (kWh/yea	197.81 219.05 ar) =Sum(2 0	468.51 518.83 211) _{15.1012} 0	728.9 807.2 = 0	0 kWh/yea 3658.92	(208) ar (211) (211)
(211)m Space = {[(98 (215)m= Water	Jan e heatin 702.86 n = {[(98 778.36 e heatin)m x (20 0 heating	Feb g require 523.29)m x (20 579.5 g fuel (s 01)] + (2 0	ry/supple Mar ement (c 408.12 4)] + (21 451.96 econdar 14) m } x	Apr alculated 204.22 0)m } x 226.15 y), kWh/ x 100 ÷ (2 0	y heatin May d above 70.31 100 ÷ (2 77.86 month 208) 0	Jun) 0 06) 0	Jul 0 0	0 Tota	0 I (kWh/yea	197.81 219.05 ar) =Sum(2 0	468.51 518.83 211) _{15.1012} 0	728.9 807.2 = 0	0 kWh/yea 3658.92	(208) ar (211) (211)
(211)m Space = {[(98 (215)m= Water Output	Jan e heatin 702.86 n = {[(98 778.36 e heatin)m x (20 m x (20 0 heating t from w 222.82	Feb g require 523.29)m x (20 579.5 g fuel (s 01)] + (2 0 g fuel hea	ry/supple Mar ement (c 408.12 4)] + (21 451.96 econdar 14) m } x 0 ter (calc 205.83	ementar Apr alculated 204.22 0)m } x 226.15 y), kWh/ (100 ÷ (2) 0	y heating May d above 70.31 100 ÷ (2 77.86 month 208) 0	Jun 0 :06) 0	Jul 0 0 0	0 Tota 0 Tota	0 I (kWh/yea 0 I (kWh/yea	197.81 219.05 ar) =Sum(2 0 ar) =Sum(2	468.51 518.83 211) _{15,1012} 0 215) _{15,1012}	728.9 807.2 = 0	0 kWh/yea 3658.92	(208) ar (211) (211)
(211)m Space = {[(98 (215)m= Water Output	Jan e heatin 702.86 n = {[(98 778.36 e heatin)m x (20 0 heating t from w 222.82 ncy of w	Feb g require 523.29)m x (20 579.5 g fuel (s 01)] + (2 0 1)] + (2 0 1)] + (2 0	ry/supple Mar ement (c 408.12 4)] + (21 451.96 econdar 14) m } x 0 ter (calc 205.83	ementar Apr alculated 204.22 0)m } x 226.15 y), kWh/ (100 ÷ (2) 0	y heating May d above 70.31 100 ÷ (2 77.86 month 208) 0	Jun 0 :06) 0	Jul 0 0 0	0 Tota 0 Tota	0 I (kWh/yea 0 I (kWh/yea	197.81 219.05 ar) =Sum(2 0 ar) =Sum(2	468.51 518.83 211) _{15,1012} 0 215) _{15,1012}	728.9 807.2 = 0	0 kWh/yea 3658.92 0	(208) ar (211) (211) (211)
(211)m Space = {[(98 (215)m= Water Output Efficien (217)m=	Jan e heatin 702.86 n = {[(98 778.36 e heatin)m x (20 m x (20 0 heating t from w 222.82 ncy of w 87.47	Feb g require 523.29)m x (20 579.5 g fuel (s 01)] + (2' 0 ater hea 196.27 ater hea 87.11	ry/supple Mar ement (c 408.12 4)] + (21 451.96 econdar; 14) m } x 0 ter (calc 205.83 ter 86.41	ementar Apr alculated 204.22 0)m } x 226.15 y), kWh/ c 100 ÷ (i 0 ulated al 184.1 84.89	y heating May d above 70.31 100 ÷ (2 77.86 month 208) 0 0 0 0 180.12	Jun 0 0 0 0 160.52	Jul 0 0 153.75	0 Tota 0 Tota 169.27	0 I (kWh/yea 0 I (kWh/yea 169.15	197.81 219.05 ar) =Sum(2 0 ar) =Sum(2 190.93	468.51 518.83 211) _{15,1012} 0 215) _{15,1012} 202.4	728.9 807.2 = 0 = 217.32	0 kWh/yea 3658.92 0	(208) ar (211) (211) (211) (215)
(211)m Space = {[(98 (215)m= Water Output Efficien (217)m= Fuel for	Jan e heatin 702.86 n = {[(98 778.36 e heatin)m x (20 m x (20 n x (20 heating t from w 222.82 n cy of w 87.47 or water	Feb g require 523.29)m x (20 579.5 g fuel (s 01)] + (2 0 ater hea 196.27 rater hea 87.11 heating,	ry/supple Mar ement (c 408.12 4)] + (21 451.96 econdar 14) m } x 0 ter (calc 205.83 ter	ementar Apr alculated 204.22 0)m } x 226.15 y), kWh/ (100 ÷ ((0 100 ÷ (100 ÷ (100 ÷ (100 ÷ (100 ÷ (100 ÷ (100 ÷))) 84.89 ponth	y heating May d above 70.31 100 ÷ (2 77.86 month 208) 0 0 0 0 180.12	Jun 0 0 0 0 160.52	Jul 0 0 153.75	0 Tota 0 Tota 169.27	0 I (kWh/yea 0 I (kWh/yea 169.15	197.81 219.05 ar) =Sum(2 0 ar) =Sum(2 190.93	468.51 518.83 211) _{15,1012} 0 215) _{15,1012} 202.4	728.9 807.2 = 0 = 217.32	0 kWh/yea 3658.92 0	(208) ar (211) (211) (211) (215)
(211)m Space = {[(98 (215)m= Water Output Efficien (217)m= Fuel for	Jan e heatin 702.86 778.36 e heatin)m x (20 b heating c from w 222.82 hcy of w 87.47 or water n = (64)	Feb g require 523.29)m x (20 579.5 g fuel (s 01)] + (2 0 ater hea 196.27 rater hea 87.11 heating,	ry/supple Mar ement (c 408.12 (4)] + (21 (451.96) econdar (14) m } x 0 (14) m } x 0 (14) m } x 0 (14) m } x (14) m } x (14) m } x (14) m } x (14) m } x (14) ementar Apr alculated 204.22 0)m } x 226.15 y), kWh/ (100 ÷ ((0 100 ÷ (100 ÷ (100 ÷ (100 ÷ (100 ÷ (100 ÷ (100 ÷))) 84.89 ponth	y heating May d above 70.31 100 ÷ (2 77.86 month 208) 0 0 0 0 180.12	Jun 0 0 0 0 160.52	Jul 0 0 153.75	0 Tota 0 Tota 169.27 79.6 212.66	0 I (kWh/yea 0 I (kWh/yea 169.15	197.81 219.05 ar) =Sum(2 0 ar) =Sum(2 190.93 84.71 225.39	468.51 518.83 211) _{15,1012} 0 215) _{15,1012} 202.4	728.9 807.2 = 0 = 217.32	0 kWh/yea 3658.92 0	(208) ar (211) (211) (211) (215)	

Annual totals Space heating fuel used, main system 1			kWh/ye	ear	kWh/year 3658.92	7
Water heating fuel used					2680.59	
Electricity for pumps, fans and electric keep-hot					1	(000 -)
central heating pump:				30		(230c)
boiler with a fan-assisted flue		((222)	(222.)	45		(230e)
Total electricity for the above, kWh/year		sum of (230a).	(230g) =		75	(231)
Electricity for lighting					454.5	(232)
10a. Fuel costs - individual heating systems:						
	Fuel kWh/year		Fuel Price (Table 12)		Fuel Cost £/year	
Space heating - main system 1	(211) x		3.48	x 0.01 =	127.3305	(240)
Space heating - main system 2	(213) x		0	x 0.01 =	0	(241)
Space heating - secondary	(215) x		13.19	x 0.01 =	0	(242)
Water heating cost (other fuel)	(219)		3.48	x 0.01 =	93.28	(247)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	9.89	(249)
(if off-peak tariff, list each of (230a) to (230g) sepa Energy for lighting	arately as applica (232)	able and apply	/ fuel price ac	cording to 7 x 0.01 =	Fable 12a 59.95	(250)
Additional standing charges (Table 12)					120	(251)
Appendix Q items: repeat lines (253) and (254) as Total energy cost (245)(24	s needed 7) + (250)(254) =				410.46	(255)
11a. SAP rating - individual heating systems						
Energy cost deflator (Table 12)					0.42	(256)
Energy cost factor (ECF) [(255) x (25	56)] ÷ [(4) + 45.0] =				1.09	(257)
SAP rating (Section 12)					84.81	(258)
12a. CO2 emissions – Individual heating system	s including micro	o-CHP				
	Energy kWh/year		Emission f kg CO2/kW		Emissions kg CO2/yea	
Space heating (main system 1)	(211) x		0.216] =	790.33	(261)
Space heating (secondary)	(215) x		0.519] =	0	(263)
Water heating	(219) x		0.216		579.01	(264)
Space and water heating	(261) + (262) + (2	263) + (264) =		-	1369.34	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519] =	38.93	(267)
Electricity for lighting	(232) x		0.519] =	235.89	(268)
Total CO2, kg/year		sum o	of (265)(271) =	_	1644.15	(272)
CO2 emissions per m ²		(272)	÷ (4) =		14.51	(273)

El rating (section 14)				86	(274)
13a. Primary Energy					
	Energy kWh/year	Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211) x	1.22	=	4463.89	(261)
Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	1.22	=	3270.32	(264)
Space and water heating	(261) + (262) + (263) + (26	64) =		7734.21	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	230.25	(267)
Electricity for lighting	(232) x	0	=	1395.31	(268)
'Total Primary Energy		sum of (265)(271) =		9359.77	(272)
Primary energy kWh/m²/year		(272) ÷ (4) =		82.58	(273)
					_



			Us	er Details:						
Assessor Name: Software Name:	Stroma FS	AP 2012		Strom Softwa	are Vei	rsion:		Versio	n: 1.0.0.28	
			Prope	erty Address	: 5 Bed 2	2013 Bas	seline			
Address : 1. Overall dwelling dime	nsions:									
	11310113.			Area(m²)		Av. Hei	iaht(m)		Volume(m ³)	
Ground floor			Г	75	(1a) x		2.7	(2a) =	202.5	(3a)
First floor				75	(1b) x	2	.41	(2b) =	180.75] (3b)
Total floor area TFA = (1a	a)+(1b)+(1c)+	(1d)+(1e)+	∟ (1n) □	150	(4)				100.10	
		(10)1(10)1		150)+(3c)+(3d)+(30)+	(3n) -		٦
Dwelling volume					(Ja)+(Jb)+(30)+(30)+(30)+	.(511) –	383.25	(5)
2. Ventilation rate:	main	secon	hanv	other		total			m ³ per hour	
	heating	heatin		other		lolai				_
Number of chimneys	0	+ 0	+	0	=	0	x 4	40 =	0	(6a)
Number of open flues	0	+ 0	+	0] = [0	x 2	20 =	0	(6b)
Number of intermittent far	ns				Γ	4	x 1	10 =	40	(7a)
Number of passive vents					Ē	0	x 1	10 =	0	(7b)
Number of flueless gas fi	res				Ē	0	× 4	⁴⁰ = Air ch	0 anges per hou](7c) Jr
Infiltration due to chimney	s, flues and f	ans = (6a)+(6b)+(7a)+(7	/b)+(7c) =	Г	40	Η.	÷ (5) =	0.1	(8)
If a pressurisation test has b	een carried out o	r is intended, pro	ceed to (17), otherwise o	continue fr	om (9) to ((16)			1
Number of storeys in th	ne dw <mark>elling</mark> (ne	5)							0	(9)
Additional infiltration							[(9)-	-1]x0.1 =	0	(10)
Structural infiltration: 0. if both types of wall are pr					•	uction			0	(11)
deducting areas of openin			g io ine g	greater wan are	a (allel					
If suspended wooden f	loor, enter 0.2	(unsealed) o	r 0.1 (s	ealed), else	enter 0				0	(12)
If no draught lobby, ent	ter 0.05, else e	enter 0							0	(13)
Percentage of windows	s and doors dr	aught strippe	b						0	(14)
Window infiltration				0.25 - [0.2					0	(15)
Infiltration rate	50					2) + (13) +			0	(16)
Air permeability value,			•	•	•	etre of e	nvelope	area	5	(17)
If based on air permeabilit Air permeability value applies	-					is hoing us	ed		0.35	(18)
Number of sides sheltere				a acgree an pe	mousinty	io boilig ac			2	(19)
Shelter factor				(20) = 1 -	[0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorporat	ing shelter fac	tor		(21) = (18) x (20) =				0.3	(21)
Infiltration rate modified for	or monthly wir	nd speed								-
Jan Feb	Mar Apr	May Ju	n Ji	ul Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Tabl	e 7								
(22)m= 5.1 5	4.9 4.4	4.3 3.8	3.	8 3.7	4	4.3	4.5	4.7		

Wind F	actor (22a)m =	(22)m ÷	4										
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjust	ed infilt	ration rat	e (allow	ing for sl	nelter ar	nd wind s	speed) =	: (21a) x	(22a)m					
	0.38	0.38	0.37	0.33	0.32	0.29	0.29	0.28	0.3	0.32	0.34	0.35		
		<i>èctive air</i> al ventila	-	rate for a	the appl	icable ca	se	-	-	-	-			(22-)
		neat pump		endix N (2	23h) - (23	a) x Emv (e	equation (N5)) othe	rwise (23h	(23a)		l	0	(23a)
		h heat reco								<i>(</i> 200)		l	0	(23b)
			-	-	-					2b)m i (22b) v [[,]	 1 – (23c)	0	(23c)
(24a)m=									a = (2.			1 - (230)	÷ 100]	(24a)
		ed mech	I	I								Ů		(_ · · ·)
(24b)m=											0	0		(24b)
		l nouse ex							_	<u> </u>	<u> </u>			· · · ·
,		m < 0.5 >			•	•				.5 × (23b))			
(24c)m=	= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
		ventilation m = 1, th								0.51				
(24d)m=	<u> </u>	0.57	0.57	0.55	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.56		(24d)
		r change	rate - ei	ı hter (24a) or (24	b) or (24	L c) or (24	ld) in box	r (25)	-		<u> </u>	_	
(25)m=	0.57	0.57	0.57	0.55	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.56		(25)
													_	
		es and he				Net Ar		U-valu		AXU		k-value		AXk
ELEN		Gro: area		Openir m	igs 1 ²	A,r		W/m2		A X U (W/	K)	kJ/m ² ·k		kJ/K
Doors						2.1	×	1.2		2.52				(26)
Windo	ws Typ	e 1				2.39		/[1/(1.4)+	0.04] =	3.17	=			(27)
Windo	ws Typ	e 2				2.39		/[1/(1.4)+	0.04] =	3.17	=			(27)
Windo	ws Typ	e 3				0.96		/[1/(1.4)+	0.04] =	1.27				(27)
Windo	ws Typ	e 4				2.39		/[1/(1.4)+	0.04] =	3.17	=			(27)
Windo	ws Typ	e 5				1.44		/[1/(1.4)+	0.04] =	1.91	\exists			(27)
	ws Typ					3.78		/[1/(1.4)+	0.04] =	5.01	=			(27)
	ws Typ					1.44	-	/[1/(1.4)+		1.91	\exists			(27)
Floor	- 71					75		0.15		11.25	Ξ, ι			(28)
Walls		180	0	31.2	4	148.7		0.13		29.75	╡╏		\exists	(29)
Roof		75		0		75		0.2		8.25	╡╏		\dashv	(30)
	area of 4	elements					╡^			0.20	L			
				offective w	indow H-w	330 alue calcul	lated using	n formula 1	/[(1/ _v=)	ر 10)ہد) ا	as aiven in	paragraph	32	(31)
		as on both						,	, ₁₁ ., O valt	, . 0.07] 0	.5 9//01/11	paragraph	J.L	

•			
Fabric heat loss, $W/K = S (A \times U)$	(26)(30) + (32) =	90.4	(33)
Heat capacity $Cm = S(A \times k)$	((28)(30) + (32) + (32a)(32e) =	37189.4	(34)
Thermal mass parameter (TMP = $Cm \div TFA$) in kJ/m ² K	Indicative Value: Medium	250	(35)
For design assessments where the details of the construction are not known r	procisely the indicative values of TMP in Table 1f	-	-

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f

can be	used inste	ad of a de	tailed calc	ulation.										
Therm	al bridg	es : S (L	x Y) cal	culated u	using Ap	pendix l	<						16.5	(36)
if details	s of therma	al bridging	are not kri	own (36) =	= 0.15 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			106.9	(37)
Ventila	ation hea	at loss ca	alculated	monthl	y				(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	72.56	72.2	71.85	70.18	69.86	68.41	68.41	68.14	68.98	69.86	70.5	71.15		(38)
Heat t	ransfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	179.46	179.11	178.75	177.08	176.77	175.31	175.31	175.05	175.88	176.77	177.4	178.06		
Heat le	oss para	meter (H	HLP), W	/m²K						Average = = (39)m ÷	Sum(39)₁. · (4)	₁₂ /12=	177.08	(39)
(40)m=	1.2	1.19	1.19	1.18	1.18	1.17	1.17	1.17	1.17	1.18	1.18	1.19		
Numb	er of day	/s in moi	nth (Tab	le 1a)				•	,	Average =	Sum(40)1.	12 /12=	1.18	(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 hea	ting enei	rav reau	irement:								kWh/ye	ear:	
		upancy, l 9 N – 1		[1 - exp	(-0.0003	849 x (TF	-13 Q)2)] + 0.0)013 x (⁻	TFA -13		93		(42)
	A £ 13.		1.70 /		(0.0000		10.0	/2/] 1 0.0	,010 x (1177 10.	,			
								(25 x N)				9.36		(43)
		al average litres per				-	7	to achieve	a water us	se target o	t			
not nici	_							A	Con	Oct	Nov	Dee		
Hot wat	Jan er usage i	Feb n litres per	Mar dav for e	Apr ach month	May Vd.m = fa	Jun	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
(44)m=	120.29	115.92	111.54	107.17	102.79	98.42	98.42	102.79	107.17	111.54	115.92	120.29		
(44)11=	120.29	115.92	111.54	107.17	102.79	90.42	90.42	102.79	-		m(44) ₁₁₂ =		1312.26	(44)
Energy	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	m x nm x E	OTm / 3600					1012.20	
(45)m=	178.39	156.02	161	140.36	134.68	116.22	107.69	123.58	125.06	145.74	159.09	172.76		
										Total = Su	m(45) ₁₁₂ =	-	1720.58	(45)
lf instan	taneous v	/ater heatii	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46,) to (61)				L	
(46)m=	26.76	23.4	24.15	21.05	20.2	17.43	16.15	18.54	18.76	21.86	23.86	25.91		(46)
	storage		includir	na anv so	olar or M	/WHRS	storage	within sa	me ves	مما		210		(47)
-		neating a					-			501		210		(47)
	•	-			-			ombi boil	ers) ente	er '0' in (47)			
	storage			,					,	,	,			
a) If n	nanufac	urer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):				1	.8		(48)
Tempe	erature f	actor fro	m Table	2b							0.	54		(49)
Energ	y lost fro	m water	storage	, kWh/ye	ear			(48) x (49)	=		0.	97		(50)
,		urer's de												
		age loss neating s			e 2 (kW	n/litre/da	ay)					0		(51)
		from Ta		011 4.3								0		(52)
		actor fro		2b								0		(52)
											L			

Energy lost from water storage, kWh/year (4 Enter (50) or (54) in (55)							(47) x (51)	x (52) x (53) =		0		(54)	
	. ,	. , .	,								0.	97		(55)
Water	storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m				
(56)m=	30.13	27.22	30.13	29.16	30.13	29.16	30.13	30.13	29.16	30.13	29.16	30.13		(56)
If cylinde	er contains	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	lix H	
(57)m=	30.13	27.22	30.13	29.16	30.13	29.16	30.13	30.13	29.16	30.13	29.16	30.13		(57)
Primar	y circuit	loss (an	nual) fro	om Table	e 3							0		(58)
Primar	y circuit	loss cal	culated t	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(mod	dified by	factor fi	rom Tab	le H5 if t	here is s	solar wat	er heatir	ng and a	cylinde	r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss 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=	231.78	204.25	214.39	192.03	188.07	167.89	161.09	176.97	176.73	199.14	210.76	226.15		(62)
Solar DH	HW input o	calculated	using App	endix G or	Appendix	H (negati	ve quantity	/) (enter '0	if no sola	r contributi	on to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or V	WWHRS	applies	, see Ap	pendix C	G)			-		
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
WWHRS	6 0	0	0	0	0	0	0	0	0	0	0	0		(63) (G10)
Output	from w	ater hea	ter											
(64)m=	231.78	204.25	214.39	192.03	188.07	167.89	161.09	176.97	176.73	199.14	210.76	226.15		_
								Outp	out from wa	ater heatei	. (annual)₁	12	2349.26	(64)
Heat g	ains fro	m water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m] + 0.8 x	(46)m	+ (57)m	+ (59)m]	
(65)m=	102.03	90.46	96.25	88. <mark>01</mark>	87.5	79.98	78.52	83.81	82.92	91.17	94.23	100.16		(65)
inclu	ide (57)	m in cale	culation	of (65)m	only if c	ylinder is	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Int	ernal ga	ains (see	e Table 5	and 5a):									
Metabo	olic gain	s (Table	e 5), Wat	ts										
	Jan	Feb		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	176.05	176.05	176.05	176.05	176.05	176.05	176.05	176.05	176.05	176.05	176.05	176.05		(66)
Lightin	g gains	(calcula	ted in Ap	pendix	L, equat	ion L9 oi	r L9a), a	lso see	Table 5					
(67)m=	72.17	64.1	52.13	39.47	29.5	24.91	26.91	34.98	46.95	59.62	69.58	74.18		(67)
Applia	nces ga	ins (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), alsc	see Ta	ble 5				
(68)m=	478.39	483.36	470.85	444.22	410.6	379	357.89	352.93	365.44	392.07	425.69	457.28		(68)
Cookin	ng gains	(calcula	ted in A	opendix	L, equat	ion L15	or L15a)), also se	e Table	5				
(69)m=	55.54	55.54	55.54	55.54	55.54	55.54	55.54	55.54	55.54	55.54	55.54	55.54		(69)
Pumps	and fai	ns gains	(Table 5	5a)										
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses	se.a. ev	aporatio	n (negat	tive valu	es) (Tab	le 5)								
	-117.37	-117.37	· · ·	-117.37	-117.37	-117.37	-117.37	-117.37	-117.37	-117.37	-117.37	-117.37		(71)
		ı gains (T				1		1		1		1	I	
(72)m=	137.14	134.61	129.36	122.23	117.6	111.08	105.54	112.64	115.16	122.55	130.88	134.62		(72)
		gains =		_						(70)m + (7			l	
(73)m=	804.93	799.29	769.57	723.14	674.93	632.22	607.57	617.78	644.78	691.46	743.38	783.31		(73)
(004.00	100.20	100.07	120.14	0.4.00	002.22	001.01	511.70	0 17.70		1 10.00	100.01		x = /

6. Solar gains:

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

-	s are calculated using sola on: Access Factor Table 6d		Area m²		Flux Table 6a	tions	g_ Table 6b		FF Table 6c		Gains (W)	
North 0.5	0.77	x	2.39	×	10.63	×	0.76	x	0.7	=	28.11	(74)
North 0.9	0.77	x	1.44	x	10.63	×	0.76	x	0.7	=	11.29	(74)
North 0.9	x 0.77	x	2.39	x	20.32	x	0.76	x	0.7	=	53.72	(74)
North 0.9	0.77 0.77	x	1.44	x	20.32	×	0.76	x	0.7	=	21.58	(74)
North 0.9	0.77 0.77	x	2.39	x	34.53	×	0.76	x	0.7	=	91.28	(74)
North 0.9	0.77 0.77	x	1.44	x	34.53	x	0.76	x	0.7	=	36.66	(74)
North 0.9	0.77 0.77	x	2.39	x	55.46	×	0.76	x	0.7	=	146.62	(74)
North 0.9	0.77 0.77	x	1.44	x	55.46	×	0.76	x	0.7	=	58.89	(74)
North 0.9	0.77	x	2.39	x	74.72	x	0.76	x	0.7	=	197.5	(74)
North 0.9	0.77 0.77	x	1.44	x	74.72	×	0.76	x	0.7	=	79.33	(74)
North 0.9	0.77	x	2.39	x	79.99	×	0.76	x	0.7	=	211.43	(74)
North 0.9	0.77	x	1.44	×	79.99	×	0.76	x	0.7	=	84.93	(74)
North 0.	0.77] ×	2.39	×	74.68	x	0.76	x	0.7	=	197.4	(74)
North 0.9	0.77	x	1.44	x	74.68	x	0.76	x	0.7	=	79.29	(74)
North 0.9	0.77	x	2.39	x	59.25	×	0.76	x	0.7	=	156.61	(74)
North 0.9	x 0.77	x	1.44	x	59.25	x	0.76	x	0.7	=	62.91	(74)
North 0.9	0.77	x	2.39	×	41.52	×	0.76	x	0.7	=	109.75	(74)
North 0.9	0.77 0.77	x	1.44	×	41,52	x	0.76	x	0.7	=	44.08	(74)
North 0.9	0.77 0.77	x	2.39	×	24.19	×	0.76	x	0.7	=	63.94	(74)
North 0.9	0.77 0.77	x	1.44	x	24.19	×	0.76	x	0.7	=	25.68	(74)
North 0.9	0.77	x	2.39	x	13.12	×	0.76	x	0.7	=	34.68	(74)
North 0.9	0.77	x	1.44	x	13.12	x	0.76	x	0.7	=	13.93	(74)
North 0.9	0.77	x	2.39	x	8.86	×	0.76	x	0.7	=	23.43	(74)
North 0.9	0.77	x	1.44	×	8.86	×	0.76	x	0.7	=	9.41	(74)
South 0.9		x	2.39	x	46.75	x	0.76	x	0.7	=	123.58	(78)
South 0.9	0.77	x	3.78	×	46.75	×	0.76	x	0.7	=	65.15	(78)
South 0.9	0.77	x	1.44	x	46.75	×	0.76	x	0.7	=	24.82	(78)
South 0.9		x	2.39	x	76.57	×	0.76	x	0.7	=	202.4	(78)
South 0.9		x	3.78	×	76.57	×	0.76	x	0.7	=	106.7	(78)
South 0.9	0.77	x	1.44	×	76.57	×	0.76	x	0.7	=	40.65	(78)
South 0.9	0.77	x	2.39	x	97.53	x	0.76	x	0.7	=	257.82	(78)
South 0.9	0.77	x	3.78	x	97.53	×	0.76	x	0.7	=	135.92	(78)
South 0.9		×	1.44	×	97.53	×	0.76	x	0.7	=	51.78	(78)
South 0.9		×	2.39	×	110.23	×	0.76	x	0.7	=	291.39	(78)
South 0.9		×	3.78	×	110.23	×	0.76	x	0.7	=	153.62	(78)
South 0.9	0.77	x	1.44	×	110.23	x	0.76	x	0.7	=	58.52	(78)

	_								_							
South	0.9x	0.77		x	2.39	:	× 1	14.87	x		0.76	x	0.7	=	303.65	(78)
South	0.9x	0.77		x	3.78		x 1 [.]	14.87	x		0.76	x	0.7	=	160.08	(78)
South	0.9x	0.77		x	1.44	:	× 1	14.87	x		0.76	x	0.7	=	60.98	(78)
South	0.9x	0.77		x	2.39	:	× 1 ⁻	10.55	x		0.76	x	0.7	=	292.22	(78)
South	0.9x	0.77		x	3.78		x 1 ⁻	10.55	×		0.76	×	0.7	=	154.06	(78)
South	0.9x	0.77		x	1.44	;	× 1	10.55	x		0.76	×	0.7	=	58.69	(78)
South	0.9x	0.77		x	2.39		× 10	08.01	x		0.76	×	0.7	=	285.52	(78)
South	0.9x	0.77		x	3.78		× 10	08.01	x		0.76	×	0.7	=	150.52	(78)
South	0.9x	0.77		x	1.44		× 10	08.01	×		0.76	×	0.7	=	57.34	(78)
South	0.9x	0.77		x	2.39	;	× 10	04.89] ×		0.76	×	0.7	=	277.28	(78)
South	0.9x	0.77		x	3.78		× 10	04.89] ×		0.76	×	0.7	=	146.18	(78)
South	0.9x	0.77		x	1.44	;	× 10	04.89] ×		0.76	×	0.7	=	55.69	(78)
South	0.9x	0.77		x	2.39	;	× 10	01.89	, x		0.76	× ٦	0.7	=	269.33	(78)
South	0.9x	0.77		x	3.78		× 10	01.89] ×		0.76	× ٦	0.7	=	141.99	(78)
South	0.9x	0.77		x	1.44	;	× 10	01.89] ×		0.76	×	0.7	=	54.09	(78)
South	0.9x	0.77		x	2.39	;	× 8	2.59	, x		0.76	× ٦	0.7	=	218.31	(78)
South	0.9x	0.77		x	3.78		× 8	2.59] ×		0.76	×	0.7	=	115.09	(78)
South	0.9x	0.77		x	1.44		× 8	2.59	x		0.76	x	0.7	=	43.84	(78)
South	0.9x	0.77		x	2.39	=	× 5	5.42	j x		0.76	x	0.7	=	146.49	(78)
South	0.9x	0.77		x	3.78	<u> </u>	× 5	5.42	i 🖌		0.76	x	0.7	=	77.23	(78)
South	0.9x	0.77		x	1.44		× 5	5.42	1 x		0.76	x	0.7	=	29.42	(78)
South	0.9x	0.77		x	2.39		x 4	40.4	x		0.76	x	0.7	- i -	106.79	(78)
South	0.9x	0.77		x	3.78		×	40.4	 X		0.76	x	0.7	=	56.3	(78)
South	0.9x	0.77		x	1.44	7	×	40.4	- x		0.76	x	0.7	=	21.45	(78)
				1					-							
Solar o	ains in	watts, ca	alcula	ted	for each	month			(83)n	n = Si	um(74)m .	(82)m				
(83)m=	301.47	519.95	729.		1	080.91	1087.3	1042.33	932	2.53	801	579.48	3 362.23	257.27		(83)
Total g	ains – i	nternal a	ind so	olar	(84)m = (73)m +	- (83)m	, watts	•				•	•	•	
(84)m=	1106.4	1319.25	1499.	.33	1660.13 1	755.84	1719.52	1649.91	155	0.31	1445.79	1270.9	4 1105.61	1040.58		(84)
7. Me	an inter	rnal temp	oeratu	ire ((heating s	eason)								•	-	
					eriods in t			from Tab	ble 9	, Th	1 (°C)				21	(85)
Utilisa	ation fac	ctor for g	ains f	or li	iving area	, h1,m	(see Ta	ble 9a)								
	Jan	Feb	Ма	ar	Apr	May	Jun	Jul	A	ug	Sep	Oct	Nov	Dec		
(86)m=	1	0.99	0.97	7	0.92	0.8	0.62	0.46	0.5	51	0.75	0.94	0.99	1		(86)
Mean	interna	l temper	ature	in l	iving area	T1 (fo	llow ste	ns 3 to 7	7 in 1	Table	- 9c)		•		•	
(87)m=	19.82	20.02	20.2	-		20.85	20.97	20.99	20.		20.92	20.6	20.15	19.78]	(87)
Tomp	oraturo				eriods in r	inct of a	dwolling	from To		о ті	2 (°C)				1	
(88)m=	19.92	19.92	19.9	<u> </u>		19.94	19.94	19.94	19.		19.94	19.94	19.93	19.93	1	(88)
															1	
Utilisa (89)m=	0.99	0.98	ains f 0.96	-	est of dwe	o.75	12,m (se 0.53	0.35	e 9a) 0.	4	0.67	0.92	0.98	1	1	(89)
(09)11=													0.90]	(00)
1/000	intorno	Itomnor	oturo	in t	he reat of	durallin	~ TO /f	allow of	0	+ o -	z in Tahl	~ ()~)				

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

	40.07	40.00	40.05	40.5	10.0	40.00	40.04	40.04	40.00	40.5	40.05	40.00		(90)
(90)m=	18.37	18.66	19.05	19.5	19.8	19.93	19.94	19.94	19.88 f	19.5 LA = Livin	18.85 g area ÷ (4	18.32	0.33	(90)
											g urou . (-		0.33	(91)
	internal	· ·	<u> </u>	i	i	<u> </u>	1	``	<u> </u>					(00)
(92)m=	18.86	19.11	19.47	19.87	20.15	20.27	20.29	20.29	20.23	19.87	19.28	18.81		(92)
	adjustm	18.96	ne mean 19.32	19.72	temperation 20	ature fro 20.12	m Table 20.14	4e, whe	20.08		10.12	18.66		(93)
(93)m=	ace heat				20	20.12	20.14	20.14	20.00	19.72	19.13	10.00		(55)
	i to the n				re obtain	od at st	on 11 of	Tahla Ol	n so tha	t Ti m-('	76)m an	d re-celo	ulato	
	tilisation			•			epiror		5, 50 tha	u 11,111–(r ojin an	u ie-caic	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	:										
(94)m=	0.99	0.98	0.95	0.88	0.75	0.55	0.37	0.42	0.68	0.91	0.98	0.99		(94)
Usefu	ul gains,			<u> </u>	<u> </u>									
(95)m=		1291.81		1468.88		942.98	618.05	649.73	981.83	1160.5	1084.16	1033.2		(95)
	hly avera	-		r i		1	1			r				(22)
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
	loss rate			al tempe 1916.6	i	i		- ,		- -	0404.04	0574.05		(97)
(97)m=	2585.35				1467.72		621.19	655.05		1611.36		2574.65		(97)
Space (98)m=	e heating	824.31	641.87	322.36	113.14	0	n = 0.02	4 X [(97)m – (95 0)m] x (4 335.45	756.32	1146.84		
(30)11-	1107.91	024.01	041.07	322.30	113.14	0	0		per year				5248.2	(98)
								TUIA	i per year	(күүп/усаг) = Sum(9	0)15,912 =		
Spac	e heating	g require	ement in	kWh/m ²	/year								34.99	(99)
										_				
9a. En	erg <mark>y req</mark>	uiremer	nts <mark>– Ind</mark> i	ividu <mark>al h</mark>	eating s	ystems i	ncluding	micro-C	CHP)					
Spac	e heatin	ig:						micro-C	HP)					
Spac Fracti	e heatin ion of sp	i g: ace hea	t from se	econdar	y/supple								0	(201)
Spac Fracti Fracti	e heatin ion of sp ion of sp	n g: ace hea ace hea	at from so at from m	econdar <u>;</u> nain syst	y/supple em(s)		system	(202) = 1 -	- (201) =				0	(202)
Spac Fracti Fracti	e heatin ion of sp	n g: ace hea ace hea	at from so at from m	econdar <u>;</u> nain syst	y/supple em(s)		system	(202) = 1 -		(203)] =				
Spac Fracti Fracti Fracti	e heatin ion of sp ion of sp	i g: ace hea ace hea al heatin	nt from so at from m ng from i	econdar nain syst main sys	y/supple em(s) stem 1		system	(202) = 1 -	- (201) =	(203)] =			1	(202)
Spac Fracti Fracti Fracti Efficie	e heatin ion of sp ion of sp ion of tot	n g: ace hea ace hea cal heatin nain spa	at from so at from m ang from a ace heati	econdar nain syst main sys ing syste	y/supple em(s) stem 1 em 1	mentary	system	(202) = 1 -	- (201) =	(203)] =			1	(202)
Spac Fracti Fracti Fracti Efficie	e heatin ion of sp ion of sp ion of tot ency of n	n g: ace hea ace hea cal heatin nain spa	at from so at from m ang from a ace heati	econdar nain syst main sys ing syste	y/supple em(s) stem 1 em 1	mentary	system	(202) = 1 -	- (201) =	(203)] = Oct	Nov	Dec	1 1 90.3	(202) (204) (206) (208)
Spac Fracti Fracti Efficie Efficie	e heatin ion of sp ion of tot ency of n ency of s	ig: ace hea ace hea al heatin nain spa seconda Feb	at from se at from m ace heati ry/supple Mar	econdary nain syst main syst ing syste ementar Apr	y/supple em(s) stem 1 em 1 y heating May	mentary g system Jun	system	(202) = 1 · (204) = (2	- (201) = 02) × [1 -		Nov	Dec	1 1 90.3 0	(202) (204) (206) (208)
Spac Fracti Fracti Efficie Efficie	e heatin ion of sp ion of tot ency of n ency of s Jan	ig: ace hea ace hea al heatin nain spa seconda Feb	at from se at from m ace heati ry/supple Mar	econdary nain syst main syst ing syste ementar Apr	y/supple em(s) stem 1 em 1 y heating May	mentary g system Jun	system	(202) = 1 · (204) = (2	- (201) = 02) × [1 -		Nov 756.32	Dec 1146.84	1 1 90.3 0	(202) (204) (206) (208)
Spac Fracti Fracti Efficie Efficie	e heatin ion of sp ion of tot ency of n ency of s Jan e heating	eg: ace hea ace hea al heatin nain spa seconda Feb g require 824.31	at from se at from m ace heati ry/supple Mar ement (c 641.87	econdary nain syst main syste ing syste ementar Apr alculate 322.36	y/supple em(s) stem 1 em 1 y heating May d above) 113.14	mentary g system Jun) 0	n, %	(202) = 1 - (204) = (2 Aug	- (201) = 02) × [1 - 1 Sep	Oct			1 1 90.3 0	(202) (204) (206) (208)
Spac Fracti Fracti Efficie Space	e heatin ion of sp ion of tot ency of n ency of s Jan e heating	ng: ace hea ace hea al heatin nain spa seconda Feb g require 824.31	at from se at from m ace heati ry/supple Mar ement (c 641.87	econdary nain syst main syste ing syste ementar Apr alculate 322.36	y/supple em(s) stem 1 em 1 y heating May d above) 113.14	mentary g system Jun) 0	n, %	(202) = 1 - (204) = (2 Aug	- (201) = 02) × [1 - 1 Sep	Oct			1 1 90.3 0	(202) (204) (206) (208) vear
Spac Fracti Fracti Efficie Space	te heatin ion of sp ion of tot ency of n ency of s Jan 1107.91 n = {[(98)	ng: ace hea ace hea al heatin nain spa seconda Feb g require 824.31	t from se at from m ace heati ry/supple Mar ement (c 641.87 4)] + (21	econdary nain syst main syst ing syste ementar Apr alculate 322.36	y/supple em(s) stem 1 em 1 y heating May d above) 113.14 100 ÷ (2	mentary g system Jun) 0 (06)	n, % Jul	(202) = 1 - (204) = (2 Aug 0	- (201) = 02) × [1 - 1 Sep 0	Oct 335.45 371.48	756.32 837.56	1146.84 1270.03	1 1 90.3 0	(202) (204) (206) (208) vear
Spac Fracti Fracti Efficie Space (211)m	te heatin ion of sp ion of tot ency of n ency of s Jan 1107.91 n = {[(98)	ace hea ace hea al heatin nain spa seconda Feb g require 824.31 m x (20 912.85	t from se at from m ace heating ry/supple Mar ement (c 641.87 4)] + (21 710.82	econdary nain syst main syst ing syste ementar Apr alculate 322.36 (0)m } x 356.98	y/supple em(s) stem 1 em 1 y heating d above) 113.14 100 ÷ (2 125.3	mentary g system Jun) 0 (06)	n, % Jul	(202) = 1 - (204) = (2 Aug 0	- (201) = 02) × [1 - 1 Sep 0	Oct 335.45 371.48	756.32 837.56	1146.84 1270.03	1 1 90.3 0 kWh/y	(202) (204) (206) (208) vear
Spac Fracti Fracti Efficie Spac (211)m	te heatin ion of sp ion of tot ency of n ency of s Jan e heating 1107.91 n = {[(98) 1226.92	ng: ace hea ace hea al heatin nain spa seconda Feb g require 824.31 m x (20 912.85	t from se at from m ng from n ace heati ry/supple Mar ement (c 641.87 4)] + (21 710.82	econdary nain syst main syst ing syste ementar Apr alculate 322.36 (0)m } x 356.98 y), kWh/	y/supple em(s) stem 1 em 1 y heating d above) 113.14 100 ÷ (2 125.3	mentary g system Jun) 0 (06)	n, % Jul	(202) = 1 - (204) = (2 Aug 0	- (201) = 02) × [1 - 1 Sep 0	Oct 335.45 371.48	756.32 837.56	1146.84 1270.03	1 1 90.3 0 kWh/y	(202) (204) (206) (208) vear
Spac Fracti Fracti Efficie Spac (211)m	te heatin ion of sp ion of tot ency of n ency of s Jan 1107.91 n = {[(98) 1226.92 e heating	ng: ace hea ace hea al heatin nain spa seconda Feb g require 824.31 m x (20 912.85	t from se at from m ng from n ace heati ry/supple Mar ement (c 641.87 4)] + (21 710.82	econdary nain syst main syst ing syste ementar Apr alculate 322.36 (0)m } x 356.98 y), kWh/	y/supple em(s) stem 1 em 1 y heating d above) 113.14 100 ÷ (2 125.3	mentary g system Jun) 0 (06)	n, % Jul	(202) = 1 - (204) = (20) = (- (201) = 02) × [1 - 1 Sep 0 1 (kWh/yea	Oct 335.45 371.48 ar) =Sum(2 0	756.32 837.56 211) _{15,1012} 0	1146.84 1270.03 = 0	1 1 90.3 0 kWh/y	(202) (204) (206) (208) vear
Space Fracti Fracti Efficie Space (211)m Space = {[(98	te heatin ion of sp ion of tot ency of n ency of s Jan 1107.91 n = {[(98) 1226.92 e heating	eg: ace heat ace heat ace heat al heat anain spa seconda Feb g require 824.31 m x (20 912.85 g fuel (s 1)] + (22)	t from so t from m ng from m ace heati ry/supple Mar ement (c 641.87 4)] + (21 710.82 econdar, 14) m } x	econdary nain syst main syst ing syste ementar Apr 322.36 0)m } x 356.98 y), kWh/ (100 ÷ ()	y/supple em(s) stem 1 em 1 y heating d above) 113.14 100 ÷ (2 125.3	g system Jun 0 06) 0	system	(202) = 1 - (204) = (20) = (- (201) = 02) × [1 - 1 Sep 0 I (kWh/yea	Oct 335.45 371.48 ar) =Sum(2 0	756.32 837.56 211) _{15,1012} 0	1146.84 1270.03 = 0	1 1 90.3 0 kWh/y	(202) (204) (206) (208) vear
Spac Fracti Fracti Efficie Spac (211)m Spac = {[(98 (215)m=	te heatin ion of sp ion of tot ency of n ency of s Jan e heating 1107.91 n = {[(98) 1226.92 e heating m x (20 0 heating	eg: ace hea ace hea al heatin nain spa seconda Feb g require 824.31 pm x (20) 912.85 g fuel (s 1)] + (2') 0	t from set at from m ace heating ry/supple Mar ement (c 641.87 4)] + (21 710.82 econdary 14) m } x 0	econdary nain syst main syst ing syste ementar alculate 322.36 10)m } x 356.98 y), kWh/ 100 ÷ (1 0	y/supple em(s) stem 1 em 1 y heating d above) 113.14 100 ÷ (2 125.3 month 208) 0	g system Jun 0 06) 0	system	(202) = 1 - (204) = (20) = (- (201) = 02) × [1 - 1 Sep 0 1 (kWh/yea	Oct 335.45 371.48 ar) =Sum(2 0	756.32 837.56 211) _{15,1012} 0	1146.84 1270.03 = 0	1 90.3 0 kWh/y 5811.96	(202) (204) (206) (208) /ear (211)
Spac Fracti Fracti Efficie Spac (211)m Spac = {[(98 (215)m=	t from water be heatin ion of sp ion of tot ion of tot ency of n ency of s Jan e heating ion = {[(98) i 226.92 i 26.92 i 26.92 	ace hea ace hea al heatin nain spa seconda Feb g require 824.31 912.85 g fuel (se 1)] + (2 0	t from so t from m ng from m ace heating ry/supple Mar (C = 641.87) (C = 641.	econdary nain syst main syst ing syste ementar Apr alculate 322.36 (0)m } x 356.98 y), kWh/ c 100 ÷ (0	y/supple em(s) stem 1 em 1 y heating d above) 113.14 100 ÷ (2 125.3 month 208) 0	g system Jun 0 06) 0	system o, % Jul o o o	(202) = 1 - (204) = (2) Aug 0 Tota 0 Tota	- (201) = 02) × [1 - 1 Sep 0 1 (kWh/yea 0 1 (kWh/yea	Oct 335.45 371.48 ar) =Sum(2 0 ar) =Sum(2	756.32 837.56 211) _{15,1012} 0 215) _{15,1012}	1146.84 1270.03 = 0	1 90.3 0 kWh/y 5811.96	(202) (204) (206) (208) /ear (211)
Spac Fracti Fracti Efficie Spac (211)m Spac = {[(98 (215)m= Water Output	te heatin ion of sp ion of tot ency of n ency of s Jan e heating 1107.91 n = {[(98) 1226.92 e heating m x (20 0 heating	ig:ace heatace heatace heatace heatal heatmain spacesecondaFebg require824.31m x (20912.85g fuel (s1)] + (2')0ater heat204.25	t from set at from m ng from m ace heati ry/supple Mar ement (c 641.87 4)] + (21 710.82 econdary 14) m } x 0 ter (calco 214.39	econdary nain syst main syst ing syste ementar alculate 322.36 10)m } x 356.98 y), kWh/ 100 ÷ (1 0	y/supple em(s) stem 1 em 1 y heating d above) 113.14 100 ÷ (2 125.3 month 208) 0	g system Jun 0 06) 0	system	(202) = 1 - (204) = (20) = (- (201) = 02) × [1 - 1 Sep 0 1 (kWh/yea	Oct 335.45 371.48 ar) =Sum(2 0	756.32 837.56 211) _{15,1012} 0	1146.84 1270.03 = 0	1 90.3 0 kWh/y 5811.96	(202) (204) (206) (208) /ear (211)

(217)m= 88.25 87.95	87.36 85.98	83.31	79.6	79.6	79.6	79.6	85.99	87.73	88.34		(217)
Fuel for water heating, k											
$(219)m = (64)m \times 100 - (219)m = 262.65 \ 232.22$	- (217)111 245.41 223.33	225.76	210.92	202.37	222.33	222.02	231.57	240.24	255.99		
					Tota	I = Sum(2	19a) ₁₁₂ =			2774.81	(219)
Annual totals							k	Wh/year	r	kWh/year	7
Space heating fuel used	-	1								5811.96	ļ
Water heating fuel used										2774.81	
Electricity for pumps, far	ns and electric	keep-ho	t								
central heating pump:									30		(230c)
boiler with a fan-assiste	ed flue								45		(230e)
Total electricity for the a	bove, kWh/yea	r			sum	of (230a).	(230g) =			75	(231)
Electricity for lighting										509.85	(232)
10a. Fuel costs - individ	dual heating sy	stems:									
			Fu kW	el /h/year			Fuel P (Table			Fuel Cost £/year	
Space heating - main sy	vstem 1			1) x			3.4	,	x 0.01 =	202.2561	(240)
Space heating - main sy			(213	3) x			0		x 0.01 =	0) (241)
Space heating - second			(215	5) x			13.		x 0.01 =	0](242)
Water heating cost (othe			(219				3.4		x 0.01 =	96.56	(247)
Pumps, fans and electric			(231				13.4	<u> </u>	x 0.01 =	9.89	(249)
(if off-peak tariff, list eac		230g) se			licable a	nd apply		<u> </u>			
Energy for lighting		2009) 0	(232			ind apply	13.		x 0.01 =	67.25	(250)
Additional standing char	ges (Table 12)									120	(251)
Appendix Q items: repea	at lines (253) ai	nd (254)	as need	ded							
Total energy cost		(245)(247) + (25	60)(254)	=					495.96	(255)
11a. SAP rating - indivi	idual heating sy	vstems									
Energy cost deflator (Ta	ıble 12)									0.42	(256)
Energy cost factor (ECF	-)	[(255) x	(256)] ÷ [(4) + 45.0]	=					1.07	(257)
SAP rating (Section 12	2)									85.1	(258)
12a. CO2 emissions –	Individual heati	ng syste	ems inclu	uding mi	cro-CHP						
				ergy /h/year			Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/yea	r
Space heating (main sys	stem 1)		(211	1) x			0.2	16	=	1255.38	(261)
Space heating (seconda	ary)		(215	ō) x			0.5	19	=	0	(263)
Water heating			(219	9) x			0.2	16	=	599.36	(264)
Space and water heating	g		(261	1) + (262)	+ (263) + (264) =				1854.74	(265)

Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	38.93	(267)
Electricity for lighting	(232) x	0.519 =	264.61	(268)
Total CO2, kg/year		sum of (265)(271) =	2158.28	(272)
CO2 emissions per m ²		(272) ÷ (4) =	14.39	(273)
El rating (section 14)			85	(274)
13a. Primary Energy				
	Energy kWh/year	Primary factor	P. Energy kWh/year	
Space heating (main system 1)	(211) x	1.22 =	7090.59	(261)
Space heating (secondary)	(215) x	3.07 =	0	(263)
Energy for water heating	(219) x	1.22 =	3385.27	(264)
Space and water heating	(261) + (262) + (263) + (26	64) =	10475.86	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07 =	230.25	(267)
Electricity for lighting	(232) x	0 =	1565.23	(268)
'Total Primary Energy		sum of (265)(271) =	12271.34	(272)
Primary energy kWh/m²/year		(272) ÷ (4) =	81.81	(273)

User Details:		
Assessor Name:Stroma Number:Software Name:Stroma FSAP 2012Software Version:Version	n: 1.0.0.28	
Property Address: 1 Bed 2013 Baseline		
Address :		
1. Overall dwelling dimensions:		
Area(m ²) Av. Height(m)	Volume(m ³)	
Ground floor 62.66 (1a) x 2.39 (2a) =	149.76	(3a)
Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ 62.66 (4)		
Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) =$	149.76	(5)
2. Ventilation rate:		
main secondary other total heating heating	m ³ per hour	
Number of chimneys $0 + 0 + 0 = 0 \times 40 =$	0	(6a)
Number of open flues $0 + 0 + 0 = 0 \times 20 =$	0	(6b)
Number of intermittent fans	20	(7a)
Number of passive vents $0 \times 10 =$	0	(7b)
Number of flueless gas fires	0	(7c)
Air cha	inges per hour	r
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16)	0.13	(8)
Number of storeys in the dwelling (ns)	0	(9)
Additional infiltration [(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction	0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35		
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0	0	(12)
If no draught lobby, enter 0.05, else enter 0	0	(13)
Percentage of windows and doors draught stripped	0	(14)
Window infiltration 0.25 - [0.2 × (14) ÷ 100] =	0	(15)
Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area		(17)
If based on air permeability value, then $(18) = [(17) \div 20]+(8)$, otherwise $(18) = (16)$ Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used	0.41	(18)
Number of sides sheltered	2	(19)
Shelter factor $(20) = 1 - [0.075 \times (19)] =$		(20)
Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$	0.35	(21)
Infiltration rate modified for monthly wind speed	1	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec		
Monthly average wind speed from Table 7		
(22)m= 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7		
Wind Factor (22a)m = (22)m \div 4		
(22a)m= 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18		

Adjuste	ed infiltr	ation rat	e (allow	ing for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
	0.44	0.43	0.43	0.38	0.37	0.33	0.33	0.32	0.35	0.37	0.39	0.41		
			•	rate for t	he appli	cable ca	se			-	-		- 	
		al ventila		endix N, (2	2h) (00a		austion /		nuiae (22h) (22a)			0	(23a)
) = (23a)			0	(23b)
			-	iency in %	-								0	(23c)
		i	1	entilation		i		1		<u> </u>	<u> </u>	1) ÷ 100] 1	(5.4.)
(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0	J	(24a)
	balance	ed mecha	anical ve	entilation	without	heat rec	overy (N	ИV) (24b)m = (22	2b)m + (23b)	1	1	
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	J	(24b)
,				ntilation of	•	•								
	· ,	1	r`	then (24a	, ,	ŕ		ŕ	,	· · ·	ŕ		1	
(24c)m=		0	0	0	0	0	0	0	0	0	0	0	J	(24c)
,				iole hous m = (22t	•	•				0.51				
(24d)m=	, <i>,</i>	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58]	(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24t	o) or (240	c) or (24	d) in boy	(25)					
(25)m=	0.6	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.58	0.58		(25)
3 He	at losse	s and he	at loss	paramete	ər.							_		
ELEN		Gros		Openin		Net Ar	ea	U-valu	Ie	AXU		k-value		AXk
		area		m		A ,n		W/m2		(W/	K)	kJ/m²·l		kJ/K
Doors						2	x	1.2	=	2.4				(26)
Windo	ws Type	e 1				2.39	x1,	/[1/(1.4)+	0.04] =	3.17	Fi i			(27)
Windo	ws Type	2				2.39	x 1	/[1/(1.4)+	0.04] =	3.17	Fi -			(27)
	ws Type					0.96		/[1/(1.4)+	0.04] =	1.27	4			(27)
Floor						62.66		0.2		12.532				(28)
Walls		60		10.13		49.87		0.2		11.97				(29)
	roa of o	lements		10.1	<u> </u>			0.24	[11.97	L			
			, 111-			122.6			—	-	—			(31)
Party v						13	×	0	=	0	[\dashv	(32)
Party c	-					62.66					Ĺ			(32b)
				effective wi nternal wal			ated using	formula 1,	/[(1/U-valu	ie)+0.04] a	as given in	paragraph	1 3.2	
Fabric	heat los	s, W/K :	= S (A x	U)				(26)(30)	+ (32) =				37.68	(33)
Heat c	apacity	Cm = S((Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	9854.9	(34)
Therm	al mass	parame	ter (TMI	- = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
For desi	gn assess	sments wh	ere the de	tails of the	construct	ion are not	t known pr	ecisely the	indicative	e values of	TMP in Ta	able 1f		
can be ι	ised inste	ad of a de	tailed calc	ulation.										
Therm	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix ł	<						6.13	(36)
			are not kr	nown (36) =	= 0.15 x (3	1)			(22)	(00)				()
	abric he			1						(36) =	(05)		43.81	(37)
ventila	_	1	i	d monthly						= 0.33 × (<u> </u>	i _	1	
(29)~	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct 28.15	Nov		4	(38)
(38)m=	29.55	29.37	29.18	28.31	28.15	27.4	27.4	27.26	27.69	28.15	28.48	28.82]	(50)
			r	70.40	74.00	74.04	74.04	74.07	. ,	= (37) + (37) + (37)		70.00	1	
(39)m=	73.37	73.18	72.99	72.12	71.96	71.21	71.21	71.07	71.5	71.96	72.29	72.63	70.40	(20)
Stroma I	-SAP 201	2 Version:	1.0.0.28	(SAP 9.91)	- http://ww	ww.stroma	.com		4	Average =	Sum(39)1	12 / 12=	12.1Pa	age 2 ϕ

Heat lo	oss para	ameter (H	HLP), W	/m²K					(40)m	= (39)m ÷	· (4)			
(40)m=	1.17	1.17	1.16	1.15	1.15	1.14	1.14	1.13	1.14	1.15	1.15	1.16		
Numbe	or of day	ys in moi	I					I	,	Average =	Sum(40)1.	.12 /12=	1.15	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
(,														
4. Wa	ter hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF.	A > 13.	upancy, 9, N = 1 9, N = 1		([1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.(0013 x (⁻	ΓFA -13.	2. .9)	06		(42)
Reduce	the annua	al average	hot water		5% if the a	welling is	designed	(25 x N) to achieve		se target o	63 f	.03		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage i	in litres per	r day for e	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m=	91.33	88.01	84.69	81.36	78.04	74.72	74.72	78.04	81.36	84.69	88.01	91.33		_
Energy c	content of	f hot water	used - ca	lculated m	onthly $= 4$.	190 x Vd,r	m x nm x E	OTm / 3600			m(44) ₁₁₂ = ables 1b, 10		996.3	(44)
(45)m=	135.44	118.45	122.23	106.57	102.25	88.24	81.76	93.83	94.95	110.65	120.78	131.16		
lf instant	aneous v	vater heati	ng at poin	t of use (no	hot water	storage).	enter 0 in	boxes (46		Fotal = Su	m(45) ₁₁₂ =		1306.31	(45)
(46)m=	0		0	0	0	0	0	0	0	0	0	0		(46)
Water	-		0		0	0	0	0		0	0	0		(40)
	-		includir	ng any se	olar or W	/WHRS	storage	within sa	ame ves	sel		120		(47)
If comr	nunity h	neating a	ind no ta	ank in dw	velling, e	nter 110) litres in	(47)						
			hot wate	er (this ir	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (47)			
Water	•						- <i>(</i> -) -						I	(12)
				loss facto	or is kno	wn (kvvr	n/day):)		(48)
•		actor fro)		(49)
•••			-	e, kWh/ye cylinder∣		or is not		(48) x (49)) =		()		(50)
,				rom Tabl)		(51)
		neating s			,							-		
Volume	e factor	from Ta	ble 2a								()		(52)
Tempe	rature f	actor fro	m Table	e 2b							()		(53)
Energy	lost fro	om water	storage	e, kWh/ye	ear			(47) x (51)) x (52) x (53) =	()		(54)
Enter	(50) or	(54) in (5	55)								()		(55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)ı	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	r 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=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	y circuit	loss (ar	nual) fro	om Table	e 3						()		(58)
							. ,	65 × (41)			- 1 - 1)			
. i	lified by	o factor f	rom Tab	$\frac{1}{1}$ 0	here is s	olar wat	ter heati	ng and a	cylinde	r thermo	, 	0	l	(59)
(59)m=	U	U	U		0	U	U		U	U	0	0		(33)

Combi	loss ca	alculated	for eac	h month	(61)m =	(60) ÷ 36	65 × (41))m						
(61)m=	0	0	0	0	0		0	0	0	0	0	0	0		(61)
Total h	eat req	uired for	water h	neating c	alculated	d fo	r each	n month	(62)m :	= 0.85 ×	(45)m +	- (46)m +	(57)m +	- · (59)m + (61)m	
(62)m=	115.12	100.69	103.9	90.58	86.91		75	69.5	79.75	80.7	94.05	102.67	111.49]	(62)
Solar DH	IW input	calculated	using Ap	pendix G c	r Appendix	к Н (negativ	ve quantity	/) (enter '	0' if no sola	r contrib	ution to wate	er heating)	-	
(add ac	dditiona	al lines if	FGHR	S and/or	WWHRS	s ap	plies,	see Ap	pendix	G)					
(63)m=	0	0	0	0	0		0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter												
(64)m=	115.12	100.69	103.9	90.58	86.91		75	69.5	79.75	80.7	94.05	102.67	111.49		_
									Ou	tput from w	ater heat	er (annual)	12	1110.36	(64)
Heat g	ains fro	m water	heating	g, kWh/m	onth 0.2	5 ´	[0.85	× (45)m	+ (61)	n] + 0.8 x	x [(46)n	า + (57)m	+ (59)m	1]	
(65)m=	28.78	25.17	25.97	22.65	21.73	1	8.75	17.37	19.94	20.18	23.51	25.67	27.87]	(65)
inclu	de (57)	m in calo	culation	of (65)m	n only if c	ylin	nder is	s in the c	dwelling	or hot w	ater is	from com	munity I	- neating	
5. Int	ernal g	ains (see	Table	5 and 5a	a):										
Metabo	olic dair	ns (Table	e 5). Wa	atts											
	Jan	Feb	Mar	Apr	May	,	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(66)m=	102.79	102.79	102.79	102.79	102.79	10)2.79	102.79	102.79	102.79	102.79	102.79	102.79		(66)
Lighting	g gains	(calcula	ted in A	ppendix	L, equat	ion	L9 or	⁻ L9a), a	lso see	Table 5					
(67)m=	16.97	15.07	12.26	9.28	6.94	5	5.86	6.33	8.23	11.04	14.02	16.36	17.44		(67)
Appliar	nces ga	ains (calc	ulated i	n Appen	dix L, eq	uat	ion L'	13 or L1:	3a), als	o see Ta	ble 5				
(68)m=	179.6	181.47	176.77	166.77	154.15	14	12.29	134.36	132.5	137.2	147.2	159.82	171.68]	(68)
Cookin	g gains	s (calcula	ited in A	Appendix	L, equa	tion	L15	or L15a)	, also s	ee Table	9 5			-	
(69)m=	33.28	33.28	33.28	33.28	33.28	_	3.28	33.28	33.28	33.28	33.28	33.28	33.28	1	(69)
Pumps	and fa	ins gains	(Table	5a)								-			
(70)m=	0	0	0	0	0		0	0	0	0	0	0	0]	(70)
Losses	e.g. e	vaporatio	n (nega	ative valu	ues) (Tab	le {	5)			- I	1	I		1	
(71)m=		<u> </u>		-	<u>, ,</u>	<u> </u>	, 2.23	-82.23	-82.23	-82.23	-82.23	-82.23	-82.23]	(71)
ا Water I	heating	ı gains (T	able 5)		1	I				1	1			1	
(72)m=	38.68	37.46	34.91	31.45	29.21	2	6.04	23.35	26.8	28.02	31.6	35.65	37.46]	(72)
ا Total i	nterna	l gains =		1			(66)	m + (67)m	ı + (68)m	+ (69)m +	(70)m + ((71)m + (72))m	1	
(73)m=	289.09	· · · · · ·	277.78	261.34	244.13	22	28.02	217.88	221.36	230.1	246.65	265.66	280.42]	(73)
6. Sol	ar gain	s:		1	1	<u> </u>				1		1			
Solar g	ains are	calculated	using sol	ar flux fron	n Table 6a	and	associ	ated equa	tions to c	onvert to th	ne applica	able orientat	tion.		
Orienta		Access F	actor	Area	a		Flu			g_		FF		Gains	
		Table 6d		m²			Tab	ole 6a		Table 6b	-	Table 6c		(W)	
North	0.9x	0.77	;	2.	39	x [1	0.63	x	0.76	×	0.8	=	10.71	(74)
North	0.9x	0.77	,	(2.	39	x [2	0.32	x	0.76	x	0.8	=	20.46	(74)
North	0.9x	0.77	,	(2.	39	× [3	4.53	x	0.76	× [0.8	=	34.77	(74)
North	0.9x	0.77	,	(2.	39	× [5	5.46	x	0.76	×	0.8	=	55.85	(74)
North	0.9x	0.77	;	(2.	39	× [7	4.72	x	0.76	×	0.8	=	75.24	(74)

North	0.9x	0.77	x	2.39)	×	79.99	x	0.76	x	0.8	=	80.55	(74)
North	0.9x	0.77	x	2.39)	×	74.68	×	0.76	×	0.8	=	75.2	(74)
North	0.9x	0.77	x	2.39)	×	59.25	×	0.76	x	0.8	=	59.66	(74)
North	0.9x	0.77	x	2.39)	×	41.52	×	0.76	x	0.8	=	41.81	(74)
North	0.9x	0.77	x	2.39)	×	24.19	×	0.76	x	0.8	=	24.36	(74)
North	0.9x	0.77	x	2.39)	×	13.12	×	0.76	x	0.8	=	13.21	(74)
North	0.9x	0.77	x	2.39)	×	8.86	×	0.76	x	0.8	=	8.93	(74)
South	0.9x	0.77	x	2.39)	×	46.75	×	0.76	x	0.8	=	94.16	(78)
South	0.9x	0.77	x	2.39)	×	76.57	×	0.76	x	0.8	=	154.21	(78)
South	0.9x	0.77	x	2.39)	×	97.53	×	0.76	x	0.8	=	196.44	(78)
South	0.9x	0.77	x	2.39)	×「	110.23	×	0.76	x	0.8	=	222.01	(78)
South	0.9x	0.77	x	2.39)	× [114.87	Ī × Ī	0.76	x	0.8	=	231.35	(78)
South	0.9x	0.77	×	2.39)	×Г	110.55	Ī × Ī	0.76	×	0.8	=	222.65	(78)
South	0.9x	0.77	x	2.39)	×Г	108.01	i × i	0.76	x	0.8	=	217.54	(78)
South	0.9x	0.77	x	2.39)	×Г	104.89		0.76	x	0.8	=	211.26	(78)
South	0.9x	0.77	×	2.39)	×Г	101.89	Ī × Ī	0.76	×	0.8	=	205.2	(78)
South	0.9x	0.77	x	2.39)	× [82.59	Ī×Ī	0.76	×	0.8	=	166.33	(78)
South	0.9x	0.77	x	2.39)	×Ē	55.42	x	0.76	x	0.8	=	111.61	(78)
South	0.9x	0.77	×	2.39		×	40.4	x	0.76	x	0.8	_	81.36	(78)
(83)m= Total ga	112.81 ains — ir	nternal and	56.8 solar	315.19 (84)m =	352.34 (73)m -	+ (83	·	309.		209.13		96.82]	(83)
(84)m= [401.91	478.05 53	34.58	576.54	596.47	578	.04 555.2	530.	58 506.87	455.78	400.39	377.24		(84)
7. Mea	an inter	nal temper	ature (heating	season)								
Temp	erature	during hea	ting pe	eriods in	the livir	ng a	rea from Ta	ble 9,	Th1 (°C)				21	(85)
Utilisa	tion fac	tor for gain	s for li	ving area	a, h1,m	(se	e Table 9a)				-		-	
	Jan	Feb	Mar	Apr	May	J	un Jul	Αι	ug Sep	Oct	Nov	Dec		
(86)m=	1	0.99 (0.98	0.95	0.88	0.	72 0.55	0.5	9 0.82	0.97	0.99	1		(86)
Mean	interna	l temperatu	ire in l	iving are	a T1 (fo	ollow	steps 3 to	7 in T	able 9c)					
(87)m=	19.77	19.95 2	20.2	20.52	20.78	20	94 20.99	20.9	98 20.89	20.54	20.09	19.74		(87)
Temp	erature	during hea	ting p	eriods in	rest of	dwe	lling from T	able 9), Th2 (°C)				_	
(88)m=	19.94		9.95	19.96	19.96	19	<u> </u>	19.9		19.96	19.96	19.95]	(88)
Utilisa	tion fac	tor for gain	s for r	est of dw	vellina l	h2 m	n (see Table	- 9a)			1		4	
(89)m=	1		0.98	0.94	0.83	0.0	<u> </u>	0.4	7 0.75	0.95	0.99	1]	(89)
	intorno	Ltomporati	uro in t	ho root o	f dwalli		2 (follow at		to 7 in Tabl				J	
г		· · · ·	i	i	1	<u> </u>	<u> </u>	-ri	- i - i	,	19 16	18.8	1	(90)
(00)11-	Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c) 00)m= 18.83 19.01 19.26 19.57 19.81 19.95 19.97 19.91 19.6 19.16 18.8 (90)													
L		<u> </u>							f	LA = Liv	ring area ÷ (4	4) =	0.64	(91)
L		_	I							LA = Liv	ing area ÷ (4	4) =	0.64	(91)
Mean (92)m=		· · ·	ure (foi 9.86	the who	ole dwel 20.43	lling)	= fLA × T1	+ (1 -	– fLA) × T2	LA = Liv 20.2	19.75	ł) = 19.4	0.64	(91)

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

(93)m=	19.43	19.61	19.86	20.18	20.43	20.58	20.62	20.62	20.53	20.2	19.75	19.4		(93)
8. Spa	ace hea	ting requ	uirement			•								
				mperatui using Ta		ned at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	culate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	tion fac	tor for g	ains, hm					<u> </u>						
(94)m=	1	0.99	0.98	0.94	0.86	0.69	0.51	0.55	0.79	0.95	0.99	1		(94)
Usefu	l gains,	hmGm	, W = (94	4)m x (84	4)m	•					•			
(95)m=	400.22	473.27	522.12	542.4	510.1	397.75	281.32	292.24	401.34	434.95	396.79	376.07		(95)
Month	ly aver	age exte	ernal tem	perature	e from Ta	able 8					•			
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat I	oss rate	e for mea	an interr	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m]				
(97)m=	1109.92	1076.38	975.36	813.23	628.4	426.01	286.23	299.64	459.87	690.77	914.81	1104.02		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(97))m – (95)m] x (4	1)m			
(98)m=	528.02	405.29	337.21	194.99	88.01	0	0	0	0	190.33	372.98	541.59		
								Tota	l per year	(kWh/yeai	r) = Sum(9	8)15,912 =	2658.42	(98)
Space	e heatin	g require	ement in	kWh/m²	²/year								42.43	(99)
8c. Sp	bace co	oling rec	quiremer	nt								-		
				August.	See Ta	ble 10b								
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat I	oss rate	e Lm (ca	lculated	using 2	5°C inter	rnal temp	berature	and exte	ernal ten	nperatur	e from T	able 10)		
(100)m=	0	0	0	0	0	669.38	526.96	540.15	0	0	0	0		(100)
Utilisa	ition fac	tor for lo	oss hm											
(101)m=	0	0	0	0	0	0.88	0.94	0.92	0	0	0	0		(101)
Usefu	l loss, h	mLm (V	vatts) =	(100)m x	(101)m									
(102)m=	0	0	0	0	0	589.19	493.55	497.91	0	0	0	0		(102)
Gains	(solar g	gains ca	lculated	for appli	cable w	eather re	egion, se	e Table	10)		-	-		
(103)m=	0	0	0	0	0	752.68	724.5	697.05	0	0	0	0		(103)
				r month, : 3 × (98		dwelling,	continue	ous (kW	/h) = 0.0	24 x [(10	03)m – (102)m]:	x (41)m	
(104)m=	0	0	0	0	0	117.71	171.82	148.16	0	0	0	0		
									Total	= Sum(104)	=	437.7	(104)
Cooled	fraction	า							f C =	cooled	area ÷ (4	4) =	1	(105)
Intermi	ttency f	actor (Ta	able 10b)							-			
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		_
									Tota	l = Sum((104)	=	0	(106)
· ·		· ·	r	month =	: (104)m	<u> </u>	<u>, </u>	r						
(107)m=	0	0	0	0	0	29.43	42.96	37.04	0	0	0	0		_
									Total	= Sum(107)	=	109.42	(107)
Space	cooling	requirer	ment in k	kWh/m²/y	/ear				(107)) ÷ (4) =			1.75	(108)
8f. Fab	ric Ene	rgy Effici	iency (ca	alculated	l only un	der spec	cial cond	litions, s	ee sectio	on 11)				
Fabric	Energ	y Efficier	псу						(99) -	+ (108) =	=		44.17	(109)

				User D	etails:						
Assessor Name: Software Name:	Stroma FS	AP 2012			Strom Softwa	are Ver	sion:		Versic	on: 1.0.0.28	
			P	roperty <i>i</i>	Address	2 Bed 2	2013 Bas	seline			
Address : 1. Overall dwelling dime	nsions:										
	11310113.			Area	a(m²)		Av. Hei	aht(m)		Volume(m ³)	
Ground floor						(1a) x		.5	(2a) =	103.75	(3a)
First floor					41.5	(1b) x	2	.5	(2b) =	103.75	(3b)
Total floor area TFA = (1)	a)+(1b)+(1c)+((1d)+(1e)	+(1n		83	(4)]]
Dwelling volume			,	′)+(3c)+(3d)+(3e)+	.(3n) =	207.5	(5)
2. Ventilation rate:										201.0](-)
2. Ventilation rate:	main		condar	у	other		total			m ³ per hour	
Number of chimneys	heating	he □+	eating] + [0] = [0	x 4	40 =	0	(6a)
Number of open flues	0	_ ∟ + [_	0	」 <u>「</u> 」 + 「	0	」	0	x 2	20 =	0	(6b)
Number of intermittent fa			0		•		3	x 1	10 =	30	(7a)
Number of passive vents							0	x 1	0 =	0	(7b)
Number of flueless gas fi							0	x 4	40 =	0	(7c)
						L	0		Air ch	anges per hou	1
Infiltration due to chimne	ys, flues and fa	ans = (6a))+(6b)+(7	<mark>a)+</mark> (7b)+(7c) =		30		÷ (5) =	0.14	(8)
If a pressurisation test has b			l, proceed	d to (17), d	otherwise o	continue fro	om (9) to (16)			- 1
Number of storeys in the Additional infiltration	ie dw <mark>eiling</mark> (ns	5)						 [(9)-	1]x0.1 =	0	(9) (10)
Structural infiltration: 0	.25 for steel or	timber fr	ame or	0.35 foi	r masonr	v constr	uction	[(0)	1110.1 -	0	(11)
if both types of wall are pl			onding to	the great	er wall are	a (after].
deducting areas of openir If suspended wooden f			ed) or 0.	1 (seale	ed). else	enter 0				0	(12)
If no draught lobby, en		•	.,	(-,,					0	(13)
Percentage of windows	s and doors dr	aught stri	ipped							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	d in cubi	c metre	s per ho	our per s	quare m	etre of e	nvelope	area	6	(17)
If based on air permeabil	ity value, then	(18) = [(17)) ÷ 20]+(8	8), otherwi	ise (18) = (16)				0.44	(18)
Air permeability value applie		on test has l	been don	e or a deg	gree air pe	rmeability	is being us	sed		r	1
Number of sides sheltere Shelter factor	d				(20) = 1 -	[0 075 x (1	9)] =			2	(19)
Infiltration rate incorporat	ing shelter fac	tor			(21) = (18)		•/]			0.85	(20)
Infiltration rate modified for	-				() (10	, (==) =				0.38	(21)
Jan Feb	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp						٣			- 70	l	
(22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		

Wind F	actor (2	2a)m =	(22)m ÷	4											
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]		
Adjust	ed infiltra	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m				_		
	0.48	0.47	0.46	0.42	0.41	0.36	0.36	0.35	0.38	0.41	0.43	0.44			
	ate effec echanica		•	rate for t	he appli	cable ca	se	-					-		
				endix N (2	3b) = (23a	a) × Fmv (e	equation (N	(5)) othe	rwise (23h) = (23a)			0		
						or in-use fa) = (200)			0	`	
			-	-	-	at recove				2b)m + ('	23h) 🗸 ['	1 – (23c)	0 	(23	C)
(24a)m=				0	0		0	0		0	0	1 - (200)]]	(24	a)
		d mech	anical ve	ntilation	without	heat rec	overv (N	///) (24b	m = (22)	2b)m + (2	23b)		J		,
(24b)m=		0	0	0	0	0	0	0	0	0	0	0]	(24	b)
· · ·		ouse ex	tract ver	tilation o	or positiv	/e input \	/entilatic	n from c	utside				1		
,					•	o); otherv				.5 × (23b)				
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24	·c)
,					•	ve input						-	-		
	<u> </u>		, ,	,	,	erwise (2	,		r Ó	-		_		(0.4	
(24d)m=	L	0.61	0.61	0.59	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6		(24	d)
					· .	o) or (240	· · · ·		1 /	0.50	0.50		1	(05	· \
(25)m=	0.62	0.61	0.61	0.59	0.58	0.56	0.56	0.56	0.57	0.58	0.59	0.6		(25)
3. He	at l <mark>osse</mark> s	s and he	eat l <mark>oss</mark> p	paramete											
										_					_
ELEN	IENT	Gros	ss	Openin	gs	Net Ar		U-valı W/m2		A X U	0	k-value		A X k	
ELEN Doors	IENT	Gros area	ss		gs	A ,n	n²	W/m2		(VV/ł	<)	k-value kJ/m²₊l		kJ/K)
Doors		area	ss	Openin	gs	A ,r	n ²	W/m2 1.2	2K	(W/ł 2.4	<)			kJ/K (26	·
Doors Windo	ws Type	area 1	ss	Openin	gs	A ,r	n ² x	W/m2 1.2 /[1/(1.4)+	0.04] =	(W/ł 2.4 3.17	<)			kJ/K (26 (27)
Doors Windo Windo	ws Type ws Type	area 1 2	ss	Openin	gs	A ,r	n ² x x x 1/	W/m2 1.2 /[1/(1.4)+ /[1/(1.4)+	2K = 0.04] = 0.04] =	(W/k 2.4 3.17 3.17	<)			kJ/K (26 (27 (27	·) ·)
Doors Windo Windo Windo	ws Type	area 1 2	ss	Openin	gs	A ,r 2 2.39 2.39 0.96	n ² x x x ^{1/} x ^{1/} x ^{1/}	W/m2 1.2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+	2K 0.04] = 0.04] = 0.04] =	(W/k 2.4 3.17 3.17 1.27				kJ/K (26 (27 (27 (27	·) ·)
Doors Windo Windo Windo Floor	ws Type ws Type	area 1 2 3	ss (m²)	Openin m	gs ²	A ,r 2 2.39 2.39 0.96 41.5	n ² x x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1.2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.2	2K 0.04] = 0.04] = 0.04] = =	(W/k 2.4 3.17 3.17 1.27 8.3				kJ/K (26 (27 (27 (27	·) ·) ·)
Doors Windo Windo Windo Floor Walls	ws Type ws Type	area 1 2 3 83.1	8	Openin m	gs ²	A ,r 2 2.39 2.39 0.96 41.5 73.05	n ² x x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1.2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.2 0.24	2K 0.04] = 0.04] = 0.04] = = = =	(W/k 2.4 3.17 3.17 1.27 8.3 17.53				kJ/K (26 (27 (27 (27 (28 (29))))
Doors Windo Windo Windo Floor Walls Roof	ws Type ws Type ws Type	area 1 2 3 83.1 41.5	8 5	Openin m	gs ²	A ,r 2 2.39 2.39 0.96 41.5 73.05 41.5	n ² x x1) x1) x1) x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1.2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.2	2K 0.04] = 0.04] = 0.04] = =	(W/k 2.4 3.17 3.17 1.27 8.3				kJ/K (26 (27 (27 (27 (27) (28) (29) (30)))))
Doors Windo Windo Windo Floor Walls Roof Total a	ws Type ws Type ws Type area of e	area 1 2 3 83.1 41.5	8 5	Openin m	gs ²	A ,r 2 2.39 2.39 0.96 41.5 73.05 41.5 166.1	n ² x 1 ¹ x ¹ x ¹ x ¹ x ¹ x x x B	W/m2 1.2 (1/(1.4)+ (1/(1.4)+ (1/(1.4)+ 0.2 0.24 0.16	2K 0.04] = 0.04] = 0.04] = = = = = =	(W/k 2.4 3.17 3.17 1.27 8.3 17.53 6.64				kJ/K (26 (27 (27 (27) (28) (29) (30) (31)))))))))
Doors Windo Windo Floor Walls Roof Total a Party v	ws Type ws Type ws Type area of e wall	area 1 2 3 83.1 41.5	8 5	Openin m	gs ²	A ,r 2 2.39 2.39 0.96 41.5 73.05 41.5 166.11 45	n ² x x1) x1) x1) x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1.2 /[1/(1.4)+ /[1/(1.4)+ /[1/(1.4)+ 0.2 0.24	2K 0.04] = 0.04] = 0.04] = = = =	(W/k 2.4 3.17 3.17 1.27 8.3 17.53				kJ/K (26 (27 (27 (27) (28 (29) (30) (31) (32)	() () () () () () () ()
Doors Windo Windo Floor Walls Roof Total a Party w Interna	ws Type ws Type ws Type area of e wall al floor	area 1 2 3 83.1 41.4 Iements	8 5 , m ²	Openin m 10.13 0	gs 2 3 ndow U-va	A ,r 2 2.39 2.39 0.96 41.5 73.05 41.5 166.11 45 41.5	n ² x 1 ¹ x ¹ x ¹ x ¹ x x x x x x x x x	W/m2 1.2 (1/(1.4)+ (1/(1.4)+ (1/(1.4)+ 0.2 0.24 0.16 0	.0.04] = .0.04] = .0.04] = .0.04] =	(W/H 2.4 3.17 1.27 8.3 17.53 6.64 0		kJ/m²+l		kJ/K (26 (27 (27 (27) (28) (29) (30) (31)	() () () () () () () ()
Doors Windo Windo Windo Floor Walls Roof Total a Party w Interna * for win ** incluo	ws Type ws Type ws Type area of e wall al floor	area 1 2 3 83.1 41.3 lements roof winde	8 (m ²) 8 5 , m ² ows, use e sides of ir	Openin m 10.13 0	gs 2 3 ndow U-va	A ,r 2 2.39 2.39 0.96 41.5 73.05 41.5 166.11 45 41.5	n ² x 1/ x 1/ x 1/ x 1/ x 2/ x 2/ x 2/ x 2/ x 2/ x 2/ x 2/ x 2	W/m2 1.2 (1/(1.4)+ (1/(1.4)+ (1/(1.4)+ 0.2 0.24 0.16 0	?K 0.04] 0.04] 0.04] 0.04] =	(W/H 2.4 3.17 1.27 8.3 17.53 6.64 0		kJ/m²+l		kJ/K (26 (27 (27 (27 (28 (29) (30) (31) (32 (32)))))))))
Doors Windo Windo Floor Walls Roof Total a Party w Interna * for win ** incluo Fabric	ws Type ws Type ws Type area of e wall al floor adows and de the area	area 1 2 3 83.1 41.3 lements roof winders s, W/K =	8 5 , m ² ows, use e sides of ir = S (A x	Openin m 10.13 0	gs 2 3 ndow U-va	A ,r 2 2.39 2.39 0.96 41.5 73.05 41.5 166.11 45 41.5	n ² x 1/ x 1/ x 1/ x 1/ x 2/ x 2/ x 2/ x 2/ x 2/ x 2/ x 2/ x 2	W/m2 1.2 (1/(1.4)+ (1/(1.4)+ (1/(1.4)+ 0.2 0.24 0.16 0 formula 1	$\frac{2}{2} \begin{bmatrix} 1 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0 \\ 0.04 \end{bmatrix}$	(W/H 2.4 3.17 1.27 8.3 17.53 6.64 0	s given in	kJ/m²+l	K	kJ/K (26 (27 (27 (27) (28 (29) (30) (31) (32) (32) (33)))))))) ;) ;) ;)
Doors Windo Windo Floor Walls Roof Total a Party w Interna * for win ** incluo Fabric Heat c	ws Type ws Type ws Type area of e wall al floor adows and the the area heat los capacity (area a 1 a 2 a 3 $\boxed{83.1}$ $\boxed{41.4}$ lements roof windown is on both is, W/K = Cm = S(8 5 , m ² ows, use e sides of ir = S (A x A x k)	Openin m 10.13 0 offective wi aternal walk U)	gs 2 3 Indow U-va Is and part	A ,r 2 2.39 2.39 0.96 41.5 73.05 41.5 166.11 45 41.5	n ² x 1 ¹ x ¹ x ¹ x ¹ x x x x B x ated using	W/m2 1.2 (1/(1.4)+ (1/(1.4)+ (1/(1.4)+ 0.2 0.24 0.16 0 formula 1	$\frac{2}{2} \left[\frac{1}{2} + 1$	(W/k 2.4 3.17 3.17 1.27 8.3 17.53 6.64 0	[]]	kJ/m²+l	K	kJ/K (26 (27 (27 (27 (28 (29) (30 (31) (32) (32) (32) (32) (33) (34)	<pre>>)))))) 2d)</pre>
Doors Windo Windo Floor Walls Roof Total a Party w Interna * for win ** includ Fabric Heat c Therm For desi	ws Type ws Type ws Type area of e wall al floor dows and de the area heat los capacity (area a 1 a 2 a 3 $\boxed{83.1}$ $\boxed{41.4}$ lements roof winders s on both s, W/K = Cm = S(parame ments wh	8 (m ²) 8 5 , m ² bws, use e sides of ir = S (A x A x k) ter (TMF ere the de	Openin m 10.13 0 effective with the ternal walk U) P = Cm + tails of the	gs 2 3 mdow U-va Is and part - TFA) ir	A ,n 2.39 2.39 0.96 41.5 73.05 41.5 166.11 45 41.5 alue calcula titions	n ² x 1/ x 1/ x 1/ x 1/ x 2 x 2 x 3 x 3 x 3 x 3 x 3 x 3 x 3 x 3 x 4 x 3 x 4 x 4 x 4 x 4 x 4 x 1/ x 1/ x 1/ x 1/ x 1/ x 1/ x 1/ x 1/	W/m2 1.2 (1/(1.4)+ (1/(1.4)+ (1/(1.4)+ 0.2 0.24 0.16 0 formula 1 (26)(30)	$\frac{2}{2} \left[\frac{1}{2} + 1$	(W/ł 2.4 3.17 1.27 8.3 17.53 6.64 0 ///////////////////////////////////	<pre></pre>	kJ/m²+l	K	kJ/K (26 (27 (27 (27 (28 (29) (30 (31) (32) (32) (32) (32) (33) (34)	<pre>>)))))) 2d)</pre>

	's of therma fabric he		are not kr	10wn (36) :	= 0.15 x (3	1)			(33) +	(36) =			52.06	(37)
	ation hea		alculated	d monthl	v						25)m x (5)		53.96	(37)
Vorial	Jan	Feb	Mar	Apr	, May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=		41.88	41.57	40.15	39.89	38.65	38.65	38.42	39.13	39.89	40.43	40.99		(38)
Heat t	transfer of	coefficie	nt, W/K		1		1		(39)m	= (37) + (38)m		1	
(39)m=		95.84	95.53	94.11	93.85	92.61	92.61	92.38	93.09	93.85	94.39	94.95		
			1		1		1		,	Average =	Sum(39)1.	12 /12=	94.11	(39)
	oss para	· · · ·	<u>, </u>	1	i	r		r		= (39)m ÷	· · ·	r	1	
(40)m=	1.16	1.15	1.15	1.13	1.13	1.12	1.12	1.11	1.12	1.13	1.14	1.14		
Numb	er of day	/s in mo	nth (Tab	le 1a)	-	-	-	-	,	Average =	Sum(40)1.	₁₂ /12=	1.13	(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. W	ater hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
Assur	ned occu	inancy	N								2	52	1	(42)
	FA > 13.9			(1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13		52		(42)
	FA £ 13.9	1							~~				1	
	al average the annua									se target o		.93		(43)
	re that 125	-				-	-			Ū				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wa	ter usage i	n litres pei	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m=	108.83	104.87	100.91	96.95	93	89.04	89.04	93	96.95	100.91	104.87	108.83		
_											m(44) ₁₁₂ =		1187.19	(44)
	content of	i			· ·					· ·			1	
(45)m=	161.39	141.15	145.65	126.98	121.84	105.14	97.43	111.8	113.14	131.85	143.92	156.29		
lf instar	ntaneous w	vater heati	ng at poin	t of use (no	o hot water	^r storage),	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =	=	1556.59	(45)
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0		(46)
· · ·	storage			<u> </u>	Ů	Ů	, °	Ů		ů	Ů	Ů		
Stora	ge volum	e (litres)) includir	ng any s	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If com	nmunity h	neating a	and no ta	ank in dv	velling, e	nter 110) litres in	(47)						
	wise if no		hot wate	er (this ir	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in (47)			
	 storage nanufact 		aclarad I	oss fact	or is kno	wn (k\//	n/dav).					0	1	(40)
	erature f						i/day).					0		(48) (49)
	y lost fro				oar			(48) x (49)	-			0		
-	nanufact		-	•		or is not		(40) X (40)	-			0		(50)
	ater stor			•								0		(51)
	munity h	-		on 4.3									1	
	ne factor erature f			2h								0		(52)
								(47) (54)	м (ГО) (50)		0]	(53)
-	y lost fro (50) or (-	;, KVVN/Y	eal			(47) x (51)	i x (⊃∠) X (00) =		0 0		(54) (55)
	(00) 01		,									0	l	(00)

Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contains	s dedicate	d solar sto	orage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	lix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(57)
Primar	ry circuit	loss (ar	nual) fro	om Table	e 3							0		(58)
Primar	ry circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(mo	dified by	factor f	rom Tab	le H5 if t	here is s	olar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	i 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	neat requ	uired for	water h	eating ca	alculated	for eacl	n month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	137.18	119.98	123.8	107.94	103.57	89.37	82.82	95.03	96.17	112.07	122.34	132.85		(62)
Solar DI	HW input o	calculated	using App	endix G o	r Appendix	H (negati	ve quantity	/) (enter '0	if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	NWHRS	applies	, see Ap	pendix (G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	t from w	ater hea	ter					-		-	-	-		
(64)m=	137.18	119.98	123.8	107.94	103.57	89.37	82.82	95.03	96.17	112.07	122.34	132.85		_
								Outp	out from w	ater heate	r (annual)₁	12	1323.1	(64)
Heat g	jains froi	m water	heating	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)n	ı] + 0.8 x	(46)m	+ (57)m	+ (59)m	1	
(65)m=	34.29	29.99	30.95	26.98	25.89	22.34	20.7	23.76	24.04	28.02	30.58	33.21		(65)
inclu	ude (57)	m in calo	culation	of (65)m	only if c	ylinder is	s in the o	dwelling	or hot w	ate <mark>r is</mark> fr	om com	munity h	neating	
5. Int	tern <mark>al g</mark> a	ains (see	e Ta <mark>ble (</mark>	5 and 5a):									
Metab	olic gain	s (Table	5), Wat	tts										
	Jan	E a la								_				
		Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	125.86	Feb 125.86	Mar 125.86	Apr 125.86	May 125.86	Jun 125.86	Jul 125.86	Aug 125.86	Sep 125.86	Oct 125.86	Nov 125.86	Dec 125.86		(66)
Lightin	125.86 Ig gains	125.86 (calcula	125.86 ted in Aj	125.86 opendix	125.86 L, equati	125.86 ion L9 oi	125.86 r L9a), a	125.86 Iso see	125.86 Table 5	125.86				(66)
Lightin	125.86 Ig gains	125.86 (calcula	125.86 ted in Aj	125.86 opendix	125.86	125.86 ion L9 oi	125.86 r L9a), a	125.86 Iso see	125.86 Table 5	125.86				(66) (67)
Lightin (67)m=	125.86 ng gains 22.67	125.86 (calcula 20.14	125.86 ted in Aj 16.38	125.86 opendix 12.4	125.86 L, equati	125.86 ion L9 oi 7.82	125.86 r L9a), a 8.45	125.86 Iso see 10.99	125.86 Table 5 14.75	125.86 18.73	125.86	125.86		
Lightin (67)m=	125.86 ng gains 22.67	125.86 (calcula 20.14	125.86 ted in Aj 16.38	125.86 opendix 12.4	125.86 L, equati 9.27	125.86 ion L9 oi 7.82	125.86 r L9a), a 8.45	125.86 Iso see 10.99	125.86 Table 5 14.75	125.86 18.73	125.86	125.86		
Lightin (67)m= Applia (68)m=	125.86 ng gains 22.67 nces ga 225.6	125.86 (calcula 20.14 ins (calc 227.94	125.86 ted in Ap 16.38 ulated ir 222.04	125.86 opendix 12.4 Append 209.48	125.86 L, equati 9.27 dix L, eq	125.86 ion L9 of 7.82 uation L 178.73	125.86 r L9a), a 8.45 13 or L1 168.77	125.86 Iso see 10.99 3a), also 166.43	125.86 Table 5 14.75 see Ta 172.33	125.86 18.73 ble 5 184.89	125.86 21.86	125.86 23.3		(67)
Lightin (67)m= Applia (68)m=	125.86 ng gains 22.67 nces ga 225.6	125.86 (calcula 20.14 ins (calc 227.94	125.86 ted in Ap 16.38 ulated ir 222.04	125.86 opendix 12.4 Append 209.48	125.86 L, equati 9.27 dix L, eq 193.63	125.86 ion L9 of 7.82 uation L 178.73	125.86 r L9a), a 8.45 13 or L1 168.77	125.86 Iso see 10.99 3a), also 166.43	125.86 Table 5 14.75 see Ta 172.33	125.86 18.73 ble 5 184.89	125.86 21.86	125.86 23.3		(67)
Lightin (67)m= Applia (68)m= Cookir (69)m=	125.86 ng gains 22.67 nces ga 225.6 ng gains 35.59	125.86 (calcula 20.14 ins (calc 227.94 (calcula 35.59	125.86 ted in Ap 16.38 ulated ir 222.04 ted in A	125.86 opendix 12.4 n Append 209.48 ppendix 35.59	125.86 L, equati 9.27 dix L, eq 193.63 L, equat	125.86 ion L9 of 7.82 uation L 178.73 ion L15	125.86 r L9a), a 8.45 13 or L1 168.77 or L15a)	125.86 Iso see ⁻ 10.99 3a), also 166.43), also se	125.86 Table 5 14.75 see Ta 172.33 ee Table	125.86 18.73 ble 5 184.89 5	125.86 21.86 200.74	125.86 23.3 215.64		(67) (68)
Lightin (67)m= Applia (68)m= Cookir (69)m=	125.86 ng gains 22.67 nces ga 225.6 ng gains 35.59	125.86 (calcula 20.14 ins (calc 227.94 (calcula 35.59	125.86 ted in Ap 16.38 ulated ir 222.04 tted in A 35.59	125.86 opendix 12.4 n Append 209.48 ppendix 35.59	125.86 L, equati 9.27 dix L, eq 193.63 L, equat	125.86 ion L9 of 7.82 uation L 178.73 ion L15	125.86 r L9a), a 8.45 13 or L1 168.77 or L15a)	125.86 Iso see ⁻ 10.99 3a), also 166.43), also se	125.86 Table 5 14.75 see Ta 172.33 ee Table	125.86 18.73 ble 5 184.89 5	125.86 21.86 200.74	125.86 23.3 215.64		(67) (68)
Lightin (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m=	125.86 ng gains 22.67 nces ga 225.6 ng gains 35.59 s and far 0	125.86 (calcula 20.14 ins (calc 227.94 (calcula 35.59 ns gains 0	125.86 ted in Ap 16.38 ulated ir 222.04 ted in A 35.59 (Table \$ 0	125.86 opendix 12.4 Appendi 209.48 ppendix 35.59 5a) 0	125.86 L, equati 9.27 dix L, eq 193.63 L, equat 35.59	125.86 ion L9 of 7.82 uation L 178.73 ion L15 35.59	125.86 r L9a), a 8.45 13 or L1 168.77 or L15a) 35.59	125.86 Iso see ⁻ 10.99 3a), also 166.43), also se 35.59	125.86 Table 5 14.75 see Ta 172.33 ee Table 35.59	125.86 18.73 ble 5 184.89 5 35.59	125.86 21.86 200.74 35.59	125.86 23.3 215.64 35.59		(67) (68) (69)
Lightin (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m=	125.86 125.86 22.67 nces ga 225.6 ng gains 35.59 s and fai 0 s e.g. ev	125.86 (calcula 20.14 ins (calc 227.94 (calcula 35.59 ns gains 0	125.86 ted in Ap 16.38 ulated ir 222.04 ted in A 35.59 (Table \$ 0	125.86 opendix 12.4 Appendi 209.48 ppendix 35.59 5a) 0	125.86 L, equati 9.27 dix L, eq 193.63 L, equat 35.59	125.86 ion L9 of 7.82 uation L 178.73 ion L15 35.59	125.86 r L9a), a 8.45 13 or L1 168.77 or L15a) 35.59	125.86 Iso see ⁻ 10.99 3a), also 166.43), also se 35.59	125.86 Table 5 14.75 see Ta 172.33 ee Table 35.59	125.86 18.73 ble 5 184.89 5 35.59	125.86 21.86 200.74 35.59	125.86 23.3 215.64 35.59		(67) (68) (69)
Lightin (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m=	125.86 ng gains 22.67 nces ga 225.6 ng gains 35.59 s and fai 0 s e.g. ev -100.69	125.86 (calcula 20.14 ins (calc 227.94 (calcula 35.59 ns gains 0 raporatic	125.86 ted in Ap 16.38 ulated ir 222.04 tted in A 35.59 (Table 9 0 n (nega -100.69	125.86 opendix 12.4 Append 209.48 ppendix 35.59 5a) 0 tive valu	125.86 L, equati 9.27 dix L, eq 193.63 L, equat 35.59 0 es) (Tab	125.86 ion L9 of 7.82 uation L 178.73 ion L15 35.59 0 le 5)	125.86 r L9a), a 8.45 13 or L1 168.77 or L15a) 35.59 0	125.86 Iso see ⁻ 10.99 3a), also 166.43), also se 35.59 0	125.86 Table 5 14.75 see Ta 172.33 ee Table 35.59 0	125.86 18.73 ble 5 184.89 5 35.59 0	125.86 21.86 200.74 35.59 0	125.86 23.3 215.64 35.59 0		(67) (68) (69) (70)
Lightin (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m=	125.86 ng gains 22.67 nces ga 225.6 ng gains 35.59 s and fai 0 s e.g. ev -100.69	125.86 (calcula 20.14 ins (calc 227.94 (calcula 35.59 ns gains 0 raporatic -100.69	125.86 ted in Ap 16.38 ulated ir 222.04 tted in A 35.59 (Table 9 0 n (nega -100.69	125.86 opendix 12.4 Append 209.48 ppendix 35.59 5a) 0 tive valu	125.86 L, equati 9.27 dix L, eq 193.63 L, equat 35.59 0 es) (Tab	125.86 ion L9 of 7.82 uation L 178.73 ion L15 35.59 0 le 5)	125.86 r L9a), a 8.45 13 or L1 168.77 or L15a) 35.59 0	125.86 Iso see ⁻ 10.99 3a), also 166.43), also se 35.59 0	125.86 Table 5 14.75 see Ta 172.33 ee Table 35.59 0	125.86 18.73 ble 5 184.89 5 35.59 0	125.86 21.86 200.74 35.59 0	125.86 23.3 215.64 35.59 0		(67) (68) (69) (70)
Lightin (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m= Water (72)m=	125.86 ng gains 22.67 nces ga 225.6 ng gains 35.59 s and far 0 s e.g. ev -100.69 heating 46.09	125.86 (calcula 20.14 ins (calc 227.94 (calcula 35.59 ns gains 0 raporatic -100.69 gains (T	125.86 ted in Ar 16.38 ulated ir 222.04 tted in A 35.59 (Table 5 0 (Table 5) 41.6	125.86 opendix 12.4 Appendi 209.48 ppendix 35.59 5a) 0 tive valu -100.69	125.86 L, equati 9.27 dix L, eq 193.63 L, equat 35.59 0 es) (Tab	125.86 ion L9 of 7.82 uation L 178.73 ion L15 35.59 0 le 5) -100.69 31.03	125.86 r L9a), a 8.45 13 or L1 168.77 or L15a) 35.59 0 -100.69 27.83	125.86 Iso see ⁻ 10.99 3a) , also 166.43), also se 35.59 0	125.86 Table 5 14.75 9 see Ta 172.33 9e Table 35.59 0 -100.69 33.39	125.86 18.73 ble 5 184.89 5 35.59 0 -100.69 37.66	125.86 21.86 200.74 35.59 0 -100.69 42.48	125.86 23.3 215.64 35.59 0 -100.69 44.64		(67)(68)(69)(70)(71)
Lightin (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m= Water (72)m=	125.86 ng gains 22.67 nces ga 225.6 ng gains 35.59 s and far 0 s e.g. ev -100.69 heating 46.09	125.86 (calcula 20.14 ins (calc 227.94 (calcula 35.59 ns gains 0 raporatic -100.69 gains (T 44.63	125.86 ted in Ar 16.38 ulated ir 222.04 tted in A 35.59 (Table 5 0 (Table 5) 41.6	125.86 opendix 12.4 Appendi 209.48 ppendix 35.59 5a) 0 tive valu -100.69	125.86 L, equati 9.27 dix L, eq 193.63 L, equat 35.59 0 es) (Tab	125.86 ion L9 of 7.82 uation L 178.73 ion L15 35.59 0 le 5) -100.69 31.03	125.86 r L9a), a 8.45 13 or L1 168.77 or L15a) 35.59 0 -100.69 27.83	125.86 Iso see 10.99 3a), also 166.43), also se 35.59 0 -100.69 31.93	125.86 Table 5 14.75 9 see Ta 172.33 9e Table 35.59 0 -100.69 33.39	125.86 18.73 ble 5 184.89 5 35.59 0 -100.69 37.66	125.86 21.86 200.74 35.59 0 -100.69 42.48	125.86 23.3 215.64 35.59 0 -100.69 44.64		(67)(68)(69)(70)(71)

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

Orientation:	Access Fa Table 6d	actor	Area m²			ux ible 6a			g_ able 6b		FF Table 6c			Gains (W)	
North 0.9	0.77	x	2.3	9	x	10.63	x		0.76	×	0.8		=	10.71	(74)
North 0.9	0.77	x	2.3	9	x	20.32	×		0.76	×	0.8		=	20.46	(74)
North 0.9	0.77	x	2.3	9	x	34.53	×		0.76	x	0.8		=	34.77	(74)
North 0.9	0.77	x	2.3	9	x	55.46	×		0.76	x	0.8		=	55.85	(74)
North 0.9	0.77	x	2.3	9	x	74.72	×		0.76	x	0.8		=	75.24	(74)
North 0.9	0.77	x	2.3	9	x	79.99	x		0.76	x	0.8		=	80.55	(74)
North 0.9	0.77	x	2.3	9	x	74.68	x		0.76	×	0.8		=	75.2	(74)
North 0.9	0.77	x	2.3	9	x	59.25	×		0.76	×	0.8		=	59.66	(74)
North 0.9	0.77	x	2.3	9	x	41.52	x		0.76	×	0.8		=	41.81	(74)
North 0.9	0.77	x	2.3	9	x	24.19	x		0.76	×	0.8		=	24.36	(74)
North 0.9	0.77	x	2.3	9	x	13.12	×		0.76	×	0.8		=	13.21	(74)
North 0.9	0.77	x	2.3	9	x	8.86	x		0.76	×	0.8		=	8.93	(74)
South 0.9	0.77	x	2.3	9	x	46.75	x		0.76	x	0.8		=	94.16	(78)
South 0.9	0.9x 0.77 x 2.39 0.9x 0.77 x 2.39		9	x	76.57	x		0.76	x	0.8		=	154.21	(78)	
South 0.9	0.77	x	2.3	9	x	97.53	x		0.76	x	0.8		=	196.44	(78)
South 0.9	0.77	x	2.3	9	×	110.23	x		0.76	X	0.8		=	222.01	(78)
South 0.9	0.77	×	2.3	9	x	114.87] ×		0.76	x	0.8		=	231.35	(78)
South 0.9	0.77	×	2.3	9	x	110.55] ×		0.76	x	0.8		=	222.65	(78)
South 0.9	0.77	x	2.3	9	×	108.01] ×		0.76	x	0.8		=	217.54	(78)
South 0.9	(0.77	×	2.3	9	x	104.89	x		0.76	×	0.8		=	211.26	(78)
South 0.9	x 0.77	×	2.3	9	x	101.89	×		0.76	x	0.8		=	205.2	(78)
South 0.9	0.77	x	2.3	9	×	82.59	x		0.76	x	0.8		=	166.33	(78)
South 0.9	0.77	x	2.3	9	x	55.42	×		0.76	×	0.8		=	111.61	(78)
South 0.9	0.77	x	2.3	9	x	40.4	x		0.76	×	0.8		=	81.36	(78)
Solar gains i	1 1				1		<u> </u>		um(74)m .						(02)
(83)m= 112.8 Total gains -		256.8	315.19	352.34	350.02	337.32	309	9.22	276.77	209.13	3 134.73	96.8	52		(83)
(84)m= 467.9		597.57	635.31	650.79	628.36	, walls	570	9.33	558	511.10	6 460.56	441.1	16		(84)
	<u> </u>				I	003.13	573	9.55	550	511.10	400.00	441.	10		(04)
7. Mean int						· -		. .							
Temperatu	0	01			U		ble 9), Th1	I (°C)					21	(85)
Utilisation f	<u> </u>				r`	1 (0	0.4	New				
		Mar	Apr	May	Jun	Jul		ug	Sep	Oct		De	ec		(86)
(86)m= 1	1	0.99	0.98	0.93	0.81	0.64	0.	69	0.89	0.98	1	1			(00)
Mean interr					r	-i	1	- 1	,						(07)
(87)m= 19.71	19.87	20.1	20.41	20.7	20.91	20.98	20	.97	20.83	20.46	20.03	19.6	9		(87)
Temperatu		eating p		n rest of		g from Ta	able	9, Th	n2 (°C)		-				
(88)m= 19.95	5 19.96	19.96	19.97	19.98	19.99	19.99	19	.99	19.98	19.98	19.97	19.9	7		(88)
Utilisation f	actor for ga	ins for	est of d	welling,	h2,m (s	ee Table	9a)								
(89)m= 1	1	0.99	0.97	0.9	0.73	0.51	0.	56	0.83	0.97	1	1			(89)

It A = Loring area + (4) = (91) Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (92) (10:12 10:26 10:20:20 10:20:20 10:20:20 10:20:21	INCall	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	ps 3 to 7	7 in Tabl	e 9c)					
Mean internal temperature (for the whole dwelling) = fLA x T1 + (1 - fLA) x T2 (\$20)** 19:12 19:21 19:51 19:20:1 20:34 <th colsp<="" td=""><td>(90)m=</td><td>18.78</td><td>18.94</td><td>19.17</td><td>19.49</td><td>19.76</td><td>19.94</td><td>19.98</td><td>19.98</td><td>19.89</td><td>19.54</td><td>19.11</td><td>18.77</td><td></td><td>(90)</td></th>	<td>(90)m=</td> <td>18.78</td> <td>18.94</td> <td>19.17</td> <td>19.49</td> <td>19.76</td> <td>19.94</td> <td>19.98</td> <td>19.98</td> <td>19.89</td> <td>19.54</td> <td>19.11</td> <td>18.77</td> <td></td> <td>(90)</td>	(90)m=	18.78	18.94	19.17	19.49	19.76	19.94	19.98	19.98	19.89	19.54	19.11	18.77		(90)
(92)m 19.12 19.27 19.51 19.82 20.1 20.29 20.34 20.23 19.87 19.45 19.1 (92) Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93) 8. Space heating requirement (93) 8. Space heating requirement Using Table 3e, where appropriate (93) (93) 9. Space heating requirement Using Table 3e, where appropriate (93) 9. Space heating requirement Using Table 3e, where appropriate (93) 9. Space heating requirement (94) Using Table 3e, where appropriate (94) Using the utilisation factor for gains, hm: (94) (94) (94) (94) (94) Ubsitu gains, hmGr, W = (94)m X (84)m (85) 0.85 0.97 0.86 458.03 440.03 (95) Monthly average external temperature from Table 8 (96)m 44 49 6.8 81.7 168.6 16.4 14.1 10.6 74.2 (96) (97) Space heating requirement for each nonth, KWhmonth = 0.024 x (97)m (97) 97.5 360.2 169.2 11								•		f	LA = Livin	g area ÷ (4	4) =	0.36	(91)	
(92)m 19.12 19.27 19.51 19.82 20.1 20.29 20.34 20.23 19.87 19.45 19.1 (92) Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93) 8. Space heating requirement (93) 8. Space heating requirement Using Table 3e, where appropriate (93) (93) 9. Space heating requirement Using Table 3e, where appropriate (93) 9. Space heating requirement Using Table 3e, where appropriate (93) 9. Space heating requirement (94) Using Table 3e, where appropriate (94) Using the utilisation factor for gains, hm: (94) (94) (94) (94) (94) Ubsitu gains, hmGr, W = (94)m X (84)m (85) 0.85 0.97 0.86 458.03 440.03 (95) Monthly average external temperature from Table 8 (96)m 44 49 6.8 81.7 168.6 16.4 14.1 10.6 74.2 (96) (97) Space heating requirement for each nonth, KWhmonth = 0.024 x (97)m (97) 97.5 360.2 169.2 11	Moon	intorna	l tompor	atura (fo	r the wh	olo dwo	llina) – fl	ΙΔ 🗸 Τ1	⊥ (1 _ fl	Δ) ~ T2						
Apply adjustment to the mean internal temperature from Table 4e, where appropriate (33) (35)me 19.12 19.22 19.51 19.82 20.1 20.29 20.34 20.34 20.23 19.87 19.45 19.1 (93) 3. Space heating requirement Utilisation factor for gains, using Table 9a Utilisation factor for gains, hm: (94)m (94)m Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)m (94)m (94)m (94)m (94)m (94)m (94)m (94)m (94) (94) (94) (94) (94) (94)m (94) (94)m			<u> </u>	<u>``</u>	1	i	<u> </u>	r			19.87	19.45	19.1		(92)	
												10110				
8. Space heating requirement Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, hm: (94)m Utilisation factor for gains, hm: (94)m (95)m (95) (95) (96)m (96)m (96)m (96)m (96)m (96)m (96)m (96)m (96)m (97)m (93)m (94)m (97)m (96)m (97)m (96)m (97)m (96)m (96)m (96)m (96)m (96)m (1	i	i	· · · ·	i	i			-	19.45	19.1		(93)	
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a. Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (4) (4) (4) (4) (4) (4) (4) Useful gains, hm: (6) (6,1) 0.85 0.97 0.99 1 (4) Useful gains, hm: (6) (6,1) 0.85 0.97 0.99 1 (4) Useful gains, hm: (6) (6,1) 0.85 0.97 472.07 496.59 456.03 440.33 (65) Monthly average external temperature from Table 8 (6) 16.4 1.41 10.6 7.1 4.2 (6) (9) 1.24.69 1327.52 1242.78 1027.87 788.4 2.6.9 365.3 365.8 570.52 870.32 1185.23 1141.9.8 (67) Space heating requirement for each month, KWh/month = 0.024 k [(97)m = (05)m] k (4)m (4)m (9) 372.053 (98) 372.053 1161.92 11101.92	· ·								2010 1	20120	10101	10110			()	
the utilisation factor for gains using Table 9a Uan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)m= 1 0.99 0.99 0.96 0.9 0.76 0.56 0.61 0.85 0.97 0.99 1 (94) Useful gains, hmGm, W = (94)m x (84)m (95)m= 4.67.1 540.53 589.63 613.07 589.7 474.98 337.75 350.78 472.07 496.59 458.03 440.33 (95) Monthly average external temperature from Table 8 (96)m= 4.3 4.9 0.5 8.9 11.7 14.8 16.6 16.4 14.1 10.8 7.1 4.2 (96) Heat loss rate for mean internal temperature (nm, W = (39)m × (93)m - (96)m) (97)m= 1424.69 137.52 1242.78 102.787 788.14 326.3 346.53 383.8 570.52 870.32 1165.23 1145.95 (97) Space heating requirement for each month, kWW/mmH = 0.024 x (197)m - (95)m) x (41)m (93)m= 712.74 562.46 485.94 238.66 148.38 0 0 0 0 2 78.06 509.18 725.12 Total pek year (KWh year) = Sum(36)×.e. v = 3720.53 (96) Space heating requirement in kWV/m ² /year Be Space heating requirement in kWV/m ² /year Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) (100)m 0 0 0 0 0 0 0 870.5 885.29 702.00 0 0 0 0 (100) Utilisation factor for loss hm (101)m 0 0 0 0 0 0 0 0 870.5 885.29 702.00 0 0 0 0 (100) (103)m 0 0 0 0 0 0 0 0 829.43 786.1 772.2 0 0 0 0 0 (102) Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m - (102)m]x (41)m set (104)m c zero if (104)m < 3 x (98)m (104)m 0 0 0 0 0 0 0 854.4 137.37 117.81 0 0 0 0 (102) Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m - (102)m]x (41)m set (104)m c 2 0 0 0 0 0 0 25 0.25 0.25 0 0 0 0 0 Total = Sum(104) = 141.02 (104) Total = Sum(104) = 0 (105) Intermittency factor (Table 10b) (105)m 0 0 0 0 0 0 0 25 0.25 0.25 0 0 0 0 0 Total = Sum(104) = 0 (106) Space cooling requirement for month = (104)m × (105) x (106)m						re obtain	ed at st	en 11 of	Table Of	n so tha	t Ti m-('	76)m an	d re-calc	ulate		
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)m 1 0.99 0.98 0.9 0.76 0.56 0.81 0.85 0.97 0.99 1 (94) Useful gains, hmCm, W (94)m X (84)m (95)m 466.71 540.53 588.63 613.07 588.7 474.98 337.76 350.78 472.07 486.58 458.03 440.33 (95) Monthy average external temperature from Table 8 (96)m 4.3 4.9 6.5 6.9 11.7 14.6 16.6 16.1 14.1 10.6 7.1 4.2 (96) (97)m 1424.89 1307.52 1242.78 102.787 788.44 328.9 363.8 570.52 870.32 1141.95 (97) Space heating requirement for each month, kWh/m2/year					•					5, 50 tha	t 11,111–(1	<i>i</i> 0)111 an		uate		
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Useful gains, hmGm, W = (94)m x (84)m (95)m 466.71 540.53 589.63 613.07 588.7 474.98 337.75 350.78 472.07 496.59 458.03 440.33 (95) Monthly average external temperature from Table 8 (96)m 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96)m 4.3 4.9 6.5 1027.67 789.14 52.9 346.53 363.8 570.52 870.32 1165.23 1414.95 Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m (97)m 1424.68 1937.52 1242.78 1027.67 789.14 52.9 346.53 363.8 570.52 870.32 1165.23 1414.95 Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m (98)m 712.74 552.46 485.94 298.65 148.38 0 0 0 0 0 278.05 506.18 725.12 Space heating requirement in kWh/m ² /year Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) (100)m 0 0 0 0 0 870.5 685.29 702.09 0 0 0 0 0 (101) Useful loss, hmLm (Watts) = (100)m x (101)m (102)m 0 0 0 0 0 0 870.5 685.29 702.09 0 0 0 0 (102) Gains (solar gains calculated for applicable weather region, see Table 10) (103)m 0 0 0 0 0 0 829.43 798.1 772.2 0 0 0 0 0 (103) Space cooling requirement for month, whole dwelling, continuous (kWh) = $0.024 x [(103)m - (102)m] x (41)m$ set (104)m to zero if (104)m < 3 x (98)m (104)m 0 0 0 0 0 0 829.43 798.1 772.2 0 0 0 0 0 (103) ECOoled fraction r for loss hm (104)m 0 0 0 0 0 0 829.43 179.1 177.81 0 0 0 0 (103) Total = Sum(104) = 341.02 (104) f C = cooled area \div (4) = 1 (105) Intermittency factor (Table 10b) (106)m 0 0 0 0 0 0.25 0.25 0.25 0 0 0 0 (107) Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m - (102)m] x (41)m (106)m 0 0 0 0 0 0 0 0.25 0.25 0.25 0 0 0 0 (104) Space cooling requirement for month = (104)m × (105) × (106)m (107)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Utilisa	ation fac	tor for g	ains, hm										I		
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$\begin{array}{c c c c c c c c c c c c c c c c c c c $	(95)m=	466.71	540.53	589.63	613.07	588.7	474.98	337.75	350.78	472.07	496.59	458.03	440.33		(95)	
Heat loss rate for mean internal temperature, Lm , W =[(39)m × [(93)m - (96)m] (97)m - 424.69 (97)m - 424.69 Space heating requirement for each month, kWh/month = 0.024 × [(97)m - (95)m] × (41)m (97) Space heating requirement for each month, kWh/month = 0.024 × [(97)m - (95)m] × (41)m (89)m - 712.74 Space heating requirement for each month, kWh/month = 0.024 × [(97)m - (95)m] × (41)m Total pervear (kWh/year) = Sum(98)st = 3720.53 Space heating requirement in kWh/m?/year Colspan="4">Colspan="4"Colspan="4">Colspan="4"Colspan="4">Colspan="4"Colspan="4">Colspan="4"Colspan="4"Colspan="4">Colspan="4"Colspan="4"Colspan="4"Colspan="4"Colspan="4"Colspan="4"Colspan="4"Colspan="4"Colspa	Month	nly aver	age exte	rnal tem	perature	e from Ta	able 8									
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)	
Space heating requirement for each month, kWh/month = $0.024 \times [(97)m - (95)m] \times (4^{\circ})m$ (98)m= 712.74 562.46 485.94 296.65 148.38 0 0 0 278.05 509.18 725.12 Total per year (kWh/year) = Sum(98):	Heat I	loss rate	e for mea	an interr	al tempe	erature,	Lm, W =	- =[(39)m :	x [(93)m∙	– (96)m]					
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	(97)m=	1424.69	1377.52	1242.78	1027.87	788.14	526.9	346.53	363.8	570.52	870.32	1165.23	1414.95	_	(97)	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Space	e heatin	g require	ement fo	r each n	nonth, k	Nh/mont	th = 0.02	4 x [(97))m – (95)m] x (4′	1)m				
Space heating requirement in kWh/m²/year 44.83 (99) 82: Space cooling requirement Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) (100) (100)m 0 0 0 0 (100) (101)m (101)m (102)m 0 0 (101) Utilisation factor for loss hm (102)m (102)m (102) (102) (102) Gains (solar gains calculated for applicable weather region, see Table 10) (103)m (104)m (3 × (98)m Total = Sum(104) = 341.02 (104) Total = Sum(104) =	(98)m=		ř								<u> </u>	·	725.12			
8c. Space cooling requirement Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) 0 <									Tota	l per year	(kWh/year	·) = Sum(9	8)15,912 =	3720.53	(98)	
8c. Space cooling requirement Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) 0 <	Space	e heatin	a require	ement in	$kM/h/m^{2}$	2/vear								11.92		
Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) 0 <td></td> <td></td> <td></td> <td></td> <td></td> <td>/ycai</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>l</td> <td>44.05</td> <td></td>						/ycai							l	44.05		
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Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) (100)m= 0 0 0 870.5 685.29 702.09 0	Calcu	lated to														
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Utilisation factor for loss hm (101)m = 0 0 0 0 0.82 0.89 0.87 0 0 0 0 (101) Utilisation factor for loss hm (101)m = 0 0 0 0 0.82 0.89 0.87 0			Feb	Mar	Apr	May	Jun		-							
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	1	loss rate	Feb e Lm (ca	Mar Iculated	Apr using 2	May 5°C inter	Jun nal temp	perature	and exte	ernal ten	nperatur	e from T	able 10)		(100)	
Useful loss, hmLm (Watts) = (100)m x (101)m (102)m = 0 0 0 0 0 710.77 612.65 614.12 0 0 0 0 0 (102) Gains (solar gains calculated for applicable weather region, see Table 10) (103)m = 0 0 0 0 0 829.43 798.1 772.2 0 0 0 0 0 (103) Space cooling requirement for month, whole dwelling, continuous (kWh) = $0.024 \times [(103)m - (102)m] \times (41)m$ (104)m to zero if (104)m < $3 \times (98)m$ (104)m to zero if (104)m < $3 \times (98)m$ Total = Sum(104) = 341.02 (104) Cooled fraction f C = cooled area $\div (4) = 1$ (105) Intermittency factor (Table 10b) Total = Sum(104) = 0 0 0 0 (106)m = 0 0 0 0 0 0 0 0.25 0.25 0.25 0 0 0 0 0 Space cooling requirement for month = (104)m $\times (105) \times (106)m$ (106)m = 0 0 0	(100)m=	loss rate	Feb e Lm (ca 0	Mar Iculated 0	Apr using 2	May 5°C inter	Jun nal temp	perature	and exte	ernal ten	nperatur	e from T	able 10)		(100)	
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Intermittency factor (Table 10b) (106)m= 0 (106) (107)m= 0 0 0 0 0 0 (106) (107)m= 0 0 0 0 0 0 (106) (107)m= 0 0 0 0 (106) (107)m= 0 0 0 0 (106) (107)m= 0 0 0 0 0 (106) 0 (106) 0	(100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= <i>Space</i> set (1	loss rate 0 ation fac 0 11 loss, h 0 (solar g 0 e cooling 04)m to	Feb e Lm (ca o tor for lo 0 mLm (V 0 gains ca 0 g require 2 zero if (Mar lculated 0 oss hm 0 vatts) = 0 lculated 0 ement fo 104)m <	Apr using 29 0 (100)m × 0 for appli 0 r month, 3 × (98	May 5°C inter 0 (101)m cable we 0 whole c)m	Jun nal temp 870.5 0.82 710.77 eather re 829.43 <i>Iwelling,</i>	685.29 0.89 612.65 egion, se 798.1 continue	and exte 702.09 0.87 614.12 e Table 772.2 cous (kW	rmal ten 0 0 10) 0 $h = 0.0.$	0 0 0 24 x [(10	e from T 0 0 0 0 0 3) <i>m</i> – (1	able 10) 0 0 0 102)m]:		(101) (102) (103)	
Total = Sum(1.0.4) = 0 (106) Space cooling requirement for month = (104)m × (105) × (106)m (107)m = 0 0 0 0 0 21.36 34.49 29.4 0 0 0 0 0 0 (107)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m=	loss rate 0 ation fac 0 1 loss, h 0 s (solar g 0 e cooling 04)m to 0	Feb e Lm (ca o tor for lc 0 mLm (V 0 gains ca 0 g require 0 zero if (0	Mar lculated 0 oss hm 0 vatts) = 0 lculated 0 ement fo 104)m <	Apr using 29 0 (100)m × 0 for appli 0 r month, 3 × (98	May 5°C inter 0 (101)m cable we 0 whole c)m	Jun nal temp 870.5 0.82 710.77 eather re 829.43 <i>Iwelling,</i>	685.29 0.89 612.65 egion, se 798.1 continue	and exte 702.09 0.87 614.12 e Table 772.2 cous (kW	ernal ten 0 10) 0 (h) = 0.0 Total	0 0 24 x [(10 0 = Sum(e from T 0 0 0 0 0 3) <i>m</i> – (0 104)	able 10) 0 0 0 102)m] 2 0 =	341.02	(101) (102) (103)	
Space cooling requirement for month = $(104)m \times (105) \times (106)m$ (107)m= 0 0 <th colspa<="" td=""><td>(100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= <i>Space</i> set (1 (104)m= Coolec</td><td>loss rate 0 ation fac 0 Il loss, h 0 s (solar g 0 e coolin 04)m to 0 d fraction</td><td>Feb e Lm (ca otor for lc omLm (W o gains ca o g require zero if (o</td><td>Mar lculated 0 oss hm 0 /atts) = 0 lculated 0 ement fo 104)m < 0</td><td>Apr using 25 0 (100)m × 0 for appli 0 <i>r month,</i> 3 × (98 0</td><td>May 5°C inter 0 (101)m cable we 0 whole c)m</td><td>Jun nal temp 870.5 0.82 710.77 eather re 829.43 <i>Iwelling,</i></td><td>685.29 0.89 612.65 egion, se 798.1 continue</td><td>and exte 702.09 0.87 614.12 e Table 772.2 cous (kW</td><td>ernal ten 0 10) 0 (h) = 0.0 Total</td><td>0 0 24 x [(10 0 = Sum(</td><td>e from T 0 0 0 0 0 3)<i>m</i> – (0 104)</td><td>able 10) 0 0 0 102)m] 2 0 =</td><td>341.02</td><td>(101) (102) (103)</td></th>	<td>(100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= <i>Space</i> set (1 (104)m= Coolec</td> <td>loss rate 0 ation fac 0 Il loss, h 0 s (solar g 0 e coolin 04)m to 0 d fraction</td> <td>Feb e Lm (ca otor for lc omLm (W o gains ca o g require zero if (o</td> <td>Mar lculated 0 oss hm 0 /atts) = 0 lculated 0 ement fo 104)m < 0</td> <td>Apr using 25 0 (100)m × 0 for appli 0 <i>r month,</i> 3 × (98 0</td> <td>May 5°C inter 0 (101)m cable we 0 whole c)m</td> <td>Jun nal temp 870.5 0.82 710.77 eather re 829.43 <i>Iwelling,</i></td> <td>685.29 0.89 612.65 egion, se 798.1 continue</td> <td>and exte 702.09 0.87 614.12 e Table 772.2 cous (kW</td> <td>ernal ten 0 10) 0 (h) = 0.0 Total</td> <td>0 0 24 x [(10 0 = Sum(</td> <td>e from T 0 0 0 0 0 3)<i>m</i> – (0 104)</td> <td>able 10) 0 0 0 102)m] 2 0 =</td> <td>341.02</td> <td>(101) (102) (103)</td>	(100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= <i>Space</i> set (1 (104)m= Coolec	loss rate 0 ation fac 0 Il loss, h 0 s (solar g 0 e coolin 04)m to 0 d fraction	Feb e Lm (ca otor for lc omLm (W o gains ca o g require zero if (o	Mar lculated 0 oss hm 0 /atts) = 0 lculated 0 ement fo 104)m < 0	Apr using 25 0 (100)m × 0 for appli 0 <i>r month,</i> 3 × (98 0	May 5°C inter 0 (101)m cable we 0 whole c)m	Jun nal temp 870.5 0.82 710.77 eather re 829.43 <i>Iwelling,</i>	685.29 0.89 612.65 egion, se 798.1 continue	and exte 702.09 0.87 614.12 e Table 772.2 cous (kW	ernal ten 0 10) 0 (h) = 0.0 Total	0 0 24 x [(10 0 = Sum(e from T 0 0 0 0 0 3) <i>m</i> – (0 104)	able 10) 0 0 0 102)m] 2 0 =	341.02	(101) (102) (103)
(107)m= 0 0 0 0 0 21.36 34.49 29.4 0 0 0 0	(100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= <i>Space</i> set (1 (104)m= Coolec Intermi	loss rate 0 ation fac 0 1 loss, h 0 s (solar g 0 e cooling 04)m to 0 d fraction ittency f	Feb = Lm (ca 0 tor for lo 0 mLm (W 0 gains ca 0 g require 2 zero if (0 n actor (Ta	Mar Iculated 0 oss hm 0 vatts) = 0 Iculated 0 Iculated 0 Iculated 0 Iculated 0 ament for 0 able 10b	Apr using 25 0 (100)m × 0 for appli 0 r month, 3 × (98 0)	May 5°C inter 0 (101)m cable we whole c)m 0	Jun nal temp 870.5 0.82 710.77 eather re 829.43 <i>welling,</i> 85.44	0.89 0.89 612.65 egion, se 798.1 continue 137.97	and exte 702.09 0.87 614.12 e Table 772.2 Dus (kW 117.61	ernal ten 0 10) 0 10) 0 10) 0 Total f C =	0 0 0 24 x [(10 0 = Sum(cooled a	e from T 0 0 0 03) <i>m</i> – (104) area ÷ (4	able 10) 0 0 0 102)m] 2 0 = +) =	341.02	(101) (102) (103)	
	(100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= <i>Space</i> set (1 (104)m= Coolec	loss rate 0 ation fac 0 1 loss, h 0 s (solar g 0 e cooling 04)m to 0 d fraction ittency f	Feb E Lm (ca 0 tor for lo 0 mLm (W 0 gains ca 0 g require 2 zero if (0 n actor (Ta	Mar Iculated 0 oss hm 0 vatts) = 0 Iculated 0 Iculated 0 Iculated 0 Iculated 0 ament for 0 able 10b	Apr using 25 0 (100)m × 0 for appli 0 r month, 3 × (98 0)	May 5°C inter 0 (101)m cable we whole c)m 0	Jun nal temp 870.5 0.82 710.77 eather re 829.43 <i>welling,</i> 85.44	0.89 0.89 612.65 egion, se 798.1 continue 137.97	and exte 702.09 0.87 614.12 e Table 772.2 Dus (kW 117.61	ernal ten 0 0 10) 0 /h) = 0.0. 0 Total f C = 0	0 0 0 24 x [(10 0 = Sum(cooled a	e from T 0 0 0 0 0 0 0 0 0 0 1 0 4 0 1 0 4 0 0	able 10) 0 0 0 102)m]: 0 = +) = 0	341.02	(101) (102) (103) (104) (105)	
Total = Sum(1,0,7) = 85.25 (107)	(100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= <i>Space</i> set (1 (104)m= Coolec Intermi (106)m=	loss rate 0 ation fac 0 1 loss, h 0 s (solar g 0 e cooling 04)m to 0 fraction ittency f 0	Feb e Lm (ca o tor for lo o mLm (W o gains ca o g require o zero if (o n actor (Ta o	Mar lculated 0 oss hm 0 /atts) = 0 lculated 0 /atts) = 0 lculated 0 /able 10b 0	Apr using 2: 0 (100)m x 0 for appli 0 <i>r month,</i> 3 x (98 0	May 5°C inter 0 (101)m 0 cable we 0 whole c)m 0	Jun nal temp 870.5 0.82 710.77 eather re 829.43 <i>welling,</i> 85.44	0.89 0.89 0.89 012.65 egion, se 798.1 continue 137.97 0.25	and exte 702.09 0.87 614.12 e Table 772.2 Dus (kW 117.61	ernal ten 0 0 10) 0 /h) = 0.0. 0 Total f C = 0	0 0 0 24 x [(10 0 = Sum(cooled a	e from T 0 0 0 0 0 0 0 0 0 0 1 0 4 0 1 0 4 0 0	able 10) 0 0 0 102)m]: 0 = +) = 0	341.02	(101) (102) (103) (104) (105)	
	(100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= <i>Space</i> set (1 (104)m= Coolec Intermi (106)m=	loss rate 0 ation fac 0 1 loss, h 0 (solar g 0 e cooling 0 d fraction ittency f 0 cooling	Feb e Lm (ca 0 ctor for lc 0 mLm (W 0 gains ca 0 g requirer 2 ero if (0 n actor (Ta 0 requirer	Mar Iculated 0 oss hm 0 Vatts) = 0 Iculated 0 Iculated 0 104)m < 0 able 10b 0 ment for	Apr using 2: 0 (100)m × 0 for appli 0 r month, 3 × (98 0) 0 month =	May 5°C inter 0 (101)m 0 cable we 0 whole c)m 0	Jun nal temp 870.5 0.82 710.77 eather re 829.43 <i>dwelling,</i> 85.44 0.25 × (105)	0.89 612.65 egion, se 798.1 continue 137.97 0.25 × (106)r	and exte 702.09 0.87 614.12 re Table 772.2 ous (kW 117.61	ernal ten 0 0 10) 0 /h) = 0.0 f C = 0 Total f C = 0 Total	0 0 0 24 x [(10 0 = Sum(cooled a 0 1 = Sum(e from T 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	able 10) 0 0 0 0 0 102)m]; 0 = 0 = 0 = 0	341.02	(101) (102) (103) (104) (105)	

Space cooling requirement in kWh/m²/year	(107) ÷ (4) =	1.03	(108)
8f. Fabric Energy Efficiency (calculated only ι	under special conditions, see section 11)		
Fabric Energy Efficiency	(99) + (108) =	45.85	(109)



				User D	etails:								
Assessor Name: Software Name:	Stroma FS	AP 201			Softwa	a Num are Ver	sion:		Versic	on: 1.0.0.28			
A daha a a			Р	roperty .	Address	: 3 Bed 2	2013 Bas	seline					
Address : 1. Overall dwelling dime	ansions:												
	51510115.			Area	a(m²)		Av. Hei	aht(m)		Volume(m ³)			
Ground floor						(1a) x	-	.5	(2a) =	121.92	(3a)		
First floor				4	8.77	(1b) x	2	.5	(2b) =	121.92	(3b)		
Total floor area TFA = (1	a)+(1b)+(1c)+	(1d)+(1e)+(1r	ı) g	7.54	(4)			1		1		
Dwelling volume						(3a)+(3b))+(3c)+(3d)+(3e)+	.(3n) =	243.85	(5)		
2. Ventilation rate:											1		
main secondary other total m ^a													
Number of chimneys				+ [0] = [0	x 4	40 =	0	(6a)		
Number of open flues	0		0] + [0] = [0	x 2	20 =	0	(6b)		
Number of intermittent fa	ins						3	x 1	0 =	30	(7a)		
Number of passive vents	6						0	x 1	0 =	0	(7b)		
Number of flueless gas fi	ires					Ē	0	x 4	40 =	0	(7c)		
									Air ch	anges per hou	ır		
Infiltration due to chimne	ys, flues and f	ans = (6a	a)+(6b)+(7	<mark>a)+</mark> (7b)+(7c) =		30	·	÷ (5) =	0.12	(8)		
If a pressurisation test has b			d, proceed	d to (17), d	otherwise of	continue fre	om (9) to (16)			- 1		
Number of storeys in the Additional infiltration	ne aw <u>eiling</u> (n	5)						[1]x0.1 =	0	(9) (10)		
Structural infiltration: 0	.25 for steel o	^r timber f	rame or	0.35 fo	r masoni	rv constr	uction	[(0)	1,0.1 -	0	(10)		
if both types of wall are p	resent, use the va	lue corres], ,		
deducting areas of openii If suspended wooden t	0 // 1		ed) or 0	1 (seale	ad) else	enter 0				0	(12)		
If no draught lobby, en		•		i (ocule	<i>a</i>), cioc					0	(13)		
Percentage of window			ripped							0	(14)		
Window infiltration		Ū			0.25 - [0.2	2 x (14) ÷ 1	= [00			0	(15)		
Infiltration rate					(8) + (10)	+ (11) + (1	2) + (13) +	- (15) =		0	(16)		
Air permeability value,	q50, expresse	ed in cub	ic metre	s per ho	our per s	quare m	etre of e	nvelope	area	6	(17)		
If based on air permeabil	lity value, then	(18) = [(1	7) ÷ 20]+(8	3), otherwi	ise (18) = ((16)				0.42	(18)		
Air permeability value applie	es if a pressurisati	on test has	been don	e or a deg	gree air pe	rmeability	is being us	sed			-		
Number of sides sheltere	ed									2	(19)		
Shelter factor						[0.075 x (1	9)] =			0.85	(20)		
Infiltration rate incorporat	-				(21) = (18) x (20) =				0.36	(21)		
Infiltration rate modified f		· · ·								1			
Jan Feb	Mar Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec				
Monthly average wind sp	eed from Tabl	e 7			i								
(22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7				

Wind	Factor (2	22a)m =	(22)m ÷	4										
(22a)m:	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjust	ted infiltr	ation rat	e (allowi	ing for sł	nelter ar	nd wind s	speed) =	: (21a) x	(22a)m					
-	0.46	0.45	0.44	0.4	0.39	0.34	0.34	0.33	0.36	0.39	0.4	0.42		
		<i>ctive air</i> al ventila	-	rate for t	he appli	cable ca	se	•				 Г		
				endix N (2	²³ h) – (23;	a) × Fmv (e	equation (N5)) othe	rwise (23h	(23a)		L	0	(23a)
						for in-use f				<i>)</i> = (200)		L	0	(23b) (23c)
			-	-	-					2h)m + (23b) x [L 1 – (23c)	-	(230)
(24a)m:		0		0	0	0	0	0		0		0]	(24a)
b) If	balance	ed mech	anical ve	entilation	without	heat red	covery (I	u MV) (24t)m = (22	1 2b)m + (23b)	1]		
(24b)m:	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If	whole h	iouse ex	tract ver	tilation of	or positiv	/e input v	ventilatio	on from o	outside		<u>.</u>			
	if (22b)r	n < 0.5 >	< (23b), t	then (24	c) = (23b	o); other	wise (24	c) = (22	b) m + 0.	.5 × (23b	o)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If						ve input erwise (2				0.51				
(24d)m:	_	0.6	0.6	0.58	0.57	0.56	0.56	0.56	0.56	0.57	0.58	0.59		(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24) or (24	c) or (24	ld) in bo	x (25)					
(25)m=	0.61	0.6	0.6	0.58	0.57	0.56	0.56	0.56	0.56	0.57	0.58	0.59		(25)
3 He	at losse	s and he	eat l <mark>oss</mark>	oaramet	er. 🗸									
	MENT	Gros	ss	Openin	igs	Net Ar		U-val		AXU		k-value		A X k
Deere		area	(m²)	r) ²	A ,r		W/m2		(VV/	K)	kJ/m²∙K		kJ/K
Doors		1				2.1	×	1.2	=	2.52	4			(26)
	ows Type					2.39	=	/[1/(1.4)+		3.17				(27)
	ows Type					2.39	=	/[1/(1.4)+	-	3.17				(27)
	ows Type					1.44	=	/[1/(1.4)+		1.91				(27)
	ws Type					1.44	= `.	/[1/(1.4)+		1.91				(27)
	ows Type	9 0				3.15		/[1/(1.4)+		4.18				(27)
Floor						48.77		0.2	=	9.75400			\downarrow	(28)
Walls		12		19.1	3	105.8	7 ×	0.24	=	25.41			╡ ┝━	(29)
Roof		48.7		0		48.77		0.16	=	7.8				(30)
		elements	s, m²			222.5	4				— , r			(31)
Party						25	×	0	=	0			╡ └─	(32)
	al floor					48.77) 0.0 <i>4</i>	. [(32d)
			ows, use e sides of ir				ated using	g tormula 1	/[(1/U-valu	le)+0.04] a	as given in	paragraph	3.2	
			= S (A x					(26)(30) + (32) =			Г	68.06	(33)
Heat o	capacity	Cm = S	(Axk)						((28).	(30) + (3	2) + (32a).	(32e) =	21016.99) (34)

Thermal mass parameter (TMP = Cm \div TFA) in kJ/m²K

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f

Indicative Value: Medium

250

(35)

can be ι	ised inste	ad of a de	tailed calc	ulation.										
Therm	al bridge	es : S (L	x Y) cal	culated	using Ap	pendix I	<						11.13	(36)
			are not kn	own (36) =	= 0.15 x (3	1)								
	abric he									(36) =			79.19	(37)
Ventila	tion hea			l monthly	y I				· · ·	= 0.33 × (r . ,		1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	48.69	48.36	48.04	46.53	46.25	44.93	44.93	44.69	45.44	46.25	46.82	47.42		(38)
Heat tr	ansfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	127.88	127.55	127.23	125.72	125.44	124.12	124.12	123.88	124.63	125.44	126.01	126.61		
						-	-	-		Average =		12 /12=	125.72	(39)
			HLP), W/	1					· · /	= (39)m ÷			1	
(40)m=	1.31	1.31	1.3	1.29	1.29	1.27	1.27	1.27	1.28	1.29	1.29	1.3		
Numbe	er of day	rs in moi	nth (Tab	le 1a)						Average =	Sum(40)1.	12 /12=	1.29	(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	iter heat	ing ene	rgy requ	irement:								kWh/ye	ear:	
A												_	1	()
		ipancy, l), N = 1		[1 - exp	(-0.0003	349 x (TF	-13.9	(2)1 + 0.0)013 x (⁻	TFA -13.		72		(42)
	A £ 13.9				()			/_/1			- /			
							erage =					3.89		(43)
		-		usage by . ^r day (<mark>all</mark> w		-	designed t ld)	o achieve	a water us	se target o	Γ			
	Jan	Feb	Mar		May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
Hot wate				Apr ach month			Table 1c x	Aug (43)	Sep	Ou	NUV	Dec	1	
(44)m=	114.28	110.12	105.97	101.81	97.66	93.5	93.5	97.66	101.81	105.97	110.12	114.28	1	
(++)11=	114.20	110.12	105.57	101.01	97.00	33.5	33.5	97.00		Total = Su			1246.68	(44)
Energy of	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D	0Tm / 3600					1240.00	()
(45)m=	169.47	148.22	152.95	133.35	127.95	110.41	102.31	117.4	118.81	138.46	151.14	164.12]	
										rotal = Su	m(45)₁12 =		1634.59	(45)
lf instan	taneous w	ater heatii	ng at point	of use (no	o hot water	r storage),	enter 0 in	boxes (46) to (61)					
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(46)
	storage												1	
-		. ,					storage		ame ves	sel		150		(47)
	•	-			-) litres in	• •	ara) ant	or (0) in (47)			
	storage		not wate	er (unis ir	iciudes i	nstantar	neous co	ווסמ ומחז	ers) ente	er u in (47)			
	-		eclared I	oss facto	or is kno	wn (kWł	n/day):					0	1	(48)
			m Table			v	,					0]	(49)
				, kWh/ye	ar			(48) x (49) =			0]	(50)
			-	ylinder l		or is not			, –			0]	(00)
,				om Tabl								0]	(51)
	•	-	ee secti	on 4.3									-	
		from Ta		0h								0	ł	(52)
rempe	erature fa	actor fro	m Table	ZD								0		(53)

		om water (54) in (5	-	e, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54) (55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)r	m	L		1	
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(56)
	er contain	L s dedicate	l d solar sto	l orage, (57)	l m = (56)m	x [(50) – (H11)] ÷ (50	0), else (5 ⁻	7)m = (56)	m where (L H11) is fro	I om Appenc	lix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(57)
Primar	y circuit	loss (ar	nual) fro	om Table	e 3							0]	(58)
	•			for each	,		. ,	• •						
•		r	r	1	r	i	1		ı cylindei		r í		1	(50)
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(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 req	uired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	I
(62)m=	144.05	125.99	130.01	113.34	108.76	93.85	86.96	99.79	100.99	117.69	128.47	139.51		(62)
Solar DI	HW input	calculated	using App	endix G o	r Appendix	H (negati	ve quantity	v) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	NWHRS	applies	, see Ap	pendix (G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(63)
Output	from w	ater hea	ter										1	
(64)m=	144.05	125.99	130.01	113.34	108.76	93.85	86.96	99.79	100.99	117.69	128.47	139.51		-
								Outp	out from wa	ater heate	r (annual)₁	12	1389.41	(64)
Heat g	ains fro	m water	heating	, kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (61)m	1] + 0.8 x	(46)m	+ (57)m	+ (59)m]	
(65)m=	36.01	31.5	32.5	28.34	27.19	23.46	21.74	24.95	25.25	29.42	32.12	34.88		(65)
inclu	ide (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	neating	
5. Int	ternal ga	ains (see	e Table 5	5 and 5a):									
Metab	olic gair	s (Table	e 5), Wat	tts								-		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	135.78	135.78	135.78	135.78	135.78	135.78	135.78	135.78	135.78	135.78	135.78	135.78		(66)
Lightin	g gains	(calcula	ted in A	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	22.66	20.12	16.36	12.39	9.26	7.82	8.45	10.98	14.74	18.71	21.84	23.29]	(67)
Applia	nces ga	ins (calc	ulated ir	n Append	dix L, eq	uation L	13 or L1	3a), also	see Tal	ble 5				
(68)m=	252.29	254.91	248.31	234.27	216.54	199.87	188.74	186.12	192.72	206.77	224.5	241.16		(68)
Cookir	ng gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a)	, also se	e Table	5		-		
(69)m=	36.58	36.58	36.58	36.58	36.58	36.58	36.58	36.58	36.58	36.58	36.58	36.58		(69)
Pumps	and fai	ns gains	(Table :	5a)										
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	s e.g. ev	vaporatio	n (nega	tive valu	es) (Tab	le 5)			•			•		
(71)m=	-108.62	-108.62	-108.62	-108.62	-108.62	-108.62	-108.62	-108.62	-108.62	-108.62	-108.62	-108.62		(71)
Water	heating	gains (T	able 5)									!	1	
(72)m=	48.4	46.87	43.69	39.36	36.54	32.59	29.22	33.53	35.06	39.55	44.61	46.88		(72)
Total i	nternal	gains =	:	!		(66)	m + (67)m	ı + (68)m +	⊦ (69)m + ((70)m + (7	1)m + (72))m	1	
(73)m=	387.08	385.64	372.1	349.75	326.08	304.01	290.15	294.37	306.26	328.76	354.68	375.06]	(73)
	lar gains	S:		1	1		1	L	1	l		1	4	

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

Orientation:	Access Factor Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North 0.9	x 0.77	x	2.39	x	10.63	×	0.76	x	0.8	=	21.42	(74)
North 0.9	x 0.77	x	1.44	x	10.63	x	0.76	x	0.8	=	12.9	(74)
North 0.9	x 0.77	x	2.39	x	20.32	x	0.76	x	0.8	=	40.93	(74)
North 0.9	x 0.77	x	1.44	x	20.32	x	0.76	x	0.8	=	24.66	(74)
North 0.9	× 0.77	x	2.39	x	34.53	x	0.76	x	0.8	=	69.54	(74)
North 0.9	× 0.77	x	1.44	x	34.53	×	0.76	x	0.8	=	41.9	(74)
North 0.9	x 0.77	x	2.39	x	55.46	×	0.76	x	0.8	=	111.71	(74)
North 0.9	x 0.77	x	1.44	x	55.46	x	0.76	x	0.8	=	67.3	(74)
North 0.9	x 0.77	x	2.39	x	74.72	x	0.76	x	0.8	=	150.48	(74)
North 0.9	x 0.77	x	1.44	x	74.72	×	0.76	x	0.8	=	90.67	(74)
North 0.9	x 0.77	x	2.39	x	79.99	×	0.76	x	0.8	=	161.09	(74)
North 0.9	x 0.77	x	1.44	x	79.99	×	0.76	x	0.8	=	97.06	(74)
North 0.9	x 0.77	x	2.39	x	74.68	x	0.76	x	0.8	=	150.4	(74)
North 0.9	x 0.77	x	1.44	x	74.68	×	0.76	x	0.8	=	90.62	(74)
North 0.9	x 0.77	x	2.39	x	59.25	×	0.76	x	0.8	=	119.32	(74)
North 0.9	× 0.77	x	1.44	×	59.25	X	0.76	X	0.8	=	71.89	(74)
North 0.9	x 0.77	x	2.39	x	41.52	x	0.76	x	0.8	=	83.62	(74)
North 0.9	x 0.77	x	1.44	x	41.52	×	0.76	x	0.8	=	50.38	(74)
North 0.9	x 0.77	x	2.39	x	24.19	x	0.76	x	0.8	=	48.72	(74)
North 0.9	x 0.77	x	1.44	×	24.19	×	0.76	x	0.8	=	29.35	(74)
North 0.9	x 0.77	x	2.39	×	13.12	×	0.76	×	0.8	=	26.42	(74)
North 0.9	x 0.77	x	1.44	x	13.12	x	0.76	x	0.8	=	15.92	(74)
North 0.9	x 0.77	x	2.39	x	8.86	×	0.76	x	0.8	=	17.85	(74)
North 0.9	x 0.77	x	1.44	x	8.86	x	0.76	x	0.8	=	10.76	(74)
South 0.9	x 0.77	x	2.39	x	46.75	×	0.76	x	0.8	=	94.16	(78)
South 0.9	x 0.77	x	1.44	x	46.75	×	0.76	x	0.8	=	28.37	(78)
South 0.9	x 0.77	x	3.15	x	46.75	×	0.76	x	0.8	=	62.05	(78)
South 0.9	x 0.77	x	2.39	x	76.57	×	0.76	x	0.8	=	154.21	(78)
South 0.9	x 0.77	x	1.44	x	76.57	x	0.76	x	0.8	=	46.46	(78)
South 0.9	x 0.77	x	3.15	x	76.57	×	0.76	x	0.8	=	101.62	(78)
South 0.9	x 0.77	x	2.39	x	97.53	×	0.76	x	0.8	=	196.44	(78)
South 0.9	× 0.77	x	1.44	x	97.53	x	0.76	x	0.8	=	59.18	(78)
South 0.9	x 0.77	x	3.15	x	97.53	x	0.76	x	0.8	=	129.45	(78)
South 0.9	x 0.77	x	2.39	x	110.23	×	0.76	x	0.8	=	222.01	(78)
South 0.9	x 0.77	x	1.44	x	110.23	×	0.76	x	0.8	=	66.88	(78)
South 0.9	x 0.77	x	3.15	×	110.23	×	0.76	x	0.8	=	146.31	(78)
South 0.9	x 0.77	x	2.39	×	114.87	×	0.76	x	0.8	=	231.35	(78)
South 0.9	x 0.77	x	1.44	×	114.87	×	0.76	x	0.8	=	69.7	(78)
South 0.9	x 0.77	X	3.15	x	114.87	×	0.76	x	0.8	=	152.46	(78)

South South									_				
South	0.9x	0.77	×	2.39	x	110.55	x	0.76	x	0.8	=	222.65	(78)
	0.9x	0.77	x	1.44	x	110.55	x	0.76	x	0.8	=	67.07	(78)
South	0.9x	0.77	x	3.15	x	110.55	x	0.76	x	0.8	=	146.72	(78)
South	0.9x	0.77	x	2.39	x	108.01	x	0.76	x	0.8	=	217.54	(78)
South	0.9x	0.77	x	1.44	×	108.01	x	0.76	×	0.8	=	65.53	(78)
South	0.9x	0.77	x	3.15	×	108.01	x	0.76	x	0.8	=	143.36	(78)
South	0.9x	0.77	x	2.39	×	104.89	x	0.76	×	0.8	=	211.26	(78)
South	0.9x	0.77	x	1.44	x	104.89	x	0.76	x	0.8	=	63.64	(78)
South	0.9x	0.77	x	3.15	×	104.89	x	0.76	x	0.8	=	139.22	(78)
South	0.9x	0.77	x	2.39	x	101.89	x	0.76	x	0.8	=	205.2	(78)
South	0.9x	0.77	x	1.44	x	101.89	x	0.76	x	0.8	=	61.82	(78)
South	0.9x	0.77	x	3.15	x	101.89	x	0.76	×	0.8	=	135.23	(78)
South	0.9x	0.77	x	2.39	×	82.59	x	0.76	x	0.8	=	166.33	(78)
South	0.9x	0.77	x	1.44	×	82.59	x	0.76	×	0.8	=	50.11	(78)
South	0.9x	0.77	x	3.15	×	82.59	x	0.76	×	0.8	=	109.61	(78)
South	0.9x	0.77	x	2.39	×	55.42	x	0.76	x	0.8	=	111.61	(78)
South	0.9x				x	55.42	x	0.76	x	0.8	=	33.62	(78)
South	0.9x	•		3.15	×	55.42	x	0.76	x	0.8	=	73.55	(78)
South	0.9x	0.77	x	2.39	x	40.4] x	0.76	x	0.8	=	81.36	(78)
South	0.9x	0.77	x	1.44	x	40.4	x	0.76	x	0.8	=	24.51	(78)
South	0.9x	0.77	x	3.15] ×	40.4	x	0.76	x	0.8	=	53.62	(78)
Solar g	gains in	watts, calcu	lated	for each mon	th		(83)m	- = S um(74)m	(82)m				
(83)m=	218.9	367.88 49	6.51	614.22 694.6	5 6	94.59 667.45	605	.34 536.24	404.12	261.12	188.1		(83)
Total g	ains – i	nternal and	solar	(84)m = (73)r	n + (83)m , watts							
(84)m=	605.98	753.51 86	8.6	963.96 1020.7	73 9	98.61 957.6	899		732.88	615.8	563.16		(84)
7 Mo	an inter	nal tempera					033	.71 842.5				ļ	(04)
1.1016			ture (heating sease	on)			.71 842.5	. 02.00				(04)
	erature	during heat		Ŭ		area from Tal	I					21	(85)
Temp		•	ing pe	Ŭ	ving		I					21	_
Temp		tor for gains	ing pe	eriods in the li	ving ,m (s		ble 9,		Oct	Nov	Dec	21	_
Temp	ation fac	tor for gains	ing pe	eriods in the li ving area, h1	ving ,m (s y	ee Table 9a)	ble 9,	Th1 (°C) ug Sep		Nov 0.99	Dec 1	21	_
Temp Utilisa (86)m=	ation fac Jan 1	Feb N	ing pe for li /lar 98	eriods in the li ving area, h1 Apr Ma 0.95 0.87	ving ,m (s y	ee Table 9a) Jun Jul	Die 9,	Th1 (°C) ug Sep 6 0.83	Oct	_		21	(85)
Temp Utilisa (86)m=	ation fac Jan 1	Feb N 0.99 0.	ing pe for li /lar 98	eriods in the li ving area, h1 Apr Ma 0.95 0.87	y (follc	ee Table 9a) Jun Jul 0.72 0.55	Die 9,	Th1 (°C) ug Sep 6 0.83 fable 9c)	Oct	0.99		21	(85)
Temp Utilisa (86)m= Mean (87)m=	ation fac Jan 1 interna 19.57	FebN0.990.1 temperatur19.7820	ing po for li /lar 98 e in l .07	eriods in the living area, h1AprMa0.950.87iving area T120.4320.4320.74	y (follo	ee Table 9a) Jun Jul 0.72 0.55 w steps 3 to 7 20.93 20.98	Die 9, Au 0.0 7 in T 20.1	Th1 (°C) ug Sep 6 0.83 Table 9c) 97 20.85	Oct 0.97	0.99	1	21	(85)
Temp Utilisa (86)m= Mean (87)m=	ation fac Jan 1 interna 19.57	tor for gains Feb M 0.99 0. I temperatur 19.78 20 during heat	ing po for li /lar 98 e in l .07	eriods in the living area, h1AprMa0.950.87iving area T120.4320.4320.74	y (follc follc	ee Table 9a) Jun Jul 0.72 0.55 w steps 3 to 7	Die 9, Au 0.0 7 in T 20.1	Th1 (°C) ug Sep 6 0.83 Fable 9c) 97 20.85 9, Th2 (°C)	Oct 0.97	0.99	1	21	(85)
Temp Utilisa (86)m= Mean (87)m= Temp (88)m=	ation fac Jan 1 interna 19.57 eerature 19.83	tor for gains Feb M 0.99 0. I temperatur 19.78 20 during heat 19.83 19	ing pe for li /lar 98 e in l 0.07 ing pe 0.84	AprMa0.950.87iving areaT120.4320.74eriods in rest19.8519.8519.85	y (follo (follo d of dw	ee Table 9a) Jun Jul 0.72 0.55 w steps 3 to 7 20.93 20.98 velling from Ta 9.86 19.86	ole 9, Ai 0.0 7 in T 20.1 able 9	Th1 (°C) ug Sep 6 0.83 Fable 9c) 97 20.85 9, Th2 (°C)	Oct 0.97 20.44	0.99	1 19.53	21	(85) (86) (87)
Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa	ation fac Jan 1 interna 19.57 eerature 19.83	tor for gains Feb N 0.99 0. I temperatur 19.78 20 during heat 19.83 19 tor for gains	ing pe for li /lar 98 e in l 0.07 ing pe 0.84	eriods in the li ving area, h1 Apr Ma 0.95 0.87 iving area T1 20.43 20.74 eriods in rest 19.85 19.85 est of dwelling	y ,m (s y (follc f dw 5 g, h2	ee Table 9a) Jun Jul 0.72 0.55 w steps 3 to 7 20.93 20.98 velling from Ta 9.86 19.86 ,m (see Table	Die 9, Ai 0.0 7 in T 20.1 able 9 19.1	Th1 (°C) ug Sep 6 0.83 Fable 9c) 97 20.85 9, Th2 (°C) 86 19.86	Oct 0.97 20.44 19.85	0.99 19.93 19.85	1 19.53 19.84	21	(85) (86) (87) (88)
Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m=	ation fac Jan 1 interna 19.57 eerature 19.83 ation fac	tor for gains Feb N 0.99 0. I temperatur 19.78 20 during heat 19.83 19 tor for gains 0.99 0.	ing pe for li /lar 98 e in l .07 ing pe .84 for r 98	eriods in the living area, h1AprMa0.950.87iving area T120.4320.4320.74eriods in rest19.8519.8519.85est of dwelling0.930.930.82	ving ,m (s y (follo 4 2 of dw 5 7 g, h2	ee Table 9a) Jun Jul 0.72 0.55 ow steps 3 to 7 20.93 20.98 velling from Ta 9.86 19.86 ,m (see Table 0.62 0.42	Die 9, Ai 0.0 7 in T 20.1 able § 19.1 19.1 0.4	Th1 (°C) ug Sep 6 0.83 Fable 9c) 97 20.85 97 20.85 9, Th2 (°C) 86 19.86	Oct 0.97 20.44 19.85 0.95	0.99	1 19.53	21	(85) (86) (87)
Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean	ation fac Jan 1 interna 19.57 erature 19.83 ation fac 1 interna	tor for gains Feb M 0.99 0. I temperatur 19.78 20 during heat 19.83 19 tor for gains 0.99 0. I temperatur	ing period for li Aar 98 e in l .07 ing period .84 for r 98 e in t	AprMa0.950.87iving areaT120.4320.74eriods in rest19.8519.8519.85est of dwelling0.930.930.82he rest of dwell	ving ,m (s y (follc 4 2 of dw 5 7 y, h2 belling	ee Table 9a) Jun Jul 0.72 0.55 w steps 3 to 7 20.93 20.98 velling from Ta 9.86 19.86 m (see Table 0.62 0.42 T2 (follow stepset)	ole 9, Ai 0.0 7 in T 20.0 able 9 19.0 9a) 0.4 eps 3	Th1 (°C) ug Sep 6 0.83 Fable 9c) 97 20.85 9, Th2 (°C) 86 19.86 19.86	Oct 0.97 20.44 19.85 0.95 e 9c)	0.99 19.93 19.85 0.99	1 19.53 19.84 1	21	(85) (86) (87) (88) (89)
Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m=	ation fac Jan 1 interna 19.57 eerature 19.83 ation fac	tor for gains Feb M 0.99 0. I temperatur 19.78 20 during heat 19.83 19 tor for gains 0.99 0. I temperatur	ing pe for li /lar 98 e in l .07 ing pe .84 for r 98	eriods in the living area, h1AprMa0.950.87iving area T120.4320.4320.74eriods in rest19.8519.8519.85est of dwelling0.930.930.82	ving ,m (s y (follc 4 2 of dw 5 7 y, h2 belling	ee Table 9a) Jun Jul 0.72 0.55 ow steps 3 to 7 20.93 20.98 velling from Ta 9.86 19.86 ,m (see Table 0.62 0.42	Die 9, Ai 0.0 7 in T 20.1 able § 19.1 19.1 0.4	Th1 (°C) ug Sep 6 0.83 able 9c) 97 20.85 97 20.85 9, Th2 (°C) 86 19.86 47 0.75 to 7 in Table 86 19.78	Oct 0.97 20.44 19.85 0.95 e 9c) 19.42	0.99 19.93 19.85 0.99	1 19.53 19.84 1 18.51	 	(85) (86) (87) (88)

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

Apply adjustment to the mean internal temperature from Table 4e, where appropriate (93) (93) 18.86 19.07 19.38 19.72 20.01 20.17 20.2 20.11 19.73 19.23 18.83 (93) 8. Space heating requirement Septence hashing requirement to brained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a (94) (94) (94) (94) (94) (94) (94) (94) (94) (94) (94) (95) (97) 0.93 0.83 0.65 0.46 0.51 0.77 0.95 0.99 1 (94) Useful gains, hmGm, W = (94)m x (84)m (96)m= [03:44 451.58 85.0 11.7 14.8 16.6 16.4 14.1 10.6 7.1 4.2 (95) Monthly average external temperature, Lm, W = ((39)m (96)m] (97) (96)m] (97) (96)m] (97) (96)m] (97) (97) (96)m] (97) (96)m]<	(92)m=	18.86	19.07	19.36	19.72	20.01	20.17	20.2	20.2	20.11	19.73	19.23	18.83		(92)
(32)me 18.86 19.07 19.72 20.01 20.17 20.2 20.11 19.73 19.23 18.83 (93) 2. Space heating requirement Sepace heating requirement Itemperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, using Table 9a Itemperature from mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, hm: (94)me 1 0.9 0.97 0.83 0.85 0.46 0.51 0.77 0.95 0.99 1 (94) Usingtugains, hmGm, W = (94)m x (84)m (96)me 60.34 74.55 84.59 64.6.9 44.0.3 459.46 64.14 10.6 7.1 4.2 (96) (96)me 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) (97)me 1861.41 180.04 140.04 60.09 47.36 740.26 748.73 1145.47 1528 1851.84 (97) Space heating requirement for each month, NWm/yearth 0 0 0 0 334.39 660.91	Apply	adiustr	nent to t	i he mear	internal	l I temper	i ature fro	n Table	e 4e. whe	ere appro	opriate				
8. Space heating requirement Set T to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a Jain Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)m 1 0.93 0.83 0.85 0.46 0.51 0.99 1 (94)m (94)m 2 0.84 0.85 0.46 0.85 0.99 1 (94) Value for mean internal temperature from Table 8 (96)m (97)m= 1861.41 100.7 1.42 (86) Value for mean internal temperature from Table 8 (97)m (98)m (93)m (93)m (93)m (93)m (93)m (93)m (98)m Value for mean internal temperature, Lm , W = (109)m x (103)m (93)m (r	r	1	r	I I	I Contraction of the second se	I I			19.23	18.83		(93)
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)m= 1 0.99 0.97 0.83 0.85 0.46 0.51 0.77 0.85 0.99 1 (94) Using colspan="2">Using colspan="2">(94)m (95)m (95)m 603.44 745.15 845.07 886.29 846.9 646.3 440.3 459.46 696.02 610.08 561.47 (95) Monthly average external temperature from Table 8 (96)m 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) Monthly average external temperature from Table 8 (96)m 1361.04 148.04 90.0 0 334.39 145.04 0 0 0 334.39 660.31 960.04 4672.27 (98) Space heating requirement in kWh/m2/year		ace hea	ting reg	uirement	t										
the utilisation factor for gains using Table 9a $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$			· ·			re obtair	ned at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
Utilisation factor for gains, hm: (94)m= 1 0.99 0.97 0.93 0.83 0.85 0.46 0.51 0.77 0.95 0.99 1 Useful gains, hmG, W = (94)m X (94)m (95)m= 603.44 745.15 845.07 896.23 846.9 646.9 440.3 459.48 649.14 696.02 610.08 561.47 (95)m= 603.44 745.15 845.07 896.23 846.9 646.9 440.3 459.48 649.14 696.02 610.08 561.47 (95)m= 603.44 745.15 845.07 896.23 846.9 646.9 440.3 459.48 649.14 696.02 610.08 561.47 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96)m= 1861.41 1807.02 1536.06 1580.04 1041.84 (90.99 447.36 470.86 748.73 1145.47 1528 1851.84 (97)m= 1861.41 1807.02 1536.06 1580.04 1041.84 (90.99 447.36 470.86 748.73 1145.47 1528 1851.84 (97)m= 1861.41 1807.02 1536.06 1580.04 1041.84 (90.99 447.36 470.86 748.73 1145.47 1528 1851.84 (97)m= 1861.41 1807.02 1536.06 1580.04 1041.84 (90.99 447.36 470.86 748.73 1145.47 1528 1851.84 (97)m= 1861.41 1807.02 1536.06 1580.04 1041.84 (90.99 447.36 470.86 748.73 1145.47 1528 1851.84 (97)m= 1861.41 1807.02 1536.06 1580.04 1041.84 (90.99 447.36 470.86 748.73 1145.47 1528 1851.84 (97)m= 1861.41 1807.02 1536.06 1580.04 1041.84 (90.99 447.36 470.86 748.73 1145.47 1528 1851.84 (97)m= 1861.41 1807.02 1536.06 1580.04 1041.84 (90.99 447.36 470.86 748.73 1145.47 1528 1851.84 (97)m= 1861.41 1807.02 1536.06 1580.04 1041.84 (90.99 447.36 470.86 748.73 1145.47 1528 1851.84 (97)m= 1861.41 1807.02 1536.05 180.04 1041.84 (90.99 447.36 470.80 748.73 1145.47 1528 1851.84 (98)m= 190.00 0 0 0 0 0 0 1166.7 918.47 941.46 0 0 0 0 0 Utilisation factor for loss hm (101m 0 0 0 0 0 0 0 0 1166.7 918.47 941.46 0 0 0 0 0 (100) Useful loss, hmLm (Watts) = (100)m x (101)m (102)m (102)m (103)m 0 0 0 0 0 0 0 1270.64 1220.5 1154.65 0 0 0 0 0 (103) Space cooling requirement for month, whole dwelling, continuous (kWh) = $0.024 x [(103)m - (102)m] x (41)m$ set (104)m to zero if (104)m < 3 x (98)m (104)m 0 0 0 0 0 0 195.97 281.36 231.88 0 0 0 0 0 Total = Sum(104) = 709.21 (104) (105) Intermitency factor (Table 10b) (106)m 0 0 0 0 0 0 25 0.25 0.25 0 0 0 0 Total = Sum(104) = 0 (•					,	, (-,			
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains, hmGm, $W = (94)m \times (84)m$ (95)m 603.44 745.15 845.07 896.29 346.9 646.9 440.3 459.48 649.14 696.02 610.08 561.47 (95) Monthly average external temperature from Table 8 (96)m 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm, $W = (39)m \times (96)m$ (97) Space heating requirement for each month, kWh/month = 0.024 $\times ((37)m - (95)m) \times (41)m$ (97)m 1861.41 1907.02 1636.06 1360.04 1041.84 [690.99 447.36 470.86 [748.73 1145.47 1528 1851.84 (97) Space heating requirement for each month, kWh/month = 0.024 $\times ((37)m - (95)m) \times (41)m$ (98)m 935.93 713.58 588.5 333.9 145.04 0 0 0 0 0 334.39 660.91 960.04 Total per year (kWh/year) = Sum(38)e., $e = 4672.27$ (98) Space heating requirement in kWh/m2/year 80. Space cooling requirement (100)m $\times (101)m$ (100)m 0 0 0 0 0 0 0 1166.7 918.47 941.46 0 0 0 0 0 0 (100) Utilisation.factor for loss hm (101)m 0 0 0 0 0 0 1166.7 918.47 941.46 0 0 0 0 0 (100) (100)m 0 0 0 0 0 0 1166.7 918.47 941.46 0 0 0 0 0 (100) (101) Useful loss, hmLm (Watts) = (100)m $\times (101)m$ (102)m 0 0 0 0 0 1270.64 1220.5 1154.65 0 0 0 0 0 (102) Gains (solar gains calculated for applicable weather region, see Table 10) (103)m 0 0 0 0 0 1270.64 1220.5 1154.65 0 0 0 0 0 (102) Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 $\times [(103)m - (102)m] \times (41)m$ set (104)m to zero if (104)m < 3 $\times (98)m$ (104)m 0 0 0 0 0 0 195.97 281.36 231.88 0 0 0 0 0 (102) Cooled fraction for Cable 10b) (105)m 0 0 0 0 0 0 205 0.25 0.25 0 0 0 0 (102) Total = Sum(104) = 709.21 (104) (105)m 0 0 0 0 0 0 0 205 0.25 0.25 0 0 0 0 (105) (106)m 0 0 0 0 0 0 0 0.25 0.25 0 0 0 0 (106)	Utilisa	ation fac	tor for g	ains, hm	1:										
(95)m= 603.44 745.15 845.07 896.29 846.9 646.9 440.3 459.48 649.14 696.02 610.08 561.47 (95) Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm , W =[(39)m x [(93)m- (96)m] (97)m (98.141) 1807.02 1636.06 1360.04 1041.86 60.99 470.86 746.73 1145.47 1528 1851.84 (97) Space heating requirement for each month, kWh/moth = 0.024 x [(97)m - (95)m] x (41)m (98)m= 935.93 713.58 588.5 333.9 145.04 0 0 0 334.39 660.91 960.04 (98) 935.93 713.58 588.5 333.9 145.04 0	(94)m=	1	0.99	0.97	0.93	0.83	0.65	0.46	0.51	0.77	0.95	0.99	1		(94)
	Usefu	l gains,	hmGm	, W = (94	4)m x (84	4)m									
(96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm, W =[(39)m x [(93)m-(96)m] (97)m= 1861.41 1807.02 1636.06 1360.04 1041.84 690.99 447.36 470.86 748.73 1145.47 1528 1851.84 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m 660.91 960.04 77.9 (98) Space heating requirement in kWh/m2/year 805.93 333.9 145.04 0 0 0 334.39 660.91 960.04 Calculated for June, July and August. See Table 10b Total per year (kWh/year) = Sum(98)s.r.t 477.9 (99) 80. Space cooling requirement Mar Apr May Jun Jul Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(95)m=	603.44	745.15	845.07	896.29	846.9	646.9	440.3	459.48	649.14	696.02	610.08	561.47		(95)
Heat loss rate for mean internal temperature, Lm , W = [(39)m × [(93)m – (96)m] (97)m= 1861.41 1807.02 1636.06 1360.04 1041.84 690.99 447.36 470.86 748.73 1145.47 1528 1851.84 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m – (95)m] x (41)m (98)m 935.93 713.58 588.5 333.9 145.04 0 0 0 334.39 660.91 960.04 Total per year (kWh/year) = Sum(98): so e = 4672.27 (98) Space heating requirement in kWh/m²/year 47.9 (93) 8c. Space cooling requirement Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) (100) (100) (101) (101) (102) (101) (102) (101) (102) (102) (103) (102) (103) (102) (103) (102) (103) (102) (103) (102)	Month	nly aver	age exte	ernal terr	perature	e from Ta	able 8		-						
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Space heating requirement for each month, kWh/month = $0.024 \times [(97)m - (95)m] \times (41)m$ (98)m= 935.93 713.58 588.5 333.9 145.04 0 0 0 334.39 660.91 960.04 Total per year (kWh/year) = Sum(98)sc 47.9 (98) 8c: Space cooling requirement in kWh/m2/year 47.9 (98) Box Space cooling requirement Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) (100) (100)m 0 0 0 0 0 0 0 0 (101) Useful loss, hmLm (Watts) = (100)m x (101)m (102)m (102) (103)m (102)m (103)m (102)m (102)m (102)m (103)m (102)m (102)m (103)m (102)m (103)m (102)m (103)m (102)m (103)m (102)m (103)m (104)m (3 x (98)m) (104)m	Heat	oss rate	e for me	an interr	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m]	-			
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	(97)m=	1861.41	1807.02	1636.06	1360.04	1041.84	690.99	447.36	470.86	748.73	1145.47	1528	1851.84		(97)
Total per year (kWh/year) = Sum(98) = 4672.27 (98) Space heating requirement in kWh/m²/year $36. Space cooling requirement$ Calculated for June, July and August. See Table 10b $Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec$ Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) (100) = 0 0 0 0 0 1166.7 918.47 941.46 0 0 0 0 0 0 (100) Utilisation factor for loss hm (101)m 0 0 0 0 0 0 0 998.46 842.33 842.98 0 0 0 0 0 (101) Useful loss, hmLm (Watts) = (100)m x (101)m (102)m 0 0 0 0 0 1270.64 1220.5 1154.65 0 0 0 0 0 (102) Gains (solar gains calculated for applicable weather region, see Table 10) (103)m 0 0 0 0 0 1270.64 1220.5 1154.65 0 0 0 0 0 (103) Space cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m - (102)m] x (41)m set (104)m to zero if (104)m < 3 x (98)m (104)m 0 0 0 0 0 0 195.97 281.36 231.88 0 0 0 0 0 0 (102) Total = Sum(10.4) = 709.21 (104) (105) Intermittency factor (Table 10b) (106)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Space	e heatin	g require	ement fo	or each n	nonth, k	Wh/mon	th = 0.02	24 x [(97))m – (95)m] x (4′	1)m			
Space heating requirement in kWh/m²/year47.9(99)8c. Space cooling requirementCalculated for June, July and August. See Table 10bJanFebMarAprMayJunJulAugSepOctNovDecHeat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10)(100)(100)(100)(100)(100)(100)m=00000.860.920.90000(101)Useful loss, hmLm (Watts) = (100)m x (101)m(100)m x (101)m(102)(102)m=00000.984.6842.33842.980000(102)Gains (solar gains calculated for applicable weather region, see Table 10)(102)(103)m(102)m (102)m] x (41)m(103)mSpace cooling requirement for month, whole dwelling, continuous (kWh) = 0.024 x [(103)m - (102)m] x (41)m(104)m0000195.97281.36231.880000Total = Sum(10.4)=709.21(104)Cooled fractionf C = cooled area \div (4) =1(105)Intermittency factor (Table 10b)000000000(106)m=000000000000Total = Sum(10.4)=0(106)<	(98)m=	935.93	713.58	588.5	333.9	145.04	0	0	0	0	334.39	660.91	960.04		
8c. Space cooling requirement Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) 0 <									Tota	l per year	(kWh/year	.) = Sum(9	8)15,912 =	4672.27	(98)
8c. Space cooling requirement Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) 0 <	Space	e heatin	a require	ement in	kWh/m²	/vear								47.9	(99)
Calculated for June, July and August. See Table 10b.JanFebMarAprMayJunJulAugSepOctNovDecHeat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10)00000000(100)m00001166.7918.47941.46000000Utilisation factor for loss hm	_														
$ \begin{array}{ c c c c c c } \hline Jan & Feb & Mar & Apr & May & Jun & Jul & Aug & Sep & Oct & Nov & Dec \\ \hline Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) (100) & 0 & 0 & 0 & 1166.7 & 918.47 & 941.46 & 0 & 0 & 0 & 0 & 0 \\ \hline (100) & 0 & 0 & 0 & 0 & 166.7 & 918.47 & 941.46 & 0 & 0 & 0 & 0 & 0 & 0 \\ \hline (101) & 0 & 0 & 0 & 0 & 0 & 0.86 & 0.92 & 0.9 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ \hline (101) & 0 & 0 & 0 & 0 & 0 & 0.86 & 0.92 & 0.9 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ \hline (102) & 0 & 0 & 0 & 0 & 0 & 998.46 & 842.33 & 842.98 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ \hline (102) & 0 & 0 & 0 & 0 & 0 & 998.46 & 842.33 & 842.98 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & $						See Tel	bla 10b								
Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) (100)m= 0 0 0 1166.7 918.47 941.46 0	Calcu							1.1	Δυα	Sen	Oct	Nov	Dec		
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Heat				<u> </u>				<u> </u>						
Utilisation factor for loss hm (101)m= 0 0 0 0.86 0.92 0.9 0<			· ·				· · ·		1			-	,		(100)
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	· /										-				. ,
Useful loss, hmLm (Watts) = (100)m x (101)m (102)m= 0 0 0 998.46 842.33 842.98 0				r		0	0.86	0.92	0.9	0	0	0	0		(101)
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$			ml m (V	-		-								_	. ,
Gains (solar gains calculated for applicable weather region, see Table 10) (103)m= 0 0 0 1270.64 1220.5 1154.65 0 0 0 0 (103) Space cooling requirement for month, whole dwelling, continuous (kWh) = $0.024 \times [(103)m - (102)m] \times (41)m$ (104)m to zero if (104)m < $3 \times (98)m$ (104)m = 0 0 0 0 0 0 0 0 (104)m Cooled fraction f C = cooled area ÷ (4) = 1 (105) (106)m = 0 <td></td> <td></td> <td><u>`</u></td> <td><u> </u></td> <td>ì <i>ć</i></td> <td><u>, </u></td> <td>î .</td> <td>842.33</td> <td>842.98</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td></td> <td>(102)</td>			<u>`</u>	<u> </u>	ì <i>ć</i>	<u>, </u>	î .	842.33	842.98	0	0	0	0		(102)
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$			l nains ca	Iculated	for appli	cable w			e Table		_	-	_		. ,
Space cooling requirement for month, whole dwelling, continuous (kWh) = $0.024 \times [(103)m - (102)m] \times (41)m$ set (104)m to zero if (104)m < $3 \times (98)m$ (104)m 0 0 0 195.97 281.36 231.88 0 0 0 Cooled fraction Total = Sum(104) = 709.21 (104) Intermittency factor (Table 10b) f C = cooled area ÷ (4) = 1 (105) Total = Sum(104) = 0 0 0 0 0 (106)m = 0 0 0.25 0.25 0 0 0 Total = Sum(104) = 0 0 0 0 0 0 0			í –	0			1	<u> </u>	i	,	0	0	0		(103)
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		e coolin	l a reauire	l ement fo	r month	whole a			L OUS (kW	(h) = 0.0	24 x [(1(1)3) <i>m – (</i> 1	102)m 1:	x (41)m	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $, noning,	oonunu	040 (111	,		((,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
Cooled fractionf C = cooled area \div (4) =1(105)Intermittency factor (Table 10b)(106)m=0000.250.25000Total = Sum(1Q.4)=0(106)	(104)m=	0	0	0	0	0	195.97	281.36	231.88	0	0	0	0		
Intermittency factor (Table 10b) (106)m = 0 0 0 0 0 0.25 0.25 0.25 0 0 0 0 Total = Sum(1QA) = 0 (106)					<u>. </u>					Total	= Sum(104)	=	709.21	(104)
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Coolec	I fractio	า							f C =	cooled a	area ÷ (4	4) =	1	(105)
$Total = Sum(1_Q4) = 0 $ (106)	Intermi	ttency f	actor (Ta	able 10b)		_					-			
	(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		
Space cooling requirement for month = $(104)m \times (105) \times (106)m$										Tota	l = Sum((104)	=	0	(106)
	Space	cooling	requirer	ment for	month =	(104)m	× (105)	<u>, </u>	n						_
(107)m= 0 0 0 0 0 48.99 70.34 57.97 0 0 0 0	(107)m=	0	0	0	0	0	48.99	70.34	57.97	0	0	0	0		_
Total = Sum(1,0,7) = 177.3 (107)										Total	= Sum(107)	=	177.3	(107)
Space cooling requirement in kWh/m ² /year $(107) \div (4) = 1.82$ (108)	Space	cooling	requirer	ment in k	<wh m²="" td="" y<=""><td>/ear</td><td></td><td></td><td></td><td>(107)</td><td>) ÷ (4) =</td><td></td><td></td><td>1.82</td><td>(108)</td></wh>	/ear				(107)) ÷ (4) =			1.82	(108)
8f. Fabric Energy Efficiency (calculated only under special conditions, see section 11)	8f. Fab	ric En <u>e</u>	rgy Effi <u>c</u>	iency (ca	alculated	l only un	der sp <u>e</u> d	cial conc	litions, <u>s</u>	ee sectio	on 11) _				
	Fabric	: Energ	y Efficier	псу						(99)	+ (108) =	=		49.72	(109)
	Fabrio	c Energ	y Efficie	псу						(99) ·	+ (108) =	=		49.72	(109)

				User D	etails:								
Assessor Name: Software Name:	Stroma FS	AP 2012			Softwa	a Num are Ver	sion:		Versic	on: 1.0.0.28			
			Pro	operty <i>i</i>	Address	: 4 Bed 2	2013 Bas	seline					
Address : 1. Overall dwelling dime	onciono:												
1. Overall dwelling dime				Δroa	a(m²)		Av. Hei	abt(m)		Volume(m ³)			
Ground floor					. ,	(1a) x	r	.5	(2a) =	141.68	(3a)		
First floor				5	6.67	(1b) x	2	.5	(2b) =	141.68] (3b)		
Total floor area TFA = (1	la)+(1b)+(1c)+(′1d)+(1e)+	(1n)			(4)		-	l`´]``		
Dwelling volume		() ()		'	10.04		+(3c)+(3d)+(3e)+	(3n) =	283.35	(5)		
2. Ventilation rate:													
2. Ventilation rate: main secondary other total mineating heating													
Number of chimneye													
Number of chimneys	0				0		0		0 = 20 =	0	(6a)		
Number of open flues	0	+()	+	0	」⁼∟	0			0	(6b)		
Number of intermittent fa						Ļ	4		0 =	40	(7a)		
Number of passive vents	5						0	x 1	0 =	0	(7b)		
Number of flueless gas f	fires						0	x 4	0 = Air ch	onanges per hou](7c) I r		
Infiltration due to chimne	evs flues and fa	ans = (6a) + (6a)	b)+(7a	ı)+(7b)+(⁻	7c) =	Г	40	<u> </u>	÷ (5) =	0.14	(8)		
If a pressurisation test has	7					continue fre			(0) -	0.14](0)		
Number of storeys in t	the dw <mark>elling</mark> (ne	5)								0	(9)		
Additional infiltration								[(9)-	1]x0.1 =	0	(10)		
Structural infiltration: 0 if both types of wall are p						•	uction			0	(11)		
deducting areas of open			ing to t	ne great	er wan are	a (allel							
If suspended wooden	floor, enter 0.2	(unsealed)	or 0.1	l (seale	d), else	enter 0				0	(12)		
If no draught lobby, er										0	(13)		
Percentage of window	s and doors dr	aught stripp	ed		0.05 10.0		0.01			0	(14)		
Window infiltration						2 x (14) ÷ 1				0	(15)		
Infiltration rate						+ (11) + (1				0	(16)		
Air permeability value,				•	•	•	etre of e	nvelope	area	5	(17)		
If based on air permeabi	-						is haina us	ad		0.39	(18)		
Number of sides shelter			n done			incability i	s being 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) =				0.33	(21)		
Infiltration rate modified	for monthly wir	id speed									-		
Jan Feb	Mar Apr	May J	un	Jul	Aug	Sep	Oct	Nov	Dec				
Monthly average wind sp	peed from Tabl	e 7								_			
(22)m= 5.1 5	4.9 4.4	4.3 3.	.8	3.8	3.7	4	4.3	4.5	4.7				

Wind F	actor (2	22a)m =	(22)m ÷	4										
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjust	ed infiltra	ation rat	e (allow	ing for sh	nelter ar	nd wind s	peed) =	: (21a) x	(22a)m					
.	0.42	0.42	0.41	0.37	0.36	0.32	0.32	0.31	0.33	0.36	0.37	0.39		
	<i>ate ettec</i> echanica		-	rate for t	he appli	icable ca	se						0	(23a)
				endix N, (2	(23a) = (23a	a) × Fmv (e	equation (N5)) , othe	rwise (23b) = (23a)			0	(23b)
				ciency in %									0	(23c)
a) If	balance	ed mech	anical ve	entilation	with he	at recove	ery (MV	HR) (24a	a)m = (22	2b)m + (23b) × [1 – (23c)	-	(
, (24a)m=		0	0	0	0	0	0	0	0	0		0	-	(24a)
b) If	balance	d mech	anical ve	entilation	without	heat rec	overy (MV) (24t)m = (22	2b)m + (23b)			
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If	whole h	ouse ex	tract ver	ntilation of	or positiv	ve input v	ventilati	on from o	outside	-	-	-		
i	if (22b)n	n < 0.5 >	< (23b), ⁻	then (240	c) = (23t	o); other\	vise (24	·c) = (22	b) m + 0.	5 × (23k) I		1	
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,				ole hous)m = (221	•	•				0.51				
(24d)m=		0.59	0.58	0.57	0.56	0.55	0.55	0.5 + [(2	0.56	0.56	0.57	0.58		(24d)
			I	nter (24a										,
(25)m=	0.59	0.59	0.58	0.57	0.56	0.55	0.55	0.55	0.56	0.56	0.57	0.58		(25)
		s and ne Gro:		paramete Openin		Net Ar	02	U-val		AXU		k-value	Δ Δ	Xk
CLCN			(m²)	m		A,r		W/m2		(W/		kJ/m²·ł		J/K
Doors						2	×	1.2	=	2.4				(26)
Windo	ws Type	e 1				2.39	x1	/[1/(1.4)+	0.04] =	3.17				(27)
Windows Type 2					2.39	2.39 x1/[1/(1.4)+ 0.04] = 3.17							(27)	
Windows Type 3					1.44	x1	/[1/(1.4)+	0.04] =	1.91				(27)	
Windows Type 4					0.96	x1	/[1/(1.4)+	0.04] =	1.27				(27)	
Windows Type 5					1.44	x1	/[1/(1.4)+	0.04] =	1.91				(27)	
Windows Type 6					3.15	x1	/[1/(1.4)+	0.04] =	4.18				(27)	
Floor						56.67	′ X	0.15	=	8.5005	5			(28)
Walls		113.	52	20		93.52	<u>x</u>	0.2	=	18.7				(29)
Roof		56.6	67	0		56.67	′ x	0.11	=	6.23				(30)
Total a	area of e	lements	s, m²			226.8	6							(31)
Party wall					50	x	0	=	0				(32)	
* for win ** includ							ated using	g formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	3.2	
	le the area	as on doth	31063 01 11	itemai wai	io ana par		(26)(30) + (32) =							
Fabric			= S (A x		io una par			(26)(30) + (32) =				59.7	(33)
		s, W/K	= S (A x		io una par			(26)(30		(30) + (3	2) + (32a).	(32e) =	59.7 13871.48	(33) (34)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f

can be u	ised instea	ad of a de	tailed calc	ulation.										
Therma	al bridge	es : S (L	x Y) cal	culated	using Ap	pendix l	<						11.34	(36)
if details	of therma	al bridging	are not kn	own (36) =	= 0.15 x (3	1)								
Total fa	abric he	at loss							(33) +	(36) =			71.04	(37)
Ventila	tion hea	at loss ca	alculated	monthl	y	-	-		(38)m	= 0.33 × (25)m x (5)	-	_	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	55.15	54.83	54.5	53.01	52.73	51.42	51.42	51.18	51.92	52.73	53.3	53.89		(38)
Heat tr	ansfer c	coefficier	nt, W/K						(39)m	= (37) + (3	38)m	•		
(39)m=	126.19	125.88	125.55	124.05	123.77	122.46	122.46	122.22	122.97	123.77	124.34	124.93]	
									,	Average =		12 /12=	124.05	(39)
Heat lo	oss para	meter (H	HLP), W/	′m²K					(40)m	= (39)m ÷	(4)			
(40)m=	1.11	1.11	1.11	1.09	1.09	1.08	1.08	1.08	1.08	1.09	1.1	1.1		
Numbe	er of day	vs in moi	nth (Tab	le 1a)				•	,	Average =	Sum(40)1	12 /12=	1.09	(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)
			I	I		I	I				1	1	1	
1 \//2	itor hoot	ing one	av roqui	iromont.								k\Mb/w	oar	
4. 170	lier neal	ing ener	gy requ	nement.						_				
												83]	(42)
	$Average = Sum(40)_{112}/12= 1.09$ (40) $umber of days in month (Table 1a)$ $I)m = \boxed{Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec}{31 28 31 30 31 30 31 30 31 30 31 30 31 30 31 (41)$ $Vater heating energy requirement: KWh/year:$ $Ssumed occupancy, N \qquad (TFA > 13.9, N = 1 + 1.76 \times [1 - exp(-0.000349 \times (TFA - 13.9)2)] + 0.0013 \times (TFA - 13.9)$ $I = 1 \qquad (42)$													
			ater usad	ae in litre	es per da	av Vd.av	erage =	(25 x N)	+ 36		10	6.84	1	(43)
Reduce	the annua	al average	hot water	usage by	5% if the a	welling is	designed t			se target o		5.04	J	(10)
not more	e that 125	litres per j	person pei	r day (all w	ater use, l	hot and co	ld)					-		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage il	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m=	117.52	113.25	108.97	104.7	100.43	96.15	96.15	100.43	104.7	108.97	113.25	117.52		
										Total = Su	× /		1282.05	(44)
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x C	0Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m=	174.28	152.43	157.29	137.13	131.58	113.54	105.21	120.74	122.18	142.39	155.43	168.78		
16				- f		(h		Total = Su	m(45) ₁₁₂ =	-	1680.97	(45)
		ater neatli	ng at point	or use (no	hot water	r storage),	enter 0 in) to (61)				1	
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0		(46)
	storage		includir		olar or W		storado	within or	movos	sol		400	1	(47)
-		. ,					-			301		180	J	(47)
		-			velling, e Icludes i			• •	ors) onto	ər '()' in (47)			
	storage		not wate			notantai								
	-		eclared I	oss facto	or is kno	wn (kWł	n/day):					0]	(48)
,			m Table			,					<u> </u>	0]	(49)
			storage		ar			(48) x (49)	-			0]	(50)
			-	•	loss fact	or is not		(40) X (40)	, –			0	J	(50)
				•	e 2 (kW							0]	(51)
		-	ee secti	on 4.3										
		from Ta										0	ļ	(52)
Tempe	rature f	actor fro	m Table	2b								0	J	(53)

•		om water (54) in (5	-	e, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54) (55)
	. ,			for each	month			((56)m = (55) × (41)ı	m		-	1	、
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0	1	(56)
	-	-	-	-	-	-		-	7)m = (56)	-	-	-	l lix H	``
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(57)
Prima	v circuit	loss (ar	nual) fro	om Table	e 3	-		-				0		(58)
Primar	y circuit	loss cal	culated	for each	month ((58) ÷ 36	• •					•	
(mo (59)m=	dified by	0 tactor f	rom Tab			olar wat	ter heatir	ng and a	cylinde	r thermo	stat)	0	1	(59)
				_					Ū	0	0	0	l	(00)
	r		r	1	,	, , I	65 × (41)	· · · · · · · · · · · · · · · · · · ·			-	<u> </u>	1	(04)
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(61)
	· · · ·	r				· · · · · ·		<u> </u>			<u> </u>	<u>, ,</u>	(59)m + (61)m 1	
(62)m=	148.14	129.56	133.7	116.56	111.84	96.51	89.43	102.62	103.85	121.03	132.11	143.46	J	(62)
			• • •					, ,	if no sola יר	r contribut	ion to wate	er heating)		
		r	r	r	r	· · ·	, see Ap	i	ŕ	0			1	(63)
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	J	(03)
		ater hea	i	110 50	444.04	06.54	00.42	102.62	103.85	121.03	122.14	143,46	1	
(64)m=	148.14	129.56	133.7	116.56	111.84	96.51	89.43		out from wa	_	132.11		1428.82	(64)
	in a fra		h a a tin a		anth 0 0		(15)							
			-	1		-			1] + 0.8 ×				, J 1	(65)
(65)m=	37.03	32.39	33.42	29.14	27.96	24.13	22.36	25.66	25.96	30.26	33.03	35.87	1	(03)
_						ylinder i	s in the d	dwelling	or hot w	ater is fr	om com	munity r	leating	
5. In	ternal ga	ains (see	e Table 5	5 and 5a):									
Metab		ns (Table											1	
(00)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(00)
									141.68	141.68	141.68	141.68	J	(66)
-		· · · · · · · · · · · · · · · · · · ·	· · · · · ·	1	· · · ·	1	r L9a), a	1					1	(07)
(67)m=	25.74	22.86	18.59	14.07	10.52	8.88	9.6	12.47	16.74	21.26	24.81	26.45		(67)
•••		<u>`</u>	r	· · ·	· · ·	ı — — —	r	· · · · · · · · · · · · · · · · · · ·	see Ta				1	
(68)m=	276.27	279.14	271.91	256.53	237.12	218.87	206.68	203.82	211.04	226.42	245.84	264.08	l	(68)
	<u> </u>	<u>`</u>			· · ·		· · · · ·		e Table			i	1	
(69)m=	37.17	37.17	37.17	37.17	37.17	37.17	37.17	37.17	37.17	37.17	37.17	37.17	J	(69)
Pumps	s and fa	ns gains	(Table :	5a)									1	
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	J	(70)
Losse	s e.g. e\	aporatic	on (nega	tive valu	es) (Tab	le 5)								
(71)m=	-113.34	-113.34	-113.34	-113.34	-113.34	-113.34	-113.34	-113.34	-113.34	-113.34	-113.34	-113.34		(71)
Water	heating	gains (T	able 5)										_	
(72)m=	49.78	48.2	44.93	40.47	37.58	33.51	30.05	34.48	36.06	40.67	45.87	48.21		(72)
Total i	internal	gains =				(66)	m + (67)m	n + (68)m -	+ (69)m + ((70)m + (7	1)m + (72))m	_	
(73)m=	417.29	415.7	400.93	376.58	350.72	326.77	311.83	316.28	329.35	353.85	382.02	404.24		(73)
6. So	lar gain:	s:												

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

Orientation:	Access Factor Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North 0.9	x 0.77	x	2.39	x	10.63	×	0.76	x	0.7	=	18.74	(74)
North 0.9	x 0.77	x	1.44	x	10.63	x	0.76	x	0.7	=	11.29	(74)
North 0.9	x 0.77	x	2.39	x	20.32	x	0.76	x	0.7	=	35.81	(74)
North 0.9	x 0.77	x	1.44	x	20.32	×	0.76	x	0.7	=	21.58	(74)
North 0.9	x 0.77	x	2.39	x	34.53	x	0.76	x	0.7	=	60.85	(74)
North 0.9	x 0.77	x	1.44	x	34.53	×	0.76	x	0.7	=	36.66	(74)
North 0.9	× 0.77	x	2.39	x	55.46	×	0.76	x	0.7	=	97.74	(74)
North 0.9	× 0.77	x	1.44	x	55.46	x	0.76	x	0.7	=	58.89	(74)
North 0.9	x 0.77	x	2.39	x	74.72	x	0.76	x	0.7	=	131.67	(74)
North 0.9	x 0.77	x	1.44	x	74.72	x	0.76	x	0.7	=	79.33	(74)
North 0.9	x 0.77	x	2.39	x	79.99	×	0.76	x	0.7	=	140.96	(74)
North 0.9	x 0.77	x	1.44	x	79.99	×	0.76	x	0.7	=	84.93	(74)
North 0.9	× 0.77	x	2.39	x	74.68	x	0.76	x	0.7	=	131.6	(74)
North 0.9	x 0.77	x	1.44	x	74.68	×	0.76	x	0.7	=	79.29	(74)
North 0.9	x 0.77	x	2.39	x	59.25	×	0.76	x	0.7	=	104.41	(74)
North 0.9	x 0.77	x	1.44	×	59.25	X	0.76	x	0.7	=	62.91	(74)
North 0.9	x 0.77	x	2.39	x	41.52	x	0.76	x	0.7	=	73.16	(74)
North 0.9	x 0.77	x	1.44	x	41.52	×	0.76	×	0.7	=	44.08	(74)
North 0.9	x 0.77	x	2.39	x	24.19	x	0.76	x	0.7	=	42.63	(74)
North 0.9	x 0.77	x	1.44	×	24.19	×	0.76	x	0.7	=	25.68	(74)
North 0.9	x 0.77	x	2.39	×	13.12	×	0.76	×	0.7	=	23.12	(74)
North 0.9	x 0.77	x	1.44	x	13.12	x	0.76	x	0.7	=	13.93	(74)
North 0.9	x 0.77	x	2.39	x	8.86	×	0.76	x	0.7	=	15.62	(74)
North 0.9	x 0.77	x	1.44	x	8.86	x	0.76	x	0.7	=	9.41	(74)
South 0.9	x 0.77	x	2.39	x	46.75	×	0.76	x	0.7	=	41.19	(78)
South 0.9	x 0.77	x	1.44	x	46.75	×	0.76	x	0.7	=	49.64	(78)
South 0.9	x 0.77	x	3.15	x	46.75	×	0.76	x	0.7	=	54.29	(78)
South 0.9	x 0.77	x	2.39	x	76.57	×	0.76	x	0.7	=	67.47	(78)
South 0.9	x 0.77	x	1.44	x	76.57	x	0.76	x	0.7	=	81.3	(78)
South 0.9	x 0.77	x	3.15	x	76.57	×	0.76	x	0.7	=	88.92	(78)
South 0.9	x 0.77	x	2.39	x	97.53	×	0.76	x	0.7	=	85.94	(78)
South 0.9	× 0.77	x	1.44	x	97.53	x	0.76	x	0.7	=	103.56	(78)
South 0.9	x 0.77	x	3.15	x	97.53	x	0.76	x	0.7	=	113.27	(78)
South 0.9	x 0.77	x	2.39	x	110.23	×	0.76	x	0.7	=	97.13	(78)
South 0.9	x 0.77	x	1.44	x	110.23	×	0.76	x	0.7	=	117.05	(78)
South 0.9	x 0.77	x	3.15	×	110.23	×	0.76	x	0.7	=	128.02	(78)
South 0.9	x 0.77	x	2.39	×	114.87	×	0.76	x	0.7	=	101.22	(78)
South 0.9	x 0.77	x	1.44	×	114.87	×	0.76	x	0.7	=	121.97	(78)
South 0.9	x 0.77	x	3.15	x	114.87	×	0.76	x	0.7	=	133.4	(78)

South	_		_							_				
	0.9x	0.77	×	2.39		× 1	10.55	x	0.76	×	0.7	=	97.41	(78)
South	0.9x	0.77	x	1.44	:	× 1	10.55	x	0.76	x	0.7	=	117.38	(78)
South	0.9x	0.77	x	3.15	:	× 1	10.55	x	0.76	x	0.7	=	128.38	(78)
South	0.9x	0.77	x	2.39	:	× 1	08.01	x	0.76	×	0.7	=	95.17	(78)
South	0.9x	0.77	x	1.44		× 1	08.01	x	0.76	×	0.7	=	114.69	(78)
South	0.9x	0.77	X	3.15	:	× 1	08.01	x	0.76	×	0.7	=	125.44	(78)
South	0.9x	0.77	x	2.39		× 1	04.89	x	0.76	×	0.7	=	92.43	(78)
South	0.9x	0.77	x	1.44	:	× 1	04.89	x	0.76	×	0.7	=	111.38	(78)
South	0.9x	0.77	x	3.15	:	× 1	04.89	x	0.76	×	0.7	=	121.82	(78)
South	0.9x	0.77	x	2.39	:	× 1	01.89	x	0.76	×	0.7	=	89.78	(78)
South	0.9x	0.77	x	1.44	:	× 1	01.89	x	0.76	x	0.7	=	108.18	(78)
South	0.9x	0.77	x	3.15	:	× 1	01.89	x	0.76	×	0.7	=	118.32	(78)
South	0.9x	0.77	x	2.39		x	82.59	x	0.76	×	0.7	=	72.77	(78)
South	0.9x	0.77	x	1.44		×	82.59	x	0.76	×	0.7	=	87.69	(78)
South	0.9x	0.77	x	3.15		x i	82.59	x	0.76	×	0.7	=	95.91	(78)
South	0.9x	0.77	×	2.39	:	x :	55.42	x	0.76	×	0.7	=	48.83	(78)
South	0.9x	0.77	×	1.44	;	×	55.42	x	0.76	x	0.7	=	58.84	(78)
South	0.9x	0.77	x	3.15		×	55.42	x	0.76	x	0.7		64.36	(78)
South	0.9x	0.77	×	2.39	=	x	40.4	x	0.76	x	0.7		35.6	(78)
South	0.9x	0.77	×	1.44	:	×	40.4	×	0.76	x	0.7	=	42.89	(78)
South	0.9x	0.77	×	3.15		× 🕅	40.4	x	0.76	x	0.7	=	46.92	(78)
Solar g	ains in	watts, calcu	ulated	for each r	month			(83)m	= Sum(74)m	.(82)m				
Solar g (83)m=	ains in 189.06		lated 15.07		month 647.64	651	624.21	<mark>(83)m</mark> 559.		. <mark>(82)m</mark> 356.9	5 226.41	161.87		(83)
(83)m=	189.06		5.07	564.15 6	647.64			r í			5 226.41	161.87		(83)
(83)m=	189.06	322.27 44 nternal and	5.07	564.15 6 (84)m = (647.64			r í	95 485.61			161.87 566.12		(83) (84)
(83)m= Total g (84)m=	189.06 ains — i 606.35	322.27 44 nternal and	15.07 solar 16.01	564.15 6 (84)m = (940.73 9	647.64 73)m + 998.37	- (83)m 977.77	, watts	559.	95 485.61	356.9				
(83)m= Total g (84)m= 7. Me	189.06 ains – i 606.35 an inter	322.27 44 nternal and 737.97 84	i5.07 solar i6.01 ature	564.15 6 (84)m = (' 940.73 9 (heating so	647.64 73)m + 998.37 eason)	- (83)m 977.77	, watts 936.04	559. 876.	95 485.61 23 814.96	356.9			21	
(83)m= Total g (84)m= 7. Me Temp	189.06 ains – i 606.35 an inter erature	322.27 44 nternal and 737.97 84 nal tempera	15.07 solar 16.01 ature ting p	564.15 6 (84)m = (' 940.73 9 (heating some seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the series of the	647.64 73)m + 998.37 eason) he livin	- (83)m 977.77 ng area	, watts 936.04 from Tab	559. 876.	95 485.61 23 814.96	356.9			21	(84)
(83)m= Total g (84)m= 7. Me Temp	189.06 ains – i 606.35 an inter erature	322.27 44 nternal and 737.97 84 nal tempera during hea ctor for gain	15.07 solar 16.01 ature ting p	564.15 6 (84)m = (' 940.73 9 (heating some seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the series of the	647.64 73)m + 998.37 eason) he livin	- (83)m 977.77 ng area	, watts 936.04 from Tab	559. 876.	95 485.61 23 814.96 Th1 (°C)	356.9	608.43		21	(84)
(83)m= Total g (84)m= 7. Me Temp	189.06 ains – i 606.35 an inter erature ation fac	322.27 44 nternal and 737.97 84 nal tempera during hea ctor for gain Feb	15.07 solar 16.01 ature ting p s for l	564.15 6 (84)m = (' 940.73 9 (heating some seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the series of the ser	647.64 73)m + 998.37 eason) he livin , h1,m	- (83)m 977.77 ng area (see Ta	, watts 936.04 from Tab able 9a)	559. 876. ble 9,	95 485.61 23 814.96 Th1 (°C) Jg Sep	710.8	608.43	566.12	21	(84)
(83)m= Total g (84)m= 7. Me Temp Utilisa (86)m=	189.06 ains – i 606.35 an inter erature tion fac Jan 1	322.2744nternal and737.9784nal temperationduring heatctor for gainFeb1	i5.07 solar i6.01 ature ting p s for l Mar 0.99	564.15 6 (84)m = (' 940.73 9 (heating seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the seriods in the series of the series	647.64 73)m + 998.37 eason) he livin , h1,m May 0.89	- (83)m 977.77 ng area (see Ta Jun 0.74	, watts 936.04 from Tab able 9a) Jul 0.56	559. 876. Die 9, Au 0.6	95 485.61 23 814.96 Th1 (°C) Jg Sep 2 0.86	356.99 710.8 Oct	608.43	566.12 Dec	21	(84)
(83)m= Total g (84)m= 7. Me Temp Utilisa (86)m=	189.06 ains – i 606.35 an inter erature tion fac Jan 1	322.2744nternal and737.9784nal temperationduring heatctor for gainFeb111	i5.07 solar i6.01 ature ting p s for l Mar 0.99	564.15 6 (84)m = (' 940.73 9 940.73 9 9 (heating scenario scenario) 9 9 (iving area, Apr 0.97 9 iving area 9 9	647.64 73)m + 998.37 eason) he livin , h1,m May 0.89	- (83)m 977.77 ng area (see Ta Jun 0.74	, watts 936.04 from Tab able 9a) Jul 0.56	559. 876. Die 9, Au 0.6	95 485.61 23 814.96 Th1 (°C) 1g Sep 2 0.86 able 9c)	356.99 710.8 Oct	608.43	566.12 Dec	21	(84)
(83)m= Total g (84)m= 7. Me Temp Utilisa (86)m= Mean (87)m=	189.06 ains – i 606.35 an inter erature ttion fac Jan 1 interna 19.75	322.2744nternal and737.9784nal temperationduring heatctor for gainFeb111119.922	IS.07 Solar I6.01 Ature ting p s for l Mar 0.99 re in 0.18	564.15 6 (84)m = (' 940.73 9 940.73 9 9 (heating stress) 9 9 (iving area, 0.97) 9 9 iving area 20.5 2	647.64 73)m + 998.37 eason) he livin , h1,m May 0.89 . T1 (fo 20.78	- (83)m 977.77 Ing area (see Ta Jun 0.74 Ilow ste 20.95	, watts 936.04 from Tat able 9a) Jul 0.56 eps 3 to 7 20.99	559. 876. Die 9, Au 0.6 7 in T 20.9	95 485.61 23 814.96 Th1 (°C) Jg Sep 2 0.86 able 9c) 98 20.87	35 6.99 710.8 Oct 0.98	608.43	566.12 Dec 1	21	(84) (85) (86)
(83)m= Total g (84)m= 7. Me Temp Utilisa (86)m= Mean (87)m= Temp	189.06 ains – i 606.35 an inter erature tion fac Jan 1 interna 19.75 erature	322.2744nternal and737.9784nal temperationduring heatctor for gainFeb111119.922during heat	I5.07 Solar I6.01 Iting p s for l Mar 0.99 re in l 0.18 ting p	564.15 6 $(84)m = (')$ 940.73 940.74 940.74 940.74 940.74 940.74 940.74 940.74 940.74 940.74 940.74 940.74 940.74 </td <td>647.64 73)m + 998.37 eason) he livin , h1,m May 0.89 1 T1 (fo 20.78 est of c</td> <td>- (83)m 977.77 ng area (see Ta Jun 0.74 Ilow ste 20.95</td> <td>, watts 936.04 from Tab able 9a) Jul 0.56 eps 3 to 7 20.99 g from Ta</td> <td>559. 876. 0le 9, 0.6 7 in T 20.9</td> <td>95 485.61 23 814.96 Th1 (°C) Jg Sep 2 0.86 able 9c) 98 20.87 9, Th2 (°C)</td> <td>35 6.9 710.8 0.0 20.51</td> <td>608.43 Nov 1 20.06</td> <td>566.12 Dec 1 19.72</td> <td>21</td> <td>(84) (85) (86) (87)</td>	647.64 73)m + 998.37 eason) he livin , h1,m May 0.89 1 T1 (fo 20.78 est of c	- (83)m 977.77 ng area (see Ta Jun 0.74 Ilow ste 20.95	, watts 936.04 from Tab able 9a) Jul 0.56 eps 3 to 7 20.99 g from Ta	559. 876. 0le 9, 0.6 7 in T 20.9	95 485.61 23 814.96 Th1 (°C) Jg Sep 2 0.86 able 9c) 98 20.87 9, Th2 (°C)	35 6.9 710.8 0.0 20.51	608.43 Nov 1 20.06	566.12 Dec 1 19.72	21	(84) (85) (86) (87)
(83)m= Total g (84)m= 7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m=	189.06 ains – i 606.35 an inter erature tion fac Jan 1 interna 19.75 erature 19.99	322.2744nternal and737.9784nal temperaduring heactor for gainFeb11119.922during hea19.991	IS.07 Solar I6.01 Ature ting p s for l Mar 0.99 re in l 0.18 ting p 9.99	564.15 6 $(84)m = (')$ 940.73 940.74 940.74 940.74 940.74 940.74 940.74 940.74 940.74 940.74 940.74 940.74 940.74 940.74 </td <td>647.64 73)m + 998.37 eason) he livin , h1,m May 0.89 1 T1 (fo 20.78 est of c 20.01</td> <td>- (83)m 977.77 ng area (see Ta Jun 0.74 llow ste 20.95 dwelling 20.02</td> <td>, watts 936.04 from Tab able 9a) Jul 0.56 eps 3 to 7 20.99 g from Ta 20.02</td> <td>559. 876. 0le 9, 0.6 7 in T 20.9 able 9 20.0</td> <td>95 485.61 23 814.96 Th1 (°C) Jg Sep 2 0.86 able 9c) 98 20.87 9, Th2 (°C)</td> <td>35 6.99 710.8 Oct 0.98</td> <td>608.43 Nov 1 20.06</td> <td>566.12 Dec 1</td> <td>21</td> <td>(84) (85) (86)</td>	647.64 73)m + 998.37 eason) he livin , h1,m May 0.89 1 T1 (fo 20.78 est of c 20.01	- (83)m 977.77 ng area (see Ta Jun 0.74 llow ste 20.95 dwelling 20.02	, watts 936.04 from Tab able 9a) Jul 0.56 eps 3 to 7 20.99 g from Ta 20.02	559. 876. 0le 9, 0.6 7 in T 20.9 able 9 20.0	95 485.61 23 814.96 Th1 (°C) Jg Sep 2 0.86 able 9c) 98 20.87 9, Th2 (°C)	35 6.99 710.8 Oct 0.98	608.43 Nov 1 20.06	566.12 Dec 1	21	(84) (85) (86)
(83)m= Total g (84)m= 7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa	189.06 ains – i 606.35 an inter erature ttion fac Jan 1 interna 19.75 erature 19.99 ttion fac	322.2744nternal and737.9784mal temperationduring heatctor for gainFeb111119.922during heat19.991ctor for gain	IS.07 Solar IG.01 Ature ting p s for l Mar 0.99 re in l 0.18 ting p 9.99 s for r	564.15 6 (84)m = (' 940.73 9 940.73 9 9 (heating steps) 9 9 (heating area, Apr 9 9 0.97 9 9 1iving area 20.5 2 eriods in regions in	647.64 73)m + 998.37 eason) he livin , h1,m May 0.89 1 T1 (fo 20.78 est of (20.01 elling, h	- (83)m 977.77 Ing area (see Ta Jun 0.74 Illow ste 20.95 dwelling 20.02 n2,m (se	, watts 936.04 from Tat able 9a) Jul 0.56 eps 3 to 7 20.99 g from Ta 20.02 ee Table	559. 876. 516 9, 0.6 7 in T 20.9 20.0 9a)	95 485.61 23 814.96 Th1 (°C) ug Sep 2 0.86 able 9c) 98 20.87 90, Th2 (°C) 91 20.01	35 6.99 710.8 0.98 20.51 20.01	608.43 Nov 1 20.06 20	566.12 Dec 1 19.72 20	21	(84) (85) (86) (87) (88)
(83)m= Total g (84)m= 7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m=	189.06 ains – i 606.35 an inter erature ation fac Jan 1 interna 19.75 erature 19.99 ation fac 1	322.2744nternal and737.9784mal temperation84during heat1000000000000000000000000000000000000	15.07 solar 16.01 ature ting p s for l Mar 0.99 re in l 0.18 ting p 9.99 s for r 0.99	564.15 6 $(84)m = (1)$ 940.73 940.74 940.74 940.74 940.74 940.74 940.74 940.74 940.74 940.74 940.74 940.74 </td <td>647.64 73)m + 998.37 eason) he livin , h1,m May 0.89 a T1 (fo 20.78 est of o 20.01 elling, h 0.85</td> <td>- (83)m 977.77 Ing area (see Ta Jun 0.74 Illow ste 20.95 dwelling 20.02 n2,m (sr 0.65</td> <td>, watts 936.04 from Tat able 9a) Jul 0.56 eps 3 to 7 20.99 g from Ta 20.02 ee Table 0.44</td> <td>559. 876. 516 9, 0.6 7 in T 20.9 20.0 9a) 0.5</td> <td>95 485.61 23 814.96 23 814.96 Th1 (°C) ug Sep 2 0.86 able 9c) 98 20.87 90, Th2 (°C) 92 20.01 93 0.79</td> <td>35 6.9 710.8 710.8 0.98 20.51 20.01</td> <td>608.43 Nov 1 20.06</td> <td>566.12 Dec 1 19.72</td> <td>21</td> <td>(84) (85) (86) (87)</td>	647.64 73)m + 998.37 eason) he livin , h1,m May 0.89 a T1 (fo 20.78 est of o 20.01 elling, h 0.85	- (83)m 977.77 Ing area (see Ta Jun 0.74 Illow ste 20.95 dwelling 20.02 n2,m (sr 0.65	, watts 936.04 from Tat able 9a) Jul 0.56 eps 3 to 7 20.99 g from Ta 20.02 ee Table 0.44	559. 876. 516 9, 0.6 7 in T 20.9 20.0 9a) 0.5	95 485.61 23 814.96 23 814.96 Th1 (°C) ug Sep 2 0.86 able 9c) 98 20.87 90, Th2 (°C) 92 20.01 93 0.79	35 6.9 710.8 710.8 0.98 20.51 20.01	608.43 Nov 1 20.06	566.12 Dec 1 19.72	21	(84) (85) (86) (87)
(83)m= Total g (84)m= 7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean	189.06 ains – i 606.35 an inter erature tion fac Jan 1 interna 19.75 erature 19.99 ttion fac 1 interna	322.27 44 nternal and 737.97 84 nal temperation 64 during heat 64 tor for gain 64 Teb 1 1 1 19.92 2 during heat 19.92 19.99 1 ctor for gain 1 1 1 1 1 1 1	15.07 solar 16.01 ature ting p s for l Mar 0.99 re in l 0.18 ting p 9.99 s for r 0.99	564.15 6 $(84)m = (')$ 940.73 940.74 940.74 940.74 940.74 940.74 940.74 940.74 940.74 940.74 940.74 940.74 940.74 </td <td>647.64 73)m + 998.37 eason) he livin , h1,m May 0.89 111 (fo 20.78 est of c 20.01 est of c 20.01 dwellin</td> <td>- (83)m 977.77 Ing area (see Ta Jun 0.74 Ilow ste 20.95 dwelling 20.02 n2,m (se 0.65 ng T2 (f</td> <td>, watts 936.04 from Tab able 9a) Jul 0.56 eps 3 to 7 20.99 g from Ta 20.02 ee Table 0.44 follow ste</td> <td>559. 876. 0le 9, 0.6 7 in T 20.9 able 9 20.0 9a) 0.5 20.0</td> <td>95 485.61 23 814.96 Th1 (°C) Jg Sep 2 0.86 able 9c) 98 20.87 9, Th2 (°C) 92 0.01 5 0.79 to 7 in Table</td> <td>35 35 6.9 710.8 710.8 0.98 20.51 20.01 0.97 20.01 0.97 9C)</td> <td>608.43 Nov 1 20.06 20 1</td> <td>566.12 Dec 1 19.72 20 1</td> <td>21</td> <td>(84) (85) (86) (87) (88) (88) (89)</td>	647.64 73)m + 998.37 eason) he livin , h1,m May 0.89 111 (fo 20.78 est of c 20.01 est of c 20.01 dwellin	- (83)m 977.77 Ing area (see Ta Jun 0.74 Ilow ste 20.95 dwelling 20.02 n2,m (se 0.65 ng T2 (f	, watts 936.04 from Tab able 9a) Jul 0.56 eps 3 to 7 20.99 g from Ta 20.02 ee Table 0.44 follow ste	559. 876. 0le 9, 0.6 7 in T 20.9 able 9 20.0 9a) 0.5 20.0	95 485.61 23 814.96 Th1 (°C) Jg Sep 2 0.86 able 9c) 98 20.87 9, Th2 (°C) 92 0.01 5 0.79 to 7 in Table	35 35 6.9 710.8 710.8 0.98 20.51 20.01 0.97 20.01 0.97 9C)	608.43 Nov 1 20.06 20 1	566.12 Dec 1 19.72 20 1	21	(84) (85) (86) (87) (88) (88) (89)
(83)m= Total g (84)m= 7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m=	189.06 ains – i 606.35 an inter erature ation fac Jan 1 interna 19.75 erature 19.99 ation fac 1	322.27 44 nternal and 737.97 84 nal temperation 64 during heat 64 tor for gain 64 Teb 1 1 1 19.92 2 during heat 19.92 19.99 1 ctor for gain 1 1 1 1 1 1 1	15.07 solar 16.01 ature ting p s for l Mar 0.99 re in l 0.18 ting p 9.99 s for r 0.99	564.15 6 $(84)m = (')$ 940.73 940.74 940.74 940.74 940.74 940.74 940.74 940.74 940.74 940.74 940.74 940.74 940.74 </td <td>647.64 73)m + 998.37 eason) he livin , h1,m May 0.89 a T1 (fo 20.78 est of o 20.01 elling, h 0.85</td> <td>- (83)m 977.77 Ing area (see Ta Jun 0.74 Illow ste 20.95 dwelling 20.02 n2,m (sr 0.65</td> <td>, watts 936.04 from Tat able 9a) Jul 0.56 eps 3 to 7 20.99 g from Ta 20.02 ee Table 0.44</td> <td>559. 876. 516 9, 0.6 7 in T 20.9 20.0 9a) 0.5</td> <td>95 485.61 23 814.96 23 814.96 Th1 (°C) Jg Sep 2 0.86 able 9c) 98 20.87 9, Th2 (°C) 92 20.01 5 0.79 to 7 in Table 91 19.94</td> <td>35 6.9 710.8 710.8 0.98 20.51 20.01 20.01 0.97 0.97 19.61</td> <td>608.43 Nov 1 20.06 20 1</td> <td>566.12 Dec 1 19.72 20 1 18.82</td> <td>21</td> <td>(84) (85) (86) (87) (88)</td>	647.64 73)m + 998.37 eason) he livin , h1,m May 0.89 a T1 (fo 20.78 est of o 20.01 elling, h 0.85	- (83)m 977.77 Ing area (see Ta Jun 0.74 Illow ste 20.95 dwelling 20.02 n2,m (sr 0.65	, watts 936.04 from Tat able 9a) Jul 0.56 eps 3 to 7 20.99 g from Ta 20.02 ee Table 0.44	559. 876. 516 9, 0.6 7 in T 20.9 20.0 9a) 0.5	95 485.61 23 814.96 23 814.96 Th1 (°C) Jg Sep 2 0.86 able 9c) 98 20.87 9, Th2 (°C) 92 20.01 5 0.79 to 7 in Table 91 19.94	35 6.9 710.8 710.8 0.98 20.51 20.01 20.01 0.97 0.97 19.61	608.43 Nov 1 20.06 20 1	566.12 Dec 1 19.72 20 1 18.82	21	(84) (85) (86) (87) (88)

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

(92)m=	19.2	19.38	19.63	19.96	20.23	20.37	20.4	20.4	20.31	19.96	19.52	19.18		(92)
	adiustr	L nent to t	l he mear	interna	temper	I ature fro	n Table	i 4e. whe	ere appro	opriate				
(93)m=	19.2	19.38	19.63	19.96	20.23	20.37	20.4	20.4	20.31	19.96	19.52	19.18		(93)
8. Spa	ace hea	ting req	uirement											
			ternal ter		re obtair	ned at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-cald	ulate	
			or gains	•		-	•	-		, (,	-		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	:										
(94)m=	1	0.99	0.98	0.95	0.86	0.68	0.49	0.55	0.81	0.97	1	1		(94)
Usefu	Il gains,	hmGm	, W = (94	4)m x (84	4)m			-						
(95)m=	605.14	733.84	832.81	895.3	860.59	666.15	459.6	478.6	661.83	688.55	605.57	565.32		(95)
	nly aver	age exte	ernal tem			î .							1	
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
		r	an intern			i i	<u> </u>		· ,	-	1	1	I	
(97)m=			1649.06			706.68	465.51	488.67	763.92		1544.68	1871.21		(97)
•		ř	ement fo			r	r		````	_ <u>- </u>	r –	1	I	
(98)m=	948.92	731.55	607.3	343.26	144.8	0	0	0	0	350.1	676.16	971.58		_
								Tota	l per year	(kWh/yeai	r) = Sum(9	8)15,912 =	4773.66	(98)
Space	e heatin	g requir	ement in	kWh/m ²	/year								42.12	(99)
8c. Sr	oace co	oling rea	uiremer	nt										
			July and		See Ta	ble 10b								
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat	loss rate	e Lm (ca	lculated	using 2	5°C inter	rnal temp	perature	and exte	ernal ten	nperatur	e from T	able 10)		
(100)m=	0	0	0	0	0	1151.16	906.23	928.88	0	0	0	0		(100)
Utilisa	ation fac	tor for lo	oss hm											
(101) <mark>m=</mark>	0	0	0	0	0	0.87	0.93	0.91	0	0	0	0		(101)
Usefu	Il loss, h	mLm (V	Vatts) = ((100)m x	(101)m	- 								
(102)m=	0	0	0	0	0	1007.03	846.15	847.6	0	0	0	0		(102)
Gains	s (solar g	gains ca	lculated	for appli	cable w	eather re	egion, se	e Table	10)					
(103)m=	0	0	0	0	0	1254.81	1203.62	1135.87	0	0	0	0		(103)
			<i>ement fo</i> (104)m <			dwelling,	continue	ous (kW	(h) = 0.0	24 x [(10	03)m – (102)m]:	x (41)m	
(104)m=	0	0	0	0	0	178.4	265.96	214.47	0	0	0	0		
									Total	= Sum(104)	=	658.83	(104)
Coolec	fraction	า							f C =	cooled	area ÷ (4	4) =	1	(105)
Intermi	ttency f	actor (Ta	able 10b)		i		i						
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		_
_									Tota	= Sum((104)	=	0	(106)
•		· · · · · · · · · · · · · · · · · · ·	ment for		· ,		r <u>`</u>	1			1	1	I	
(107)m=	0	0	0	0	0	44.6	66.49	53.62	0	0	0	0		_
										= Sum(107)	=	164.71	(107)
Space	cooling	require	ment in k	(Wh/m²/y	/ear				(107)	÷ (4) =			1.45	(108)
8f. Fab	oric Ene	rgy Effic	iency (ca	alculated	l only un	der spec	cial cond	litions, s	ee sectio	on 11)				
Fabrio	c Energ	y Efficie	ncy						(99) -	+ (108) =	=		43.57	(109)

				User D	etails:						
Assessor Name: Software Name:	Stroma FS	AP 2012			Strom Softwa	are Ver	sion:		Versio	n: 1.0.0.28	
			Pr	operty /	Address	5 Bed 2	2013 Bas	seline			
Address : 1. Overall dwelling dime	nsions:										
				Area	a(m²)		Av. Hei	ght(m)		Volume(m ³)	
Ground floor						(1a) x		.7	(2a) =	202.5	(3a)
First floor					75	(1b) x	2.	41	(2b) =	180.75	(3b)
Total floor area TFA = (1a	a)+(1b)+(1c)+((1d)+(1e)+	(1n)	150	(4)]		J
Dwelling volume	, , , , , ,		,	,			+(3c)+(3d)+(3e)+	.(3n) =	383.25	(5)
_										000.20](-)
2. Ventilation rate:	main		ondar	y	other		total			m ³ per hour	
Number of chimneys	heating	hea	oting] + [0] = [0	x 4	40 =	0	(6a)
Number of open flues	0	 +	0	」 <u>に</u> ヿ + ᄃ	0	」 <u>「</u>] = [0	x 2	20 =	0	(6b)
Number of intermittent fa			0		0		4	x 1	0 =	40](⁰²)](7a)
Number of passive vents								x 1	0 =	-	(74) (7b)
Number of flueless gas fi							0		40 =	0	
Number of fideless gas fi	es					L	0	^		o anges per hou	(7c) Ir
Infiltration due to chimne	ys, flues and fa	ans = (6a)+	-(6b)+(7a	a)+(7b)+(⁻	7c) =	Г	40		÷ (5) =	0.1	(8)
If a pressurisation test has b			proceed	to (17), c	otherwise o	continue fro	om (9) to (16)			-
Number of storeys in the Additional infiltration	ne dw <mark>elling</mark> (ns	5)							41-0-4	0	(9)
Structural infiltration: 0	25 for steel or	timber fra	me or	0 35 for	masonr	v constr	uction	[(9)-	1]x0.1 =	0	(10) (11)
if both types of wall are pr						•	aotion			0]()
deducting areas of openir			l) or 0	1 (coolo	d) also	ontor 0				2	
If suspended wooden f If no draught lobby, en		•	i) 01 0.	i (Seale	u), eise	enter 0				0	(12) (13)
Percentage of windows			ped							0	(13)
Window infiltration			F		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	d in cubic	metres	s per ho	our per so	quare m	etre of e	nvelope	area	5	(17)
If based on air permeabil	ity value, then	(18) = [(17) ·	÷ 20]+(8), otherwi	se (18) = (16)				0.35	(18)
Air permeability value applie		on test has be	een don	e or a deg	gree air pe	rmeability	is being us	ed			-
Number of sides sheltere	d				(20) = 1 -	0 075 v (1	0)1 -			2	(19)
Shelter factor	ing chalter for	tor			(20) = (18)		5)] –			0.85	(20)
Infiltration rate incorporat	-				(21) - (10)	, ^ (20) =				0.3	(21)
Jan Feb	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
			5011	001	1 / 109	000	001	1407			
Monthly average wind sp (22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		

Wind F	actor (2	22a)m =	(22)m ÷	4										
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjuste	ed infiltr	ation rat	e (allow	ing for sl	nelter ar	nd wind s	speed) =	(21a) x	(22a)m					
	0.38	0.38	0.37	0.33	0.32	0.29	0.29	0.28	0.3	0.32	0.34	0.35		
		<i>ctive air</i> al ventila	-	rate for a	the appl	icable ca	ise	•	•					(00-)
				endix N (2	23h) - (23;	a) × Fmv (e	equation (1	N5)) othe	rwise (23h) - (23a)			0	(23a)
						for in-use f				<i>(</i>) = (200)			0	(23b)
			-	-	-	at recov				2h)m + (23h) v ['	1 – (23c)	0 	(23c)
(24a)m=	0]	(24a)
	balance	ed mech	I anical ve	entilation	without	heat red	coverv (N	///) (24h	(2) $m = (2)$	2b)m + (23b)		I	· · ·
(24b)m=	0	0	0	0	0	0		0		0	0	0		(24b)
	u whole h	L Nouse ex	I tract ver	L htilation (I or positiv	ve input v	I ventilatio	n from o	L outside				I	
,					•	o); other				.5 × (23b))			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,					•	ve input erwise (2				0.5]				
(24d)m=	0.57	0.57	0.57	0.55	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.56		(24d)
Effe	ctive air	change	rate - e	nter (24a	a) or (24	b) or (24	c) or (24	d) in bo	x (25)					
(25)m=	0.57	0.57	0.57	0.55	0.55	0.54	0.54	0.54	0.55	0.55	0.56	0.56		(25)
3 He	at l <mark>osse</mark>	es and he	eat l <mark>oss</mark>	paramet	er 🖌									
ELEN		Gros		Openir		Net Ar	ea	U-val	ue	AXU		k-value	e	AXk
			(m²)		J ²	A ,r	m²	W/m2	2K	(W/	K)	kJ/m²∙l	ĸ	kJ/K
Doors						2.1	x	1.2	=	2.52				(26)
Window	ws Type	e 1				2.39	x1	/[1/(1.4)+	0.04] =	3.17				(27)
Window	ws Type	e 2				2.39	x1	/[1/(1.4)+	- 0.04] =	3.17				(27)
Window	ws Type	e 3				0.96	x1	/[1/(1.4)+	0.04] =	1.27				(27)
Window	ws Type	e 4				2.39	x1	/[1/(1.4)+	- 0.04] =	3.17				(27)
Window	ws Type	e 5				1.44	x1	/[1/(1.4)+	0.04] =	1.91				(27)
Window	ws Type	e 6				3.78	x1	/[1/(1.4)+	0.04] =	5.01				(27)
Window	ws Type	e 7				1.44	x1	/[1/(1.4)+	- 0.04] =	1.91				(27)
Floor						75	×	0.15	=	11.25				(28)
Walls		180	0	31.2	4	148.7	6 ×	0.2	=	29.75			\exists	(29)
Roof		75		0	=	75	x	0.11		8.25			\exists	(30)
Total a	rea of e	elements		<u> </u>		330				-	L			(31)
* for win	dows and		lows, use e			alue calcul	lated using	formula 1	1/[(1/U-valı	ıe)+0.04] a	as given in	paragraph	1 3.2	

Fabric heat loss, $W/K = S (A \times U)$	(26)(30) + (32) =	90.4	(33)
Heat capacity $Cm = S(A \times k)$	((28)(30) + (32) + (32a)(32e) =	37189.4	(34)
Thermal mass parameter (TMP = $Cm \div TFA$) in kJ/m ² K	Indicative Value: Medium	250	(35)
For design approximate where the details of the construction are not know	n providely the indicative values of TMD in Table 11		

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f

can be u	ised instea	ad of a de	tailed calc	ulation.										
Therma	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix l	<						16.5	(36)
if details	of therma	l bridging	are not kn	own (36) =	= 0.15 x (3	1)								
Total fa	abric he	at loss							(33) +	(36) =			106.9	(37)
Ventila	tion hea	t loss ca	alculated	monthl	Ý		-		(38)m	= 0.33 × (25)m x (5)		_	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	72.56	72.2	71.85	70.18	69.86	68.41	68.41	68.14	68.98	69.86	70.5	71.15		(38)
Heat tr	ansfer c	oefficier	nt, W/K						(39)m	= (37) + (3	38)m	-	-	
(39)m=	179.46	179.11	, 178.75	177.08	176.77	175.31	175.31	175.05	175.88	176.77	177.4	178.06]	
									/	Average =	Sum(39)1.		177.08	(39)
Heat lo	oss para	meter (H	HLP), W/	′m²K						= (39)m ÷				
(40)m=	1.2	1.19	1.19	1.18	1.18	1.17	1.17	1.17	1.17	1.18	1.18	1.19		
Numbe	er of day	rs in mor	nth (Tab	le 1a)					/	Average =	Sum(40)1	12 /12=	1.18	(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)
								I			I		1	
4 \//o	tor boot	ing one	av roqui	romont:								k\//b/u	oor	
4. VVd	ller neal	ing ener	gy requ	nement.						_		κνντι/γ	ear.	_
												.93		(42)
	$Average = Sum(40)_{112}/12 = 1.18$ (40) umber of days in month (Table 1a) $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$													
			ater usad	ge in litre	s per da	v Vd av	erage =	(25 x N)	+ 36		100	9.36	1	(43)
				usage by						se target o		9.50	J	(40)
not more	e that 125	litres per _l	person pei	r day (all w	ater use, l	not and co	ld)					-		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage ii	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m=	120.29	115.92	111.54	107.17	102.79	98.42	98.42	102.79	107.17	111.54	115.92	120.29		
											m(44) ₁₁₂ =		1312.26	(44)
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x C	0Tm / 3600	kWh/mor	oth (see Ta	ables 1b, 1	c, 1d)	-	
(45)m=	178.39	156.02	161	140.36	134.68	116.22	107.69	123.58	125.06	145.74	159.09	172.76		
16				- f		(h		Total = Su	m(45) ₁₁₂ =	=	1720.58	(45)
		ater neatli	ng at point	of use (no	not water	storage),	enter 0 in) to (61)				1	
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0		(46)
	storage		includir	ng any so	alar or M		storado	within or	mayas	col		040	1	(47)
-		. ,					-			501		210	J	(47)
		-		ink in dw er (this in	-			• •	ors) onto	ar 'O' in (47)			
	storage		not wate			instantai				51 O III (
	-		eclared I	oss facto	or is kno	wn (kWł	n/day):					0	1	(48)
,			m Table			,	• /					0		(49)
				, kWh/ye	ar			(48) x (49)	=			0]	(50)
			-	cylinder l		or is not		(,,				0	J	(00)
		-		om Tabl	e 2 (kW	h/litre/da	ıy)					0]	(51)
		-	ee secti	on 4.3									•	
		from Ta		0								0	-	(52)
I empe	erature fa	actor fro	m Table	20								0		(53)

		om water (54) in (5	-	, kWh/ye	ear			(47) x (51)	x (52) x (53) =		0		(54) (55)
Water	storage	loss cal	culated f	for each	month			((56)m = (55) × (41)	m			I	
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contain	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	v circuit	loss (an	nual) fro	om Table	9.3							0		(58)
	•					59)m = ((58) ÷ 36	5 × (41)	m		L		I	
(mo	dified by	factor fi	rom Tab	le H5 if t	here is s	solar wat	ter heatir	ng and a	cylinde	r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(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	neat req	uired for	water he	eating ca	alculated	for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	151.63	132.62	136.85	119.31	114.48	98.79	91.54	105.04	106.3	123.88	135.22	146.84		(62)
Solar Dł	-IW input	calculated	using App	endix G or	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 V	WHRS	applies	, see Ap	pendix (G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
WWHR	S 0	0	0	0	0	0	0	0	0	0	0	0		(63) (G10)
Output	t from w	ater hea	ter											
(64)m=	151.63	132.62	136.85	119.31	114.48	98.79	91.54	105.04	106.3	123.88	135.22	146.84		-
										ater heate			1462.49	(64)
Heat g	ains fro	m water		kWh/mo		-	× (45)m	+ (61)m	_	((46)m	+ (57)m	+ (59)m]	
(65)m=	37.91	33.15	34.21	29.83	28.62	24.7	22.88	26.26	26.57	30.97	33.81	36.71		(65)
inclu	ıde (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Int	ternal ga	ains (see	e Table 5	and 5a):									
Metab	olic gain	s (Table	5), Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	146.71	146.71	146.71	146.71	146.71	146.71	146.71	146.71	146.71	146.71	146.71	146.71		(66)
Lightin	g gains	(calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	28.87	25.64	20.85	15.79	11.8	9.96	10.77	13.99	18.78	23.85	27.83	29.67		(67)
Applia	nces ga	ins (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5				
(68)m=	320.52	323.85	315.47	297.62	275.1	253.93	239.79	236.46	244.84	262.69	285.21	306.38		(68)
Cookir	ng gains	(calcula	ted in A	ppendix	L, equat	tion L15	or L15a)	, also se	e Table	5				
(69)m=	37.67	37.67	37.67	37.67	37.67	37.67	37.67	37.67	37.67	37.67	37.67	37.67		(69)
Pumps	and fa	ns gains	(Table 5	ōa)										
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	s e.g. ev	aporatio	n (nega	tive valu	es) (Tab	le 5)				_		-	_	
(71)m=	-117.37	-117.37	-117.37	-117.37	-117.37	-117.37	-117.37	-117.37	-117.37	-117.37	-117.37	-117.37		(71)
Water	heating	gains (T	able 5)											
(72)m=	50.95	49.34	45.98	41.43	38.47	34.3	30.76	35.3	36.91	41.63	46.95	49.34		(72)
Total i	nternal	gains =				(66)	m + (67)m	ı + (68)m -	- (69)m + ((70)m + (7	1)m + (72)	m	_	
(73)m=	467.36	465.84	449.32	421.85	392.38	365.21	348.33	352.77	367.55	395.17	427.01	452.41		(73)

6. Solar gains:

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

-		Access Facto		Area m ²	a and	Flux Flus Table 6a	tions	g_ Table 6b		FF Table 6c		Gains (W)	
North	0.9x	0.77	x	2.39	x	10.63	x	0.76	x	0.7	=	28.11	(74)
North	0.9x	0.77	x	1.44	x	10.63	x	0.76	x	0.7] =	11.29	(74)
North	0.9x	0.77	x	2.39	x	20.32	x	0.76	x	0.7	=	53.72	(74)
North	0.9x	0.77	x	1.44	x	20.32	x	0.76	x	0.7	=	21.58	(74)
North	0.9x	0.77	x	2.39	x	34.53	x	0.76	x	0.7	=	91.28	(74)
North	0.9x	0.77	x	1.44	x	34.53	x	0.76	x	0.7] =	36.66	(74)
North	0.9x	0.77	x	2.39	x	55.46	x	0.76	x	0.7	=	146.62	(74)
North	0.9x	0.77	x	1.44	x	55.46	x	0.76	x	0.7	=	58.89	(74)
North	0.9x	0.77	x	2.39	x	74.72	x	0.76	x	0.7	=	197.5	(74)
North	0.9x	0.77	x	1.44	x	74.72	x	0.76	x	0.7	=	79.33	(74)
North	0.9x	0.77	x	2.39	x	79.99	x	0.76	x	0.7	=	211.43	(74)
North	0.9x	0.77	x	1.44	x	79.99	x	0.76	x	0.7	=	84.93	(74)
North	0.9x	0.77	x	2.39	×	74.68	x	0.76	x	0.7] =	197.4	(74)
North	0.9x	0.77	x	1.44	x	74.68	x	0.76	x	0.7	_	79.29	(74)
North	0.9x	0.77	x	2.39	x	59.25	X	0.76	x	0.7	=	156.61	(74)
North	0.9x	0.77	x	1.44	X	59.25	x	0.76	x	0.7	=	62.91	(74)
North	0.9x	0.77	x	2.39	x	41.52	×	0.76	x	0.7	=	109.75	(74)
North	0.9x	0.77	x	1.44	x	41.52	x	0.76	x	0.7	=	44.08	(74)
North	0.9x	0.77	x	2.39	x	24.19	x	0.76	x	0.7	=	63.94	(74)
North	0.9x	0.77	x	1.44	x	24.19	x	0.76	x	0.7	=	25.68	(74)
North	0.9x	0.77	x	2.39	x	13.12	x	0.76	x	0.7	=	34.68	(74)
North	0.9x	0.77	x	1.44	x	13.12	x	0.76	x	0.7	=	13.93	(74)
North	0.9x	0.77	x	2.39	x	8.86	x	0.76	x	0.7	=	23.43	(74)
North	0.9x		x	1.44	x	8.86	x	0.76	x	0.7	=	9.41	(74)
South	0.9x		x	2.39	x	46.75	x	0.76	X	0.7	=	123.58	(78)
South	0.9x		x	3.78	x	46.75	x	0.76	x	0.7	=	65.15	(78)
South	0.9x		x	1.44	X	46.75	x	0.76	x	0.7	=	24.82	(78)
South	0.9x		x	2.39	x	76.57	x	0.76	x	0.7	=	202.4	(78)
South	0.9x		x	3.78	x	76.57	x	0.76	x	0.7	=	106.7	(78)
South	0.9x		x	1.44	X	76.57	x	0.76	x	0.7	=	40.65	(78)
South	0.9x		x	2.39	x	97.53	x	0.76	x	0.7	=	257.82	(78)
South	0.9x		x	3.78	X	97.53	x	0.76	x	0.7	=	135.92	(78)
South	0.9x		x	1.44	x	97.53	x	0.76	x	0.7	=	51.78	(78)
South	0.9x		x	2.39	x	110.23	x	0.76	x	0.7	=	291.39	(78)
South	0.9x		×	3.78	x	110.23	x	0.76	x	0.7	=	153.62	(78)
South	0.9x	0.77	x	1.44	x	110.23	x	0.76	x	0.7	=	58.52	(78)

	_								_							
South	0.9x	0.77		x	2.39	×	1	14.87	×		0.76	x	0.7	=	303.65	(78)
South	0.9x	0.77		x	3.78	×	1	14.87	×		0.76	x	0.7	=	160.08	(78)
South	0.9x	0.77		x	1.44	×	1	14.87	×		0.76	x	0.7	=	60.98	(78)
South	0.9x	0.77		x	2.39	×	1	10.55	X		0.76	x	0.7	=	292.22	(78)
South	0.9x	0.77		x	3.78	×	1	10.55	×		0.76	x	0.7	=	154.06	(78)
South	0.9x	0.77		x	1.44	×	1	10.55	×		0.76	x	0.7	=	58.69	(78)
South	0.9x	0.77		x	2.39	×	1	08.01	×		0.76	×	0.7	=	285.52	(78)
South	0.9x	0.77		x	3.78	×	1	08.01	×		0.76	x	0.7	=	150.52	(78)
South	0.9x	0.77		x	1.44	×	1	08.01	×		0.76	x	0.7	=	57.34	(78)
South	0.9x	0.77		x	2.39	×	1	04.89	×		0.76	x	0.7	=	277.28	(78)
South	0.9x	0.77		x	3.78	×	1	04.89	×		0.76	x	0.7	=	146.18	(78)
South	0.9x	0.77		x	1.44	×	1	04.89	×		0.76	x	0.7	=	55.69	(78)
South	0.9x	0.77		x	2.39	×	1	01.89	×		0.76	x	0.7	=	269.33	(78)
South	0.9x	0.77		x	3.78	×	1	01.89	_ _ ×		0.76	×	0.7	=	141.99	(78)
South	0.9x	0.77		x	1.44	×	1	01.89	×		0.76	×	0.7	=	54.09	(78)
South	0.9x	0.77		x	2.39	×	3	32.59	×		0.76	×	0.7	=	218.31	(78)
South	0.9x	0.77		x	3.78	×	<u>ع</u>	32.59	_ _ ×		0.76	×	0.7	=	115.09	(78)
South	0.9x	0.77		x	1.44	×	8	32.59	x		0.76	x	0.7	=	43.84	(78)
South	0.9x	0.77		x	2.39	₹ ×	E E	55.42] x		0.76	x	0.7		146.49	(78)
South	0.9x	0.77		x	3.78	– ×		55.42	Ī×		0.76	x	0.7	=	77.23	(78)
South	0.9x	0.77		x	1.44	= ×		55.42] x		0.76	x	0.7	=	29.42	(78)
South	0.9x	0.77		x	2.39	Ī×	:	40.4	X		0.76	x	0.7	=	106.79	(78)
South	0.9x	0.77		x	3.78	T ×		40.4	i x		0.76	x	0.7	=	56.3	(78)
South	0.9x	0.77		x	1.44	٦ ×		40.4	_ ×		0.76	x	0.7	=	21.45	(78)
									-							
Solar g	jains in	watts, ca	alculat	ed	for each mo	nth			(83))m = \$	Sum(74)m .	(82)m				
(83)m=	301.47	519.95	729.7	6	936.99 1080).91	1087.3	1042.33	93	32.53	801	579.4	8 362.23	257.27		(83)
Total g	ains – i	nternal a	nd so	lar	(84)m = (73))m +	(83)m	, watts						-	-	
(84)m=	768.83	985.79	1179.	08	1358.84 1473	3.29	1452.51	1390.66	12	85.29	1168.55	974.6	5 789.25	709.68		(84)
7. Me	an inter	nal temp	eratu	re ((heating seas	son)										
Temp	erature	during h	eating	g p	eriods in the	livin	g area	from Tal	ble	9, TI	n1 (°C)				21	(85)
Utilisa	ation fac	ctor for g	ains fo	or li	iving area, h [.]	1,m ((see Ta	ble 9a)								
	Jan	Feb	Ma	r	Apr M	ay	Jun	Jul		Aug	Sep	Oct	Nov	Dec		
(86)m=	1	1	0.99		0.96 0.8	7	0.71	0.54		0.6	0.85	0.98	1	1		(86)
Mean	interna	l temper	ature	in l	iving area T1	l (fol	low ste	ps 3 to 7	7 in	Tab	le 9c)		-	-	_	
(87)m=	19.62	19.82	20.1 ⁻	-	20.48 20.7	<u> </u>	20.94	20.99	-	0.98	20.86	20.45	19.96	19.58]	(87)
Temp	erature	durina h	eating		eriods in rest	f of d	welling	from Ta	able	9 7	 [h2 (°C)				-	
(88)m=	19.92	19.92	19.9	<u> </u>	19.94 19.9	_	19.94	19.94	-	9.95	19.94	19.94	19.93	19.93]	(88)
		tor for a	nine fr		est of dwalling		2 m (cr			`					J	
(89)m=	1		0.98	-	0.94 0.8	- T	2,m (Se 0.62	0.42	-)).48	0.77	0.97	1	1	1	(89)
					the rest of dw				I				<i>`</i>	I	J	x - /

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

(90)m=	18.66	18.86	19.16	19.52	19.79	19.92	19.94	19.94	19.87	19.5	19.01	18.63		(90)
									f	iLA = Livin	g area ÷ (4	4) =	0.33	(91)
Moon	intorna	Itompor	aturo (fo	or the wh	olo dwo	lling) – fl	Δ 🗸 Τ1	ı (1 fl	Δ) ν Τ2			•		
(92)m=	18.98	19.18	19.48	19.84	20.12	20.26	20.29	20.29	20.2	19.81	19.32	18.95		(92)
											10.02	10.00		(02)
	18.98	19.18	19.48	19.84	20.12	20.26	20.29	20.29	20.2	19.81	19.32	18.95		(93)
(93)m=					20.12	20.26	20.29	20.29	20.2	19.61	19.32	18.95		(33)
			uirement											
				•		ned at ste	ep 11 of	Table 9t	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the ut			<u> </u>	using Ta		lun	11	A	Car	Oct	Next			
Litilion	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
		0.99	ains, hm 0.98	0.94	0.84	0.65	0.46	0.52	0.79	0.97	4	4		(94)
(94)m=						0.65	0.46	0.52	0.79	0.97	1	1		(94)
			r – – – – –	4)m x (84	· · · · · · · · · · · · · · · · · · ·	000.40	000.45	000 55	000.40			700.00		(05)
(95)m=	767.44	979.97	1157.38		1230.79		639.15	666.55	928.18	941.91	785.77	708.83		(95)
				perature										
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea		al tempe		Lm , W =	- ,	<u> </u>	· ,					
(97)m=	2634.13	2557.91	2319.38	1936.63	1488.07	992.43	647.03	680.48	1072.39	1628.78	2168.3	2625.72		(97)
Space		_	ement fo	r each n	honth, k	Wh/mont	h = 0.02	24 x [(97))m – (95)m] x (4	1)m			
(98)m=	1388.81	1060.37	864.53	474.22	191.42	0	0	0	0	511.03	995.42	1426.16		
								Tota	l per year	(kWh/year	[.]) = Sum(9	8)15,912 =	6911.96	(98)
Space	e heatin	g require	ement in	$kM/h/m^2$	wear							i i	46.08	
														(99)
					/ycai								40.00	(99)
8c. S	pac <mark>e co</mark>	oling rec	quiremer	nt									40.08	(99)
8c. S	bace co llated fo	oling red r June, J	uiremer July and	nt August.	See Tal								40.00	(99)
8c. Sp Calcu	bace coo lated fo Jan	oling rec r June, Feb	uiremer July and Mar	nt August. Apr	See Tal May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	40.00	
8c. Si Calcu Heat	lated fo Jan loss rate	oling rec r June, C Feb e Lm (ca	uiremer July and Mar Iculated	nt August. Apr using 25	See Tal May 5°C inter	Jun nal temp	perature	and exte	ernal ten	nperatur	e from T	able 10)	40.00	
8c. S Calcu Heat (100)m=	lated fo Jan oss rate	oling rec r June, Feb e Lm (ca 0	Juiremer July and Mar Iculated 0	nt August. Apr	See Tal May	Jun	perature							(100)
8c. Sp Calcu Heat (100)m= Utilisa	lated fo Jan loss rate 0 ation fac	oling rec r June, Feb e Lm (ca 0 tor for lo	July and July and Mar Iculated 0 oss hm	August. Apr using 25	See Tal May 5°C inter 0	Jun nal temp 1647.95	perature 1297.32	and exte	ernal ten 0	nperatur 0	e from T 0	able 10) 0		(100)
8c. Sp Calcu Heat (100)m= Utilisa (101)m=	lated fo Jan loss rate 0 ation fac	oling rec r June, Feb e Lm (ca 0 tor for lc	July and July and Mar Iculated 0 oss hm 0	August. Apr using 25 0	See Tal May 5°C inter 0	Jun nal temp 1647.95 0.87	perature	and exte	ernal ten	nperatur	e from T	able 10)		
8c. Sr Calcu Heat (100)m= Utilisa (101)m= Usefu	lated fo Jan loss rate 0 ation fac 0 Il loss, h	oling rec r June, Feb e Lm (ca 0 tor for lc 0 mLm (V	July and Mar Iculated 0 oss hm 0 Vatts) = 0	August. Apr using 25 0 (100)m x	See Tal May 5°C inter 0 0 (101)m	Jun nal temp 1647.95 0.87	0.93	and exte 1330.37 0.9	ernal ten 0	nperatur 0	e from T 0	able 10) 0		(100) (101)
8c. Sr Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m=	lated fo Jan loss rate 0 ation fac 0 I loss, h	oling rec r June, Feb a Lm (ca 0 tor for lc 0 mLm (W 0	July and Mar Iculated 0 oss hm 0 Vatts) = 0	August. Apr using 25 0 (100)m x 0	See Tal May 5°C inter 0 0 (101)m 0	Jun nal temp 1647.95 0.87 1436.02	0.93 1205.6	and exte 1330.37 0.9 1202.78	ernal ten 0 0	nperatur 0	e from T 0	able 10) 0		(100)
8c. Sr Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains	lated fo Jan loss rate 0 ation fac 0 Il loss, h 0 s (solar g	oling rec r June, Feb e Lm (ca 0 ttor for lc 0 mLm (W 0 gains ca	July and Mar Iculated 0 oss hm 0 Vatts) = 0 1 culated	August. Apr using 25 0 (100)m x 0 for appli	See Tal May 5°C inter 0 (101)m 0 cable we	Jun nal temp 1647.95 0.87 1436.02 eather re	0.93 1205.6 2000, se	and exte 1330.37 0.9 1202.78 e Table	ernal ten 0 0 10)	nperatur 0 0	e from T 0 0	able 10) 0 0		(100) (101) (102)
8c. Sp Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m=	ation fac 0 1 loss rate 0 1 loss, h 0 1 loss, h 0 5 (solar c 0	oling rec r June, Feb E Lm (ca 0 tor for lc 0 mLm (V 0 gains ca 0	July and Mar Iculated 0 bss hm 0 Vatts) = 0 Iculated 0	August. Apr using 25 0 (100)m x 0 for appli	See Tal May 5°C inter 0 (101)m 0 (101)m 0 cable we 0	Jun nal temp 1647.95 0.87 1436.02 eather re 1823.3	0.93 1205.6 2900, se 1748.1	and exte 1330.37 0.9 1202.78 e Table 1627.4	ernal ten 0 0 10) 0	nperatur 0 0 0	e from T 0 0 0	able 10) 0 0 0 0 0		(100) (101)
8c. Sp Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space	lated fo Jan loss rate 0 ation fac 0 il loss, h 0 s (solar g 0 e cooling	oling rec r June, Feb e Lm (ca 0 ttor for lc 0 mLm (W 0 gains ca 0 g require	July and Mar Iculated 0 oss hm 0 Vatts) = 0 Iculated 0 coment fo	August. Apr using 25 0 (100)m x (100)m x for appli 0 <i>r month,</i>	See Tal May 5°C inter 0 (101)m (101)m (able we 0 whole c	Jun nal temp 1647.95 0.87 1436.02 eather re 1823.3	0.93 1205.6 2900, se 1748.1	and exte 1330.37 0.9 1202.78 e Table 1627.4	ernal ten 0 0 10) 0	nperatur 0 0 0	e from T 0 0 0	able 10) 0 0		(100) (101) (102)
8c. Sr Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= <i>Space</i> set (1	ation fac 0 1 loss rate 0 ation fac 0 1 loss, h 0 (solar (0 0 e coolin(04)m to	oling rec r June, Feb E Lm (ca 0 tor for lc 0 mLm (W 0 gains ca 0 g require zero if (July and Mar Iculated 0 bss hm 0 Vatts) = 0 Iculated 0 Iculated 0 ement fo 104)m <	August. Apr using 25 0 0 (100)m x 0 for appli 0 r month, 3 x (98	See Tal May 5°C inter 0 (101)m 0 (101)m 0 cable we 0 whole c)m	Jun nal temp 1647.95 0.87 1436.02 eather re 1823.3 dwelling,	0.93 1205.6 2gion, se 1748.1 continue	and exte 1330.37 0.9 1202.78 e Table 1627.4 ous (kW	ernal ten 0 0 10) 0 /h) = 0.0	0 0 0 24 x [(10	e from T 0 0 0 0 03) <i>m</i> – (able 10) 0 0 0 0 102)m] >		(100) (101) (102)
8c. Sp Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space	ation fac 0 1 loss rate 0 ation fac 0 1 loss, h 0 (solar (0 0 e coolin(04)m to	oling rec r June, Feb e Lm (ca 0 ttor for lc 0 mLm (W 0 gains ca 0 g require	July and Mar Iculated 0 oss hm 0 Vatts) = 0 Iculated 0 coment fo	August. Apr using 25 0 (100)m x (100)m x for appli 0 <i>r month,</i>	See Tal May 5°C inter 0 (101)m (101)m (able we 0 whole c	Jun nal temp 1647.95 0.87 1436.02 eather re 1823.3	0.93 1205.6 2900, se 1748.1	and exte 1330.37 0.9 1202.78 e Table 1627.4	ernal ten 0 0 10) 0 /h) = 0.0	0 0 0 24 x [(10	e from T 0 0 0 0 03) <i>m</i> – (0	able 10) 0 0 0 0 0		(100) (101) (102) (103)
8c. Sr Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= <i>Space</i> set (1 (104)m=	lated fo Jan loss rate 0 ation fac 0 il loss, h 0 is (solar (0 e coolin(04)m to 0	oling rec r June, Feb e Lm (ca 0 tor for lc 0 mLm (W 0 gains ca 0 g require zero if (0	July and Mar Iculated 0 bss hm 0 Vatts) = 0 Iculated 0 Iculated 0 ement fo 104)m <	August. Apr using 25 0 0 (100)m x 0 for appli 0 r month, 3 x (98	See Tal May 5°C inter 0 (101)m 0 (101)m 0 cable we 0 whole c)m	Jun nal temp 1647.95 0.87 1436.02 eather re 1823.3 dwelling,	0.93 1205.6 2gion, se 1748.1 continue	and exte 1330.37 0.9 1202.78 e Table 1627.4 ous (kW	ernal ten 0 10) 0 (h) = 0.0 Total	0 0 24 x [(10 0 = Sum(e from T 0 0 0 0 0 0 3) <i>m</i> – (0 104)	able 10) 0 0 0 0 102)m] > 0		(100) (101) (102) (103)
8c. Sr Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m= Coolec	ation fac 0 1 loss rate 0 ation fac 0 1 loss, h 0 s (solar g 0 e cooling 04)m to 0	oling rec r June, Feb E Lm (ca 0 tor for lc 0 mLm (W 0 gains ca 0 grequire zero if (0	uiremenJuly andMarIculated00vatts) = 00Iculated001culated00104)m 0	August. Apr using 25 0 0 (100)m x 0 for appli 0 r month, 3 x (98 0	See Tal May 5°C inter 0 (101)m 0 (101)m 0 cable we 0 whole c)m	Jun nal temp 1647.95 0.87 1436.02 eather re 1823.3 dwelling,	0.93 1205.6 2gion, se 1748.1 continue	and exte 1330.37 0.9 1202.78 e Table 1627.4 <i>cous (kW</i>	ernal ten 0 10) 0 (h) = 0.0 Total	0 0 0 24 x [(10	e from T 0 0 0 0 0 0 3) <i>m</i> – (0 104)	able 10) 0 0 0 0 102)m] > 0	< (41)m	(100) (101) (102) (103)
8c. Sf Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= <i>Space</i> set (1 (104)m= Coolece Intermi	lated fo Jan loss rate 0 ation fac 0 il loss, h 0 il loss, h 0 is (solar o 0 e cooling 04)m to 0 i fractior	oling rec r June, Feb e Lm (ca 0 tor for lc 0 mLm (W 0 gains ca 0 g require zero if (0 n actor (Ta	July and July and Mar Iculated 0 pss hm 0 Vatts) = 0 1culated 0 Vatts) = 0 1culated 0 2 0 2 0 2 0 2 0 2 0 able 10b	August. Apr using 25 0 (100)m x 0 for appli 0 <i>r month,</i> 3 x (98 0	See Tal May 5°C inter 0 (101)m 0 (101)m 0 cable we 0 whole c)m 0	Jun nal temp 1647.95 0.87 1436.02 eather re 1823.3 dwelling, 278.84	0.93 1205.6 2900, se 1748.1 continue 403.62	and exte 1330.37 0.9 1202.78 ee Table 1627.4 Dus (kW 315.92	ernal ten 0 10) 0 (h) = 0.0 Total f C =	0 0 0 24 x [(10 0 = Sum(cooled a	e from T 0 0 0 03) <i>m</i> – (0 1,04) area ÷ (4	able 10) 0 0 0 0 102)m] > 0 1, 2) 1, 2) 1, 2) 1, 2) 1, 2)	< (41)m 998.38	(100) (101) (102) (103)
8c. Sr Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m= Coolec	lated fo Jan loss rate 0 ation fac 0 il loss, h 0 il loss, h 0 is (solar o 0 e cooling 04)m to 0 i fractior	oling rec r June, Feb E Lm (ca 0 tor for lc 0 mLm (W 0 gains ca 0 grequire zero if (0	uiremenJuly andMarIculated00vatts) = 00Iculated001culated001culated00104)m 0	August. Apr using 25 0 0 (100)m x 0 for appli 0 r month, 3 x (98 0	See Tal May 5°C inter 0 (101)m 0 (101)m 0 cable we 0 whole c)m	Jun nal temp 1647.95 0.87 1436.02 eather re 1823.3 dwelling,	0.93 1205.6 2gion, se 1748.1 continue	and exte 1330.37 0.9 1202.78 e Table 1627.4 <i>cous (kW</i>	ernal ten 0 10) 0 /h) = 0.0 Total f C = 0	0 0 0 24 x [(10 0 = Sum(cooled a	e from T 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	able 10) 0 0 0 0 102)m] > 0	< (41)m 998.38	(100) (101) (102) (103) (104) (105)
8c. Sf Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= <i>Spac</i> set (1 (104)m= Coolec Intermi (106)m=	lated fo Jan loss rate 0 ation fac 0 il loss, h 0 il loss, h 0 is (solar o 0 e cooling 04)m to 0 d fractior ittency fa	oling rec r June, Feb e Lm (ca 0 tor for lc 0 mLm (W 0 gains ca 0 g require zero if (0 n actor (Ta 0	July and MarJuly and MarIculated0 0 0 0 0 0 0 0 1 0 0 0 1 0 0 1 0 0 0 0 0	August. Apr using 25 0 (100)m x 0 for appli 0 r month, 3 x (98) 0 0	See Tal May 5°C inter 0 (101)m (101)m 0 (101)m 0 (101)m 0 (101)m 0 (101)m (Jun nal temp 1647.95 0.87 1436.02 eather re 1823.3 <i>dwelling,</i> 278.84	0.93 1205.6 2000, se 1748.1 2001, se 1748.1 2001, se 1748.1 2001, se 1748.1 2001, se	and exte 1330.37 0.9 1202.78 ee Table 1627.4 Dus (kW 315.92	ernal ten 0 10) 0 /h) = 0.0 Total f C = 0	0 0 0 24 x [(10 0 = Sum(cooled a	e from T 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	able 10) 0 0 0 0 102)m] > 0 1, 2) 1, 2) 1, 2) 1, 2) 1, 2)	< (41)m 998.38	(100) (101) (102) (103)
8c. Sf Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m= Coolec Intermi (106)m=	lated fo Jan loss rate 0 ation fac 0 il loss, h 0 il r>loss, h 0 i loss,	oling rec r June, Feb E Lm (ca 0 tor for lc 0 mLm (W 0 gains ca 0 g require zero if (0 n actor (Ta 0 requirer	uiremenJuly andJuly andMarIculated00vatts) = 00104)m 0able 10b00	August. Apr using 25 0 0 (100)m × 0 for appli 0 r month, 3 × (98 0) 0 month =	See Tal May 5°C inter 0 (101)m 0 (101)m 0 cable we 0 whole c)m 0 0	Jun nal temp 1647.95 0.87 1436.02 eather re 1823.3 dwelling, 278.84 0.25 × (105)	0.93 1205.6 2gion, se 1748.1 <i>continue</i> 403.62 0.25 × (106)r	and exte 1330.37 0.9 1202.78 re Table 1627.4 ous (kW 315.92 0.25 n	ernal ten 0 0 10) 0 /h) = 0.0 0 Total f C = 0 Total	0 0 0 24 x [(10 0 = Sum(cooled a 0 1 = Sum(e from T 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	able 10) 0 0 0 0 0 102)m]> 0 = 4) = 0 = 0 = 0 = 0 =	<i>x (41)m</i> 998.38 1	(100) (101) (102) (103) (104) (105)
8c. Sf Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= <i>Spac</i> set (1 (104)m= Coolec Intermi (106)m=	lated fo Jan loss rate 0 ation fac 0 il loss, h 0 il loss, h 0 is (solar o 0 e cooling 04)m to 0 d fractior ittency fa	oling rec r June, Feb e Lm (ca 0 tor for lc 0 mLm (W 0 gains ca 0 g require zero if (0 n actor (Ta 0	July and MarJuly and MarIculated0 0 0 0 0 0 0 0 1 0 0 0 1 0 0 1 0 0 0 0 0	August. Apr using 25 0 (100)m x 0 for appli 0 r month, 3 x (98) 0 0	See Tal May 5°C inter 0 (101)m (101)m 0 (101)m 0 (101)m 0 (101)m 0 (101)m (Jun nal temp 1647.95 0.87 1436.02 eather re 1823.3 <i>dwelling,</i> 278.84	0.93 1205.6 2000, se 1748.1 2001, se 1748.1 2001, se 1748.1 2001, se 1748.1 2001, se	and exte 1330.37 0.9 1202.78 ee Table 1627.4 Dus (kW 315.92	ernal ten 0 10) 0 10) 0 /h) = 0.0 0 Total f C = 0 Total 0 Total	0 0 0 24 x [(10 0 = Sum(cooled a 0 1 = Sum(0	e from T 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	able 10) 0 0 0 0 0 102)m]> 0 1)= 0	<i>x (41)m</i> 998.38 1	(100) (101) (102) (103) (104) (105) (106)
8c. Sf Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m= Coolec Intermi (106)m=	lated fo Jan loss rate 0 ation fac 0 il loss, h 0 il r>loss, h 0 i loss,	oling rec r June, Feb E Lm (ca 0 tor for lc 0 mLm (W 0 gains ca 0 g require zero if (0 n actor (Ta 0 requirer	uiremenJuly andJuly andMarIculated00vatts) = 00104)m 0able 10b00	August. Apr using 25 0 0 (100)m × 0 for appli 0 r month, 3 × (98 0) 0 month =	See Tal May 5°C inter 0 (101)m 0 (101)m 0 cable we 0 whole c)m 0 (104)m	Jun nal temp 1647.95 0.87 1436.02 eather re 1823.3 dwelling, 278.84 0.25 × (105)	0.93 1205.6 2gion, se 1748.1 <i>continue</i> 403.62 0.25 × (106)r	and exte 1330.37 0.9 1202.78 re Table 1627.4 ous (kW 315.92 0.25 n	ernal ten 0 10) 0 10) 0 /h) = 0.0 0 Total f C = 0 Total 0 Total	0 0 0 24 x [(10 0 = Sum(cooled a 0 1 = Sum(e from T 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	able 10) 0 0 0 0 0 102)m]> 0 = 4) = 0 = 0 = 0 = 0 =	<i>x (41)m</i> 998.38 1	(100) (101) (102) (103) (104) (105)

8f. Fabric Energy Efficiency (calculated only under	r special conditions, see section 11)		
Fabric Energy Efficiency	(99) + (108) =	47.74	(109)



Appendix C: SAP Worksheets – Enhanced Fabric Energy Efficiency Standards

		User D	etails:						
Assessor Name: Software Name:	Stroma FSAP 2012		Stroma Softwa	re Ver	sion:			n: 1.0.0.28	
		Property A	Address:	1 Bed E	nhance	ed Fabric	;		
Address :									
1. Overall dwelling dimer	1510115.	۸ros	a(m²)		Av. Hei	iaht(m)		Volume(m ³)	
Ground floor				(1a) x		.39	(2a) =	149.76	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+	(1n) 6		(4)]``]``
Dwelling volume	/ (-/ (-/ (-/ (-/		2.00		+(3c)+(3d	l)+(3e)+	.(3n) =	149.76	(5)
_						· · ·		140.70](0)
2. Ventilation rate:	main seco	ndary	other		total			m ³ per hour	
	heating heat	ing		, r			40	-	1
Number of chimneys	0 + (0 +	0] = [0		40 =	0	(6a)
Number of open flues	0 + (0 +	0	=	0	x 2	20 =	0	(6b)
Number of intermittent far	IS				3	x ′	10 =	30	(7a)
Number of passive vents					0	x 7	10 =	0	(7b)
Number of flueless gas fir	es				0	× 4	40 =	0	(7c)
							Air ch	anges per hou	ır
Infiltration due to chimney	rs. flues and fans = $(6a)+(6a)$	6b)+(7a)+(7b)+(7	7c) =	Г	30	<u> </u>	÷ (5) =	0.2	(8)
	een carried out or is intended, pr			ontinue fre			. (0)	0.2](0)
Number of storeys in th	e dwelling (ns)							0	(9)
Additional infiltration						[(9)	1]x0.1 =	0	(10)
	25 for steel or timber fram			•	uction	-		0	(11)
if both types of wall are pre deducting areas of opening	esent, use the value correspond as), if equal user 0.35	ling to the greate	er wall area	a (after					
	oor, enter 0.2 (unsealed)	or 0.1 (seale	d), else	enter 0				0	(12)
If no draught lobby, ente	er 0.05, else enter 0							0	(13)
Percentage of windows	and doors draught stripp	ed						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)
	q50, expressed in cubic m	•	•	•	etre of e	nvelope	area	5	(17)
If based on air permeabilit	•							0.45	(18)
	s if a pressurisation test has bee	en done or a deg	iree air per	meability	is being us	sed			1
Number of sides sheltered Shelter factor	L		(20) = 1 - [0.075 x (1	9)] =			2 0.85	(19) (20)
Infiltration rate incorporati	ng shelter factor		(21) = (18)		-71			0.85	(21)
Infiltration rate modified for	•		x / x -/				l	0.36](21)
r i i		lun Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe				F			- • •		
		.8 3.8	3.7	4	4.3	4.5	4.7		
		I	<u> </u>			1	1	I	
Wind Factor $(22a)m = (22a)m $, 	0		. 1	4.00			l	
(22a)m= 1.27 1.25 1	1.23 1.1 1.08 0.	.95 0.95	0.92	1	1.08	1.12	1.18		

Adjust	ed infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m		-			
	0.49	0.48	0.47	0.42	0.41	0.36	0.36	0.35	0.38	0.41	0.43	0.45		
		<i>ctive air</i> al ventila	-	rate for t	he appli	cable ca	se							
				endix N (2	3b) = (23a	a) x Fmv (e	equation (I	N5)) , othei	rwise (23h) = (23a)			0	(23a)
			0 11		, (, ,	• •	n Table 4h)	,) = (204)			0	(23b)
			-	-	-			HR) (24a		2b)m i (22h) v [/	1 (22a)	0	(23c)
a) II (24a)m=	r								$0^{111} = (22)^{111}$			0	- 100j	(24a)
				-	-	-			-		ů	Ŭ		(2.00)
(24b)m=								VV) (24b	0 = (22)		230)	0		(24b)
			_		-	-	_			0	0	0		(210)
,					•	•		on from c c) = (22b		5 x (23h))			
(24c)m=	<u> </u>	0	0		0				0		0	0		(24c)
		ventilatio	n or wh	ole hous	e nositiv	/e input	ventilatio	on from I	oft			_		
,					•			0.5 + [(2		0.5]				
(24d)m=	0.62	0.61	0.61	0.59	0.58	0.57	0.57	0.56	0.57	0.58	0.59	0.6		(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24t	o) or (24	c) or (24	d) in boy	(25)					
(25)m=	0.62	0.61	0.61	0.59	0.58	0.57	0.57	0.56	0.57	0.58	0.59	0.6		(25)
2 40		a and he		ooromot	or									
ELEN		S and he Gros		oaramete Openin		Net Ar	00	U-valı	10	AXU		k-value	.	AXk
		area		m		A,r		W/m2		(W/I	K)	kJ/m²·ł		kJ/K
Doors						2	x	1.1	= [2.2				(26)
Windo	ws Type	e 1				2.39		/[1/(1.2)+	0.04] =	2.74	F			(27)
Windo	ws Type	2				2.39	x 1	/[1/(1.2)+	0.04] =	2.74	Fi i			(27)
	ws Type					0.96		/[1/(1.2)+	0.04] =	1.1	5			(27)
Floor		-				62.66		0.15		9.399				(28)
Walls				40.44					=				\dashv	
	roo of a			10.13	3	49.87		0.2	= [9.97				(29)
		elements	, 111-			122.6			r		—			(31)
Party v						13	X	0	=	0			\dashv	(32)
Party of	•					62.66								(32b)
				effective wi Internal wall			ated using	g formula 1,	/[(1/U-valu	ie)+0.04] a	as given in	paragraph	3.2	
		s, W/K :			io ana pan			(26)(30)	+ (32) =				30.88	(33)
		Cm = S(- /					((28)	(30) + (32	2) + (32a).	(32e) =	9854.9	(34)
			,	⊃ = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium	, ,	250	(35)
		•						recisely the	e indicative	e values of	TMP in Ta	able 1f	200	(00)
	-	ad of a de												
Therm	al bridg	es : S (L	x Y) cal	culated u	using Ap	pendix ł	<						6.13	(36)
			are not kr	own (36) =	= 0.15 x (3	1)			()	()				
	abric he									(36) =			37.02	(37)
Ventila		1		monthly				i		1	25)m x (5)		I	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	30.6	30.37	30.14	29.09	28.9	27.98	27.98	27.81	28.33	28.9	29.29	29.71		(38)
Heat ti	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (38)m			
(39)m=	67.61	67.38	67.16	66.11	65.91	64.99	64.99	64.82	65.35	65.91	66.31	66.73		
Stroma	FSAP 201	2 Version	1.0.0.28	(SAP 9.91)	- http://ww	ww.stroma	.com		/	Average =	Sum(39)1	12 /12=	66.1 ф а	ige 2 of 39)

Heat lo	ss para	imeter (H	HLP), W	/m²K					(40)m	= (39)m ÷	· (4)			
(40)m=	1.08	1.08	1.07	1.06	1.05	1.04	1.04	1.03	1.04	1.05	1.06	1.06		
Numbo	r of day	vs in mo	nth (Tab	lo 12)					,	Average =	Sum(40)1.	12 /12=	1.06	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ter heat	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF	A > 13.9	upancy, 9, N = 1 9, N = 1		: [1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.(0013 x (⁻	TFA -13		06		(42)
Reduce	the annua	al average		usage by	5% if the a	welling is	designed	(25 x N) to achieve		se target o		.03		(43)
[Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	r usage i	n litres pei	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)					4	
(44)m=	91.33	88.01	84.69	81.36	78.04	74.72	74.72	78.04	81.36	84.69	88.01	91.33		
-											m(44) ₁₁₂ =		996.3	(44)
Energy c			used - cal			190 x Vd,r	m x nm x L	OTm / 3600) kWh/mor			c, 1d)		
(45)m=	135.44	118.45	122.23	106.57	102.25	88.24	81.76	93.83	94.95	110.65	120.78	131.16		
lf instanta	aneous w	vater heati	ng at point	t of use (no	o hot water	r storage),	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =		1306.31	(45)
(46)m=	20.32	17.77	18.34	15.98	15.34	13.24	12.26	14.07	14.24	16.6	18.12	19.67		(46)
Water s	-		7											
Storage	e volum	e (litres)) includir	ng any se	olar or W	/WHRS	storage	within sa	ame ves	sel		120		(47)
		-	and no ta		-			. ,		(0) : ((
Water s			not wate	er (this ir	iciudes i	nstantar	neous co	ombi boil	ers) ente	er 'O' in (47)			
	-		eclared I	oss facto	or is kno	wn (kWł	n/dav):					0		(48)
,			m Table			,	,					0		(49)
			r storage		ear			(48) x (49)) =			0		(50)
			eclared of			or is not	known:						1	
		•	factor fr		le 2 (kW	h/litre/da	ay)					0		(51)
	-	from Ta	see secti	on 4.3									1	(50)
			om Table	2b								0		(52) (53)
			rstorage		ear			(47) x (51)	x (52) x (53) =		0		(54)
		(54) in (5	-	,, y.	Jul			(,()		,		0		(55)
Water s	storage	loss cal	culated	for each	month			((56)m = (55) × (41)ı	m			1	
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	r contains	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ı lix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary	/ circuit	loss (ar	nnual) fro	om Table	e 3							0		(58)
-		•				59)m = ((58) ÷ 36	65 × (41)	m				•	
(mod	lified by	factor f	rom Tab	le H5 if t	here is s	solar wat	ter heati	ng and a	cylinde	r thermo	stat)		1	
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)

Comb	loss ca	alculated	for eac	h n	nonth (61)m =	(60)) ÷ 36	65 × (41))m						
(61)m=	22.94	20.53	22.42	Τ	21.35	21.81	2	0.82	21.33	21.64	21.11	22.17	21.85	22.84]	(61)
Total h	neat red	uired for	water	hea	ating ca	alculated	d fo	r eacl	n month	(62)m =	= 0.85 ×	(45)m	+ (46)m +	(57)m +	- (59)m + (61)m	1
(62)m=	158.37	138.98	144.65	; ,	127.92	124.06	1	09.05	103.09	115.47	116.05	132.8	2 142.64	154	1	(62)
Solar D	HW input	calculated	using Ap	pen	ndix G or	Appendix	к Н (negati	ve quantity	v) (enter '()' if no sola	ar contrib	oution to wate	er heating))	
(add a	ddition	al lines if	FGHR	Sa	nd/or V	VWHRS	S ap	plies	, see Ap	pendix	G)				_	
(63)m=	0	0	0		0	0		0	0	0	0	0	0	0		(63)
Outpu	t from v	vater hea	iter											-	_	
(64)m=	158.37	138.98	144.65	; /	127.92	124.06	1(09.05	103.09	115.47	116.05	132.8	2 142.64	154		_
										Out	put from w	ater hea	ter (annual)	112	1567.11	(64)
Heat g	ains fro	om water	heatin	g, k	Wh/mo	onth 0.2	5 ´	[0.85	× (45)m	+ (61)r	n] + 0.8 x	x [(46)ı	m + (57)m	+ (59)m	<u>ı</u>]	
(65)m=	50.77	44.52	46.25		40.77	39.45	3	4.54	32.52	36.61	36.85	42.33	45.62	49.32		(65)
inclu	ude (57)m in cal	culatior	n of	(65)m	only if c	cylir	nder is	s in the c	dwelling	or hot w	ater is	from com	imunity l	neating	
5. In	ternal g	ains (see	e Table	5 a	and 5a)):										
Metab	olic gai	ns (Table	e 5), Wa	atts	i										_	
	Jan	Feb	Mar		Apr	May		Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(66)m=	123.35	123.35	123.35	; /	123.35	123.35	1:	23.35	123.35	123.35	123.35	123.3	5 123.35	123.35		(66)
Lightir	ig gains	s (calcula	ted in A	٩р	endix l	L, equat	tion	L9 o	r L9a), a	lso see	Table 5					
(67)m=	43.67	38.78	31.54		23.88	17.85	1	5.07	16.28	21.16	28.41	36.07	42.1	44.88		(67)
Applia	nces ga	ains (calc	ulated	in A	Append	dix L, eq	uat	ion L	13 or L1	3a), also	o see Ta	ble 5			-	
(68)m=	268.07	270.85	263.84	- 2	248 <mark>.</mark> 91	230.08	2	12.37	200.54	197.76	204.77	219.7	238.53	256.24]	(68)
Cookii	ng gain	s (calcula	ated in .	App	pendix	L, equa	tior	n L15	or L15a)	, also s	ee Table	95		-	-	
(69)m=	49.39	49.39	49.39	Т	49.39	49.39	4	9.39	49.39	49.39	49.39	49.39	49.39	49.39]	(69)
Pump	s and fa	ns gains	(Table	5a	ı)											
(70)m=	3	3	3		3	3		3	3	3	3	3	3	3	1	(70)
Losse	s e.g. e	vaporatio	n (neg	ativ	ve valu	es) (Tab	ble	5)			•	•	•		-	
(71)m=	-82.23	-82.23	-82.23		-82.23	-82.23	-8	32.23	-82.23	-82.23	-82.23	-82.2	3 -82.23	-82.23]	(71)
Water	heating	, gains (1	Fable 5)							•		•	<u>.</u>	-	
(72)m=	68.24	66.25	62.16	Τ	56.63	53.03	4	7.98	43.71	49.2	51.18	56.9	63.37	66.29	1	(72)
Total	interna	I gains =	:					(66)	m + (67)m	ı + (68)m	+ (69)m +	(70)m +	(71)m + (72)m	-	
(73)m=	473.47	469.38	451.05	; 4	422.93	394.46	3	68.92	354.04	361.64	377.86	406.1	7 437.51	460.92	1	(73)
6. So	lar gair	IS:	•							_						
Solar g	gains are	calculated	using so	lar fl	lux from	Table 6a	and	associ	ated equa	tions to c	onvert to th	ne applic	able orienta	tion.		
Orient		Access F			Area			Flu		-	g		FF		Gains	
		Table 6d		_	m²			lat	ole 6a		Table 6b		Table 6c		(W)	
North	0.9x	0.77		× [2.3	9	x	1	0.63	x	0.76	x	0.7	=	9.37	(74)
North	0.9x	0.77		× [2.3	9	x	2	0.32	×	0.76	x	0.7	=	17.91	(74)
North	0.9x	0.77		× [2.3	9	x	3	4.53	×	0.76	×	0.7	=	30.43	(74)
North	0.9x	0.77		× [2.3	9	x	5	5.46	x	0.76	x	0.7	=	48.87	(74)
North	0.9x	0.77		×「	2.3	9	x	7	4.72	x	0.76	x	0.7	=	65.83	(74)

North	0.9x	0.77	×	2.3	39	x	7	9.99	x	0.76		x [0.7		= [70.48	(74)
North	0.9x	0.77	×	2.3	39	x	7	4.68	x	0.76		×	0.7		= [65.8	(74)
North	0.9x	0.77	x	2.3	39	x	5	9.25	x	0.76		×	0.7		= [52.2	(74)
North	0.9x	0.77	x	2.3	39	x	4	1.52	x	0.76		×	0.7		= [36.58	(74)
North	0.9x	0.77	x	2.3	39	x	2	4.19	x	0.76		×	0.7		= [21.31	(74)
North	0.9x	0.77	×	2.3	39	x	1	3.12	x	0.76		×	0.7		= [11.56	(74)
North	0.9x	0.77	×	2.3	39	x		3.86	x	0.76		×	0.7		= [7.81	(74)
South	0.9x	0.77	×	2.3	39	x	4	6.75	x	0.76		×	0.7		= [82.39	(78)
South	0.9x	0.77	×	2.3	39	x	7	6.57	x	0.76		×	0.7		= [134.93	(78)
South	0.9x	0.77	×	2.3	39	x	9	7.53	x	0.76		×	0.7		= [171.88	(78)
South	0.9x	0.77	×	2.3	39	x	1	10.23	x	0.76		×	0.7		= [194.26	(78)
South	0.9x	0.77	×	2.3	39	x	1	14.87	x	0.76		×	0.7		= [202.43	(78)
South	0.9x	0.77	×	2.3	39	x	1	10.55	x	0.76		×	0.7		= [194.82	(78)
South	0.9x	0.77	×	2.3	39	x	1	08.01	x	0.76		×	0.7		= [190.35	(78)
South	0.9x	0.77	x	2.3	39	x	1	04.89	x	0.76		×	0.7		= [184.85	(78)
South	0.9x	0.77	×	2.3	39	x	1	01.89	x	0.76		×	0.7		= [179.55	(78)
South	0.9x	0.77	×	2.3	39	x	8	2.59	x	0.76		×	0.7		= [145.54	(78)
South	0.9x	0.77	×	2.3	39	x	5	5.42	x	0.76		х	0.7		=	97.66	(78)
South	0.9x	0.77	×	2.3	39	x	<u> </u>	40.4	x	0.76		×	0.7		= [71.19	(78)
															-		
Solar o	ains in	watts, ca	alculate	d for eac	h month	٦			(83)m	= Sum(74)	m(82	2)m					
(83)m=	9 <mark>8.71</mark>	166.44	224.7	275.8	308.3	<u> </u>	06.27	295.16	270.	.57 242.1	8 18	2.99	117.89	84.7	72		(83)
Total g	jains – i	nternal a	nd sola	r (84)m =	- = (73)m	+ (83)m	, watts									
(84)m=	572.18	635.82	675.75	698.72	702.76	6	75.19	649.2	632	.2 620.0)4 58	9.16	555.39	545.	64		(84)
7. Me	an inter	nal temp	erature	(heatinc	seaso	n)											
							area	from Tab	ole 9,	Th1 (°C))				Г	21	(85)
Utilisa	ation fac	tor for g	ains for	living are	ea, h1,r	n (s	ee Ta	ble 9a)							L		
	Jan	Feb	Mar	Apr	May	Ť	Jun	Jul	Aı	ug Se	p (Dct	Nov	De	ec		
(86)m=	0.99	0.97	0.95	0.89	0.78		0.6	0.44	0.4	7 0.69) 0).9	0.97	0.9	9		(86)
Mear	interna	l tempera	ature in	living ar	ea T1 (f	follo	w ste	ps 3 to 7	' in T	able 9c)	•		•				
(87)m=	20.14	20.29	20.5	20.73	20.9	-	20.98	21	21		6 20).76	20.42	20.1	1		(87)
Tomr				L Deriode i		 E du	olling	from To), Th2 (°C	<u> </u>						
(88)m=	20.02	20.02	20.02	20.04	20.04	-	20.05	20.05	20.0	· · · · ·	<u>í</u>	0.04	20.04	20.0)3		(88)
						<u> </u>					-						
Utilisa (89)m=	ation fac	tor for ga	ains for 0.94	0.86	welling,	-	,m (se 0.52	0.34	9a) 0.3	7 0.61		.87	0.96	0.9			(89)
						_				ļ			0.96	0.9	9		(03)
		· · ·		1	r	<u> </u>			i –	to 7 in Ta	-						(0.0)
(90)m=	18.9	19.12	19.41	19.74	19.95	2	20.04	20.05	20.0	20.02		9.79	19.32	18.8	37		(90)
											rLA =	= LIVI	ing area ÷ (4	+) =	L	0.64	(91)
		l temper	ature (fo	or the wh	ole dwe	ellin	g) = fl	_A × T1	+ (1	− fLA) × 1	Г2						
(92)m=	19.69	19.87	20.1	20.38	20.56	2	20.64	20.66	20.6		2 20).41	20.02	19.6	67		(92)

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

													(02)
(93)m= 19.54	19.72	19.95	20.23	20.41	20.49	20.51	20.51	20.47	20.26	19.87	19.52		(93)
8. Space hea									• T : /'	70)			
Set Ti to the the utilisation			•					o, so tha	t 11,m=(ro)m an		ulate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	1	1	1							i			<i>(</i> - .)
(94)m= 0.98	0.96	0.94	0.87	0.75	0.56	0.39	0.42	0.64	0.87	0.96	0.98		(94)
Useful gains	1	i ì	ŕ	r – – – – – – – – – – – – – – – – – – –	075.07	050.00	004 77	000.07	545.00		500 50		(05)
(95)m= 560.57	613.44	632.5	608.66	525.45	375.27	252.86	264.77	399.37	515.28	534.12	536.58		(95)
Monthly aver (96)m= 4.3	age exte	6.5	8.9	11.7	able 8 14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
	-						-			7.1	4.2		(30)
Heat loss rat (97)m= 1030.71	1	903.55	748.68	573.95	382.91	253.81	266.11	416.37	J 636.78	846.7	1021.98		(97)
Space heatin											1021.00		(01)
(98)m= 349.78	258.84	201.66	100.82	36.09	0	0.02			90.4	225.06	361.14		
						-	-	l per year				1623.79	(98)
On a sa h satin				24			1014	i por your	(ittriii) jour) – Oum(o	• /1		
Space heatir	• •											25.91	(99)
9a. Energy re	quiremer	nts – Indi	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					
Space heati													
Fraction of s					mentary							0	(201)
Fraction of s	pace hea	it from m	iain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fraction of to	otal heati	ng from i	main sys	stem 1			(204) = (2	02) <mark>× [</mark> 1 – ((203)] =			1	(204)
Efficiency of	main spa	ace heati	ing syste	em 1								92.9	(206)
Efficiency of	seconda	ry/supple	ementar	y heatin	g system	n, % —						0	(208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/y	ear
Space heatir	ng require	ement (c	alculate	d above)								
349.78	258.84	201.66	100.82	36.09	0	0	0	0	90.4	225.06	361.14		
(211)m = {[(98	3)m x (20	94)] + (21	0)m } x	100 ÷ (2	206)								(211)
376.52	278.62	217.07	108.52	38.84	0	0	0	0	97.3	242.26	388.74		
	-				-		Tota	l (kWh/yea	r) =Sum(2	2 11) _{15,1012}	<u>_</u>	1747.89	(211)
Space heatir	ng fuel (s	econdar	y), kWh/	month							•		
= {[(98)m x (2	01)] + (2	14) m } x	(100 ÷ (208)									
(215)m= 0	0	0	0	0	0	0	0	0	0	0	0		
							Tota	l (kWh/yea	r) =Sum(2	2 15) _{15,1012}	7	0	(215)
Water heating	g												
Output from w						r	r			r	· · · · · ·		
158.37	138.98	144.65	127.92	124.06	109.05	103.09	115.47	116.05	132.82	142.64	154		_
Efficiency of w	· · · · · ·									r		87.3	(216)
(217)m= 89.07	88.97	88.8	88.43	87.87	87.3	87.3	87.3	87.3	88.33	88.87	89.11		(217)
Fuel for water	•												
(219)m = (64) (219)m = 177.8	<u>)m x 100</u> 156.2) ÷ (217) 162.91	m 144.66	141.19	124.92	118.09	132.26	132.94	150.36	160.5	172.83		
(,	L .00.2				L			I = Sum(21)				1774.65	(219)
Annual totals										Wh/yeaı	. l	kWh/yea	· · ·
Space heating									ĸ	• • • • y edi		r will yea	
	g fuel use	əd, main	system	1								1747.89	

Water heating fuel used			1774.65
Electricity for pumps, fans and electric keep-ho	t		
central heating pump:		30	(230c)
boiler with a fan-assisted flue		45	(230e
Total electricity for the above, kWh/year	su	m of (230a)(230g) =	75 (231)
Electricity for lighting			308.46 (232)
10a. Fuel costs - individual heating systems:			
	Fuel kWh/year	Fuel Price (Table 12)	Fuel Cost £/year
Space heating - main system 1	(211) x	3.48 × 0.01	= 60.8265 (240)
Space heating - main system 2	(213) x	0 × 0.01	= 0 (241)
Space heating - secondary	(215) x	13.19 × 0.01	= 0 (242)
Water heating cost (other fuel)	(219)	3.48 × 0.01	= 61.76 (247)
Pumps, fans and electric keep-hot	(231)	13.19 × 0.01	= 9.89 (249)
(if off-peak tariff, list each of (230a) to (230g) see Energy for lighting	eparately as applicable (232)	and apply fuel price according t	
Additional standing charges (Table 12)			120 (251)
Appendix Q items: repeat lines (253) and (254)	as needed		
	(247) + (250)(254) =		293.16 (255)
11a. SAP rating - individual heating systems			
Energy cost deflator (Table 12)			0.42 (256)
3,	(256)] ÷ [(4) + 45.0] =		1.14 (257)
SAP rating (Section 12)			84.05 (258)
12a. CO2 emissions – Individual heating syste	ems including micro-CF	IP	
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	377.54 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	383.32 (264)
Space and water heating	(261) + (262) + (263) -	+ (264) =	760.87 (265)
Electricity for pumps, fans and electric keep-ho	t (231) x	0.519 =	38.93 (267)
Electricity for lighting	(232) x	0.519 =	160.09 (268)
Total CO2, kg/year		sum of (265)(271) =	959.88 (272)
CO2 emissions per m ²		(272) ÷ (4) =	15.32 (273)
El rating (section 14)			88 (274)
13a Primary Energy			

	Energy kWh/year	Primary factor		Energy Vh/year	
Space heating (main system 1)	(211) x	1.22	=	2132.42	(261)
Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	1.22	=	2165.07	(264)
Space and water heating	(261) + (262) + (263) + (264) =			4297.49	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	230.25	(267)
Electricity for lighting	(232) x	0	=	946.97	(268)
'Total Primary Energy	sur	m of (265)(271) =		5474.71	(272)
Primary energy kWh/m²/year	(27	72) ÷ (4) =		87.37	(273)



				User D	etails:						
Assessor Name: Software Name:	Stroma FS	AP 2012			Strom Softwa	are Vei	rsion:			n: 1.0.0.28	
			Pr	operty /	Address	: 2 Bed I	Enhance	d Fabric			
Address : 1. Overall dwelling dime	neione:										
				Δrea	a(m²)		Av. Hei	iaht(m)		Volume(m ³)	
Ground floor					. ,	(1a) x		2.5	(2a) =	103.75	(3a)
First floor						(1b) x		2.5	(2b) =	103.75] (3b)
Total floor area TFA = (1)	a)+(1b)+(1c)+	(1d)+(1e)+	.(1n		83	(4)		-]```], ,
Dwelling volume	/ (-/ (-/	(-) (-)	`	,	00)+(3c)+(3d	l)+(3e)+	.(3n) =	207.5	(5)
-								, , ,		201.0](")
2. Ventilation rate:	main	secon	dary	/	other		total			m ³ per hour	
Number of chimpove	heating	heati		,] + [7 = Г			40 =	-	
Number of chimneys	0			<u> </u>	0	_	0			0	(6a)
Number of open flues	0	+ 0		+	0	」⁼∟	0		20 =	0	(6b)
Number of intermittent fa	ins						3	x 1	10 =	30	(7a)
Number of passive vents							0	x 1	10 =	0	(7b)
Number of flueless gas fi	res					E	0	X 4	⁴⁰ = Air ch	o nanges per hou](7c) Ir
Infiltration due to chimne	ys, flues and f	ans = (6a) + (6b)	o)+(7a	a)+(7b)+(⁻	7c) =	Г	30	<u> </u>	÷ (5) =	0.14	(8)
If a pressurisation test has b			ceea	to (17), c	otherwise o	continue fr	om (9) to ((16)			-
Number of storeys in the	he dw <mark>elling</mark> (na	5)								0	(9)
Additional infiltration	OF for steel o	timb or from		0.25 for		n (oonotr	viction	[(9)-	1]x0.1 =	0	(10)
Structural infiltration: 0 if both types of wall are pl						•	uction			0	(11)
deducting areas of openin	ngs); if equal user	0.35	-	-							-
If suspended wooden f		,	or 0.1	1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en										0	(13)
Percentage of windows Window infiltration	s and doors dr	augnt strippe	a		0.25 - [0.2	$\mathbf{x}(14) \pm 1$	001 -			0	(14)
Infiltration rate							2) + (13) +	+ (15) -		0	(15)
Air permeability value,	a50 expresse	d in cubic m	atrad						area	0	(16) (17)
If based on air permeabil				•	•	•		invelope	aica	0.39	(17) (18)
Air permeability value applie	-						is being us	sed		0.39](10)
Number of sides sheltere				-		Ĩ	-			2	(19)
Shelter factor					(20) = 1 -	[0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorporat	ting shelter fac	tor			(21) = (18)) x (20) =				0.34	(21)
Infiltration rate modified f	or monthly wir	nd speed	,							L	
Jan Feb	Mar Apr	May Ju	ın	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Tabl	e 7									
(22)m= 5.1 5	4.9 4.4	4.3 3.8	3	3.8	3.7	4	4.3	4.5	4.7		

Wind F	actor (2	22a)m =	(22)m ÷	4									_	
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18]	
Adjust	ed infiltr	ation rat	e (allowi	ing for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
	0.43	0.42	0.41	0.37	0.36	0.32	0.32	0.31	0.34	0.36	0.38	0.39]	
			-	rate for t	he appli	cable ca	se	•	-				- 	(00-)
		al ventila		endix N, (2	2h) - (22	\rightarrow Emy (c	austion (NE)) otho	nuico (22h) - (220)			(
				endix N, (2) = (23a)			(. ,
			•	•	•				,	7h)	00h) [4	(00.0)	() (23c)
a) If (24a)m=			anical ve	entilation				HR) (24a	a m = (22)	20)m + (2 0	23D) × [1 0	1 - (23C)) ÷ 100]]	(24a)
	_		-		-	-	-		-		-	0	J	(244)
				entilation					m = (22)	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	230)	0	1	(24b)
(24b)m=				-			-			0	0	0		(240)
,				ntilation o then (24o	•	•				5 v (23h)			
(24c)m=	, <i>,</i>		0		0 = (201)		0	$\frac{0}{0} = \frac{221}{2}$	0	0	0	0	1	(24c)
				l v ole hous	-	-	_		-	Ů	, 	Ů	J	X - 7
,				m = (22)	•	•				0.5]				
(24d)m=	0.59	0.59	0.58	0.57	0.56	0.55	0.55	0.55	0.56	0.56	0.57	0.58		(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24	o) or (24	c) or (24	d) in bo	(25)				· · · · ·	
(25)m=	0.59	0.59	0.58	0.57	0.56	0.55	0.55	0.55	0.56	0.56	0.57	0.58	1	(25)
2 40	atlagaa	o ond by		oromot										
3. He	at 1055e	s anu ne	at 1055	paramete	JI.									
		Gros	22	Onenin	ae	Not Ar	02	LL-valı		ΔΧΠ		k-value	_	AXK
ELEN		Gros area		Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/ł	<)	k-value kJ/m²·		A X k kJ/K
ELEN Doors	IENT	-									<)			
Doors	IENT ws Type	area				A ,r	m ² x	W/m2	K =	(VV/ł	<)			kJ/K
Doors Windo		area e 1				A ,r	m ² x	W/m2	0.04] =	(W/ł 2.2	<) 			kJ/K (26)
Doors Windo Windo	ws Type	area e 1 e 2				A ,r 2 2.39	m ² x x x1. x1.	W/m2 1.1 /[1/(1.2)+	K 0.04] = 0.04] =	(W/ł 2.2 2.74				kJ/K (26) (27)
Doors Windo Windo	ws Type ws Type	area e 1 e 2				A ,r 2 2.39 2.39 0.96	m ² x x x1. x1.	W/m2 1.1 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+	K 0.04] = 0.04] =	(W/ł 2.2 2.74 2.74 1.1				kJ/K (26) (27) (27) (27)
Doors Windo Windo Windo Floor	ws Type ws Type	area 2 1 2 3	(m²)		2	A ,r 2 2.39 2.39 0.96 41.5	n ² x x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 1.1 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.15		(W/ł 2.2 2.74 2.74 1.1 6.225				kJ/K (26) (27) (27) (27) (28)
Doors Windo Windo Windo Floor Walls	ws Type ws Type	area = 1 = 2 = 3 <u>83.1</u>	(m ²) 8	10.13	2	A ,r 2 2.39 2.39 0.96 41.5 73.05	n ² x x1. x1. x1. x1. x1. x1. x1. x1. x1. x1.	W/m2 1.1 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.15 0.2	.0.04] = 0.04] = 0.04] = 0.04] =	(W/ł 2.2 2.74 2.74 1.1 6.225 14.61				kJ/K (26) (27) (27) (27) (28) (29)
Doors Windo Windo Windo Floor Walls Roof	ws Type ws Type ws Type	area = 1 = 2 = 3 <u>83.1</u> <u>41.</u>	(m²) 8 5		2	A ,r 2 2.39 2.39 0.96 41.5 73.05 41.5	n ² x x1. x1. x1. x1. x1. x1. x1. x2. x2. x2. x3. x3. x4. x4. x4. x4. x4. x4. x4. x4. x4. x4	W/m2 1.1 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.15		(W/ł 2.2 2.74 2.74 1.1 6.225				kJ/K (26) (27) (27) (27) (28) (28) (29) (30)
Doors Windo Windo Windo Floor Walls Roof Total a	ws Type ws Type ws Type area of e	area = 1 = 2 = 3 <u>83.1</u>	(m²) 8 5	10.13	2	A ,r 2 2.39 2.39 0.96 41.5 73.05 41.5	n ² x x1. x1. x1. x1. x1. x1. x2. x3. x4. x4. x4. x4. x4. x4. x4. x4. x4. x4	W/m2 1.1 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.15 0.2 0.11	$ \begin{array}{c} $	(W/k 2.2 2.74 2.74 1.1 6.225 14.61 4.56				kJ/K (26) (27) (27) (27) (28) (28) (29) (30) (31)
Doors Windo Windo Vindo Floor Walls Roof Total a Party v	ws Type ws Type ws Type area of e vall	area = 1 = 2 = 3 <u>83.1</u> <u>41.</u>	(m²) 8 5	10.13	2	A ,r 2 2.39 2.39 0.96 41.5 73.05 41.5 166.1 45	n ² x x1. x1. x1. x1. x1. x1. x1. x2. x2. x2. x3. x3. x4. x4. x4. x4. x4. x4. x4. x4. x4. x4	W/m2 1.1 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.15 0.2	.0.04] = 0.04] = 0.04] = 0.04] =	(W/ł 2.2 2.74 2.74 1.1 6.225 14.61				kJ/K (26) (27) (27) (27) (28) (28) (29) (30) (31) (32)
Doors Windo Windo Floor Floor Walls Roof Total a Party v Interna	ws Type ws Type ws Type area of e vall al floor dows and	area = 1 = 2 = 3 83.1 41.4 elements	(m²) 8 5 , m²	10.13	2 3 ndow U-va	A ,r 2 2.39 2.39 0.96 41.5 73.05 41.5 166.1 45 41.5	n ² x x11 x11 x11 x11 x12 x x x x x x x x x	W/m2 1.1 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ [0.15] 0.2 0.11 0	$ \begin{array}{c} $	(W/k 2.2 2.74 2.74 1.1 6.225 14.61 4.56 0		kJ/m²-		kJ/K (26) (27) (27) (27) (28) (28) (29) (30) (31)
Doors Windo Windo Floor Walls Roof Total a Party v Interna * for win ** incluo	ws Type ws Type ws Type ws Type area of e vall al floor dows and le the area	area area	(m ²) 8 5 , m ² ows, use e sides of ir	10.1: 0	2 3 ndow U-va	A ,r 2 2.39 2.39 0.96 41.5 73.05 41.5 166.1 45 41.5	n ² x x1. x1. x1. x1. x x x x x x x x x x x x x x x x x x x	W/m2 1.1 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ [0.15] 0.2 0.11 0	$\begin{bmatrix} K \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.0$	(W/k 2.2 2.74 2.74 1.1 6.225 14.61 4.56 0		kJ/m²-	K	kJ/K (26) (27) (27) (27) (28) (29) (30) (31) (32) (32d)
Doors Windo Windo Floor Walls Roof Total a Party v Interna * for win ** incluo Fabric	ws Type ws Type ws Type ws Type area of e vall al floor dows and le the area heat los	area = 1 = 2 = 3 83.1 41.3 elements I roof wind as on both ss, W/K =	(m ²) 8 5 , m ² ows, use e sides of ir = S (A x	10.1: 0	2 3 ndow U-va	A ,r 2 2.39 2.39 0.96 41.5 73.05 41.5 166.1 45 41.5	n ² x x1. x1. x1. x1. x x x x x x x x x x x x x x x x x x x	W/m2 1.1 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.15 0.2 0.11 0 0 0 formula 1	$\begin{bmatrix} 1 \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.0$	(W/k 2.2 2.74 2.74 1.1 6.225 14.61 4.56 0	s given in	kJ/m²+	K	kJ/K (26) (27) (27) (27) (28) (29) (30) (31) (32) (32) (32d) 91 (33)
Doors Windo Windo Floor Walls Roof Total a Party v Interna * for win ** incluo Fabric Heat c	ws Type ws Type ws Type ws Type area of e vall al floor dows and le the area heat los apacity	area area a = 1 a = 2 a = 3 a = 3 a = 3 a = 3 a = 1 a = 2 a = 3 a = 3 a = 1 a = 1	(m ²) 8 5 , m ² ows, use e sides of ir = S (A x (A x k)	m 10.13 0 effective with ternal walk U)	2 3 ndow U-va ds and par	A ,r 2 2.39 2.39 0.96 41.5 73.05 41.5 166.1 45 41.5 alue calculations	n ² x x1. x1. x1. x1. x1. x1. x1. x1. x1. x	W/m2 1.1 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.15 0.2 0.11 0 0 0 formula 1	$\begin{array}{c} \mathbf{K} \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ \\ \end{bmatrix} = \\ \\ \end{bmatrix} \\ = \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	(W/ł 2.2 2.74 2.74 1.1 6.225 14.61 4.56 0	[]]	kJ/m²+	K	kJ/K (26) (27) (27) (27) (28) (29) (30) (31) (32) (32) (32d) 91 (33) 4.75 (34)
Doors Windo Windo Floor Walls Roof Total a Party v Interna * for win ** incluo Fabric Heat c Therm	ws Type ws Type ws Type ws Type area of e vall al floor dows and le the area heat los apacity al mass	area area a = 1 a = 2 a = 3 a = 3	(m ²) 8 5 , m ² ows, use e sides of ir = S (A x A x k) ter (TMF	10.1: 0	² 3 ndow U-va Is and par - TFA) ir	A ,r 2 2.39 2.39 0.96 41.5 73.05 41.5 166.1 41.5 41.5 alue calculations	n ² x x1. x1. x1. x1. x x x x x x x x x x x x x x x x x x x	W/m2 1.1 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.15 0.2 0.11 0 0 formula 1 (26)(30)	$\begin{bmatrix} K \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.0$	(W/ł 2.2 2.74 2.74 1.1 6.225 14.61 4.56 0 0 re)+0.04] a .(30) + (32)	kJ/m²-	K	kJ/K (26) (27) (27) (27) (28) (29) (30) (31) (32) (32) (32d) 91 (33) 4.75 (34)
Doors Windo Windo Floor Walls Roof Total a Party v Interna * for win ** incluo Fabric Heat c Therm <i>For desi</i> <i>can be c</i>	ws Type ws Type ws Type ws Type area of e vall al floor dows and le the area heat los apacity al mass ign assess used inste	area area	(m ²) 8 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	$\begin{bmatrix} 10.13 \\ 0 \end{bmatrix}$ effective with the the the the the the the the the t	² ³ ³ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹	A ,r 2 2.39 2.39 0.96 41.5 73.05 41.5 166.1 41.5 166.1 41.5 166.1 41.5 166.1 167.1 177.1 1	n ² x x1. x1. x1. x1. x x x x x x x x x x x	W/m2 1.1 /[1/(1.2)+ /[1/(1.2)+ /[1/(1.2)+ 0.15 0.2 0.11 0 0 formula 1 (26)(30)	$\begin{bmatrix} K \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.0$	(W/ł 2.2 2.74 2.74 1.1 6.225 14.61 4.56 0 0 re)+0.04] a .(30) + (32)	kJ/m²-	K	kJ/K (26) (27) (27) (27) (28) (29) (30) (31) (32) (32) (32d) 91 (33) 4.75 (34)

if detail	s of therma	al bridging	are not kr	nown (36) =	= 0.15 x (3	1)								_
Total	fabric he	at loss							(33) +	(36) =			45.22	(37)
Ventila	ation hea	at loss ca	alculated	d monthly	у		-		(38)m	= 0.33 × (25)m x (5)	1		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	40.5	40.26	40.02	38.89	38.69	37.72	37.72	37.53	38.09	38.69	39.11	39.56		(38)
Heat t	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (38)m			
(39)m=	85.71	85.47	85.23	84.11	83.91	82.93	82.93	82.75	83.3	83.91	84.33	84.78		
			· · · · · · · · · · · · · · · · · · ·	· · · · ·						-	Sum(39)1	12 /12=	84.11	(39)
	oss para	· · · ·	<u> </u>	1				,	· · ·	= (39)m ÷	· · ·		1	
(40)m=	1.03	1.03	1.03	1.01	1.01	1	1	1	1	1.01	1.02	1.02		
Numb	er of day	/s in mo	nth (Tab	le 1a)					,	Average =	Sum(40)1	12 /12=	1.01	(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. W	ater hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
		Ŭ											1	
	ned occu =A > 13			/ [1 - exp	(-0 000?	849 x (TI	- Δ -13 Q)2)] + 0.0	1013 x (⁻	TFA -13		52		(42)
	FA £ 13.		1.107	(i onp	(0.0000	, io x (ii	10.0	<i>[</i>			.0)			
								(25 x N)				.93		(43)
		-		usage by r day (all w		-	-	to achieve	a water us	se target o	it .			
notino													1	
Hot wa	Jan	Feb	Mar r day for e	Apr ach month	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	l.	
		104.87	100.91	96.95	93				96.95	100.91	104.87	108.83	1	
(44)m=	108.83	104.07	100.91	90.95	93	89.04	89.04	93			m(44) ₁₁₂ =		1187.19	(44)
Energy	content of	hot water	used - ca	lculated mo	onthly = 4.	190 x Vd,i	m x nm x D	OTm / 3600					1107.19	
(45)m=	161.39	141.15	145.65	126.98	121.84	105.14	97.43	111.8	113.14	131.85	143.92	156.29		
16 :								h		Total = Su	m(45) ₁₁₂ =	=	1556.59	(45)
lf instar		ater heati.	ng at point T	t of use (no	o hot watei	r storage), I	enter 0 in	boxes (46) to (61)	1	1	1	1	
(46)m= Water	24.21 storage	21.17	21.85	19.05	18.28	15.77	14.61	16.77	16.97	19.78	21.59	23.44		(46)
	-) includir	na anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		150]	(47)
	-	. ,		ank in dw			-					100	l	
	•	U U			•			ombi boil	ers) ente	er '0' in (47)			
Water	storage	loss:												
a) If r	nanufact	urer's de	eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temp	erature f	actor fro	m Table	e 2b								0		(49)
-	•		-	e, kWh/ye				(48) x (49)) =			0		(50)
				cylinder l									1	(= .)
	ater stor Imunity h	-		rom Tabl	ie z (kvv	n/litre/da	ay)					0		(51)
	ne factor	-		011-1.0								0		(52)
	erature f			2b								0		(53)
Enera	y lost fro	m water	r storade	e, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
-	(50) or		-	,								0		(55)

Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0	1	(56)
If cylind	er contain	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	lix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Prima	v circuit	loss (ar	nual) fro	om Table	e 3			•		•		0	İ	(58)
	-	loss cal				59)m = ((58) ÷ 36	65 × (41)	m				•	
(mo	dified by	/ factor fi	rom Tab	le H5 if t	here is s	solar wat	er heatii	ng and a	cylinde	r thermo	stat)		_	
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	i loss ca	lculated	for each	month	(61)m =	(60) ÷ 30	65 × (41))m						
(61)m=	23.91	21.48	23.5	22.29	22.67	21.53	21.99	22.43	21.94	23.15	22.82	23.78		(61)
Total h	neat req	uired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	185.29	162.62	169.16	149.27	144.52	126.67	119.42	134.23	135.08	155	166.75	180.07		(62)
Solar D	HW input	calculated	using App	endix G o	· Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix (G)			-	_	
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Outpu	t from w	ater hea	ter										_	
(64)m=	185.29	162.62	169.16	149.27	144.52	126.67	119.42	134.23	135.08	155	166.75	180.07		_
								Outp	out from w	ater heate	r (annual)₁	12	1828.07	(64)
Heat g	jains fro	m water	heating	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)n	n] + 0.8 x	x [(46)m	+ (57)m	+ (59)m	1	
(65)m=	59.64	52.3	54.31	47.79	46.18	40.34	37.89	42.78	43.1	49.63	53.56	57.91		(65)
inclu	ude (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	vater is fi	om com	munity h	eating	
5 . In	tern <mark>al g</mark> a	ains (s <mark>ee</mark>	e Ta <mark>ble {</mark>	5 and 5a):									
Metab	<u>olic gair</u>	ns (Table	e <u>5), Wa</u> t	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	151.04	151.04	151.04	151.04	151.04	151.04	151.04	151.04	151.04	151.04	151.04	151.04		(66)
Lightir	ng gains	(calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5				_	
(67)m=	56.67	50.34	40.94	30.99	23.17	19.56	21.13	27.47	36.87	46.82	54.64	58.25		(67)
Applia	nces ga	ins (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5	_	-	_	
(68)m=	336.71	340.2	331.4	312.65	288.99	266.75	251.9	248.4	257.21	275.95	299.61	321.85		(68)
Cookir	ng gains	(calcula	ated in A	ppendix	L, equa	tion L15	or L15a)), also se	e Table	5			_	
(69)m=	52.62	52.62	52.62	52.62	52.62	52.62	52.62	52.62	52.62	52.62	52.62	52.62		(69)
Pumps	s and fa	ns gains	(Table &	5a)										
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losse	s e.g. e\	vaporatio	on (nega	tive valu	es) (Tab	ole 5)								
(71)m=	-100.69	-100.69	-100.69	-100.69	-100.69	-100.69	-100.69	-100.69	-100.69	-100.69	-100.69	-100.69		(71)
Water	heating	gains (T	able 5)											
(72)m=	80.16	77.83	72.99	66.38	62.07	56.03	50.93	57.5	59.87	66.7	74.39	77.84		(72)
Total	internal	gains =				(66)	m + (67)m	n + (68)m -	+ (69)m +	(70)m + (7	1)m + (72)	m	-	
(73)m=	579.51	574.34	551.29	515.99	480.2	448.31	429.93	439.34	459.91	495.44	534.61	563.91		(73)
6 50	lar gain:	s.												

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

Orientation:	Access Fac Table 6d	ctor	Area m²		Flu Ta	ıx ble 6a		g_ Table	6b	Т	FF able 6c		G	ains (W)	
North 0.9	× 0.77	x	2.3	9	x -	10.63	x	0.76		хГ	0.8	=		10.71	(74)
North 0.9	× 0.77	x	2.3	9	x	20.32	x	0.76		×	0.8	=		20.46	(74)
North 0.9	× 0.77	x	2.3	9	x :	34.53	x	0.76		×	0.8	= =		34.77	(74)
North 0.9	× 0.77	x	2.3	9	x !	55.46	x	0.76		×	0.8	=		55.85	(74)
North 0.9	× 0.77	x	2.3	9	x	74.72	x	0.76		×	0.8	=		75.24	(74)
North 0.9	× 0.77	x	2.3	9	x	79.99	x	0.76		×	0.8	=		80.55	(74)
North 0.9	× 0.77	x	2.3	9	x	74.68	x	0.76		x	0.8	=		75.2	(74)
North 0.9	× 0.77	x	2.3	9	x e	59.25	x	0.76		x	0.8	=		59.66	(74)
North 0.9	× 0.77	x	2.3	9	x	41.52	x	0.76		x	0.8	=		41.81	(74)
North 0.9	× 0.77	x	2.3	9	x	24.19	x	0.76		x	0.8	=		24.36	(74)
North 0.9	× 0.77	x	2.3	9	x	13.12	x	0.76		x	0.8	=		13.21	(74)
North 0.9	× 0.77	x	2.3	9	x	8.86	x	0.76		x	0.8	=		8.93	(74)
South 0.9	× 0.77	x	2.3	9	x	46.75	x	0.76		x	0.8	=		94.16	(78)
South 0.9	× 0.77	x	2.3	9	x	76.57	x	0.76		x	0.8	=		154.21	(78)
South 0.9	x 0.77	x	2.3	9	x s	97.53	x	0.76		x	0.8	=		196.44	(78)
South 0.9	× 0.77	x	2.3	9	× 1	10.23	x	0.76		Х	0.8	=		222.01	(78)
South 0.9	0.77	x	2.3	9	x 1	14.87	x	0.76		x	0.8	=		231.35	(78)
South 0.9	x 0.77	×	2.3	9	x 1	10.55] ×	0.76		x	0.8	=		222.65	(78)
South 0.9	× 0.77	x	2.3	9	х <u>1</u>	08.01] x	0.76		x	0.8	=		217.54	(78)
South 0.9	× 0.77	×	2.3	9	× 1	04.89	x	0.76		×	0.8	=		211.26	(78)
South 0.9	x 0.77	×	2.3	9	x 1	01.89	x	0.76		x	0.8	=		205.2	(78)
South 0.9	× 0.77	x	2.3	9	x	82.59	x	0.76		x	0.8	=		166.33	(78)
South 0.9	x 0.77	x	2.3	9	x t	55.42	x	0.76		x	0.8	=		111.61	(78)
South 0.9	× 0.77	x	2.3	9	x	40.4	x	0.76		×	0.8	=		81.36	(78)
	a watta aala						(00)	0)	20)					
(83)m= 112.8	n watts, calc	256.8	315.19	352.34	350.02	337.32	309	n = Sum(74	<u> </u>	09.13	134.73	96.82	٦		(83)
	- internal and				1 + (83)m										
(84)m= 692.3	2 764.55 8	308.1	831.19	832.54	798.33	767.25	748	.56 736.	69 70	04.57	669.34	660.73	3		(84)
7 Mean int	ernal temper	ature	(heating	season		I	1					1			
	re during hea) v		,	from Tal	ole 9	. Th1 (°C	;)					21	(85)
	actor for gair	• •			-			, (-	,						
Jar		Mar	Apr	May	Jun	Jul	A	ug Se	ae	Oct	Nov	Dec			
(86)m= 0.99		0.96	0.92	0.82	0.64	0.47	0.		<u> </u>	0.92	0.98	0.99			(86)
Mean inter	nal temperati	ure in	living are	ea T1 (fo	ollow ste	eps 3 to 7	7 in T	able 9c)							
(87)m= 20.14	i	20.47	20.71	20.89	20.98	21	2	<i>`</i>	95 2	20.74	20.4	20.11	7		(87)
Temperatu	re during hea	atina n	eriods ir	rest of	dwelling	n from Ta	able	9 Th2 (°(<u></u>						
(88)m= 20.00		20.06	20.07	20.07	20.08	20.08	20.	`	<u> </u>	20.07	20.07	20.07	٦		(88)
	actor for gair	ns for	rest of d	welling	h2 m (c	L Da Tabla	(op)	I	I		Į	ļ	_		
(89)m= 0.99		0.95	0.89	0.77	0.56	0.38	9a)	41 0.6	5 0	0.89	0.97	0.99	٦		(89)
0.00		5.50	0.00	5.11	L			0.0	`		1 0.07	0.00			x = */

Mean	interna	l temper	ature in	the rest	of dwell	ing T2 (f	ollow ste	eps 3 to 7	7 in Tabl	e 9c)				
(90)m=	18.93	19.13	19.41	19.74	19.97	20.07	20.08	20.08	20.05	19.79	19.32	18.89		(90)
									f	iLA = Livin	g area ÷ (4	4) =	0.36	(91)
Moon	intorna	Itompor	atura (fe	or the wh	olo dwo	lling) – fl	Ι Λ Ν Τ1	ı (1 fl	A) v T2					
(92)m=	19.36	19.54	19.79	20.09	20.3	20.4	20.41	+ (1 – 1L 20.41	20.38	20.14	19.71	19.33		(92)
				n interna							10.71	10.00		(0-)
(93)m=	19.21	19.39	19.64	19.94	20.15	20.25	20.26	20.26	20.23	19.99	19.56	19.18		(93)
		ting requ	l	1	20.10	20.20	20.20	20.20	20.20	10.00	10.00	10.10		()
				mperatu	re ohtair	hed at st	en 11 of	Table 9	h so tha	t Ti m–(76)m an	d re-calc	ate	
				using Ta					o, oo ma	(, it ii,iii–(<i>i</i> 0)111 an		Julate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hr	1 <u>.</u> 1:					. <u> </u>					
(94)m=	0.98	0.97	0.95	0.89	0.77	0.57	0.39	0.42	0.66	0.89	0.97	0.99		(94)
Usefu	l gains,	hmGm	, W = (9	4)m x (84	4)m	•								
(95)m=	681.11	742.99	765.75	740.17	643.13	458.48	302.76	318.14	488.35	627.77	648.46	652.07		(95)
Montl	hly aver	age exte	rnal terr	perature	e from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an interr	al tempe	erature,	Lm , W =	- =[(39)m	x [(93)m	– (96)m					
(97)m=	1278.38	1238.82	1120.18	928.45	708.92	468.4	303.79	319.67	510.25	787.58	1050.79	1270.17		(97)
Spac	e heatin	g require	ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 × [(97)m – (95)m] x (4	1)m			
(98)m=	444.37	333.2	263.7	135.56	48.94	0	0	0	0	118.9	289.68	459.86		
								Tota	l per year	(kWh/yeai	.) = Sum(9	8)15,912 =	2 094.2	(98)
Space	e heatin	a reauire	ement in	kWh/m²	2/vear								25.23	(99)
	e heatir		its – inu	ividu <mark>al h</mark>	eatings	ysterns	nciuding	micro-c						
•		•	at from s	econdar	v/supple	mentary	svstem						0	(201)
				nain syst		,,		(202) = 1 ·	- (201) =				1	(202)
	-			-						(202)1 -				
			-	main sys				(204) = (2	02) x [1 –	(203)] =			1	(204)
Efficie	ency of I	main spa	ace heat	ing syste	em 1								92.9	(206)
Efficie	ency of	seconda	ry/suppl	ementar	y heatin	g systen	ח, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space	e heatin	g require	ement (c	alculate	d above)							-	
	444.37	333.2	263.7	135.56	48.94	0	0	0	0	118.9	289.68	459.86		
(211)m	n = {[(98)m x (20	4)] + (2′	10)m } x	100 ÷ (2	206)								(211)
()	478.33	358.66	283.85	145.92	52.68	0	0	0	0	127.98	311.82	495.01		
		1	1	ļ	1		1	I Tota	l I (kWh/yea	I ar) =Sum(2	211) ₁₅₁₀₁₂	=	2254.26	(211)
Snac	o hoatin	a fuel (s	econdar	y), kWh/	month									
•				x 100 ÷ (
(215)m=		0	0	0	0	0	0	0	0	0	0	0		
				I				I Tota	l I (kWh/yea	l ar) =Sum(2	215) _{1 510 12}	=	0	(215)
Wator	heating	1											, v	` -/
			ter (calc	ulated a	bove)									
2 3 4 9 01	185.29	162.62	169.16	149.27	144.52	126.67	119.42	134.23	135.08	155	166.75	180.07		
Efficie	ncy of w	ater hea	iter	!	1	ļ		ļ		1			87.3	(216)

······									•	
(217)m= 89.12 89.03 88.87 88.52	87.94	87.3	87.3	87.3	87.3	88.41	88.93	89.15	J	(217)
Fuel for water heating, kWh/month $(219)m = (64)m \times 100 \div (217)m$										
(219)m = 207.92 182.66 190.35 168.63	164.33	145.1	136.79	153.76	154.73	175.32	187.5	201.98		
	•			Tota	l = Sum(2	19a) ₁₁₂ =		•	2069.06	(219)
Annual totals						k	Wh/year	•	kWh/year	-
Space heating fuel used, main system	11								2254.26	ļ
Water heating fuel used									2069.06]
Electricity for pumps, fans and electric	keep-hot								_	
central heating pump:								30		(230c)
boiler with a fan-assisted flue								45]	(230e)
Total electricity for the above, kWh/ye	ar			sum	of (230a).	(230g) =			75	(231)
Electricity for lighting									400.36	(232)
10a. Fuel costs - individual heating s	ystems:									
		Fu	el			Fuel P	rice		Fuel Cost	
		kW	/h/year			(Table	12)		£/year	
Space heating - main system 1		(211	l) x			3.4	.8	x 0.01 =	78.4481	(240)
Space heating - main system 2		(213	3) x			0		x 0.01 =	0	(241)
Space heating - secondary		(218	5) X			13.	19	x 0.01 =	0	(242)
Water heating cost (other fuel)		(219))			3.4	.8	x 0.01 =	72	(247)
Pumps, fans and electric keep-hot		(231	D _			13.	19	x 0.01 =	9.89	(249)
(if off-peak tariff, list each of (230a) to Energy for lighting	(230g) se	parately (232		licable a	nd apply	/ fuel prid		ding to - x 0.01 =	Table 12a	(250)
Additional standing charges (Table 12	2)						<u> </u>		120	(251)
									120]()
Appendix Q items: repeat lines (253) a Total energy cost	. ,		ied 0)(254)	=					333.15	(255)
11a. SAP rating - individual heating s		, . (-,(,						000.10]()
Energy cost deflator (Table 12) Energy cost factor (ECF)	[(255) x ((256)] ÷ [(4) + 45.0]	_					0.42	(256)
SAP rating (Section 12)	[(200) x ((200)] . [(1) 1 10.0]	_					1.09 84.75	(257)
12a. CO2 emissions – Individual hea	itina syste	ms inclu	ıdina mi	cro-CHP)				04.75	_(200)
						F uele e		4	Fusia sia na	
			ergy /h/year			kg CO	ion fac 2/kWh	tor	Emissions kg CO2/yea	r
Space heating (main system 1)		(211	l) x			0.2	16	=	486.92	(261)
Space heating (secondary)		(215	5) x			0.5	19	=	0	(263)
Water heating		(219	9) x			0.2	16	=	446.92	(264)
Space and water heating		(261) + (262)	+ (263) + (264) =				933.84	(265)

Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	38.93 (267)
Electricity for lighting	(232) x	0.519 =	207.79 (268)
Total CO2, kg/year		sum of (265)(271) =	1180.55 (272)
CO2 emissions per m ²		(272) ÷ (4) =	14.22 (273)
El rating (section 14)			88 (274)
13a. Primary Energy			
	Energy kWh/year	Primary factor	P. Energy kWh/year
Space heating (main system 1)	(211) x	1.22 =	2750.19 (261)
Space heating (secondary)	(215) x	3.07 =	0 (263)
Energy for water heating	(219) x	1.22 =	2524.25 (264)
Space and water heating	(261) + (262) + (263) + (26	64) =	5274.45 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07 =	230.25 (267)
Electricity for lighting	(232) x	0 =	1229.1 (268)
'Total Primary Energy		sum of (265)(271) =	6733.8 (272)
Primary energy kWh/m²/year		(272) ÷ (4) =	81.13 (273)

			User D	Details:									
Assessor Name: Software Name:	Stroma FS	-		Strom Softwa	are Vei	sion:			n: 1.0.0.28				
		I	Property	Address	: 3 Bed I	Enhance	d Fabric	;					
Address :													
1. Overall dwelling dim	ensions:		٨٣٥	o(m ²)			abt(m)		Volumo(m3)				
Ground floor				a(m²) ^{18.77}	(1a) x	Av. Hei	ignt(m)	(2a) =	Volume(m ³)	(3a)			
First floor				-	(1b) x			(2b) =	121.92](3b)			
	• - \ - (4 L \ - (4 - \ -	(4.1) - (4) - (4		18.77		2	2.5	(20) =	121.92				
Total floor area TFA = (?	1a)+(1b)+(1c)+	(1d)+(1e)+(1	n) g	97.54	(4)					_			
Dwelling volume					(3a)+(3b))+(3c)+(3d)+(3e)+	.(3n) =	243.85	(5)			
2. Ventilation rate:													
	main heating	seconda heating	ry	other		total			m ³ per hour				
Number of chimneys													
Number of open flues	0	+ 0	_ + [0	_] = [0	x 2	20 =	0	(6b)			
Number of intermittent fa	ans				- T	3	x 1	10 =	30	(7a)			
Number of passive vent	s				Г	0	x 1	10 =	0	(7b)			
Number of flueless gas	Jumber of passive vents 0 x 10 = Jumber of flueless gas fires 0 x 40 =												
								Air ch	anges per hou	ır			
Infiltration due to chimne	nfiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) = 30 \div (5) =$												
If a pressurisation test has			ed to (17),	otherwise o	continue fr	om (9) to (16)			-			
Number of storeys in t	the dwelling (n	s)							0	(9)			
Additional infiltration) OF for steel o	r timbor fromo o	* 0.25 fa	r 20000	n conotr	uction	[(9)-	1]x0.1 =	0	(10)			
Structural infiltration: (if both types of wall are p					•	uction			0	(11)			
deducting areas of open	ings); if equal user	0.35	-							-			
If suspended wooden		. ,).1 (seale	ed), else	enter 0				0	(12)			
If no draught lobby, er									0	(13)			
Percentage of window Window infiltration	is and doors di	aught stripped		0.25 - [0.2	• x (14) ∸ 1	001 =			0	(14)			
Infiltration rate				(8) + (10)			⊦ (15) =		0	(15) (16)			
Air permeability value	. a50. expresse	ed in cubic metr	es per ho					area	5	(17)			
If based on air permeab	• •		-	•	•				0.37	(18)			
Air permeability value appli	-					is being us	sed], ,			
Number of sides shelter	ed			(20) = 1 -					2	(19)			
Shelter factor	0.85	(20)											
Infiltration rate incorpora	-			(21) = (18) x (20) =				0.32	(21)			
Infiltration rate modified for monthly wind speed													
Jan Feb	Mar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec					
Monthly average wind s	·	· · · · · ·					4 -		I				
(22)m= 5.1 5	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7					

Wind F	actor (2	22a)m =	(22)m ÷	4										
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjust	ed infiltr	ation rat	e (allow	ing for sł	nelter ar	nd wind s	speed) =	: (21a) x	(22a)m					
•	0.4	0.4	0.39	0.35	0.34	0.3	0.3	0.29	0.32	0.34	0.36	0.37		
			-	rate for t	he appli	cable ca	ise							
		al ventila		endix N, (2	(25) = (22)	a) v Emy (aquation (nuico (22h	(220)		l	0	(23a)
				viency in %						9) = (23a)		l	0	(23b)
					•				,	2b)m i ((22h) v [1 – (23c)	0	(23c)
(24a)m=	r								$\frac{1}{0} = \frac{2}{2}$	0	230) × [0	÷ 100]	(24a)
				I entilation	-	-					-	ů	I	(,
(24b)m=	r										0	0		(24b)
				ntilation of	-				-				I	
				then (24	-	-				.5 × (23t	c)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
				ole hous						•				
	<u> </u>		<u>, ,</u>)m = (22l	,	· · ·	<u> </u>		<u> </u>	-				
(24d)m=		0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57		(24d)
				nter (24a	í ·	<u>, , , , , , , , , , , , , , , , , , , </u>	<u>, , , , , , , , , , , , , , , , , , , </u>		1 /					(05)
(25)m=	0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57	l i	(25)
3. He	at l <mark>osse</mark>	s and he	eat l <mark>oss</mark>	paramet	er:						_			
ELEN		Gros area		Openin m	-	Net Ar A ,r		U-val W/m2		A X U (W/		k-value kJ/m²·ł		A X k kJ/K
Doors						2.1	×	1.1		2.31				(26)
Windo	ws Type	e 1				2.39	x1	/[1/(1.2)+	- 0.04] =	2.74	=			(27)
Windo	ws Type	2				2.39	x1	/[1/(1.2)+	- 0.04] =	2.74				(27)
Windo	ws Type	e 3				1.44	x1	/[1/(1.2)+	- 0.04] =	1.65				(27)
Windo	ws Type	e 4				1.44	x1	/[1/(1.2)+	- 0.04] =	1.65				(27)
	ws Type					3.15	=	/[1/(1.2)+	0.04] =	3.61				(27)
Floor						48.77		0.15		7.3155	5		-	(28)
Walls		125	5	19.1	3	105.8		0.2		21.17	= 1		\dashv	(29)
Roof		48.7		0		48.77		0.11		5.36			\dashv	(30)
	area of e	lements				222.5					[(31)
Party v						45	x	0		0			-	(32)
Interna						48.77				Ū	I		\dashv	(32d)
		roof wind	ows, use e	effective wi	indow U-v			g formula 1	1/[(1/U-valu	ıe)+0.04] a	l as given in	n paragraph		(-=w)
** inclua	le the area	as on both	sides of ii	nternal wal			-					-		
		ss, W/K :	•	U)				(26)(30					55.66	(33)
Heat c	apacity	Cm = S((Axk)						((28).	(30) + (3	2) + (32a)	(32e) =	22416.99) (34)

Thermal mass parameter (TMP = Cm \div TFA) in kJ/m²K

((28)(30) + (32) + (32a)(32e) =	22416.
Indicative Value: Medium	250

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f

(35)

can be ι	ised inste	ad of a de	tailed calc	ulation.										
Therm	ermal bridges : S (L x Y) calculated using Appendix K 11.13 (36) etails of thermal bridging are not known (36) = 0.15 x (31)													
if details	of therma	al bridging	are not kn	own (36) =	= 0.15 x (3	1)								
Total fa	abric he	at loss							(33) +	(36) =			66.79	(37)
Ventila	tion hea	at loss ca	alculated	monthl	y				(38)m	= 0.33 × (25)m x (5)	_		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	46.81	46.55	46.3	45.13	44.91	43.88	43.88	43.7	44.27	44.91	45.35	45.82		(38)
Heat tr	ansfer o	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	113.6	113.34	113.09	111.92	111.7	110.67	110.67	110.49	111.07	111.7	112.14	112.61		
Heat lo	oss para	meter (F	HLP), W	/m²K						Average = = (39)m ÷	Sum(39)₁. · (4)	₁₂ /12=	111.92	(39)
(40)m=	1.16	1.16	1.16	1.15	1.15	1.13	1.13	1.13	1.14	1.15	1.15	1.15		
(-)		_	-			_	_	_			Sum(40)1.		1.15	(40)
Numbe	er of day	s in mo	nth (Tab	le 1a)	-									
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
A Water beating energy requirement:														
4. Water heating energy requirement: kWh/year:														
A														
	ssumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)													(42)
	if TFA \pounds 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9) if TFA \pounds 13.9, N = 1													
Annual average hot water usage in litres per day Vd,average = (25 x N) + 36 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of														(43)
				r day (all w				o acriieve	a water ut	se largel o	1			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate				ach month	-			, v	Jeb			Dec		
(44)m=	114.28	110.12	105.97	101.81	97.66	93.5	93.5	97.66	101.81	105.97	110.12	114.28		
()	111.20	110.12	100.01	101.01	01.00	00.0	00.0	01.00			m(44) ₁₁₂ =	_	1246.68	(44)
Energy	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x E) Tm / 3600			ables 1b, 1			
(45)m=	169.47	148.22	152.95	133.35	127.95	110.41	102.31	117.4	118.81	138.46	151.14	164.12		
										Total = Su	m(45) ₁₁₂ =		1634.59	(45)
lf instan	taneous w	ater heati	ng at point	t of use (no	hot water	r storage),	enter 0 in	boxes (46) to (61)					
(46)m=	25.42	22.23	22.94	20	19.19	16.56	15.35	17.61	17.82	20.77	22.67	24.62		(46)
	storage		ingludir		olor or M		otorogo	within or		ool			l	(47)
-		. ,					-	within sa	anie ves	501		150		(47)
	•	-		nk in dw r (this in	-			(47) mbi boil	ers) ente	r '0' in <i>(</i>	47)			
	storage		not wate			notantai					,			
	-		eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature f	actor fro	m Table	2b								0		(49)
Energy	/ lost fro	m water	storage	, kWh/ye	ear			(48) x (49)) =			0		(50)
b) If m	nanufact	urer's de	eclared o	cylinder l	oss fact									
				om Tabl	e 2 (kW	h/litre/da	ay)					0		(51)
	•	leating s from Ta	ee secti	on 4.3								-	l	(50)
			bie ∠a m Table	2b								0		(52) (53)
pc												0		(00)

0.		om water (54) in (5	•	e, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54) (55)
	. ,		,	for each	month			((56)m = (55) × (41)r	m		0		(00)
(56)m=		0	0		0	0	0	0	0	0	0	0	1	(56)
	-	-	-	÷	-	-	-	-	7)m = (56)	-	-		lix H	(00)
(57)m=	0	0	0	0	0		0	0	0	0	0	0		(57)
			_		-	Ů	Ů		Ĵ]	(58)
	-			om Table for each		59)m – ((58) ÷ 36	5 🗸 (41)	m			0		(30)
	•					,	. ,	• •	ı cylindeı	r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	loss ca	Iculated	for each	, month ((61)m =	(60) ÷ 36	65 × (41))m				•	•	
(61)m=	25.39	22.85	25.1	24.03	24.6	23.5	24.08	24.42	23.77	24.84	24.34	25.3		(61)
Total h	neat req	uired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	, (59)m + (61)m	
(62)m=	194.86	171.07	178.05	157.38	152.55	133.91	126.4	141.82	142.58	163.3	175.48	189.42		(62)
Solar DI	HW input	calculated	using App	endix G or	r Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)	1	
(add a	dditiona	l lines if	FGHRS	and/or \	NWHRS	applies	, see Ap	pendix (G)				_	
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	t from w	ater hea	ter											
(64)m=	194.86	171.07	178.05	157.38	152.55	133.91	126.4	141.82	142.58	163.3	175.48	189.42		
								Outp	out from wa	ater heate	r (annual)₁	12	1926.82	(64)
Heat g	ains fro	m water	heating	, kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (61)m	n] + 0.8 x	(46)m	+ (57)m	+ (59)m]	
(65)m=	62.7	55	57.13	50.34	48.69	42.59	40.04	45.14	45.45	52.25	56.34	60.9		(65)
inclu	ude (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. In	ternal ga	ains (see	e Table 5	5 and 5a):									
Metab	<u>olic gair</u>	s (Table	e 5), Wat	ts						_				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	162.94	162.94	162.94	162.94	162.94	162.94	162.94	162.94	162.94	162.94	162.94	162.94		(66)
Lightin	ig gains	(calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5		-			
(67)m=	56.64	50.31	40.91	30.97	23.15	19.55	21.12	27.45	36.85	46.79	54.61	58.21		(67)
Applia	nces ga	ins (calc	ulated ir	n Append	dix L, eq	uation L	13 or L1	3a), alsc	see Tal	ble 5	-			
(68)m=	376.55	380.46	370.61	349.65	323.19	298.32	281.71	277.8	287.64	308.61	335.07	359.94		(68)
Cookir	ng gains	(calcula	ted in A	ppendix	L, equat	tion L15	or L15a)	, also se	e Table	5				
(69)m=	54.01	54.01	54.01	54.01	54.01	54.01	54.01	54.01	54.01	54.01	54.01	54.01		(69)
Pumps	s and fa	ns gains	(Table \$	5a)	-	-			-		-	-		
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losse	s e.g. ev	aporatic	on (nega	tive valu	es) (Tab	ole 5)					-	-		
(71)m=	-108.62	-108.62	-108.62	-108.62	-108.62	-108.62	-108.62	-108.62	-108.62	-108.62	-108.62	-108.62		(71)
Water	heating	gains (T	able 5)											
(72)m=	84.27	81.84	76.79	69.92	65.45	59.15	53.82	60.67	63.12	70.23	78.25	81.85		(72)
Total i	internal	gains =				(66)	m + (67)m	ı + (68)m +	+ (69)m + ((70)m + (7	1)m + (72))m		
(73)m=	628.78	623.93	599.64	561.87	523.11	488.33	467.96	477.25	498.93	536.94	579.25	611.32		(73)
6. So	lar gains	s:												

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

Orientation:	Access Facto Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North 0.9	0.77	x	2.39	×	10.63	x	0.76	x	0.8	=	21.42	(74)
North 0.9	0.77 0.77	×	1.44	x	10.63	x	0.76	x	0.8	=	12.9	(74)
North 0.9	0.77 0.77	×	2.39	x	20.32	x	0.76	x	0.8	=	40.93	(74)
North 0.9	0.77 0.77	×	1.44	x	20.32	x	0.76	x	0.8	=	24.66	(74)
North 0.9	0.77 0.77	×	2.39	x	34.53	x	0.76	x	0.8	=	69.54	(74)
North 0.9	0.77 0.77	×	1.44	x	34.53	x	0.76	x	0.8	=	41.9	(74)
North 0.9	0.77 0.77	×	2.39	x	55.46	x	0.76	x	0.8	=	111.71	(74)
North 0.9	0.77	×	1.44	x	55.46	x	0.76	x	0.8	=	67.3	(74)
North 0.9	0.77 0.77	×	2.39	×	74.72	x	0.76	x	0.8	=	150.48	(74)
North 0.9	0.77 0.77	×	1.44	x	74.72	x	0.76	x	0.8	=	90.67	(74)
North 0.9	0.77	×	2.39	×	79.99	x	0.76	x	0.8	=	161.09	(74)
North 0.9	0.77 0.77	×	1.44	x	79.99	x	0.76	x	0.8	=	97.06	(74)
North 0.9	0.77	×	2.39	x	74.68	x	0.76	x	0.8	=	150.4	(74)
North 0.9	0.77	×	1.44	×	74.68	x	0.76	x	0.8	=	90.62	(74)
North 0.9	0.77	×	2.39	x	59.25	x	0.76	x	0.8	=	119.32	(74)
North 0.9	0.77	×	1.44	×	59.25	x	0.76	x	0.8	=	71.89	(74)
North 0.9	0.77 0.77	×	2.39	x	41.52	x	0.76	x	0.8	=	83.62	(74)
North 0.9	0.77 0.77	×	1.44	x	41.52	×	0.76	x	0.8	=	50.38	(74)
North 0.9	0.77 X	×	2.39	X	24.19	×	0.76	x	0.8	=	48.72	(74)
North 0.9	0.77 0.77	x	1.44	×	24.19	x	0.76	x	0.8	=	29.35	(74)
North 0.9	0.77 0.77	×	2.39	x	13.12	x	0.76	x	0.8	=	26.42	(74)
North 0.9	0.77 0.77	×	1.44	×	13.12	x	0.76	x	0.8	=	15.92	(74)
North 0.9	0.77	×	2.39	×	8.86	x	0.76	x	0.8	=	17.85	(74)
North 0.9	0.77	×	1.44	x	8.86	х	0.76	x	0.8	=	10.76	(74)
South 0.9	0.77	×	2.39	x	46.75	x	0.76	x	0.8	=	94.16	(78)
South 0.9	0.77	×	1.44	×	46.75	x	0.76	x	0.8	=	28.37	(78)
South 0.9	0.77	×	3.15	×	46.75	x	0.76	x	0.8	=	62.05	(78)
South 0.9	0.77	×	2.39	×	76.57	x	0.76	x	0.8	=	154.21	(78)
South 0.9	0.77	×	1.44	×	76.57	x	0.76	x	0.8	=	46.46	(78)
South 0.9	0.77	×	3.15	×	76.57	x	0.76	x	0.8	=	101.62	(78)
South 0.9	-	×	2.39	x	97.53	x	0.76	x	0.8	=	196.44	(78)
South 0.9	-	×	1.44	×	97.53	x	0.76	x	0.8	=	59.18	(78)
South 0.9		×	3.15	×	97.53	x	0.76	x	0.8	=	129.45	(78)
South 0.9	-	×	2.39	×	110.23	x	0.76	x	0.8	=	222.01	(78)
South 0.9		x	1.44	×	110.23	x	0.76	x	0.8	=	66.88	(78)
South 0.9	-	x	3.15	×	110.23	x	0.76	x	0.8	=	146.31	(78)
South 0.9		x	2.39	×	114.87	x	0.76	x	0.8	=	231.35	(78)
South 0.9		x	1.44	×	114.87	x	0.76	x	0.8	=	69.7	(78)
South 0.9	0.77 0.77	×	3.15	x	114.87	x	0.76	x	0.8	=	152.46	(78)

	-									_				_
South	0.9x	0.77	×	2.39	:	<1	10.55	X	0.76	×	0.8	=	222.65	(78)
South	0.9x	0.77	x	1.44	1	< 1	10.55	x	0.76	x	0.8	=	67.07	(78)
South	0.9x	0.77	x	3.15	:	<1	10.55	x	0.76	×	0.8	=	146.72	(78)
South	0.9x	0.77	x	2.39		<1	08.01	x	0.76	×	0.8	=	217.54	(78)
South	0.9x	0.77	x	1.44		(1	08.01	x	0.76	x	0.8	=	65.53	(78)
South	0.9x	0.77	x	3.15		(1	08.01	x	0.76	x	0.8	=	143.36	(78)
South	0.9x	0.77	x	2.39		(1	04.89	x	0.76	x	0.8	=	211.26	(78)
South	0.9x	0.77	x	1.44	1	< 1	04.89	x	0.76	x	0.8	=	63.64	(78)
South	0.9x	0.77	x	3.15	:	(1	04.89	x	0.76	×	0.8	=	139.22	(78)
South	0.9x	0.77	x	2.39		(1	01.89	x	0.76	×	0.8	=	205.2	(78)
South	0.9x	0.77	x	1.44	1.44		01.89	x	0.76	x	0.8	=	61.82	(78)
South	0.9x	0.77	x	3.15		(1	01.89	x	0.76	x	0.8	=	135.23	(78)
South	0.9x	0.77	x	2.39		<	82.59	x	0.76	x	0.8	=	166.33	(78)
South	0.9x	0.77	x	1.44	:	< .	82.59	x	0.76	x	0.8	=	50.11	(78)
South	0.9x	0.77	x	3.15	:	< .	82.59	x	0.76	x	0.8	=	109.61	(78)
South	0.9x	0.77	x	2.39	;	< .	55.42	x	0.76	x	0.8	=	111.61	(78)
South	0.9x	0.77	x	1.44	:	< .	55.42	x	0.76	x	0.8	=	33.62	(78)
South	0.9x	0.77	x	3.15		<	55.42	x	0.76	x	0.8	-	73.55	(78)
South	0.9x	0.77	×	2.39		<	40.4	x	0.76	x	0.8	- 1	81.36	(78)
South	0.9x	0.77	×	1.44	7:	< 🗌	40.4	x	0.76	x	0.8	=	24.51	(78)
South	0.9x	0.77	x	3.15		<	40.4	x	0.76	x	0.8	=	53.62	(78)
			T							_				
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m														
														(83)
Total g	jains – i	nternal and	d solar	(84)m = (7	3)m +	· (83)m	, watts							
(84)m= 847.68 991.8 1096.14 1176.09 1217.77 1182.93 1135.41 1082.59 1035.17 941.06 840.37 799.42 (84)													(84)	
7. Mean internal temperature (heating season)														
Temperature during heating periods in the living area from Table 9, Th1 (°C)														(85)
Utilisation factor for gains for living area, h1,m (see Table 9a)														
	Jan	n Feb Mar Apr Ma		May	Jun	Jul	A	ug Sep	Oct	Nov	Dec			
(86)m=	0.99	0.98	0.95	0.89 C	.76	0.58	0.43	0.4	6 0.69	0.91	0.98	0.99		(86)
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)														
(87)m=	19.98	<u> </u>	20.43	<u> </u>).89	20.98	21	20.		20.7	20.29	19.94		(87)
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)														
(88)m=	19.95	<u> </u>	19.95		9.96	19.97	19.97	19.	· · · · ·	19.96	19.96	19.96		(88)
					ling h	2 m (a	L							
	Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)													
(89)m= 0.99 0.97 0.94 0.86 0.7 0.49 0.33 0.36 0.61 0.88 0.97 0.99 (89)														()
	-	r	- 1			<u> </u>	1	r –	to 7 in Tab	<u> </u>	40.00	40.57		(00)
(90)m=	18.62	18.9	19.26	19.63 1	9.87	19.96	19.97	19.		19.65		18.57	0.04	(90)
fLA = Living area ÷ (4) =												-,-	0.31	(91)

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

Efficiency of main space heating system 1 g2.9 (206) Efficiency of secondary/supplementary heating system, % Quarter of secondary/supplementary heating system, % $y2.9$ 0 0<														
(33)me 18.88 19.15 19.47 19.81 20.03 20.12 20.14 20.11 20.11 19.82 19.3 18.84 (\$3) 8. Space heating requirement 8. Space heating requirement 10 of Table 9b, so that Ti,m=(76)m and re-calculate 9. Jan Feb Mar Apr May Jun Jul Aug Space Oct Nov Dec Utilisation factor for gains, hm: (9.0)m 0.86 0.86 0.71 0.51 0.38 0.62 0.87 0.96 0.99 (94) Useful gains, hmGm W = (94)m (84)m (93)me 13.8 0.85 0.71 0.41 0.38 0.62 0.87 0.86 0.89 (94) Useful gains, hmGm W = (94)m (83)m 11.7 14.8 16.6 16.4 14.1 10.8 7.1 4.2 (96) (90)me 4.3 4.9 6.5 8.9 11.7 14.8 16.6 16.4 14.1 10.8 10.2	(92)m= 19.04	19.3	19.62	19.96	20.18	20.27	20.29	20.29	20.25	19.97	19.45	18.99		(92)
Bits Date Date <thdate< th=""> Date Date <thd< td=""><td>Apply adjust</td><td>ment to th</td><td>ne mear</td><td>n internal</td><td>l temper</td><td>ature fro</td><td>m Table</td><td>4e, whe</td><td>ere appro</td><td>opriate</td><td></td><td></td><td></td><td></td></thd<></thdate<>	Apply adjust	ment to th	ne mear	n internal	l temper	ature fro	m Table	4e, whe	ere appro	opriate				
Set Th to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains sum Table 9a. Image: The Time Time Time Time Time Time Time Tim	(93)m= 18.89	19.15	19.47	19.81	20.03	20.12	20.14	20.14	20.1	19.82	19.3	18.84		(93)
the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)m= 038 0.06 0.33 0.05 0.71 0.51 0.34 0.38 0.62 0.87 0.96 0.99 (94) Useful gains, hmGm, W = (94)m x (84)m (95)m= 53.26 65.2 017.6 99.2 660.35 600.81 300.24 410.95 638.7 818.63 810.87 788.31 (95)m= 53.26 65.2 017.6 99.92 660.35 600.81 300.24 410.95 638.7 818.63 810.87 788.31 (95)m= 53.26 65.2 017.6 99.92 660.35 600.81 300.24 410.95 638.7 818.63 810.87 788.31 (95)m= 1557.73 1614.77 1460.38 1221.28 300.86 611.28 301.41 412.04 660.05 1000.42 1388.28 1849 (97)m= 1557.73 1614.77 1460.38 1221.28 300.86 611.28 301.41 412.04 660.05 1000.42 1388.28 1849 (97) Space heating requirement for each month, KVM/month = 0.024 x [(97)m - (95)m] x (41)m (98)m= 103.84 442.66 338.84 159.9 52.45 0 0 0 0 0 0 10 75.77 401.32 640.35 Space heating requirement in kWM/m2/year Total per year (kWh/yea) = Sun(89), = 2001.85 (98) Space heating requirement in kWM/m2/year 28.73 (02) 29. Encropy requirement in kWM/m2/year 28.73 (02) 29. Encropy requirement in kWM/m2/year 28.73 (02) 29. Encropy requirement in kWM/m2/year 28.73 (02) 29. Encropy requirement in kWM/m2/year 28.73 (02) 29. Encropy requirement in kWM/m2/year 28.73 (02) 29. Encropy requirement in kWM/m2/year 28.73 (02) 29. Encropy requirement in kWM/m2/year 28.73 (02) 29. Encropy requirement in kWM/m2/year 28.73 (02) 29. Encropy requirement (calculated systems for the system	8. Space hea	ating requ	uirement	i		•			•					
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)m 0.38 0.68 0.37 0.51 0.34 0.38 0.62 0.87 0.96 0.99 (94) Useful gains, hm: (94)m 0.38 0.62 0.87 0.96 0.99 (94) Useful gains, hm: (94)m 0.38 0.62 0.87 0.96 0.99 (94) (90)m 63.26 55.2 1017.66 99.2 860.35 600.81 300.24 410.95 63.7 14.2 (96) (90)m 163.7 161.77 142.3 300.86 611.28 314.1 412.84 660.05 1030.42 1308.28 14.9 (97) (97)m 163.74 142.56 33.84 159.9 52.45 0 0 0 157.57 401.32 640.35 Space heating requirement in kWh/m2/year 0.244 10.77 <td>Set Ti to the</td> <td>mean int</td> <td>ernal ter</td> <td>mperatui</td> <td>re obtair</td> <td>ned at ste</td> <td>ep 11 of</td> <td>Table 9</td> <td>b, so tha</td> <td>t Ti,m=(</td> <td>76)m an</td> <td>d re-calc</td> <td>ulate</td> <td></td>	Set Ti to the	mean int	ernal ter	mperatui	re obtair	ned at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
Utilisation factor for gains, hm: (94)m= (0.86 0.96 0.93 0.65 0.71 0.51 0.34 0.38 0.62 0.87 0.96 0.99 (94) (95)m= (852.86 966.2 1017.66 999.2 860.35 600.81 300.24 410.05 638.7 818.63 810.87 788.31 (96)m= (4.3 4.3 0.5 8.9 11.7 146.16 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm, W =((39)m × ((93)m - (96)m) (97)m= (167.73) 1614.77 1466.38 1221.28 930.86 (911.26 391.41 412.84 (966.65 1030.42 1388.28 1049) (97)m= (167.73) 1614.77 1466.38 1221.28 930.86 (911.26 391.41 412.84 (966.65 1030.42 1388.28 1049) (98)m= (153.84 442.56 33.84 159.9 52.45 0 0 0 0 0 157.57 401.32 400.35 Space heating requirement for each month, kWh/month = 0.024 x (197)m - (95)m) x (41)m (98)m= (153.84 442.56 33.84 159.9 52.45 0 0 0 0 0 157.57 401.32 400.35 Space heating requirement in kWb/m2/year. 93. Encry requirement is - Ind vidual-baating system 1 (200) = 1 - (201) = 1 - (201) = 1 (200) = 1 - (201) = 1	the utilisation	n factor fo	or gains	using Ta	ble 9a	i								
(94)m= 0.98 0.98 0.93 0.85 0.71 0.51 0.34 0.38 0.62 0.87 0.96 0.99 (94) Useful gains, hmGm, W = (94)m x (84)m (95)m= 832.66 996.2 1017.66 999.2 890.35 690.31 390.24 410.95 638.7 618.63 810.87 788.63 (95) (95)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.4 16.4 10.6 7.1 4.2 (96) (97) (97)m= 167.73 161.47.1 146.3 122.12 300.86 0.12 91.41 412.44 666.5 100.42 1388.26 1649 (97) Space heating requirement for each month, kWh/month = 0.024 x (107)m - (95)m] x (41)m (201 7.6 7.6 28.7 (203) Space heating requirement in kWh/m2/year 93.6 57.67 401.32 640.35 (201) 7.6 12.22 (202) 1 (201) 7.7 12.2 28.7 (203) 1 (204) 1 (204) 1 (204) 1.7 14.2 16.2	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains, hmGm, W = (94)m x (84)m (95)m [832.66] 9562 1017.66 992 860.35 600.81 390.24 410.95 638.7 616.63 810.87 786.31 (95) Monthly average external temperature from Table 8 (96)m 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) (96)m 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) (97)m [155.7.3] 161.67 11.26 391.41 412.84 666.05 1030.42 1388.26 168.9 (97) Space heating requirement for each month, kWh/month = 0.024 x (197)m - (95)m) x (41)m (90)m (30) 5.3 (41).20 40.35 Space heating requirement in kWh/m2/year 28.73 0 0 0 15.75 401.32 640.35 Fraction of space heat from main system 1 (204) = (202) x (1 - (201)) = 1 (202) 1 (201) 1 (202) (202) x (1 - (201)) = 1 (202) (201)	Utilisation fa	ctor for ga	ains, hm	1:									L	
(95)m= 832.68 956.2 1017.66 999.2 960.35 600.81 390.24 410.95 638.7 818.63 810.87 788.31 (95) Monthly average external temperature from Table 8 (90)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.67 7.4 2.4 (96) (90)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.67 7.4 2.4 (97) (97)m= 1557.73 1614.77 146.38 1221.28 930.86 611.26 391.41 412.84 666.05 103.42 198.28 164.9 (97) Space heating requirement for each month, kWh/month = 0.024 x ((07)m - (95)m) x (41)m Total per year (Whywar) = Sum(8)	(94)m= 0.98	0.96	0.93	0.85	0.71	0.51	0.34	0.38	0.62	0.87	0.96	0.99		(94)
	Useful gains	, hmGm ,	W = (94	4)m x (84	4)m	•							L	
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	(95)m= 832.68	956.2	1017.66	999.2	860.35	600.81	390.24	410.95	638.7	818.63	810.87	788.31		(95)
Heat loss rate for mean internal temperature, Lm, W = [(39)m x [(93)m - (96)m] (97)m = 1657.73 1614.77 1466.38 1221.28 300.86 611.26 391.41 412.84 666.05 1030.42 1388.26 164.9 (97) Space heating requirement for each month, KWh/month = 0.024 x [(97)m - (95)m] x (41)m (96)m = $(13.84 442.56 33.84 159.9 52.46 0 0 0 0 157.57 401.32 640.35 280.35 (97) Space heating requirement in kWh/m2/year 28.73 (30) 28.73 (30) 28.73 (30) Space heating requirement in kWh/m2/year 28.73 (30) 28.73 (30) 28.73 (30) Space heating: 0 (202) = 1 - (201) = 1 (202) Fraction of space heat from main system 1 (202) = 1 - (201) = 1 (202) Fraction of space heating system 1 (202) = 1 - (201) = 1 (202) Efficiency of secondary/supplementary heating system, % 0 (203) (204) (202) × (1 - (203)) = (204) (211)m = ([(98)m x (204)] + (210)m) x 100 ÷ (206) (211)m = ([(98)m x (204)] + (210)m) x 100 ÷ (206) (211)m = ([(98)m x (201)] + (214)m) x 100 ÷ (208) (211)m = ([(98)m x (201)] + (214)m) x 100 ÷ (208) (211)m = ([(98)m x (201)] + (214)m) x 100 ÷ (208) (211)m = ([(98)m x (201)] + (214)m) x 100 ÷ (208) (211)m = ((98)m x (201)] + (214)$	Monthly ave	rage exte	rnal tem	perature	e from Ta	able 8								
	(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Space heating requirement for each month, kWh/month = $0.024 \times [(97)m - (95)m] \times (41)m$ (98)m= 613.84 442.56 333.84 159.9 52.45 0 0 0 157.57 401.32 640.35 Space heating requirement in kWh/m2/year 28.73 (99) 28.73 (99) Space heating: 0 0 0 157.57 401.32 640.35 Fraction of space heat from secondary/supplementary system 0 (201) 1 (202) Fraction of space heating from main system 1 (202) = 1 - (201) = 1 (202) Efficiency of axin space heating system 1 (204) = (202) \times (1 - (203)) = 1 (204) Efficiency of secondary/supplementary heating system, % 0 (203) (204) = (202) \times (1 - (203)) = 1 (204) Efficiency of secondary/supplementary heating system, % 0 0 0 (203) \times (1 - (203)) = 1 (204) (211)m = ([(98)m x (204)] + (210)m } x 100 + (206) (211)m = ((108)m x (204)] + (214)m } x 100 + (208) (211)m = 3015.98 (211) Space heating fuel (secondary), kWh/month = ((108)m x (201)] + (214)m } x 100 + (208) (211) 3015.98 (2	Heat loss rat	te for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]				
	(97)m= 1657.73	3 1614.77	1466.38	1221.28	930.86	611.26	391.41	412.84	666.05	1030.42	1368.26	1649		(97)
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	Space heatir	ng require	ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4′	1)m			
Space heating requirement in kWh/m²/year 28.73 (92) 9a. Energy requirements - Individual heating systems including micro-CHP) 9a. Energy requirements - Individual heating systems including micro-CHP) 0 (201) Fraction of space heat from main system(s) $(202) = 1 - (201) =$ 1 (202) Fraction of space heat from main system(s) $(202) = 1 - (201) =$ 1 (202) Fraction of total heating from main system 1 $(202) = 1 - (203) =$ 1 (204) Efficiency of main space heating system 1 $(202) = 1 - (203) =$ 1 (204) Efficiency of secondary/supplementary heating system, % 0 (208) (208) (211)m = [[(98)m x (204)] + (210)m] x 100 ÷ (206) (211)m = [[(98)m x (204)] + (210)m] x 100 ÷ (206) (211)m = [(98)m x (201)] + (214) m] x 100 ÷ (206) (211)m = [(98)m x (201)] + (214) m] x 100 ÷ (208) (211)m = [(98)m x (201)] + (214) m] x 100 ÷ (208) (211)m = [(98)m x (201)] + (214) m] x 100 ÷ (208) (211)m = [(98)m x (201)] + (214) m] x 100 ÷ (208) (211)m = [(98)m x (201)] + (214) m] x 100 ÷ (208) (215) Mater heating 100 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	<mark>(98)</mark> m= 613.84	442.56	333.84	159.9	52.45	0	0	0	0	157.57	401.32	640.35		
9a. Energy requirements - Individual heating systems including micro-CHP) Space heating: Fraction of space heat from main system(s) $(202) = 1 - (201) =$ Fraction of space heat from main system(s) $(202) = 1 - (201) =$ Fraction of space heat from main system(s) $(202) = 1 - (201) =$ Fraction of total heating from main system 1 $(202) = 1 - (201) =$ Efficiency of main space heating system 1 $(202) = 1 - (203) =$ Efficiency of secondary/supplementary heating system, % 0 Jan Feb Mar Apr May Jun Jan Feb Mar Apr May Jun Jan Feb Mar Apr May Jun Jan Feb Mar Apr May Jun Jun Aug Sep Oct Nov Dec KWh/year Space heating requirement (calculated above) (211) Efficiency of fac.39 359.36 172.12 66.46 0 0 0 0 0 (211) Space heating fuel (secondary), kWh/month = ([(98) m								Tota	l per year	(kWh/year) = Sum(9	8)15,912 =	2801.85	(98)
9a. Energy requirements - Individual heating systems including micro-CHP) Space heating: Fraction of space heat from main system(s) $(202) = 1 - (201) =$ Fraction of space heat from main system(s) $(202) = 1 - (201) =$ Fraction of space heat from main system(s) $(202) = 1 - (201) =$ Fraction of total heating from main system 1 $(202) = 1 - (201) =$ Efficiency of main space heating system 1 $(202) = 1 - (203) =$ Efficiency of secondary/supplementary heating system, % 0 Jan Feb Mar Apr May Jun Jan Feb Mar Apr May Jun Jan Feb Mar Apr May Jun Jan Feb Mar Apr May Jun Jun Aug Sep Oct Nov Dec KWh/year Space heating requirement (calculated above) (211) Efficiency of fac.39 359.36 172.12 66.46 0 0 0 0 0 (211) Space heating fuel (secondary), kWh/month = ([(98) m	Space heatir	na reauire	ement in	kWh/m²	²/vear							i	28,73	(99)
Space heating: Fraction of space heat from main system (s) $(202) = 1 - (201) =$ 0 (201) Fraction of space heat from main system (s) $(202) = 1 - (201) =$ 1 (202) Fraction of space heat from main system 1 $(202) = 1 - (201) =$ 1 $(202) =$ Fraction of total heating from main system 1 $(202) = 1 - (201) =$ 1 $(202) =$ Efficiency of main space heating system 1 $(202) = 1 - (201) =$ 1 $(202) =$ Efficiency of secondary/supplementary heating system, % 0 $(208) =$ $(208) =$ Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) $(211) = (211) = (218) + (210) + (210) + (210) + (206) + (211) + (210) + (206) + (211) + (210) + (206) + (211) + (210) + (208) + (211) + (210) + (208) + (211) + (210) + (208) + (211) + (210) + (208) + (211) + (210) + (208) + (211) + (210) + (208) + (211) + (210) + (208) + (211) + (210) + (208) + (211) + (210) + (208) + (211) + (210) + (210) + (208) + (212) + (210$		-					1 11						20110	
Fraction of space heat from secondary/supplementary system 0 (201) Fraction of space heat from main system(s) (202) = 1 - (201) = 1 (202) Fraction of total heating from main system 1 (204) = (202) × (1 - (203)] = 1 (204) Efficiency of main space heating system 1 92.9 (206) 0 0 (208) Efficiency of secondary/supplementary heating system, % 0 (208) 0 0 0 (208) Space heating requirement (calculated above) 613.84 442.56 333.84 159.9 52.45 0 0 0 157.57 401.32 640.35 (211)m = {[[98]m x (204)] + (210)m } x 100 ÷ (206) (211) 660.76 476.38 59.36 172.12 56.46 0 0 0 169.61 431.99 689.29 (211) Space heating fuel (secondary), kWh/month = {[[98]m x (201)] + (214) m } x 100 ÷ (208) (211) (211) (212) (212) (213) (214) (214) (215) (215) (216) (217) (216) (216) (211) (211) (211) (212) (211) (211) (211) (211)<			its – Indi	ividual n	eating s	ystems I	nciuaing	micro-Q	HP)					
Fraction of space heat from main system(s) $(202) = 1 - (201) =$ 1 $(202) = 1 - (201) =$ Fraction of total heating from main system 1 $(204) = (202) \times 1 - (203) =$ 1 $(204) = (202) \times 1 - (203) =$ Efficiency of main space heating system 1 $(204) = (202) \times 1 - (203) =$ 0 $(204) = (202) \times 1 - (203) =$ Efficiency of main space heating system 1 $(204) = (202) \times 1 - (203) =$ 0 $(204) = (202) \times 1 - (203) =$ Efficiency of main space heating system 1 $(204) = (202) \times 1 - (203) =$ 0 $(204) = (202) \times 1 - (203) =$ Efficiency of secondary/supplementary heating system, % 0 $(204) = (202) \times 1 - (203) =$ 0 Space heating requirement (calculated above) (613.84 442.56 333.84 159.9 52.45 0 0 0 0 0 157.57 401.32 640.35 (211) m = (((98)m x (204)) + (210)m } x 100 ÷ (206) (211) m = (((98)m x (204)) + (210)m } x 100 ÷ (206) (211) m = (((98)m x (201)) + (214) m } x 100 ÷ (208) (211) m = ((160)m x (201)) + (214) m } x 100 ÷ (208) (211) m = ((160)m x (201)) + (214) m } x 100 ÷ (208) (211) m = (170)m (210) m m (211)_{L_{10}00} = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		-	t from o	ooondor		monton	ovetere						0	
Fraction of total heating from main system 1 $(204) = (202) \times [1 - (203)] =$ 1 $(204) = (202) \times [1 - (203)] =$ Efficiency of main space heating system 1 92.3 (206) Efficiency of secondary/supplementary heating system, % 0 (208) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec KWh/year Space heating requirement (calculated above) 613.84 442.56 33.84 159.9 52.45 0 0 0 157.57 401.32 640.35 (211)m = {[[(98)m x (204)] + (210)m } x 100 ÷ (206) (211) (211) (211) (211) (211) (211) (201) (201) (211) (211) (211) (201) (201) (212) (211) (211) (211) (211) (211) (211) (212) (211) (211) (211) (211) (211) (212) (211) (211) (211) (211) (211) (211) (211) (211) (212) (211) (211) (211) (211) (211) (212) (211) (211) (211)						mentary			(224)					
Efficiency of main space heating system 1 92.9 (206) Efficiency of secondary/supplementary heating system, % 0 (208) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) $613.84 442.56 333.84 159.9 52.45 0 0 0 0 157.57 401.32 640.35$ (211) 660.76 476.39 359.36 172.12 56.46 0 0 0 0 169.61 431.99 689.29 Total (kWh/year) =Sum(211) Space heating fuel (secondary), kWh/month = {[(98)m x (201)] + (214) m } x 100 ÷ (208) Colspan="2">Total (kWh/year) =Sum(215) Space heating fuel (secondary), kWh/month = {[(98)m x (201)] + (214) m } x 100 ÷ (208) Colspan="2">Total (kWh/year) =Sum(215) Water heating Mater heating O 0 </td <td>Fraction of s</td> <td>pace hea</td> <td>it from m</td> <td>nain syst</td> <td>em(s)</td> <td></td> <td></td> <td>(202) = 1 -</td> <td>- (201) =</td> <td></td> <td></td> <td></td> <td>1</td> <td>(202)</td>	Fraction of s	pace hea	it from m	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Efficiency of secondary/supplementary heating system, % Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec kWh/year Space heating requirement (calculated above) $\boxed{613.84 442.56 333.84 159.9 52.45 0 0 0 0 0 157.57 401.32 640.35}$ (211)m = $[[(98)m x (204)] + (210)m \} x 100 \div (206)$ (211)m = $[[(98)m x (204)] + (210)m \} x 100 \div (206)$ (211)m = $[[(98)m x (204)] + (210)m \} x 100 \div (206)$ (211)m = $Total (kWh/year) = Sum(211)_{116,17}$ (211) Space heating fuel (secondary), kWh/month = $[[(98)m x (201)] + (214) m \} x 100 \div (208)$ (215)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Fraction of to	otal heatir	ng from	main sys	stem 1			(204) = (204)	02) × [1 –	(203)] =			1	(204)
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	Efficiency of	main spa	ace heat	ing syste	em 1								92.9	(206)
Space heating requirement (calculated above) 613.84 442.56 333.84 159.9 52.45 0 0 0 157.57 401.32 640.35 (211) $= \{[(98)m \times (204)] + (210)m \} \times 100 \div (206)$ (211) (211) (206) (211) 660.76 476.39 359.36 172.12 56.46 0 0 0 169.61 431.99 689.29 (211) 660.76 476.39 359.36 172.12 56.46 0 0 0 169.61 431.99 689.29 (211) Total (kWh/year) =Sum(211) _{1.430.132} 3015.98 (211) Space heating fuel (secondary), kWh/month = {[(98)m x (201)] + (214) m } x 100 ÷ (208) (215) Total (kWh/year) =Sum(215) _{1.430.132} 0 0	Efficiency of	seconda	ry/suppl	ementar	y heatin	g systen	n, %				I	İ	0	(208)
Space heating requirement (calculated above) 613.84 442.56 333.84 159.9 52.45 0 0 0 157.57 401.32 640.35 (211) $= \{[(98)m \times (204)] + (210)m \} \times 100 \div (206)$ (211) (211) (206) (211) 660.76 476.39 359.36 172.12 56.46 0 0 0 169.61 431.99 689.29 (211) 660.76 476.39 359.36 172.12 56.46 0 0 0 169.61 431.99 689.29 (211) Total (kWh/year) =Sum(211) _{1.430.132} 3015.98 (211) Space heating fuel (secondary), kWh/month = {[(98)m x (201)] + (214) m } x 100 ÷ (208) (215) Total (kWh/year) =Sum(215) _{1.430.132} 0 0	lan	Feb	Mar	Anr	May	lun	1.1	Δυσ	Sen	Oct	Nov	Dec	k\//b/v/	 ear
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$							001	Aug	Ocp	000	TNOV	Dee		cai
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $				1	i	Í	0	0	0	157.57	401.32	640.35		
$\frac{660.76}{60.76} \frac{476.39}{476.39} \frac{359.36}{359.36} \frac{172.12}{172.12} \frac{56.46}{56.46} \frac{0}{0} \frac{0}{0} \frac{0}{0} \frac{0}{169.61} \frac{431.99}{431.99} \frac{689.29}{689.29}$ $Total (kWh/year) = Sum(211)_{1.51017} = 3015.98$ (211) Space heating fuel (secondary), kWh/month $= \{[(98)m \times (201)] + (214) m \} \times 100 \div (208)$ (215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		1 1						Ŭ	Ŭ			0.0100		(014)
$Total (kWh/year) = Sum(211)_{1.5,1012} = 3015.98 (211)_{1.5,1012} = 3015.98 (211)_{1.5,1012} = 3015.98 (211)_{1.5,1012} = 3015.98 (211)_{1.5,1012} = 3015.98 (211)_{1.5,1012} = 3015.98 (211)_{1.5,1012} = 3015.98 (211)_{1.5,1012} = 0 (215)_{1.5,1012} = 0 (2$, , , , , , , , , , , , , , , , , , , ,	í ì	, <u> </u>	<u>, ,</u>	,	<u> </u>		0	0	160.61	424.00	690.20		(211)
Space heating fuel (secondary), kWh/month = {[[98]m x (201)] + (214) m } x 100 ÷ (208) (215)m= 0 0 0 0 0 0 0 0 0 0 Total (kWh/year) =Sum(215) _{1_5.10_172} 0 0	660.76	476.39	309.30	172.12	30.40	0	0		-					
$ = \{ [(98)m \times (201)] + (214)m \} \times 100 \div (208) \\ (215)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 $								TOLA	ii (KVVII/yea	ar = Sum(2)	11) _{15,1012}	-	3015.98	(211)
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	•	•												
Total (kWh/year) =Sum(215) ₁₅₁₀₁₂ 0 (215) Water heating Output from water heater (calculated above) 194.86 171.07 178.05 157.38 152.55 133.91 126.4 141.82 142.58 163.3 175.48 189.42 Efficiency of water heater 87.3 (216) 87.3 87.3 87.3 87.3 (216) (217)m= 89.26 89.16 88.98 88.59 87.95 87.3 87.3 87.3 88.56 89.09 89.29 (217) Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m (219)m = (218.31 191.87 200.1 177.64 173.45 153.39 144.78 162.46 163.32 184.4 196.96 212.13				í –									l	
Water heating Output from water heater (calculated above) 194.86 171.07 178.05 157.38 152.55 133.91 126.4 141.82 142.58 163.3 175.48 189.42 Efficiency of water heater (217)m= 89.26 89.16 88.98 88.59 87.3 87.3 87.3 87.3 87.3 87.3 87.3 87.3 (216) Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m (217)m= 191.87 200.1 177.64 173.45 153.39 144.78 162.46 163.32 184.4 196.96 212.13	(215)m= 0	0	0	0	0	0	0		-	-				
Output from water heater (calculated above) 194.86 171.07 178.05 157.38 152.55 133.91 126.4 141.82 142.58 163.3 175.48 189.42 Efficiency of water heater 87.3 (216) (217)m= 89.26 89.16 88.98 88.59 87.3 87.3 87.3 87.3 88.56 89.09 89.29 (217) Fuel for water heating, kWh/month (219)m = (64)m x 100 ÷ (217)m (219)m = (218.31 191.87 200.1 177.64 173.45 153.39 144.78 162.46 163.32 184.4 196.96 212.13								Tota	l (kWh/yea	ar) =Sum(2	2 15) _{15,1012}	=	0	(215)
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Water heatin	g												
Efficiency of water heater 87.3 (216) (217)m= 89.26 89.16 88.98 88.59 87.3 87.3 87.3 87.3 88.56 89.09 89.29 (217) Fuel for water heating, kWh/month (219)m= (64)m x 100 \div (217)m (219)m= 191.87 200.1 177.64 173.45 153.39 144.78 162.46 163.32 184.4 196.96 212.13						i							I	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	194.86	171.07	178.05	157.38	152.55	133.91	126.4	141.82	142.58	163.3	175.48	189.42		
Fuel for water heating, kWh/month $(219)m = (64)m \times 100 \div (217)m$ $(219)m = 218.31$ 191.87 200.1 177.64 173.45 153.39 144.78 162.46 163.32 184.4 196.96 212.13	Efficiency of w	water hea	ter										87.3	(216)
$(219)m = (64)m \times 100 \div (217)m$ $(219)m = 218.31 191.87 200.1 177.64 173.45 153.39 144.78 162.46 163.32 184.4 196.96 212.13$														(- · ·
(219)m= 218.31 191.87 200.1 177.64 173.45 153.39 144.78 162.46 163.32 184.4 196.96 212.13	(217)m= 89.26	89.16	88.98	88.59	87.95	87.3	87.3	87.3	87.3	88.56	89.09	89.29		(217)
					87.95	87.3	87.3	87.3	87.3	88.56	89.09	89.29		
$Total = Sum(219a)_{112} = 2178.82$ (219)	Fuel for water (219)m = (64	r heating,	kWh/mo) ÷ (217)	onth m			I							
	Fuel for water (219)m = (64	r heating,	kWh/mo) ÷ (217)	onth m			I	162.46	163.32	184.4				

Annual totals Space heating fuel used, main system 1			kWh/ye	ear	kWh/year 3015.98	7
Water heating fuel used					2178.82	」]
Electricity for pumps, fans and electric keep-hot					20.02	
central heating pump:				30		(230c)
boiler with a fan-assisted flue				45		(230e)
Total electricity for the above, kWh/year		sum of (230a).	(230g) =		75	(231)
Electricity for lighting					400.11	(232)
10a. Fuel costs - individual heating systems:], ,
	Fuel kWh/year		Fuel Price (Table 12)		Fuel Cost £/year	
Space heating - main system 1	(211) x		3.48	x 0.01 =	104.9562	(240)
Space heating - main system 2	(213) x		0	x 0.01 =	0	(241)
Space heating - secondary	(215) x		13.19	x 0.01 =	0	(242)
Water heating cost (other fuel)	(219)		3.48	x 0.01 =	75.82	(247)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	9.89	(249)
(if off-peak tariff, list each of (230a) to (230g) sepa Energy for lighting	arately as applica (232)	able and apply	/ fuel price act	cording to T x 0.01 =	Table 12a 52.77	(250)
Additional standing charges (Table 12) Appendix Q items: repeat lines (253) and (254) as			E		120	(251)
Total energy cost (245)(24) 11a. SAP rating - individual heating systems	7) + (250)(254) =				363.45	(255)
						-
Energy cost deflator (Table 12)	56)] ÷ [(4) + 45.0] =				0.42	(256)
Energy cost factor (ECF) [(255) x (25 SAP rating (Section 12)	50)] ÷ [(4) + 45.0] =				1.07	(257) (258)
12a. CO2 emissions – Individual heating system	s includina micro	-CHP			85.06	_(230)
	Energy kWh/year		Emission f kg CO2/kW		Emissions kg CO2/yea	
Space heating (main system 1)	(211) x		0.216	=	651.45	(261)
Space heating (secondary)	(215) x		0.519	_ =	0	(263)
Water heating	(219) x		0.216	_ =	470.63	(264)
Space and water heating	(261) + (262) + (2	263) + (264) =		_	1122.08	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	_ =	38.93	(267)
Electricity for lighting	(232) x		0.519] =	207.66	(268)
Total CO2, kg/year		sum o	of (265)(271) =		1368.66	(272)
CO2 emissions per m ²		(272)	÷ (4) =		14.03	(273)

El rating (section 14)				87	(274)
13a. Primary Energy					
	Energy kWh/year	Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211) x	1.22	=	3679.5	(261)
Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	1.22	=	2658.16	(264)
Space and water heating	(261) + (262) + (263) + (2	264) =		6337.66	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	230.25	(267)
Electricity for lighting	(232) x	0	=	1228.34	(268)
'Total Primary Energy		sum of (265)(271) =		7796.25	(272)
Primary energy kWh/m²/year		(272) ÷ (4) =		79.93	(273)



				User D	etails:						
Assessor Name: Software Name:	Stroma F	SAP 201		roperty	Strom Softwa Address	are Ver	rsion:	d Fabric		on: 1.0.0.28	
Address :				roperty	Address						
1. Overall dwelling dim	ensions:										
				Area	a(m²)		Av. Hei	ight(m)		Volume(m ³)	
Ground floor				5	6.67	(1a) x	2	2.5	(2a) =	141.68	(3a)
First floor				5	6.67	(1b) x	2	2.5	(2b) =	141.68	(3b)
Total floor area TFA = (*	1a)+(1b)+(1c)	+(1d)+(1e	e)+(1r	n) <u> </u>	13.34	(4)			-		-
Dwelling volume				L		(3a)+(3b))+(3c)+(3d	l)+(3e)+	.(3n) =	283.35	(5)
2. Ventilation rate:											1
2. Ventilation rate.	main		econdar	У	other		total			m ³ per hour	
Number of chimneys	heatin	g r +	neating 0] + [0] = [0	x 4	40 =	0	(6a)
Number of open flues	0	— + F	0		0] = [0	x 2	20 =	0] (6b)
Number of intermittent fa	ans	L	-		-		3	x 1	10 =	30](7a)
Number of passive vent	s						0	x 1	10 =	0	(7b)
Number of flueless gas							_		40 =		
							0			o anges per hou](7c) Ir
Infiltration due to chimne							30		÷ (5) =	0.11	(8)
If a pressurisation test has Number of storeys in t			ea, procee	a to (17), (otherwise (continue in	om (9) to (16)		0	(9)
Additional infiltration		,						[(9)-	-1]x0.1 =	0	(10)
Structural infiltration:	0.25 for steel	or timber	frame or	0.35 fo	r masoni	y constr	uction			0	(11)
if both types of wall are p			ponding to	the great	er wall are	a (after					-
deducting areas of open If suspended wooden			led) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er	nter 0.05, els	e enter 0	,	,	,.					0	(13)
Percentage of window	s and doors	draught st	tripped							0	(14)
Window infiltration					0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)
Infiltration rate					(8) + (10)					0	(16)
Air permeability value				•	•	•	etre of e	nvelope	area	4.5	(17)
If based on air permeab	-						ia haina w	ad		0.33	(18)
Air permeability value appli Number of sides shelter		allon lest nas	s been dor	ie or a deg	gree all pe	meability	is being us	seu		2	(19)
Shelter factor	00				(20) = 1 -	[0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorpora	ating shelter f	actor			(21) = (18) x (20) =				0.28	(21)
Infiltration rate modified	for monthly v	ind speed									-
Jan Feb	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind s	peed from Ta	ble 7									
(22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		

Wind F	actor (2	2a)m =	(22)m ÷	4										
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjuste	ed infiltra	ation rat	e (allow	ing for sl	nelter an	nd wind s	speed) =	(21a) x	(22a)m					
	0.36	0.35	0.34	0.31	0.3	0.27	0.27	0.26	0.28	0.3	0.32	0.33		
			-	rate for t	he appli	cable ca	se					<u>.</u>		
	echanica				01.) (00.) (00-)			C	
				endix N, (2) = (23a)			C	
			-	iency in %	-								C) (23c)
			I	entilation		1	<u> </u>	<u> </u>	ŕ	r , ,	1	r , ,	÷ 100] I	(04-)
(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24a)
			r	entilation		1	r , ,	r Ó	ŕ	r , ,	, 1	<u> </u>	1	(0.41)
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
,				ntilation of	•	•				F (00k	.)			
1	, ,		<u>, ,</u>	then (240	, ,	ŕ	r Ì	r i	, I	r È	ŕ		1	(24c)
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(240)
,				iole hous m = (22l		•				0 51				
(24d)m=	· /	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.55		(24d)
		change	rate - er	nter (24a) or (24) or (24	L c) or (24	d) in box	(25)					
(25)m=	0.56	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.55		(25)
				paramet		Not Ar						l l		
ELEN	1EN I	Gros area		Openin m	-	Net Ar A ,r		U-val W/m2		A X U (W/I	K)	k-value kJ/m²-l		A X k kJ/K
Doors						2	×	r		2.2				(26)
Window	ws Type	1				2.39	x1	/[1/(1.2)+	0.04] =	2.74				(27)
Window	ws Type	2				2.39	x1	/[1/(1.2)+	0.04] =	2.74	=			(27)
Windov	ws Type	3				1.44		/[1/(1.2)+	0.04] =	1.65	=			(27)
Window	ws Type	4				1.44		/[1/(1.2)+	0.04] =	1.65	=			(27)
	ws Type					0.96	=	/[1/(1.2)+	0.04] =	1.1	=			(27)
Window	ws Type	6				3.15	x1	/[1/(1.2)+	0.04] =	3.61				(27)
Floor						56.67	7 X	0.15] = [8.5005	 ;			(28)
Walls		113.	52	20		93.52	<u>2</u> x	0.18	= [16.83	i F		Ξ Ē	(29)
Roof		56.6	67	0		56.67	7 X	0.1	; = [5.67	ז ד		Ξ Ē	(30)
Total a	rea of e	lements	, m²			226.8	6							(31)
Party v	vall					50	×	0		0				(32)
				effective wi nternal wal			ated using	formula 1	/[(1/U-valu	ie)+0.04] a	as given in	paragraph	n 3.2	
			= S (A x		par			(26)(30)) + (32) =				53.	.81 (33)
	apacity		•	,					((28)	.(30) + (32	2) + (32a).	(32e) =	1387	
			. ,	⊃ = Cm ÷	- TFA) ir	ר kJ/m²K				tive Value			25	
					, .								23	

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f

can be ι	ised inste	ad of a de	tailed calc	ulation.										
Therm	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix l	<						11.34	(36)
if details	of therma	al bridging	are not kri	own (36) =	= 0.15 x (3	1)								
Total fa	abric he	at loss							(33) +	(36) =			65.15	(37)
Ventila	tion hea	at loss ca	alculated	monthl	Ý	-			(38)m	= 0.33 × (25)m x (5)		_	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	52.77	52.53	52.31	51.23	51.03	50.09	50.09	49.92	50.46	51.03	51.44	51.86		(38)
Heat tr	ansfer o	coefficier	nt, W/K			-		-	(39)m	= (37) + (3	38)m			
(39)m=	117.92	117.69	117.46	116.39	116.18	115.25	115.25	115.08	115.61	116.18	116.59	117.01		
									/	Average =	Sum(39)1.	.12 /12=	116.38	(39)
Heat lo	oss para	meter (H	HLP), W/	/m²K					(40)m	= (39)m ÷	· (4)		1	
(40)m=	1.04	1.04	1.04	1.03	1.03	1.02	1.02	1.02	1.02	1.03	1.03	1.03		_
Numbe	er of day	vs in moi	nth (Tab	le 1a)					,	Average =	Sum(40)1.	.12 /12=	1.03	(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)
		<u> </u>			<u> </u>		<u> </u>							
4. Wa	iter heat	tina ener	rav reau	irement:								kWh/ye	ear:	
													1	
		ipancy, l A N – 1			(-0.0003		-13 Q)2)] + 0.0)013 v (⁻	TFA -13		83		(42)
	A £ 13.9		+ 1.70 X	. [1 - exp	(-0.0000	,43 × (11	A = 10.9	/2)] + 0.0		11 A - 13.	.5)			
Annua	l averag	e hot wa	ater usag	ge in <mark>litre</mark>	es per da	ay Vd,av	erage =	(25 x N)	+ 36		106	6.84	1	(43)
				usage by : r day (<mark>all</mark> w				o achieve	a water us	se target o	f		·	
notmore														
1 lat	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot Wate	er usage li	h litres per	r day for ea	ach month	Vd,m = fa	ctor from		(43)						
(44)m=	117.52	113.25	108.97	104.7	100.43	96.15	96.15	100.43	104.7	108.97	113.25	117.52		_
Enerav a	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd.r	n x nm x D) Tm / 3600			<mark>m(44)</mark> 112 = ables 1b, 1		1282.05	(44)
(45)m=	174.28	152.43	157.29	137.13	131.58	113.54	105.21	120.74	122.18	142.39	155.43	168.78	1	
(40)11-	174.20	102.40	107.20	107.10	101.00	110.04	100.21	120.14			m(45) ₁₁₂ =		1680.97	(45)
lf instant	taneous w	ater heatii	ng at point	of use (no	hot water	^r storage),	enter 0 in	boxes (46,						
(46)m=	26.14	22.86	23.59	20.57	19.74	17.03	15.78	18.11	18.33	21.36	23.31	25.32		(46)
Water	storage	loss:											1	
Storag	e volum	e (litres)	includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		180]	(47)
If comr	nunity h	eating a	ind no ta	nk in dw	velling, e	nter 110	litres in	(47)						
			hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
	storage						· / -l · ·) ·						1	
				oss facto	or is kno	wn (kvvr	n/day):				1.	51		(48)
		actor fro									0.	54		(49)
			-	e, kWh/y€ ≫dindor I		or io pot		(48) x (49)	=		0.	82		(50)
,				cylinder l om Tabl)	1	(51)
		leating s				.,						J	1	(10)
	•	-		-								0]	(52)
Tempe	olume factor from Table 2a 0 emperature factor from Table 2b 0]	(53)		

•••	nergy lost from water storage, kWh/year Enter (50) or (54) in (55)						(47) x (51) x (52) x (53) =					0 82		(54) (55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)ı	m				
(56)m=	25.28	22.83	25.28	24.46	25.28	24.46	25.28	25.28	24.46	25.28	24.46	25.28		(56)
		s dedicate	l d solar sto	l orage, (57)	I m = (56)m	x [(50) – (I [H11)] ÷ (50	0), else (5 ⁻	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	25.28	22.83	25.28	24.46	25.28	24.46	25.28	25.28	24.46	25.28	24.46	25.28		(57)
Primar	v circuit	loss (ar	nual) fro	om Table								0		(58)
		``	,			59)m = ((58) ÷ 36	65 × (41)	m					
(mo	dified by	factor f	rom Tab	le H5 if t	here is s	solar wat	ter heatir	ng and a	cylinde	r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	lculated	for each	month	(61)m =	(60) ÷ 30	65 × (41))m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	neat req	uired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)r	n
(62)m=	222.82	196.27	205.83	184.1	180.12	160.52	153.75	169.27	169.15	190.93	202.4	217.32		(62)
Solar DI	HW input	calculated	using App	endix G o	r Appendix	: H (negati	ve quantity	v) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	NWHRS	applies	, see Ap	pendix (G)				I	
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	t from w	ater hea	ter										I	
(64)m=	222.82	196.27	205.83	184.1	180.12	160.52	153.75	169.27	169.15	190.93	202.4	217.32		_
									out from wa				2252.49	(64)
Heat g	ains fro	m water	heating	, kWh/m	onth 0.2		× (45)m	+ (61)m	1] + 0.8 x	(<mark>(46)</mark> m	+ (57)m	+ (59)m]	
(65)m=	96.78	85.76	91.13	83.17	82.58	75.33	73.82	78.98	78.2	86.18	89.26	94.95		(65)
inclu	ude (57)	m in cal	culation	of (65)m	only if c	ylinder i	s in the c	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Int	ternal ga	ains (see	e Table 5	5 and 5a):									
Metab	olic gair		<u>e 5), Wat</u>	ts									I	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
				170.01				170.01		170.01	170.01	170.01		(66)
-	<u> </u>	· · · · · · · · · · · · · · · · · · ·	· · · ·	·	· · ·	i	r L9a), a I		· · · · · ·		1		I	(07)
(67)m=	64.34	57.15	46.47	35.18	26.3	22.2	23.99	31.19	41.86	53.15	62.03	66.13		(67)
••		r È	r	· · ·	· ·	r	13 or L1	, .	-	1	1		I	(00)
(68)m=	412.35		405.84	382.89	353.91	326.68	308.48	304.2	314.99	337.94	366.92	394.15		(68)
	<u> </u>	<u>`</u>			· · ·	r	or L15a)						I	(00)
(69)m=	54.83	54.83	54.83	54.83	54.83	54.83	54.83	54.83	54.83	54.83	54.83	54.83		(69)
	r	<u> </u>	(Table (<u> </u>					-		<u> </u>	-	I	(70)
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
		· ·	· · ·	tive valu I	, `	· · · · · · · · · · · · · · · · · · ·	1				1		I	
(71)m=		-113.34		-113.34	-113.34	-113.34	-113.34	-113.34	-113.34	-113.34	-113.34	-113.34		(71)
		gains (1	, <u> </u>	I	I .					· · · ·	I		l	
(72)m=	130.08	127.61	122.49	115.52	111	104.63	99.21	106.15	108.62	115.83	123.97	127.62		(72)
		gains =	i			· · ·)m + (67)m		i .	· · ·	1	i	I	
(73)m=	721.27	715.89	689.31	648.1	605.71	568.01	546.19	556.05	579.96	621.42	667.42	702.41		(73)
6. So	lar gains	S.												

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

Orientation	Access Factor Table 6d	or	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North 0.	9x 0.77	×	2.39	×	10.63	x	0.76	x	0.7	=	18.74	(74)
North 0.	9x 0.77	×	1.44	x	10.63	x	0.76	x	0.7	=	11.29	(74)
North 0.	9x 0.77	×	2.39	×	20.32	x	0.76	x	0.7	=	35.81	(74)
North 0.	9x 0.77	×	1.44	×	20.32	x	0.76	x	0.7	=	21.58	(74)
North 0.	9x 0.77	x	2.39	x	34.53	x	0.76	x	0.7	=	60.85	(74)
North 0.	9x 0.77	×	1.44	x	34.53	x	0.76	x	0.7	=	36.66	(74)
North 0.	9x 0.77	×	2.39	x	55.46	x	0.76	x	0.7	=	97.74	(74)
North 0.	9 x 0.77	×	1.44	x	55.46	x	0.76	x	0.7	=	58.89	(74)
North 0.	9x 0.77	×	2.39	x	74.72	x	0.76	x	0.7	=	131.67	(74)
North 0.	9x 0.77	×	1.44	x	74.72	x	0.76	x	0.7	=	79.33	(74)
North 0.	9x 0.77	×	2.39	x	79.99	x	0.76	x	0.7	=	140.96	(74)
North 0.	9x 0.77	×	1.44	x	79.99	x	0.76	x	0.7	=	84.93	(74)
North 0.	9x 0.77	×	2.39	x	74.68	x	0.76	x	0.7	=	131.6	(74)
North 0.	9x 0.77	×	1.44	x	74.68	x	0.76	x	0.7	=	79.29	(74)
North 0.	9x 0.77	×	2.39	×	59.25	x	0.76	x	0.7	=	104.41	(74)
North 0.	9x 0.77] ×	1.44	×	59.25	x	0.76	x	0.7	=	62.91	(74)
North <mark>0</mark> .	9x 0.77] ×	2.39	x	41.52	x	0.76	x	0.7	=	73.16	(74)
North 0.	9x 0.77] ×	1.44	x	41.52	×	0.76	x	0.7	=	44.08	(74)
North 0.	9x 0.77	x	2.39	X	24.19	x	0.76	x	0.7	=	42.63	(74)
North 0.	9x 0.77	×	1.44	×	24.19	x	0.76	x	0.7	=	25.68	(74)
North 0.	9x 0.77] ×	2.39	x	13.12	x	0.76	x	0.7	=	23.12	(74)
North 0.	9x 0.77	×	1.44	x	13.12	x	0.76	x	0.7	=	13.93	(74)
North 0.	9x 0.77	×	2.39	×	8.86	x	0.76	x	0.7	=	15.62	(74)
	9x 0.77	×	1.44	x	8.86	x	0.76	x	0.7	=	9.41	(74)
	9x 0.77	×	2.39	x	46.75	x	0.76	x	0.7	=	41.19	(78)
	9x 0.77	×	1.44	x	46.75	x	0.76	x	0.7	=	49.64	(78)
	9x 0.77	×	3.15	x	46.75	x	0.76	x	0.7	=	54.29	(78)
	9x 0.77	×	2.39	x	76.57	x	0.76	x	0.7	=	67.47	(78)
	9x 0.77	×	1.44	x	76.57	x	0.76	x	0.7	=	81.3	(78)
	9x 0.77	×	3.15	x	76.57	х	0.76	x	0.7	=	88.92	(78)
	9x 0.77	×	2.39	x	97.53	x	0.76	x	0.7	=	85.94	(78)
	9x 0.77	×	1.44	x	97.53	x	0.76	x	0.7	=	103.56	(78)
	9x 0.77	×	3.15	x	97.53	x	0.76	x	0.7	=	113.27	(78)
	9x 0.77	×	2.39	×	110.23	x	0.76	x	0.7	=	97.13	(78)
	9x 0.77	×	1.44	x	110.23	x	0.76	x	0.7	=	117.05	(78)
	9x 0.77	×	3.15	×	110.23	x	0.76	x	0.7	=	128.02	(78)
	9x 0.77	×	2.39	×	114.87	x	0.76	x	0.7	=	101.22	(78)
	9x 0.77	×	1.44	×	114.87	x	0.76	x	0.7	=	121.97	(78)
South 0.	9x 0.77	×	3.15	×	114.87	x	0.76	X	0.7	=	133.4	(78)

_	_											-				
South	0.9x	0.77	x	2.3	9	x	110.	55	x	0.76		x	0.7	=	97.41	(78)
South	0.9x	0.77	x	1.4	4	x	110.	55	x	0.76		×	0.7	=	117.38	(78)
South	0.9x	0.77	x	3.1	5	x	110.	55	x	0.76		×	0.7	=	128.38	(78)
South	0.9x	0.77	x	2.3	9	x	108.	01	x	0.76		× [0.7	=	95.17	(78)
South	0.9x	0.77	x	1.4	4	x	108.	01	x	0.76		× [0.7	=	114.69	(78)
South	0.9x	0.77	x	3.1	5	x	108.	01	x	0.76		× [0.7	=	125.44	(78)
South	0.9x	0.77	x	2.3	9	x	104.	89	x	0.76		× [0.7	=	92.43	(78)
South	0.9x	0.77	x	1.4	4	x	104.	89	x	0.76		× [0.7	=	111.38	(78)
South	0.9x	0.77	x	3.1	5	x	104.	89	x	0.76		× [0.7	=	121.82	(78)
South	0.9x	0.77	x	2.3	9	x	101.	89	x	0.76		× [0.7	=	89.78	(78)
South	0.9x	0.77	x	1.4	4	x	101.	89	x	0.76		× [0.7	=	108.18	(78)
South	0.9x	0.77	x	3.1	5	x	101.	89	x	0.76		× [0.7	=	118.32	(78)
South	0.9x	0.77	x	2.3	9	x	82.5	i9	x	0.76		×	0.7	=	72.77	(78)
South	0.9x	0.77	x	1.4	4	x	82.5	i9	x	0.76		×	0.7	=	87.69	(78)
South	0.9x	0.77	x	3.1	5	x	82.5	i9	x	0.76		×	0.7	=	95.91	(78)
South	0.9x	0.77	x	2.3	9	x	55.4	2	x	0.76		×	0.7	=	48.83	(78)
South	0.9x	0.77	x	1.4	4	x	55.4	2	x	0.76		×	0.7	=	58.84	(78)
South	0.9x	0.77	x	3.1	5	x	55.4	2	х	0.76		x	0.7	=	64.36	(78)
South	0.9x	0.77	×	2.3	9	x	40.	4	x	0.76		×	0.7		35.6	(78)
South	0.9x	0.77	×	1.4	4	x	40.	4	×	0.76		×	0.7	=	42.89	(78)
South	0.9x	0.77	x	3.1	5	x	40.	4	x	0.76		×	0.7	=	46.92	(78)
									•							
Solar g	gains in	watts, calc	culated	for each	n month				(83)m	= Sum(74)	m(8	2)m				
(83)m=	189.06	322.27	445.07	564.15	647.64		651 6	24.21	559.	95 485.6	51 35	56.95	226.41	161.87		(83)
Total g	ains – i	nternal and	d solar	(84)m =	: (73)m	+ (8	33)m , w	vatts								
(84)m=	910.33	1038.16 1	134.38	1212.25	1253.36	12	19.01 1	170.4	111	6 1065.	58 97	78.37	893.83	864.28		(84)
7. Me	an inter	nal tempei	rature ((heating	season)										
Temp	erature	during hea	ating p	eriods in	the livi	ng	area fro	m Tab	ole 9,	Th1 (°C))				21	(85)
Utilisa	ation fac	tor for gain	ns for li	iving are	a, h1,m	ı (s	ee Table	e 9a)								
	Jan	Feb	Mar	Apr	May		Jun	Jul	Αι	ug Se	р	Oct	Nov	Dec		
(86)m=	0.99	0.98	0.96	0.9	0.78	(0.59	0.43	0.4	7 0.7	().92	0.98	0.99]	(86)
Mear	interna	l temperat	ure in l	iving are	ea T1 (fe	ollo	w steps	3 to 7	' in T	able 9c)						
(87)m=	20.1	· · ·	20.48	20.73	20.91	-	0.98	21	21	<u> </u>	6 2	0.74	20.37	20.06]	(87)
Temr	erature	during hea	atina n	eriods in	rest of	dw	elling fr	om Ta	hle C	 	2)				-	
(88)m=	20.05	<u> </u>	20.05	20.06	20.06	-	<u> </u>	20.07	20.0	`	<u> </u>	0.06	20.06	20.06	1	(88)
		tor for goin		upper of du	valling	ـــــــــــــــــــــــــــــــــــــ			00)							
(89)m=	0.99	tor for gain	0.95	0.87	0.72	-	<u> </u>	0.34	9a) 0.3	8 0.63		0.89	0.98	0.99	1	(89)
						I							0.00	0.00		(00)
	r	l temperat				<u> </u>	<u> </u>		· · · ·			,	1 40 07	40.00	1	(90)
(00)	10.07		10 11 1													
(90)m=	18.87	19.1	19.41	19.76	19.98	2	0.06	20.07	20.0	07 20.04		9.78 – Livi	19.27 ing area ÷ (4	18.82	0.4	(91)

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

(92)m=	19.35	19.56	19.84	20.15	20.35	20.43	20.44	20.44	20.4	20.16	19.71	19.31		(92)
Apply	adjustn	nent to t	he mear	internal	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	19.2	19.41	19.69	20	20.2	20.28	20.29	20.29	20.25	20.01	19.56	19.16		(93)
8. Sp	ace hea	ting requ	uirement											
Set T	i to the i	mean int	ernal ter	nperatur	e obtair	ned at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the ut	ilisation	factor fo	or gains	using Ta	ble 9a			1					1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
		r	ains, hm	i		1		1			1		1	
(94)m=	0.99	0.97	0.94	0.87	0.73	0.53	0.36	0.4	0.64	0.89	0.97	0.99		(94)
	<u> </u>		<u> </u>	4)m x (84	,								1	
(95)m=				1056.96	916.2	644.49	424.04	445.62	684.32	870.16	868.98	855.03		(95)
	<u> </u>		i	perature		î								(00)
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
	r	i	i	· · · ·		Lm , W =	-· /	- <u>`</u>	r í í		4 450 00	1750.0		(07)
(97)m=		1707.69		1291.73	987.48	654.22	424.96	447.33	711.44	1093.37		1750.8		(97)
-	r					Wh/moni		r			1)m 419.93	000.45		
(98)m=	639.56	468.76	355.98	169.03	53.03	0	0	0	0	166.06		666.45		
								lota	ll per year	(kwh/yeai	r) = Sum(9	8)15,912 =	2938.8	(98)
Spac	e heatin	g require	ement in	kWh/m ²	/year								25.93	(99)
9a. En	ergy rec	uiremer	nts – Ind	ividu <mark>al h</mark>	eating s	ystems i	ncluding	micro-C	CHP)					
Spac	e heatir	ng:												_
Fracti	ion of sp	ace hea	t from s	econdar	//supple	mentary	system						0	(201)
Fracti	ion of sp	ace hea	nt from n	nain syst	em(s)			(202) = 1	- (201) =		_		1	(202)
Fracti	on of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficie	ency of I	main spa	ace heat	ing syste	em 1							·	90.3	(206)
						g system	1 %						0	(208)
Linon	-	i					i		0	0.1		Du	-	
Snoo	Jan	Feb	Mar Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space	639.56	468.76	355.98	alculate	53.03)	0	0	0	166.06	419.93	666.45		
(_	0	0	0	100.00	419.93	000.45		
(211)m				0)m } x		Î.				400.0	405.04	700.04		(211)
	708.26	519.11	394.22	187.19	58.72	0	0		0	183.9	465.04 211) _{15,1012}	738.04		
_								TOLA	li (Kvvii/yea	ar) =Sum(2	211) _{15,10} 12	-	3254.49	(211)
•		•		y), kWh/										
		[1] + (2)	14) m } x	(100 ÷ (2 0		0	0	0	0	0	0	0		
(215)m=	0	0	0	0	0	0	0			-	215) _{15,10} 12	-		
								TOLA	ii (KVVII/yea	ar) =Sum(2	213) _{15,1012}	-	0	(215)
	heating	-												
Output	222.82	ater nea 196.27	205.83	ulated al	180.12	160.52	153.75	169.27	169.15	190.93	202.4	217.32		
Efficie		ater hea		10			100110		100110				79.6	(216)
(217)m=	-	86.85	86.06	84.39	81.8	79.6	79.6	79.6	79.6	84.24	86.52	87.41	79.0	(217)
· · ·					01.0	13.0	13.0	13.0	13.0	07.24	00.02	07.41		()
		•	kWh/mo (217) ÷ (
(219)m=		225.98	239.17	218.17	220.18	201.65	193.16	212.66	212.5	226.63	233.94	248.62		
								Tota	I = Sum(2	19a) =		•	2687.99	(219)

Annual totals			kWh/ye	ear	kWh/year	7
Space heating fuel used, main system 1					3254.49	
Water heating fuel used					2687.99	
Electricity for pumps, fans and electric keep-hot					L	
central heating pump:				30		(230c)
boiler with a fan-assisted flue				45		(230e)
Total electricity for the above, kWh/year		sum of (230a).	(230g) =		75	(231)
Electricity for lighting					454.5	(232)
10a. Fuel costs - individual heating systems:						
	Fuel kWh/year		Fuel Price (Table 12)		Fuel Cost £/year	
Space heating - main system 1	(211) x		3.48	x 0.01 =	113.2563	(240)
Space heating - main system 2	(213) x		0	x 0.01 =	0	(241)
Space heating - secondary	(215) x		13.19	x 0.01 =	0	(242)
Water heating cost (other fuel)	(219)		3.48	x 0.01 =	93.54	(247)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	9.89	(249)
(if off-peak tariff, list each of (230a) to (230g) sepa Energy for lighting	arately as applica (232)	able and apply	fuel price act	cording to $7 \times 0.01 =$	Fable 12a 59.95	(250)
Additional standing charges (Table 12) Appendix Q items: repeat lines (253) and (254) as	speeded				120	(251)
	7) + (250)(254) =				396.64	(255)
11a. SAP rating - individual heating systems						
Energy cost deflator (Table 12)					0.42	(256)
	56)] ÷ [(4) + 45.0] =				1.05	(257)
SAP rating (Section 12)					85.32	(258)
12a. CO2 emissions – Individual heating system	s including micro	-CHP				
	Energy kWh/year		Emission f kg CO2/kW		Emissions kg CO2/yea	
Space heating (main system 1)	(211) x		0.216	=	702.97	(261)
Space heating (secondary)	(215) x		0.519		0	(263)
Water heating	(219) x		0.216	_ =	580.6	(264)
Space and water heating	(261) + (262) + (2	263) + (264) =		-	1283.57	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519] =	38.93	(267)
Electricity for lighting	(232) x		0.519] =	235.89	(268)
Total CO2, kg/year		sum o	f (265)(271) =	-	1558.38	(272)
CO2 emissions per m ²		(272) ·	÷ (4) =		13.75	(273)

El rating (section 14)				87	(274)
13a. Primary Energy					
	Energy kWh/year	Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211) x	1.22	=	3970.48	(261)
Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	1.22	=	3279.34	(264)
Space and water heating	(261) + (262) + (263) + ((264) =		7249.82	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	230.25	(267)
Electricity for lighting	(232) x	0	=	1395.31	(268)
'Total Primary Energy		sum of (265)(271) =		8875.38	(272)
Primary energy kWh/m²/year		(272) ÷ (4) =		78.31	(273)



				User D	etails:						
Assessor Name: Software Name:	Stroma F	SAP 201			Strom Softwa Address	are Vei	rsion:	d FAbric		on: 1.0.0.28	
Address :											
1. Overall dwelling dime	ensions:										
				Area	a(m²)		Av. Hei	ight(m)		Volume(m ³)	_
Ground floor					75	(1a) x	2	2.7	(2a) =	202.5	(3a)
First floor					75	(1b) x	2.	.41	(2b) =	180.75	(3b)
Total floor area TFA = (1	a)+(1b)+(1c)-	⊦(1d)+(1e)+(1r	n)	150	(4)					-
Dwelling volume						(3a)+(3b))+(3c)+(3d	l)+(3e)+	.(3n) =	383.25	(5)
2. Ventilation rate:											1
2. Ventilation fate.	main		econdar	у	other		total			m ³ per hour	
Number of chimneys	heating) n +	eating 0] + [0] = [0	x 4	40 =	0	(6a)
Number of open flues	0	+	0	 +	0	 = [0	x2	20 =	0] (6b)
Number of intermittent fa	ans		-		-		4	x ^	0 =	40](7a)
Number of passive vents							0	× ´	0 =	0	(7b)
Number of flueless gas f							_		40 =		
							0			0 anges per hou](7c) Ir
Infiltration due to chimne	7						40		÷ (5) =	0.1	(8)
If a pressurisation test has I Number of storeys in t			ea, procee	a to (17), c	otherwise (continue tr	om (9) to (16)	ĺ	0	(9)
Additional infiltration		,						[(9)·	1]x0.1 =	0	(10)
Structural infiltration: 0).25 for steel of	or timber f	rame or	0.35 fo	r masoni	ry constr	uction			0	(11)
if both types of wall are p			ponding to	the great	er wall are	a (after					-
deducting areas of openi If suspended wooden			ed) or 0.	1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, er	nter 0.05, else	enter 0	,	,	,,					0	(13)
Percentage of window	s and doors o	lraught st	ripped						·	0	(14)
Window infiltration					0.25 - [0.2	2 x (14) ÷ 1	= [00			0	(15)
Infiltration rate					(8) + (10)					0	(16)
Air permeability value,				•	•	•	etre of e	nvelope	area	4.5	(17)
If based on air permeabi	-						ia haina w	and		0.33	(18)
Air permeability value applie Number of sides shelter		uon test nas	s been don	le or a deg	jree all pe	rmeability	is being us	seu		2	(19)
Shelter factor					(20) = 1 -	[0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorpora	ting shelter fa	ctor			(21) = (18) x (20) =				0.28	(21)
Infiltration rate modified	for monthly w	ind speed									-
Jan Feb	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	beed from Tab	ole 7									
(22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		

Wind F	actor (2	22a)m =	(22)m ÷	4										
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjust	ed infiltr	ration rat	e (allow	ing for sl	nelter ar	nd wind s	peed) =	: (21a) x	(22a)m					
	0.36	0.35	0.34	0.31	0.3	0.27	0.27	0.26	0.28	0.3	0.32	0.33		
			-	rate for t	he appl	icable ca	se	•						
		al ventila		ondix N (C	23h) - (23)	a) × Fmv (e	auation (I	N5)) othe	nuise (23h	(232)		l	0	(23a)
		• •	0 11		, ,	for in-use f		<i>,,</i> .	,) – (25a)		L	0	(23b)
			-	-	-					0h)m. (226) [·	 ۱ (22م)	0	(23c)
(24a)m=									$\frac{1}{0} = \frac{2}{2}$	2D)m + (0	230) × [1 – (23c) 0	÷ 100]	(24a)
				-	-	heat rec						Ů		(210)
(24b)m=								0			230)	0		(24b)
		ļ			-	ve input v		-				ů		(=,
,					•	o); other				.5 × (23t))			
(24c)m=	<u>, </u>	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If	natural	ventilatio	u on or wh	iole hous	e positi	ve input	ventilatio	on from I	loft	<u> </u>	<u> </u>			
,					•	erwise (2				0.5]				
(24d)m=	0.56	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.55		(24d)
Effe	ctive air	change	rate - ei	nter (24a) or (24	b) or (24	c) or (24	ld) in bo	x (25)					
(25)m=	0.56	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.55		(25)
3. He	at l <mark>osse</mark>	es and he	eat l <mark>oss</mark>	oaramet	er: 🗹									
	IENT	Gros		Openir		Net Ar	ea	U-val	ue	AXU		k-value		AXk
		area	(m²)	'n	-	A ,r	n²	W/m2	2K	(W/	K)	kJ/m²∙k	(kJ/K
Doors						2.1	X	1.1	=	2.31				(26)
Windo	ws Type	e 1				2.39	x1	/[1/(1.2)+	0.04] =	2.74				(27)
Windo	ws Type	e 2				2.39	x1	/[1/(1.2)+	0.04] =	2.74				(27)
Windo	ws Type	e 3				3.78	x1	/[1/(1.2)+	0.04] =	4.33				(27)
Windo	ws Type	e 4				2.39	x1	/[1/(1.2)+	0.04] =	2.74				(27)
Windo	ws Type	e 5				1.44		/[1/(1.2)+	0.04] =	1.65				(27)
Windo	ws Type	e 6				0.96		/[1/(1.2)+	0.04] =	1.1	=			(27)
Windo	ws Type	e 7				1.44		/[1/(1.2)+	0.04] =	1.65	=			(27)
Floor						75	×	0.15		11.25	Ξ r			(28)
Walls		180	0	31.2	4	148.7	6 ×	0.18		26.78	= 1		╡ =	(29)
Roof		75		0		75	×	0.1		7.5	= 1		╡┢	(30)
	area of e	elements]	330				7.0	J L			(31)
				effective w	indow U-v		ated using	a formula 1	/[(1/U-valı	ıe)+0.041≠	as aiven in	paragraph	3.2	(01)
		as on both						,				,		

Fabric heat loss, $W/K = S (A \times U)$	(26)(30) + (32) =	81.2	(33)
Heat capacity $Cm = S(A \times k)$	((28)(30) + (32) + (32a)(32e) =	37189.4	(34)
Thermal mass parameter (TMP = $Cm \div TFA$) in kJ/m ² K	Indicative Value: High	450	(35)
			-

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f

can be ι	ised inste	ad of a dei	tailed calc	ulation.										
Therm	al bridg	es : S (L	x Y) cal	culated u	using Ap	pendix ł	<						16.5	(36)
if details	of therma	al bridging	are not kn	own (36) =	= 0.15 x (3	1)								
Total fa	abric he	at loss							(33) +	(36) =			97.7	(37)
Ventila	tion hea	at loss ca	alculated	l monthly	/				(38)m	= 0.33 × (25)m x (5)	_		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	71.29	70.98	70.67	69.23	68.97	67.71	67.71	67.47	68.19	68.97	69.51	70.08		(38)
Heat tr	ansfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	169	168.68	168.38	166.93	166.67	165.42	165.42	165.18	165.9	166.67	167.21	167.78		
Hoatle		meter (H	יע (ס ור	/m2k/						Average = = (39)m ÷	Sum(39) ₁ .	12 /12=	166.94	(39)
(40)m=	1.13	1.12	1.12	1.11	1.11	1.1	1.1	1.1	1.11	1.11	1.11	1.12		
(40)11=	1.13	1.12	1.12	1.11	1.11	1.1	1.1	1.1					1 1 1	(40)
Numbe	er of day	/s in moi	nth (Tab	le 1a)					,	Average =	Sum(40)₁.	12 / 12=	1.11	(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 hea	ting ener	rav reau	rement:								kWh/ye	ear:	
		upancy, I		[1 - ovp	(_0_0003		-13 O)2)] + 0.0	013 v (⁻	TEA -13		93		(42)
	A £ 13.		T 1.70 X	[i - evh	(-0.0003	743 X (11	A - 13.9)2)] + 0.0	013 X (II A -13.	.9)			
								(25 x N)				9.36		(43)
		al average litres per p				-	7	to achieve	a water us	se target o	f			
normore				uay (all W				·i		-				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage i	n litres per	day for ea	ach month	Vd,m = fa	ctor from I	able 1c x	(43)						
(44)m=	120.29	115.92	111.54	107.17	102.79	98.42	98.42	102.79	107.17	111.54	115.92	120.29		_
Energy	content of	bot water	used - cal	culated m	onthly - 1	100 v Vd r	n v nm v F) Tm / 3600			$m(44)_{112} =$		1312.26	(44)
	178.39	156.02	161	140.36	134.68	116.22	107.69	123.58	125.06	145.74	159.09	172.76	l	
(45)m=	170.39	130.02	101	140.30	134.00	110.22	107.09	123.30			m(45) ₁₁₂ =		1720.58	(45)
If instant	taneous w	vater heatii	ng at point	of use (no	hot water	·storage),	enter 0 in	boxes (46)		10tal = 3u	111(4J)112 =	-	1720.30	
(46)m=	26.76	23.4	24.15	21.05	20.2	17.43	16.15	18.54	18.76	21.86	23.86	25.91		(46)
	storage	loss:												
Storag	e volum	e (litres)	includir	ig any so	olar or W	/WHRS	storage	within sa	ime ves	sel	:	210		(47)
If com	munity h	neating a	ind no ta	nk in dw	elling, e	nter 110	litres in	(47)						
Otherv	vise if no	o stored	hot wate	er (this in	cludes i	nstantar	neous co	mbi boile	ers) ente	er '0' in (47)			
	storage													
		urer's de			or is kno	wn (kWł	n/day):				1	.8		(48)
Tempe	erature f	actor fro	m Table	2b							0.	54		(49)
		om water	-	-		or io not		(48) x (49)	=		0.	97		(50)
,		urer's de age loss										0		(51)
		neating s				.,						U		(31)
	•	from Ta		-								0		(52)
Tempe	erature f	actor fro	m Table	2b								0		(53)

		om water (54) in (5	-	e, kWh/yo	ear			(47) x (51)) x (52) x (53) =		0 97		(54) (55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)ı	m	L			
(56)m=	30.13	27.22	30.13	29.16	30.13	29.16	30.13	30.13	29.16	30.13	29.16	30.13		(56)
		s dedicate	l d solar sto	I orage, (57)	I m = (56)m	x [(50) – (I H11)] ÷ (5	0), else (5	1 7)m = (56)	n where (H11) is fro	m Append	l lix H	
(57)m=	30.13	27.22	30.13	29.16	30.13	29.16	30.13	30.13	29.16	30.13	29.16	30.13		(57)
Primar	y circuit	loss (ar	nnual) fro	om Table	e 3							0		(58)
Primar	y circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(mo		factor f	rom Tab	le H5 if t	here is s	solar wat	ter heatir	<u> </u>	cylinde	· · · · · · · · · · · · · · · · · · ·	stat)		1	
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	lculated	for each	month	(61)m =	(60) ÷ 30	65 × (41))m					_	
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	neat req	uired for	water h	eating ca	alculated	l for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)ı	n
(62)m=	231.78	204.25	214.39	192.03	188.07	167.89	161.09	176.97	176.73	199.14	210.76	226.15		(62)
Solar DI	-IW input	calculated	using App	endix G o	r Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	NWHRS	applies	, see Ap	pendix (G)	-				
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	t from w	ater hea	ter											
(64)m=	231.78	204.25	214.39	192.03	188.07	167.89	161.09	176.97	176.73	199.14	210.76	226.15		_
								Outp	out from wa	ater heate	r (annual)₁	12	2349.26	(64)
Heat g	ains fro	m water	heating	, kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (61)m	n] + 0.8 x	(<mark>46)m</mark> (+ (57)m	+ (59)m]	
(65)m=	102.03	90.46	96.25	88.01	87.5	79.98	78.52	83.81	82.92	91.17	94.23	100.16		(65)
inclu	ide (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. Int	ternal ga	ains (see	e Table 5	5 and 5a):									
Metab	<u>olic gair</u>	s (Table	<u>e 5), Wat</u>	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	176.05	176.05	176.05	176.05	176.05	176.05	176.05	176.05	176.05	176.05	176.05	176.05		(66)
Lightin	g gains	(calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5	-	-	-		
(67)m=	72.17	64.1	52.13	39.47	29.5	24.91	26.91	34.98	46.95	59.62	69.58	74.18		(67)
Applia	nces ga	ins (calc	ulated ir	n Appeno	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5			_	
(68)m=	478.39	483.36	470.85	444.22	410.6	379	357.89	352.93	365.44	392.07	425.69	457.28		(68)
Cookir	ng gains	(calcula	ated in A	ppendix	L, equa	tion L15	or L15a)), also se	e Table	5				
(69)m=	55.54	55.54	55.54	55.54	55.54	55.54	55.54	55.54	55.54	55.54	55.54	55.54		(69)
Pumps	s and fa	ns gains	(Table !	5a)										
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses	s e.g. ev	aporatic	on (nega	tive valu	es) (Tab	ole 5)								
(71)m=	-117.37	-117.37	-117.37	-117.37	-117.37	-117.37	-117.37	-117.37	-117.37	-117.37	-117.37	-117.37		(71)
Water	heating	gains (T	Table 5)											
(72)m=	137.14	134.61	129.36	122.23	117.6	111.08	105.54	112.64	115.16	122.55	130.88	134.62		(72)
Total i	internal	gains =				(66)	m + (67)m	n + (68)m -	+ (69)m + ((70)m + (7	1)m + (72)	m		
(73)m=	804.93	799.29	769.57	723.14	674.93	632.22	607.57	617.78	644.78	691.46	743.38	783.31		(73)
6. So	lar gains	S:	•	•	•	•	•	•	•	•	•	•		

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

Orientation	Access Facto Table 6d	or	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North 0.9	9x 0.77	x	2.39	x	10.63	x	0.76	x	0.7	=	28.11	(74)
North 0.9	0.77 0.77	x	1.44	x	10.63	x	0.76	x	0.7	=	11.29	(74)
North 0.5	9x 0.77	×	2.39	×	20.32	x	0.76	x	0.7	=	53.72	(74)
North 0.9	0.77	x	1.44	x	20.32	x	0.76	x	0.7	=	21.58	(74)
North 0.9	9x 0.77	×	2.39	x	34.53	x	0.76	x	0.7	=	91.28	(74)
North 0.9	0.77 0.77	x	1.44	x	34.53	x	0.76	x	0.7	=	36.66	(74)
North 0.9	0.77 0.77	x	2.39	x	55.46	x	0.76	x	0.7	=	146.62	(74)
North 0.9	x 0.77	x	1.44	x	55.46	x	0.76	x	0.7	=	58.89	(74)
North 0.9) x 0.77	x	2.39	x	74.72	x	0.76	x	0.7	=	197.5	(74)
North 0.9	9x 0.77	x	1.44	x	74.72	x	0.76	x	0.7	=	79.33	(74)
North 0.9	9x 0.77	x	2.39	x	79.99	x	0.76	x	0.7	=	211.43	(74)
North 0.9	x 0.77	×	1.44	x	79.99	x	0.76	x	0.7	=	84.93	(74)
North 0.9	9x 0.77	x	2.39	x	74.68	x	0.76	x	0.7	=	197.4	(74)
North 0.9	9x 0.77	x	1.44	x	74.68	x	0.76	x	0.7	=	79.29	(74)
North 0.9	9x 0.77	x	2.39	x	59.25	x	0.76	x	0.7	=	156.61	(74)
North 0.9	0.77	x	1.44	×	59.25	х	0.76	X	0.7	=	62.91	(74)
North 0.	0.77] ×	2.39	x	41.52	x	0.76	x	0.7	=	109.75	(74)
North 0.9	9x 0.77] ×	1.44	x	41.52	×	0.76	x	0.7	=	44.08	(74)
North 0.9	9x 0.77	x	2.39	X	24.19	x	0.76	x	0.7	=	63.94	(74)
North 0.9	0.77 0.77] ×	1.44	x	24.19	x	0.76	x	0.7	=	25.68	(74)
North 0.9	0.77 0.77] ×	2.39	x	13.12	x	0.76	x	0.7	=	34.68	(74)
North 0.9	9x 0.77	x	1.44	x	13.12	x	0.76	x	0.7	=	13.93	(74)
North 0.9	0.77 0.77	×	2.39	x	8.86	x	0.76	x	0.7	=	23.43	(74)
North 0.9	0.77 0.77	x	1.44	x	8.86	x	0.76	x	0.7	=	9.41	(74)
South 0.9	9x 0.77	x	2.39	x	46.75	x	0.76	x	0.7	=	123.58	(78)
South 0.9	9x 0.77	x	3.78	x	46.75	x	0.76	x	0.7	=	65.15	(78)
South 0.9	9x 0.77	x	1.44	x	46.75	x	0.76	x	0.7	=	24.82	(78)
South 0.9	0.77	x	2.39	x	76.57	x	0.76	x	0.7	=	202.4	(78)
South 0.9	0.77	x	3.78	x	76.57	x	0.76	x	0.7	=	106.7	(78)
South 0.9	9x 0.77	x	1.44	x	76.57	x	0.76	x	0.7	=	40.65	(78)
South 0.9	0.77	x	2.39	×	97.53	x	0.76	x	0.7	=	257.82	(78)
South 0.9	-	x	3.78	×	97.53	x	0.76	x	0.7	=	135.92	(78)
South 0.9	9x 0.77	x	1.44	x	97.53	x	0.76	x	0.7	=	51.78	(78)
South 0.9	0.77	x	2.39	×	110.23	x	0.76	x	0.7	=	291.39	(78)
South 0.9	0.77	x	3.78	x	110.23	x	0.76	x	0.7	=	153.62	(78)
South 0.9	-	×	1.44	×	110.23	x	0.76	x	0.7	=	58.52	(78)
South 0.9	-	×	2.39	×	114.87	x	0.76	x	0.7	=	303.65	(78)
South 0.9		×	3.78	x	114.87	x	0.76	x	0.7	=	160.08	(78)
South 0.9	0.77	×	1.44	×	114.87	x	0.76	x	0.7	=	60.98	(78)

South			_		_		-		_				_
• •	0.9x	0.77	x	2.39	×	110.55	x	0.76	x	0.7	=	292.22	(78)
South	0.9x	0.77	x	3.78	x	110.55	x	0.76	x	0.7	=	154.06	(78)
South	0.9x	0.77	x	1.44	x	110.55	x	0.76	x	0.7	=	58.69	(78)
South	0.9x	0.77	x	2.39	x	108.01	x	0.76	x	0.7	=	285.52	(78)
South	0.9x	0.77	x	3.78	x	108.01	x	0.76	×	0.7	=	150.52	(78)
South	0.9x	0.77	x	1.44	x	108.01	x	0.76	x	0.7	=	57.34	(78)
South	0.9x	0.77	x	2.39	x	104.89	x	0.76	x	0.7	=	277.28	(78)
South	0.9x	0.77	x	3.78	x	104.89	x	0.76	x	0.7	=	146.18	(78)
South	0.9x	0.77	x	1.44	x	104.89	x	0.76	x	0.7	=	55.69	(78)
South	0.9x	0.77	x	2.39	x	101.89	x	0.76	x	0.7	=	269.33	(78)
South	0.9x	0.77	x	3.78	x	101.89	x	0.76	x	0.7	=	141.99	(78)
South	0.9x	0.77	x	1.44	x	101.89	x	0.76	x	0.7	=	54.09	(78)
South	0.9x	0.77	x	2.39	×	82.59	x	0.76	x	0.7	=	218.31	(78)
South	0.9x	0.77	x	3.78	×	82.59	x	0.76	x	0.7	=	115.09	(78)
South	0.9x	0.77	x	1.44	×	82.59	x	0.76	x	0.7	=	43.84	(78)
South	0.9x	0.77	x	2.39	×	55.42	x	0.76	×	0.7	=	146.49	(78)
South	0.9x	0.77	x	3.78	×	55.42	x	0.76	x	0.7	=	77.23	(78)
South	0.9x	0.77	×	1.44	X	55.42	x	0.76	x	0.7	=	29.42	(78)
South	0.9x	0.77	٦ x	2.39	×	40.4	x	0.76	x	0.7	=	106.79	(78)
South	0.9x	0.77	x	3.78) x	40.4	ī 🖈	0.76	x	0.7	=	56.3	(78)
South	0.9x	0.77	x	1.44	T x	40.4	٦x	0.76	x	0.7	=	21.45	(78)
							7						
Solar g	ains in	watts, calcu	lated	for each mo	nth		(83)m	= Sum(74)m	(82)m				
(83)m=	301.47	519.95 72											
		010.00 12	9.76	936.99 1080	0.91 1	087.3 1042.33	932	.53 801	579.48	362.23	257.27		(83)
Total g	ains – ii					087.3 1042.33 (83)m , watts	932	.53 801	579.48	362.23	257.27		(83)
Total g (84)m=	ains — ii 1106.4	nternal and)m + (932 1550		579.48 1270.9		257.27 1040.58		(83) (84)
(84)m=	1106.4	nternal and 1319.25 149	solar 99.33	(84)m = (73)m + (5.84 1	83)m , watts					-		
(84)m= 7. Me	1106.4 an inter	nternal and 1319.25 149 nal tempera	solar 99.33 ture ((84)m = (73 1660.13 1755 (heating sea)m + (5.84 1 son)	83)m , watts	1550	0.31 1445.79			-	21	
(84)m= 7. Me Temp	1106.4 an inter erature	nternal and 1319.25 149 nal tempera during heat	solar 99.33 ture (ing po	(84)m = (73 1660.13 1755 (heating sea eriods in the)m + (5.84 1 son) living	83)m , watts 719.52 1649.91	1550	0.31 1445.79			-	21	(84)
(84)m= 7. Me Temp	1106.4 an inter erature	nternal and 1319.25 149 nal tempera during heat	solar 99.33 ture (ing po	(84)m = (73 1660.13 1755 (heating sea eriods in the iving area, h)m + (5.84 1 son) living	83)m , watts 719.52 1649.91 area from Ta	1550 ble 9	0.31 1445.79		4 1105.61	-	21	(84)
(84)m= 7. Me Temp	1106.4 an inter erature ation fac	nternal and 1319.25 149 nal tempera during heat tor for gains Feb N	solar 99.33 ture (ing po s for li	(84)m = (73 1660.13 1755 (heating sea eriods in the iving area, h)m + (5.84 1 son) living 1,m (s ay	83)m , watts 719.52 1649.91 area from Ta see Table 9a)	1550 ble 9	0.31 1445.79 Th1 (°C) ug Sep	1270.9	4 1105.61	1040.58	21	(84)
(84)m= 7. Me Temp Utilisa (86)m=	1106.4 an inter erature ation fac Jan 1	nternal and 1319.25 149 nal tempera during heat tor for gains Feb N 1 0.	solar 99.33 ture (ing po s for li Mar 99	(84)m = (73 1660.13 1755 (heating sea eriods in the iving area, h Apr M 0.96 0.8)m + (5.84 1 son) living 1,m (s ay 3	83)m , watts 719.52 1649.91 area from Taisee Table 9a) Jun Jul 0.61 0.44	1550 ble 9,	0.31 1445.79 Th1 (°C) ug Sep 9 0.77	1270.9 Oct	4 1105.61 Nov	1040.58 Dec	21	(84)
(84)m= 7. Me Temp Utilisa (86)m=	1106.4 an inter erature ation fac Jan 1	nternal and 1319.25 149 nal tempera during heat tor for gains Feb N 1 0. I temperatur	solar 99.33 ture (ing po s for li Mar 99	(84)m = (73 1660.13 1755 (heating sea eriods in the iving area, h Apr M 0.96 0.8)m + (5.84 1 500) living 1,m (s ay 3 1 (folla	83)m , watts 719.52 1649.91 area from Ta see Table 9a) Jun Jul	1550 ble 9,	0.31 1445.79 Th1 (°C) ug Sep 9 0.77 Table 9c)	1270.9 Oct	4 1105.61 Nov	1040.58 Dec	21	(84)
(84)m= 7. Me Temp Utilisa (86)m= Mean (87)m=	1106.4 an inter erature ation fac Jan 1 interna 20.34	nternal and 1319.25 149 nal tempera during heat tor for gains Feb N 1 0. I temperatur 20.46 20	solar 99.33 ture (ing po s for li Mar 99 re in l 0.63	(84)m = (73) 1660.13 1758 (heating sea eriods in the iving area, h Apr M 0.96 0.8 iving area T 20.84 20.84 20.)m + (5.84 1 son) living 1,m (s ay 3 l (follo 96	83)m , watts 719.52 1649.91 area from Talsee Table 9a) Jun Jul 0.61 0.44 ow steps 3 to 21 21	1550 ble 9 A 0.4 7 in T 2	0.31 1445.79 Th1 (°C) ug Sep 9 0.77 Table 9c) 1 20.99	1270.9 Oct 0.98	4 1105.61 Nov	1040.58 Dec 1	21	(84) (85) (86)
(84)m= 7. Me Temp Utilisa (86)m= Mean (87)m= Temp	1106.4 an inter erature ation fac Jan 1 interna 20.34 erature	nternal and 1319.25 149 nal tempera during heat tor for gains Feb N 1 0. I temperatur 20.46 20 during heat	solar 99.33 ture (ing po 5 for li Mar 99 re in l 0.63	$(84)m = (73)$ $1660.13 1758$ $(heating sea)$ eriods in the iving area, h $Apr \qquad M$ $0.96 \qquad 0.8$ iving area T $20.84 \qquad 20.$ eriods in res)m + (5.84 1 son) living 1,m (s ay 3 l (follo 96 t of dv	83)m , watts 719.52 1649.91 area from Ta see Table 9a) Jun Jul 0.61 0.44 ow steps 3 to 21 21 velling from Ta	1550 ble 9 A 0.4 7 in T 2 able 9	0.31 1445.79 Th1 (°C) ug Sep 9 0.77 Fable 9c) 1 20.99 0, Th2 (°C)	1270.9 Oct 0.98 20.81	4 1105.61 4 1105.61 Nov 1 20.53	1040.58 Dec 1 20.32	21	(84) (85) (86)
(84)m= 7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m=	1106.4 an inter erature ation fac Jan 1 interna 20.34 erature 19.98	nternal and 1319.25 149 nal tempera during heat ctor for gains Feb N 1 0. I temperatur 20.46 20 during heat 19.98 19	solar 99.33 ture (ing po 5 for li Mar 99 ce in l 0.63 ing po 0.98	(84)m = (73) 1660.13 1758 (heating sea eriods in the iving area, h Apr M 0.96 0.8 iving area T 20.84 20. eriods in res 19.99 19.)m + (5.84 1 son) living 1,m (s ay 3 l (follo 96 t of dv 99	83)m , watts 719.52 1649.91 area from Taisee Table 9a) Jun Jun Jul 0.61 0.44 ow steps 3 to 21 21 21 20 20	1550 ble 9 0.4 7 in T 2 able 9	0.31 1445.79 Th1 (°C) ug Sep 9 0.77 Fable 9c) 1 20.99 0, Th2 (°C)	1270.9 Oct 0.98	4 1105.61 4 1105.61 Nov 1 20.53	1040.58 Dec 1	21	(84) (85) (86) (87)
(84)m= 7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa	1106.4 an inter erature ation fac Jan 1 interna 20.34 erature 19.98 ation fac	nternal and 1319.25 149 nal tempera during heat tor for gains Feb N 1 0. I temperatur 20.46 20 during heat 19.98 19 tor for gains	solar 99.33 ture (ing po s for li Mar .99 re in l 0.63 ing po 0.98 s for r	(84)m = (73) $1660.13 1759$ $(heating sea)$ eriods in the iving area, h $Apr M$ $0.96 0.8$ iving area T $20.84 20.$ eriods in res $19.99 19.$ est of dwelling)m + (5.84 1 5.84 1 1,m (1,m (ay 3 1 (follo 3 1 (follo 96 1 1 (follo 99 1 1 (follo 99 1 1 (follo 99 1 1 (follo 99 1 1 (follo 99 1 1 (follo 99 1 1 (follo 99 1 1 (follo 99 1 1 (follo 99 1 1 (follo 99 1 1 (follo 99 1 1 (follo 99 1 1 (follo 99 1 1 (follo 99 1 1 (follo 99 1 1 (follo 99 1 1 (follo 99 1 1 (follo 99 1 1 (follo 99 1 1 (follo 1 (follo	(83)m , watts 719.52 1649.91 area from Talsee Table 9a) Jun Jun Jul 0.61 0.44 ow steps 3 to 21 21 21 20 20 2,m (see Table 30	1550 ble 9 0.4 7 in T 2 able 9 20 20	0.31 1445.79 Th1 (°C) ug Sep 9 0.77 Table 9c) 1 20.99 0, Th2 (°C) 0 20	1270.9 Oct 0.98 20.81 19.99	4 1105.61 4 1105.61 1 20.53 19.99	1040.58 Dec 1 20.32 19.99	21	(84) (85) (86) (87) (88)
(84)m= 7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m=	1106.4 an inter erature ation fac Jan 1 interna 20.34 erature 19.98 ation fac 1	nternal and 1319.25 149 nal tempera during heat tor for gains Feb N 1 0. I temperatur 20.46 20 during heat 19.98 19 tor for gains 1 0.	solar 99.33 ture (ing po s for li Mar .99 re in l 0.63 ing po 0.98 s for r .99	(84)m = (73) 1660.13 1758 1660.13 1758 $(heating sealeriods in theiving area, hAprM0.960.8iving area T20.8420.eriods in res19.9919.est of dwellin0.940.7$)m + (5.84 1 son) living 1,m (s ay 3 1 (folle 3 1 (folle 96 1 (folle 99 1 ag, h2 6	(83)m , watts 719.52 1649.91 area from Talsee Table 9a) Jun Jun Jul 0.61 0.44 ow steps 3 to 21 21 21 velling from Talse 20 20 20 2,m (see Table 0.52 0.34	1550 ble 9 0.4 7 in T 2 able 9 20 20 20 20 20 20 20 20 20 20 20 20 20	0.31 1445.79 Th1 (°C) ug Sep 9 0.77 Table 9c) 1 20.99 0, Th2 (°C) 0 20 18 0.67	1270.9 Oct 0.98 20.81 19.99 0.96	4 1105.61 4 1105.61 Nov 1 20.53	1040.58 Dec 1 20.32	21	(84) (85) (86) (87)
(84)m= 7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean	1106.4 an inter erature ation fac Jan 1 interna 20.34 erature 19.98 ation fac 1 interna	nternal and 1319.25 149 nal tempera during heat tor for gains Feb N 1 0. I temperatur 20.46 20 during heat 19.98 19 tor for gains 1 0. I temperatur	solar 99.33 ture (ing po 5 for li Mar 99 ce in l 0.63 ing po 0.63 ing po 0.98 s for r 99	(84)m = (73) 1660.13 1758 1660.13 1758 $(heating sealeriods in theiving area, hAprM0.960.8iving area T20.8420.eriods in res19.9919.est of dwellin0.940.7the rest of dw$)m + (5.84 1 son) living 1,m (s ay 3 1 (follo 96 1 (follo 99 1 (follo 1 (follo 99 1 (follo 1 (fo	83)m , watts 719.52 1649.91 area from Talsee Table 9a) Jun Jun Jul 0.61 0.44 ow steps 3 to 21 21 21 velling from Talse 20 20 20 20 20 20 20 21 21 20 20 21 21 20 20 20 20 20 20 20 20 21 21 20 20 21 21 20 20 21 20 20 20 21 21 20 20 21 21	1550 ble 9 0.4 7 in T 2 able 9 20 9 a) 0.3 eps 3	0.31 1445.79 Th1 (°C) ug Sep 9 0.77 Table 9c) 1 20.99 0, Th2 (°C) 0 20 18 0.67 to 7 in Table	1270.9 Oct 0.98 20.81 19.99 0.96 e 9c)	4 1105.61 4 1105.61 Nov 1 20.53 19.99 1	1040.58 Dec 1 20.32 19.99	21	(84) (85) (86) (87) (88) (89)
(84)m= 7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m=	1106.4 an inter erature ation fac Jan 1 interna 20.34 erature 19.98 ation fac 1	nternal and 1319.25 149 nal tempera during heat tor for gains Feb N 1 0. I temperatur 20.46 20 during heat 19.98 19 tor for gains 1 0. I temperatur	solar 99.33 ture (ing po s for li Mar .99 re in l 0.63 ing po 0.98 s for r .99	(84)m = (73) 1660.13 1758 1660.13 1758 $(heating sealeriods in theiving area, hAprM0.960.8iving area T20.8420.eriods in res19.9919.est of dwellin0.940.7$)m + (5.84 1 son) living 1,m (s ay 3 1 (follo 96 1 (follo 99 1 (follo 1 (follo 99 1 (follo 1 (fo	(83)m , watts 719.52 1649.91 area from Talsee Table 9a) Jun Jun Jul 0.61 0.44 ow steps 3 to 21 21 21 welling from Talse 20 20 20 e,m (see Table 0.34	1550 ble 9 0.4 7 in T 2 able 9 20 20 20 20 20 20 20 20 20 20 20 20 20	0.31 1445.79 Th1 (°C) ug Sep 9 0.77 Table 9c) 1 20.99 0, Th2 (°C) 0 20 8 0.67 to 7 in Table 0 19.99	1270.9 Oct 0.98 20.81 19.99 0.96 e 9c) 19.8	4 1105.61 4 1105.61 1 20.53 19.99	1040.58 1040.58 Dec 1 20.32 19.99 1 19.08	21	(84) (85) (86) (87) (88)

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

(92)m=	19.52	19.68	19.9	20.16	20.3	20.33	20.33	20.33	20.32	20.14	19.77	19.49		(92)
Apply	adjustn	nent to t	he mear	internal	temper	ature fro	m Table	4e, whe	ere appro	priate				
(93)m=	19.37	19.53	19.75	20.01	20.15	20.18	20.18	20.18	20.17	19.99	19.62	19.34		(93)
8. Sp	ace hea	ting requ	uirement						-					
				•		ned at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the ut			or gains											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
			ains, hm		0 77	0.54	0.00	0.4	0.00	0.00				(04)
(94)m=	1	1	0.99	0.94	0.77	0.54	0.36	0.4	0.69	0.96	1	1		(94)
	<u> </u>		, W = (94 1481.63	<u>, , , , , , , , , , , , , , , , , , , </u>	4)m 1359.54	921.15	592.48	624.77	992.82	1223.53	1103.29	1040.27		(95)
			ernal tem				332.40	024.77	992.02	1220.00	1103.23	1040.27		(00)
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
	_	-						x [(93)m						()
(97)m=		2467.87		1854.74		· · ·	592.56	624.88	r í í	1564.47	2094.15	2540.43		(97)
Space							1 = 0.02	24 x [(97)			L 1)m			
(98)m=	1072.02		558.03	215.3	36.31	0	0	0	0	253.66	, 713.42	1116.12		
								Tota	l per year	(kWh/year) = Sum(9	8)15,912 =	4738.86	(98)
Space	e heatin	a require	ement in	kW/h/m²	lvear								31.59	 (99)
		-											01.00	
			ns – Ind	ividual n	eating s	ystems i	nciuaing	micro-C	HP)					
	e heatir on of sr	-	at from s	econdar	/supple	mentary	system					_ 1	0	(201)
			at from n			, including		(202) = 1 -	- (201) =				1	(202)
			ng from					(204) = (204)		(203)] -				(204)
								(204) - (2	02) ~ [1	(200)] –			1	╡`´
			ace heat										90.3	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heatin	g system	ז, % י						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space		ř. –	ement (c			í – – – – – – – – – – – – – – – – – – –	1							
	1072.02	774	558.03	215.3	36.31	0	0	0	0	253.66	713.42	1116.12		
(211)m			4)] + (21			206)								(211)
	1187.18	857.14	617.97	238.43	40.21	0	0	0	0	280.9	790.06	1236.01		-
								Tota	l (kWh/yea	ar) =Sum(2	211) _{15,1012}	=	5247.91	(211)
•			econdar											
	, <u>,</u>	<u>,-</u> (14) m } x	, i	,					-				
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		٦
	_							Tota	l (kWh/yea	ir) =5um(∠	215) _{15,1012}	=	0	(215)
	heating	•			```									
Output	231.78	ater hea 204.25	ter (calc 214.39	ulated al	188.07	167.89	161.09	176.97	176.73	199.14	210.76	226.15		
Efficier		ater hea		.02.00							2.0.0		79.6	(216)
(217)m=	, 	87.83	87.05	84.92	81.16	79.6	79.6	79.6	79.6	85.26	87.61	88.3	10.0	(217)
· · ·			kWh/mo		01110		I		. 0.0	00.20	01.01	50.0		(= · · /)
		•) ÷ (217)											
(219)m=		232.53	246.28	226.14	231.74	210.92	202.37	222.33	222.02	233.56	240.55	256.12		
								Tota	l = Sum(2	19a) ₁₁₂ =			2787.38	(219)

Annual totals Space heating fuel used, main system 1			kWh/ye	ear	kWh/year 5247.91	1
Water heating fuel used					2787.38]
Electricity for pumps, fans and electric keep-hot						J
central heating pump:				30		(230c)
boiler with a fan-assisted flue				45		(230e)
Total electricity for the above, kWh/year		sum of (230a).	(230g) =	L	75	(231)
Electricity for lighting					509.85	(232)
10a. Fuel costs - individual heating systems:						_
	Fuel kWh/year		Fuel Price (Table 12)		Fuel Cost £/year	
Space heating - main system 1	(211) x		3.48	x 0.01 =	182.6271	(240)
Space heating - main system 2	(213) x		0	x 0.01 =	0	(241)
Space heating - secondary	(215) x		13.19	x 0.01 =	0	(242)
Water heating cost (other fuel)	(219)		3.48	x 0.01 =	97	(247)
Pumps, fans and electric keep-hot	(231)		13.19	x 0.01 =	9.89	(249)
(if off-peak tariff, list each of (230a) to (230g) sepa Energy for lighting	arately as applica (232)	able and apply	y fuel price act	cording to T x 0.01 =	Table 12a 67.25	(250)
Additional standing charges (Table 12) Appendix Q items: repeat lines (253) and (254) as			г		120	(251)
, , , , , , , , , , , , , , , , , , ,	7) + (250)(254) =				476.77	(255)
11a. SAP rating - individual heating systems						_
Energy cost deflator (Table 12)					0.42	(256)
	56)] ÷ [(4) + 45.0] =				1.03	(257)
SAP rating (Section 12) 12a. CO2 emissions – Individual heating systems	s including micro	-CHP			85.67	(258)
				4	Fastantana	
	Energy kWh/year		Emission fakg CO2/kW		Emissions kg CO2/yea	ar
Space heating (main system 1)	(211) x		0.216	=	1133.55	(261)
Space heating (secondary)	(215) x		0.519] =	0	(263)
Water heating	(219) x		0.216] =	602.08	(264)
Space and water heating	(261) + (262) + (2	263) + (264) =		-	1735.62	(265)
Electricity for pumps, fans and electric keep-hot	(231) x		0.519	=	38.93	(267)
Electricity for lighting	(232) x		0.519	=	264.61	(268)
Total CO2, kg/year		sum o	f (265)(271) =	_	2039.16	(272)
CO2 emissions per m ²		(272) -	÷ (4) =		13.59	(273)

El rating (section 14)				86	(274)
13a. Primary Energy					
	Energy kWh/year	Primary factor		P. Energy kWh/year	
Space heating (main system 1)	(211) x	1.22	=	6402.44	(261)
Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	1.22	=	3400.61	(264)
Space and water heating	(261) + (262) + (263) + (26	64) =		9803.05	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	230.25	(267)
Electricity for lighting	(232) x	0	=	1565.23	(268)
'Total Primary Energy		sum of (265)(271) =		11598.53	(272)
Primary energy kWh/m²/year		(272) ÷ (4) =		77.32	(273)
					_



User Details:		
Assessor Name:Stroma Number:Software Name:Stroma FSAP 2012Software Version:Version	: 1.0.0.28	
Property Address: 1 Bed Enhanced Fabric		
Address :		
1. Overall dwelling dimensions:		
Area(m ²) Av. Height(m)	Volume(m ³)	
Ground floor 62.66 (1a) x 2.39 (2a) =	149.76	(3a)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 62.66 (4)		
Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) =$	149.76	(5)
2. Ventilation rate:		
main secondary other total	m ³ per hour	
Number of chimneys 0 + 0 + 0 = 0 x 40 =	0	(6a)
Number of open flues $0 + 0 + 0 = 0 \times 20 = 0$	0	(6b)
Number of intermittent fans $2 \times 10 = $	20	(00) (7a)
	-	(7d) (7b)
	0	
	0 Inges per hou	(7c) r
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 20 \div (5) =	0.13	(8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns)		
Additional infiltration [(9)-1]x0.1 =	0	(9) (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction	0	(11)
if both types of wall are present, use the value corresponding to the greater wall area (after		1.
deducting areas of openings); if equal user 0.35 If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		lua
If no draught lobby, enter 0.05, else enter 0	0	(12) (13)
Percentage of windows and doors draught stripped	0	(13)
Window infiltration $0.25 - [0.2 \times (14) \div 100] =$	0	(15)
Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$	0	(16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area	5	(17)
If based on air permeability value, then $(18) = [(17) \div 20]+(8)$, otherwise $(18) = (16)$	0.38	(18)
Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used		
Number of sides sheltered	2	(19)
Shelter factor $(20) = 1 - [0.075 \times (19)] =$	0.85	(20)
Infiltration rate incorporating shelter factor $(21) = (18) \times (20) =$	0.33	(21)
Infiltration rate modified for monthly wind speed		
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec		
Monthly average wind speed from Table 7		
(22)m= 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7		
Wind Factor (22a)m = (22)m \div 4		
(22a)m= 1.27 1.25 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18		

Adjuste	ed infiltr	ation rat	e (allow	ing for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
	0.42	0.41	0.4	0.36	0.35	0.31	0.31	0.3	0.33	0.35	0.37	0.38		
		<i>ctive air</i> al ventila	•	rate for t	he appli	cable ca	se			-	-	-		(00-)
				endix N, (2	3h) - (23a	a) x Emv (c	auation (N	(15)) other	wice (23h) - (23a)			0	(23a)
) = (23a)			0	(23b)
			-	iency in %	-					2 15)		4 (00-)	0	(23c)
a) If (24a)m=	r			entilation			o o	HR) (24a	m = (22)	20)m + (0	$230) \times [$	1 - (23C)	÷ 100] I	(24a)
		-	-		-	-	-	÷		-	Ţ	0		(244)
D) II (24b)m=	-			entilation				0 (240	m = (22)	20)m + (. 0	230)	0	1	(24b)
				-	-	-	-	-	-	0	0	0		(240)
,				ntilation o then (24o	•	•				5 x (23h)			
(24c)m=	· ,	0	0		0		0	0 = (22)	0		0	0	1	(24c)
		ventilatio	n or wh	l ole hous	e nositiv		ventilatio	n from l	oft				l	· · ·
,				m = (22k)		•				0.5]				
(24d)m=	0.59	0.58	0.58	0.56	0.56	0.55	0.55	0.55	0.55	0.56	0.57	0.57		(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24t	o) or (24	c) or (24	d) in boy	(25)		-			
(25)m=	0.59	0.58	0.58	0.56	0.56	0.55	0.55	0.55	0.55	0.56	0.57	0.57		(25)
3 Ho	atlossa	e and he	at loss i	paramete	ar:									_
ELEN		Gros		Openin		Net Ar	ea	U-valu	IP	AXU		k-value		AXk
		area		m		A ,n		W/m2		(W/I		kJ/m ² ·l		kJ/K
Doors						2	x	1.1	=	2.2				(26)
Windo	ws Type	e 1				2.39	x1.	/[1/(1.2)+	0.04] =	2.74	Π.			(27)
Windo	ws Type	2				2.39	x1.	/[1/(1.2)+	0.04] =	2.74	F.			(27)
Windo	ws Type	e 3				0.96		/[1/(1.2)+	0.04] =	1.1	5			(27)
Floor						62.66	x	0.15		9.399	Ξ r			(28)
Walls		60)	10.13	3	49.87	, x	0.2		9.97	3		\dashv	(29)
Total a	rea of e	lements				122.6			I		J L		L	(31)
Party v			,			13	×	0	= [0	—			(32)
Party c								0	[0	L		\dashv	
-	-	roof wind	OWS USA	effective wi	ndow U-va	62.66		i formula 1	/[(1/]_vəlu	<u>م) 10 مد</u>	L s aiven in	naragraph		(32b)
				nternal wall			alou using	, ionnaia n	[[1/ O Valu	ic)+0.0+j c	is given in	paragrapi	10.2	
Fabric	heat los	s, W/K :	= S (A x	U)				(26)(30)	+ (32) =				30.88	(33)
Heat c	apacity	Cm = S((Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	9854.9	(34)
Therm	al mass	parame	ter (TMI	⊃ = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
	-			tails of the	construct	ion are not	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
		ad of a de				P 1	,							
	-			culated u	• •		ζ						6.13	(36)
	abric he		are not kr	10wn (36) =	= 0.15 X (3	1)			(33) +	(36) =			37.02	(37)
			alculated	d monthly	/						(25)m x (5))	07.02	
	Jan	Feb	Mar	Apr	, May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	28.98	28.81	28.65	27.89	27.74	27.08	27.08	26.96	27.33	27.74	28.04	28.33		(38)
		L coefficier								= (37) + (3		I	I	
(39)m=	66	65.83	65.67	64.9	64.76	64.1	64.1	63.97	64.35	64.76	65.05	65.35	1	
				(SAP 9.91)							Sum(39)1	I	64.	age 2 of 39)
	01	2. 5.6.11		,,										<u> </u>

Heat lo	ss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	(4)			
(40)m=	1.05	1.05	1.05	1.04	1.03	1.02	1.02	1.02	1.03	1.03	1.04	1.04		
Numbe	or of day	s in moi	nth (Tab	le 1a)					/	Average =	Sum(40)1	.12 /12=	1.04	(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)
()	01	20	01				01			01		01		()
4. Wa	ter heat	ting enei	rgy requ	irement:								kWh/ye	ear:	
if TF/				: [1 - exp	(-0.0003	349 x (TF	-13.9)2)] + 0.0	0013 x (1	ΓFA -13.	9) 2.0	06		(42)
Reduce t	the annua	al average	hot water		5% if the a	welling is	designed t	(25 x N) to achieve		se target o	83. f	.03		(43)
[Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage i	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m=	91.33	88.01	84.69	81.36	78.04	74.72	74.72	78.04	81.36	84.69	88.01	91.33		_
Energy c	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D	0Tm / 3600			m(44) ₁₁₂ = ables 1b, 10		996.3	(44)
(45)m=	135.44	118.45	122.23	106.57	102.25	88.24	81.76	93.83	94.95	110.65	120.78	131.16		_
lf instanta	aneous w	ater heatii	ng at point	t of use (no	o hot water	r storage),	enter 0 in	boxes (46,		Fotal = Su	m(45) ₁₁₂ =		1306.31	(45)
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0		(46)
Water s	storage	loss:												
Storage	e volum	e (litres)	includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		120		(47)
	•	-		ank in dw	-			. ,						
			hot wate	er (this ir	icludes i	nstantar	eous co	ombi boil	ers) ente	er '0' in (47)			
Water s	-		oclarod I	oss facto	or is kno	wp (k\//k	v/dav/).							(40)
		actor fro					i/uay).)		(48) (49)
•				, kWh/ye	oor			(48) x (49)	_)		
			-	cylinder l		or is not		(40) x (40)	-)		(50)
,				rom Tabl							()		(51)
		eating s		on 4.3										
		from Ta									()		(52)
		actor fro)		(53)
0,			•	e, kWh/ye	ear			(47) x (51)	x (52) x (53) =)		(54)
	. ,	(54) in (5			4			((==))			()		(55)
Water s	storage	loss cal	culated T	for each	month	1		((56)m = (55) × (41)r	n			1	
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	r contains	s dedicate	d solar sto	orage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	IX H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary	y circuit	loss (ar	nual) fro	om Table	e 3						()		(58)
							, ,	65 × (41)						
Ċ			1	i	1	I		ng and a	-		í í		l	
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(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	eat req	uired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	115.12	100.69	103.9	90.58	86.91	75	69.5	79.75	80.7	94.05	102.67	111.49		(62)
Solar DH	W input	calculated	using App	pendix G o	r Appendix	H (negati	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add ad	dditiona	al lines if	FGHRS	and/or	NWHRS	applies	, see Ap	pendix (G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	from w	ater hea	ter							_				
(64)m=	115.12	100.69	103.9	90.58	86.91	75	69.5	79.75	80.7	94.05	102.67	111.49		_
								Outp	out from wa	ater heate	r (annual)₁	12	1110.36	(64)
Heat g	ains fro	m water	heating	, kWh/m	onth 0.2	5´[0.85	× (45)m	+ (61)m	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m]	
(65)m=	28.78	25.17	25.97	22.65	21.73	18.75	17.37	19.94	20.18	23.51	25.67	27.87		(65)
inclu	de (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in the c	dwelling	or hot w	ater is f	rom com	munity h	eating	
5. Int	ernal g	ains (see	Table	5 and 5a):									
Metabo	olic gair	ns (Table	e 5), Wa	tts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	102.79	102.79	102.79	102.79	102.79	102.79	102.79	102.79	102.79	102.79	102.79	102.79		(66)
Lightin	g gains	(calcula	ted in A	ppendix	L, equati	on L9 o	r L9a), a	lso see	Table 5					
(67)m=	17.47	15.51	12.62	9.55	7.14	6.03	6.51	8.47	11.36	14.43	16.84	17.95		(67)
Appliar	nces ga	ins (calc	ulated i	n Appen	dix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5				
(68)m=	179.6	181.47	176.77	166.77	154.15	142.29	134.36	132.5	137.2	147.2	159.82	171.68		(68)
Cookin	g gains	, calcula	ited in A	ppendix	L, equat	ion L15	or L15a)	, also se	e Table	5				
(69)m=	33.28	33.28	33.28	33.28	33.28	33.28	33.28	33.28	33.28	33.28	33.28	33.28		(69)
Pumps	and fa	ns gains	(Table	 5a)							•			
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	s e.g. ev	vaporatio	n (nega	tive valu	es) (Tab	le 5)								
(71)m=	-82.23	-82.23	-82.23	-82.23	-82.23	-82.23	-82.23	-82.23	-82.23	-82.23	-82.23	-82.23		(71)
Water	heating	gains (T	able 5)	•										
(72)m=	38.68	37.46	34.91	31.45	29.21	26.04	23.35	26.8	28.02	31.6	35.65	37.46		(72)
Total i	nterna	l gains =				(66)	m + (67)m	ı + (68)m -	L + (69)m + ((70)m + (7	1)m + (72)	m		
(73)m=	289.59	288.28	278.14	261.61	244.33	228.2	218.07	221.6	230.42	247.06	266.14	280.93		(73)
6. Sol	ar gain	s:			!				1	I	<u> </u>			
Solar g	ains are	calculated	using sola	ar flux from	Table 6a a	and assoc	iated equa	tions to co	onvert to th	ne applicat	ole orientat	ion.		
Orienta		Access F	actor	Area		Flu			g_		FF		Gains	
	-	Table 6d		m²		Tal	ole 6a	Т	able 6b	Т	able 6c		(W)	
North	0.9x	0.77	x	2.3	39	x 1	0.63	x	0.76	x	0.7	=	9.37	(74)
North	0.9x	0.77	x	2.3	39	x 2	0.32	x	0.76	x	0.7	=	17.91	(74)
North	0.9x	0.77	x	2.3	39	х 3	4.53	x	0.76	_ x [0.7	=	30.43	(74)
North	0.9x	0.77	×	2.3	39	x 5	5.46	x	0.76	_ x [0.7	=	48.87	(74)
North	0.9x	0.77	×	2.3	39	x 7	4.72	x	0.76	_ × [0.7	=	65.83	(74)

North	0.9x	0.77	x	2.3	9	x	7	9.99	x	0.76		x [0.7		= [70.48	(74)
North	0.9x	0.77	x	2.3	9	x	74	4.68	x	0.76		×	0.7		= [65.8	(74)
North	0.9x	0.77	x	2.3	9	x	5	9.25	x	0.76		×	0.7		=	52.2	(74)
North	0.9x	0.77	x	2.3	9	x	4	1.52	x	0.76		×	0.7		= [36.58	(74)
North	0.9x	0.77	x	2.3	9	x	24	4.19	x	0.76		×	0.7		= [21.31	(74)
North	0.9x	0.77	x	2.3	9	x	1:	3.12	x	0.76		×	0.7		= [11.56	(74)
North	0.9x	0.77	x	2.3	9	x	8	.86	x	0.76		× [0.7		=	7.81	(74)
South	0.9x	0.77	x	2.3	9	x	4	6.75	x	0.76		× [0.7		= [82.39	(78)
South	0.9x	0.77	x	2.3	9	x	7	6.57	x	0.76		x [0.7		= [134.93	(78)
South	0.9x	0.77	x	2.3	9	x	9	7.53	x	0.76		× [0.7		=	171.88	(78)
South	0.9x	0.77	x	2.3	9	x	11	0.23	x	0.76		× [0.7		=	194.26	(78)
South	South 0.9x 0.77 x 2.39 x 114.									0.76		×	0.7		=	202.43	(78)
South	outh 0.9x 0.77 x 2.39 x								x	0.76		x [0.7		= [194.82	(78)
South								8.01	x	0.76		× [0.7		=	190.35	(78)
South	0.9x	0.77	x	2.3	9	x	10	4.89	x	0.76		× [0.7		=	184.85	(78)
South	0.9x	0.77	x	2.3	9	x	10	1.89	x	0.76		x [0.7		=	179.55	(78)
South	0.9x	0.77	x	2.3	9	x	8	2.59	x	0.76		x [0.7		= [145.54	(78)
South	0.9x	0.77	x	2.3	9	x	5	5.42	x	0.76		x	0.7		=[97.66	(78)
South	0.9x	0.77	x	2.3	9	х	4	0.4	x	0.76		x [0.7		= [71.19	(78)
(83)m= Total g	98.71 ains — ii	nternal an	224.7 d solar	275.8 (84)m =	308.3 (73)m	30	· 1	295.16 watts	270		8 18	2.99		84.7			(83)
(84)m=	388.3	454.71	502.84	537.41	552.63	5	34.46	513.22	492	.17 472.6	6 43	0.05	384.03	365.	.65		(84)
7. Mea	an inter	nal tempe	erature ((heating	seasor	ר)											
Temp	erature	during he	ating p	eriods in	the livi	ing	area f	rom Tab	ole 9,	Th1 (°C)					[21	(85)
Utilisa	tion fac	tor for gai	ins for li	iving are	a, h1,n	n (s	ee Ta	ole 9a)									
	Jan	Feb	Mar	Apr	May		Jun	Jul	A	ug Se	p (Oct	Nov	D	ec		
(86)m=	1	0.99	0.98	0.96	0.88	().72	0.54	0.5	8 0.82	0.	.97	0.99	1			(86)
Mean	interna	l temperat	ture in l	iving are	a T1 (f	ollo	w step	os 3 to 7	7 in T	able 9c)							
(87)m=	19.91	20.07	20.3	20.58	20.82	2	0.96	20.99	20.9	99 20.9 ²	1 20).61	20.2	19.8	88		(87)
Temp	erature	during he	ating p	eriods in	rest of	dw	elling	from Ta	able 9), Th2 (°C	;)						
(88)m=	20.04	20.04	20.04	20.05	20.06	2	0.06	20.06	20.	20.06	6 20	0.06	20.05	20.0	05		(88)
- Utilisa	tion fac	tor for gai	ins for r	est of dv	velling,	h2,	m (se	e Table	9a)								
(89)m=	1	0.99	0.98	0.94	0.84	-	0.63	0.43	0.4	7 0.75	0.	.95	0.99	1			(89)
Mean	interna	l temperat	ture in t	he rest o	of dwel	lina	T2 (fc	ollow ste	ens 3	to 7 in Ta	able 90	c)	-				
(90)m=	19.05	<u> </u>	19.44	19.72	19.93	Ť	0.05	20.06	20.0	1	- i).74	19.35	19.0	02		(90)
· í L		L I				<u> </u>			I				ing area ÷ (4			0.64	(91)
Maar	intorna	Itomaarat	turo /fa	r tho wh		.	a) - fi	۸., ۲۰	. /4	fl ۸\	го				L		` ´
(92)m=	19.6	l temperat	19.99	20.27	20.5		g) = TL 0.63	20.66	+ (1	<u> </u>).29	19.89	19.	57		(92)
(92)m = 1									. 20.9		~ U		10.00	10.0			(0-)

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

8. Space heating requirement Set T to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains, hm: (94)m Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)m 1 0.99 0.99 0.99 (94) Utilisation factor for gains, hm: (94)m (94)m (94)m (94)m (94)m (94) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (94) Useful gains, hm: (94) (94)m (94)m (94) Jac Part Set Tit (PM KAS) 386.16 (95)m X (93)m X (93)m X (93)m (93)m X (93)m (93)m X (93)m (93)m X (93)m (93)m X (93)m (93)m X (93)m (93)m (93)m (93)m X (93)m (9	(93)m=	19.6	19.76	19.99	20.27	20.5	20.63	20.66	20.65	20.59	20.29	19.89	19.57		(93)	
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (9)m= 1 0.98 0.98 0.94 0.66 0.89 0.5 0.5 0.79 0.86 0.99 1 (94) Useful gains, hmGm, W = (94)m x (84)m (86)m= 38.8.3 450.8 424.3 507.85 474.38 366.16 256.97 257.48 373.07 411.38 380.96 364.7 (93) Monthy average external temperature from Table 8 (9)m= 4.3 4.9 0.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (98) Heat toss rate for mean internal temperature, Lm, W = (103)m × (103)m - (95)m] × (41)m (8)m= 483.23 378.19 885.85 78.807 569.97 388.4 200 272.15 417.47 627.8 832.11 1004.37 (97) Space heating requirement for each month, KWh/month = 0.024 × [(97)m - (95)m] × (41)m (9)m= 463.23 378.19 885.85 78.07 569.97 388.4 200 772.15 417.47 627.8 832.11 1004.37 (97) Space heating requirement in kWh/m²/year 36.00 0 0 0 101.01 324.83 475.92 Total per year (kWh/year) = Sum(08)	8. Spa	ace hea	ting regu	uirement			I		1	<u> </u>		I	<u> </u>			
the utilisation factor for gains using Table 9a Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Utilisation factor for gains, hm: (94)m= 1 0.99 0.98 0.94 0.88 0.69 0.5 0.54 0.79 0.96 0.98 1 Useful gains, hmGm, W = (94)m x (84)m (95)m= 386.9 450.8 492.43 507.85 474.38 386.16 256.97 267.49 373.07 411.39 380.96 364.7 Monthly average external temperature from Table 8 (96)m= 4.3 4.9 6.5 8.9 11.7 14.6 16.6 15.4 14.1 10.6 7.1 4.2 (96)m= 4.3 4.9 6.5 8.9 11.7 14.8 16.6 15.4 14.1 10.6 7.1 4.2 (97)m= 1006.5 787.19 885.8 738.07 685.7 386.7 686.9 366.4 260 272.15 47.47 47 227.8 332.11 1004.37 Space heating requirement for each month, KWh/moth = 0.024 x ((97)m - (95)m] x (41)m (99)m= 43.23 354.4 292.7 155.76 71.12 0 0 0 0 1 161.01 32.48.8 475.32 Total per year (KWh)year) = Sum(98), Law e 2008.98 (93) Space heating requirement in kWh/m7/year Calculated for June, July and August. See Table 10b Useful Joss, hmLfn (Watts) = (100)m x (101)m (100)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0						re obtair	ned at ste	ep 11 of	Table 9	b so tha	t Ti m=(76)m an	d re-calc	culate		
Utilisation factor for gains, hm: (94)m= 1 0.99 0.98 0.94 0.66 0.60 0.5 0.54 0.79 0.96 0.99 1 (94) Useful gains, hmGm, W = (94)m x (84)m (96)m 366.8 42.43 507.85 742.38 367.61 256.97 267.49 373.07 411.39 380.96 364.77 (95) Monthly average external temperature from Table 8 (96)m 4.3 4.8 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) (97)m= 1008.53 978.19 885.85 738.07 568.97 386.4 280 272.15 417.47 827.8 832.11 1004.37 (97) Space heating requirement for each month, kWh/m/war 0 0 0 161.01 324.83 475.82 (98) Space heating requirement in KWh/m2/year 141.04 Aug Sep Ot 0 0 0 0 0 0 0 0 0 0 0 0 0 0					•			-p		.,	()				
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Under test Under	Utilisa	tion fac	tor for g	ains, hm	• 1:											
(95)m 388.3 450.8 432.43 507.85 474.38 366.16 256.97 267.49 373.07 411.38 380.96 364.7 (95) Monthly average external temperature from Table 8 (96)m 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2 (96) (97)m 1008.53 978.19 885.85 738.07 569.97 386.4 280 272.15 417.4 627.8 832.11 1004.37 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (96) 90 0 161.01 324.83 475.92 2308.98 (96) Space heating requirement in kWh/m2/year 165.76 71.12 0 0 0 161.01 324.83 475.92 2308.98 (96) Space heating requirement in kWh/m2/year 200 0 <td>(94)m=</td> <td>1</td> <td>0.99</td> <td>0.98</td> <td>0.94</td> <td>0.86</td> <td>0.69</td> <td>0.5</td> <td>0.54</td> <td>0.79</td> <td>0.96</td> <td>0.99</td> <td>1</td> <td></td> <td>(94)</td>	(94)m=	1	0.99	0.98	0.94	0.86	0.69	0.5	0.54	0.79	0.96	0.99	1		(94)	
	Usefu	l gains,	hmGm	, W = (94	4)m x (84	4)m										
(96)m= 4.3 4.9 6.5 8.9 11.7 14.8 16.6 16.4 14.1 10.6 7.1 4.2 (96) Heat loss rate for mean internal temperature, Lm, W =[(39)m x [(33)m - (95)m] x (41)m (97)m - (95)m] x (41)m (97)m - (95)m] x (41)m (97)m (97)m - (95)m] x (41)m (98)m (98) (98) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (97)m (97)m (97)m (97)m (97)m (97)m - (95)m] x (41)m (97)m (97)m - (95)m] x (41)m (98)m (98) (98) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (98)m (98) (98) Space heating requirement in kWh/m2/year 36.85 (99) 36.85 (99) 36.85 (99) 36.85 (99) 36.85 (99) 36.85 (99) 36.85 (99) 480 a 0 0 0 0 100 100 100 100 100 100 100 100 100 100 100 100 100 100 100 100	(95)m=	386.9	450.8	492.43	507.85	474.38	366.16	256.97	267.49	373.07	411.39	380.96	364.7		(95)	
Heat loss rate for mean internal temperature, Lm , W =[(39)m × [(93)m - (96)m] (97)m= 1009.53 978.19 885.85 738.07 569.97 386.4 260 272.15 417.47 627.8 832.11 1004.37 (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (97) Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m (97) (98)m= 463.23 354.4 292.7 165.76 71.12 0 0 0 161.01 324.83 475.92 Space heating requirement in kWh/m²/year 36.85 (99) 36.85 (99) 36.85 (99) Sc. Space cooling requirement In Wh/m²/year 36.85 0.99 0 <	Month	ly aver	age exte	rnal tem	perature	e from Ta	able 8									
	(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)	
Space heating requirement for each month, kWh/month = $0.024 \times [(97)m - (95)m] \times (41)m$ (98) Space heating requirement in kWh/m²/year Colspan="2">Colspan="2" Colspan="2">Colspan="2" Colspan="2"	Heat I	oss rate	e for mea	an interr	al tempe	erature,	Lm , W =	- =[(39)m :	r x [(93)m	– (96)m]					
	(97)m=	1009.53	978.19	885.85	738.07	569.97	386.4	260	272.15	417.47	627.8	832.11	1004.37		(97)	
Total per year (kWh/year) = Sum(88), ss. v = 2308.98 (98) Space heating requirement in kWh/m²/year Space cooling requirement (98) Source cooling requirement Calculated for June, July and August. See Table 10b June Teb Mar Apr May Jun Jul August. See Table 10b June Teb Mar Apr May Jun Jul August. See Table 10b June Teb Mar Apr May Jun Jul August. See Table 10b June Teb Mar Apr May Jun Jun Jun Jun Jun June Teb	Space	heatin	g require	ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m	1			
Space heating requirement in kWh/m²/year 36.85 (99) Space cooling requirement Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) (100) 0	· · ·		<u> </u>	i		i	1	i	r <u>-</u> `	Í	<u> </u>	r –	475.92			
8c. Space cooling requirement Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) 0 <	I								Tota	l per year	(kWh/yeai	r) = Sum(9	8)15,912 =	2308.98	(98)	
Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) 0 <td>Space</td> <td>e heatin</td> <td>g require</td> <td>ement in</td> <td>kWh/m²</td> <td>?/year</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>36.85</td> <td>(99)</td>	Space	e heatin	g require	ement in	kWh/m²	?/year								36.85	(99)	
Calculated for June, July and August. See Table 10b Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) 0 <td>8c Sr</td> <td></td> <td>olina rea</td> <td>ujiremer</td> <td>ht.</td> <td></td>	8c Sr		olina rea	ujiremer	ht.											
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) 0 <t< td=""><td></td><td></td><td>Ŭ</td><td>•</td><td></td><td>Soo Ta</td><td>blo 10b</td><td></td><td></td><td></td><td></td><td></td><td>_</td><td></td><td>_</td></t<>			Ŭ	•		Soo Ta	blo 10b						_		_	
Heat loss rate Lm (calculated using 25°C internal temperature and external temperature from Table 10) (100) (100)m=0 <	Calcu							Jul	Aug	Sep	Oct	Nov	Dec			
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	l Heat l									· ·						
Utilisation factor for loss hm (101)m-0 0 0 0 0.95 0.94 0			i i				i .						,		(100)	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	· · ·	tion fac	tor for lo	l ss hm											. ,	
Useful loss, hmLm (Watts) = (100)m x (101)m (102)m 0 0 0 544_37 452_12 457.71 0					0	0	0.9	0.95	0.94	a	0	0	0		(101)	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	· · ·		ml m (V		(100)m x	(101)m										
Gains (solar gains calculated for applicable weather region, see Table 10) $(103)m = 0$ 0 0 701.97 675.67 652.48 0 0 0 0 (103) Space cooling requirement for month, whole dwelling, continuous (kWh) = $0.024 \times [(103)m - (102)m] \times (41)m$ set (104)m to zero if (104)m < 3 × (98)m	<td></td> <td></td> <td>,</td> <td><u> </u></td> <td>ì í</td> <td>r` (</td> <td></td> <td>452.12</td> <td>457.71</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td></td> <td>(102)</td>			,	<u> </u>	ì í	r` (452.12	457.71	0	0	0	0		(102)
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$					for appli	cable w								_		
Space cooling requirement for month, whole dwelling, continuous (kWh) = $0.024 \times [(103)m - (102)m] \times (41)m$ Space cooling requirement for month, whole dwelling, continuous (kWh) = $0.024 \times [(103)m - (102)m] \times (41)m$ (104)m to zero if (104)m < $3 \times (98)m$ Total = Sum(104) = 424.7 (104) Cooled fraction Total = Sum(104) = 424.7 (104) Cooled fraction Total = Sum(104) = 424.7 (104) (106)m Total = Sum(104) = 424.7 (104) (106)m Total = Sum(104) = 0 (105) (106)m Total = Sum(104) = 0 (106) Total = Sum(104) = 0 (106) Space cooling requirement for month = (104)m × (105) × (106)m Total = Sum(107) = 106.18 (107) Total = Sum(107) = 106.18 (107) Space cooling requirement in kWh/m²/year					Î		Î		1	Î	0	0	0		(103)	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	· · ·		-	-	-	-				-	-			(41)m		
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$, woning,	oonana				(102)111]1			
Cooled fraction f C = cooled area $\div (4) =$ 1 (105) Intermittency factor (Table 10b) (106)m= 0 0 0 0.25 0.25 0 <td></td> <td></td> <td>i</td> <td>i</td> <td>1</td> <td></td> <td>113.47</td> <td>166.32</td> <td>144.91</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td></td> <td></td>			i	i	1		113.47	166.32	144.91	0	0	0	0			
Intermittency factor (Table 10b) (106)m= 0 0 0 0.25 0.25 0.25 0 0 0 0 Total = Sum(104) = 0 (106) Space cooling requirement for month = (104)m × (105) × (106)m (107) m= 0 <td>I</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>1</td> <td>Total</td> <td>= Sum(</td> <td>104)</td> <td>=</td> <td>424.7</td> <td>(104)</td>	I								1	Total	= Sum(104)	=	424.7	(104)	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Cooled	fraction	า							f C =	cooled	area ÷ (4	4) =	1	(105)	
Total = Sum(1.04) = 0 (106) Space cooling requirement for month = (104)m × (105) × (106)m (107)m = 0 0 0 0 0 28.37 41.58 36.23 0 0 0 0 0 0 Total = Sum(1.07) = 106.18 (107) Space cooling requirement in kWh/m ² /year (107) ÷ (4) = 1.69 (108)	Intermi	ttency f	actor (Ta	able 10b)	-	-	-				-			_	
Space cooling requirement for month = $(104)m \times (105) \times (106)m$ $(107)m = 0$ 0 0 0 0 0 0 0 $(107)m = 0$ 0 0 0 28.37 41.58 36.23 0 0 0 0 Total = Sum(1,0,7) = 106.18 (107) Space cooling requirement in kWh/m²/year (107) ÷ (4) = 1.69 (108)	(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0			
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	-									Tota	l = Sum((104)	=	0	(106)	
Total = Sum(1.0.7)=106.18(107)Space cooling requirement in kWh/m²/year $(107) \div (4) =$ 1.69 (108)	Space	cooling	requirer	nent for	month =	(104)m	× (105)	× (106)r	n							
Space cooling requirement in kWh/m ² /year $(107) \div (4) = 1.69$ (108)	(107)m=	0	0	0	0	0	28.37	41.58	36.23	0	0	0	0			
										Total	= Sum(107)	=	106.18	(107)	
8f. Fabric Energy Efficiency (calculated only under special conditions, see section 11)	Space	cooling	requirer	ment in k	(Wh/m²/y	/ear				(107)) ÷ (4) =			1.69	(108)	
	8f. Fab	ric Ene	rgy Effici	iency (ca	alculated	l only u <mark>n</mark>	der spec	cial cond	litions, s	ee sectio	on 11) _					
Fabric Energy Efficiency (99) + (108) = 38.54 (109)	Fabric	Energ	y Efficier	псу						(99)	+ (108) =	=		38.54	(109)	

				User D	etails:						
Assessor Name: Software Name:	Stroma FS	AP 201			Softwa	a Num are Ver	sion:	d Estado		n: 1.0.0.28	
Address :			P	roperty <i>i</i>	Address	: 2 Bed E	Innance	d Fabric			
1. Overall dwelling dime	nsions:										
				Area	a(m²)		Av. Hei	ght(m)		Volume(m ³)	
Ground floor					• •	(1a) x		.5	(2a) =	103.75	(3a)
First floor				4	41.5	(1b) x	2	.5	(2b) =	103.75	(3b)
Total floor area TFA = (1a	a)+(1b)+(1c)+	(1d)+(1e)+(1n	ı)	83	(4)			1		1
Dwelling volume				L		(3a)+(3b)	+(3c)+(3d)+(3e)+	.(3n) =	207.5	(5)
2. Ventilation rate:											1
2. Ventilation rate.	main		econdar	у	other		total			m ³ per hour	
Number of chimneys	heating 0	+	eating 0] + [0] = [0	x 4	40 =	0	(6a)
Number of open flues	0] + [0] + [0] = [0	x 2	20 =	0	(6b)
Number of intermittent fa	ns						3	x 1	0 =	30	(7a)
Number of passive vents							0	x 1	0 =	0	(7b)
Number of flueless gas fi	res					Ē	0	x 4	40 =	0	(7c)
									Air ch	anges per hou	, 1
Infiltration due to chimne							30		÷ (5) =	0.14	(8)
If a pressurisation test has b Number of storeys in th			ed, proceed	d to (17), d	otherwise o	continue fro	om (9) to (16)			1.00
Additional infiltration		5)						l [(9)-	1]x0.1 =	0	(9) (10)
Structural infiltration: 0	.25 for steel o	r timber f	frame or	0.35 foi	r masoni	y constr	uction	1(-7		0	(11)
if both types of wall are p			ponding to	the great	er wall are	a (after			ļ		1
deducting areas of openir If suspended wooden f	0 // 1		ed) or 0.	1 (seale	ed). else	enter 0				0	(12)
If no draught lobby, en		•	,	(,,					0	(13)
Percentage of windows	s and doors d	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,				•	•	•	etre of e	nvelope	area	5	(17)
If based on air permeabil	-									0.39	(18)
Air permeability value applie Number of sides sheltere		on test has	s been don	e or a deg	gree air pe	rmeability	is being us	sed		0	(19)
Shelter factor	iu i				(20) = 1 -	[0.075 x (1	9)] =			2 0.85	(20)
Infiltration rate incorporat	ing shelter fac	ctor			(21) = (18) x (20) =				0.34	(21)
Infiltration rate modified f	or monthly wir	nd speed	ł								1
Jan Feb	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Tab	le 7									
(22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		

Wind F	actor (2	2a)m =	(22)m ÷	4										
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjust	ed infiltra	ation rat	e (allowi	ng for sh	elter an	d wind s	peed) =	(21a) x	(22a)m				-	
.	0.43	0.42	0.41	0.37	0.36	0.32	0.32	0.31	0.34	0.36	0.38	0.39		
	<i>ate effec</i> echanica		•	rate for t	he appli	cable ca	se						0	(23a)
				endix N. (2	3b) = (23a	a) × Fmv (e	equation (N	(15)) . othei	rwise (23b) = (23a)			0	(23a) (23b)
						or in-use fa				, (,			0	(230) (23c)
				•	•	at recove			,	2b)m + (;	23b) x [′	l – (23c)	-	(200)
(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24a)
	balance	d mecha	anical ve	ntilation	without	heat rec	overv (N	//V) (24b	m = (22)	2b)m + (2	23b)			
, (24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If	whole h	ouse ex	tract ver	tilation o	or positiv	ve input v	/entilatio	on from c	outside					
i	if (22b)n	า < 0.5 ×	(23b), t	hen (240	c) = (23b); otherv	vise (24	c) = (22b	o) m + 0.	5 × (23b)	-		
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,						ve input v erwise (2				0.5]				
(24d)m=	0.59	0.59	0.58	0.57	0.56	0.55	0.55	0.55	0.56	0.56	0.57	0.58		(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24k	o) or (240	c) or (24	d) in boy	(25)					
(25)m=	0.59	0.59	0.58	0.57	0.56	0.55	0.55	0.55	0.56	0.56	0.57	0.58		(25)
3 He	at l <mark>osse</mark>	s and he	at l <mark>oss</mark> r	paramete	ər									
		Gros		Openin		Net Ar	ea	U-valu	ue	AXU		k-value)	AXk
ELEN			ss		gs	Net Ar A ,r		U-valı W/m2		A X U (W/ł	<)	k-value kJ/m²·l		A X k kJ/K
		Gros	ss	Openin	gs						<)			
ELEN Doors		Gros area	ss	Openin	gs	A ,r	n ²	W/m2	K =	(VV/ł	<)			kJ/K
ELEN Doors Windo		Gros area	ss	Openin	gs	A ,r	n ² x x	W/m2 1.1	0.04] =	(W/ł 2.2	<)			kJ/K (26)
ELEN Doors Windo Windo	NENT ws Type	Gros area	ss	Openin	gs	A ,r	n ² x x x 1/	W/m2 1.1 /[1/(1.2)+	K 0.04] = 0.04] =	(W/ł 2.2 2.74	<)			kJ/K (26) (27)
ELEN Doors Windo Windo	NENT ws Type ws Type	Gros area	ss	Openin	gs	A ,r	n ² x x x 1/	W/m2 1.1 /[1/(1.2)+ /[1/(1.2)+	K 0.04] = 0.04] =	(W/ł 2.2 2.74 2.74	<) 			kJ/K (26) (27) (27)
ELEN Doors Windo Windo Windo	NENT ws Type ws Type	Gros area	ss (m²)	Openin	gs ²	A ,r 2 2.39 2.39 0.96	n ² x x x 1/ x x 1/ x x 1/ x x 1/ x x 1/ x x 1/ x x 1/	W/m2 1.1 ([1/(1.2)+ ([1/(1.2)+ ([1/(1.2)+	K 0.04] = [0.04] = [0.04] = [(W/ł 2.2 2.74 2.74 1.1				kJ/K (26) (27) (27) (27)
ELEN Doors Windo Windo Windo Floor	NENT ws Type ws Type	Gros area 1 2 3	8	Openin m	gs ²	A ,r 2 2.39 2.39 0.96 41.5	n ² x x x 1/ x x 1/ x x 1/ x x 1/ x x 1/ x x 1/ x x 1/	W/m2 1.1 (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ 0.15		(W/k 2.2 2.74 2.74 1.1 6.225				kJ/K (26) (27) (27) (27) (28)
ELEN Doors Windo Windo Windo Floor Walls Roof	NENT ws Type ws Type	Gros area 4 1 4 2 4 3 83.1 41.5	8 5	Openin m	gs ²	A ,r 2 2.39 2.39 0.96 41.5 73.05	n ² x x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1.1 ([1/(1.2)+ ([1/(1.2)+ ([1/(1.2)+ 0.15 0.2	K 0.04] = [0.04] = [0.04] = [] = [(W/k 2.2 2.74 2.74 1.1 6.225 14.61				kJ/K (26) (27) (27) (27) (28) (28) (29)
ELEN Doors Windo Windo Windo Floor Walls Roof	MENT ws Type ws Type ws Type	Gros area 4 1 4 2 4 3 83.1 41.5	8 5	Openin m	gs ²	A ,r 2 2.39 2.39 0.96 41.5 73.05 41.5	n ² x x1/ x1/ x1/ x1/ x1/ x1/ x1/ x1/	W/m2 1.1 ([1/(1.2)+ ([1/(1.2)+ ([1/(1.2)+ 0.15 0.2	K 0.04] = [0.04] = [0.04] = [] = [(W/k 2.2 2.74 2.74 1.1 6.225 14.61				kJ/K (26) (27) (27) (27) (28) (29) (30)
ELEN Doors Windo Windo Floor Walls Roof Total a	WENT ws Type ws Type ws Type area of e vall	Gros area 4 1 4 2 4 3 83.1 41.5	8 5	Openin m	gs ²	A ,r 2 2.39 2.39 0.96 41.5 73.05 41.5 166.1	n ² x x1/ x1/ x1/ x1/ x x x x x x x x x x	W/m2 1.1 (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ 0.15 0.2 0.11	$ \begin{array}{c} $	(W/k 2.2 2.74 2.74 1.1 6.225 14.61 4.56				kJ/K (26) (27) (27) (27) (28) (29) (30) (31)
ELEN Doors Windo Windo Floor Floor Walls Roof Total a Party v Interna * for win	ws Type ws Type ws Type ws Type area of e vall al floor dows and	Gros area 1 2 3 83.1 41.3 Iements	8 5 , m ²	Openin m 10.13	gs 2 3 	A ,r 2 2.39 2.39 0.96 41.5 73.05 41.5 166.11 45 41.5	n ² x x 1/ x 1/ x 1/ x 1/ x 1/ x 1/ x 1/ x	W/m2 1.1 (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ 0.15 0.2 0.11 0	$ \begin{array}{c} $	(W/k 2.2 2.74 2.74 1.1 6.225 14.61 4.56 0		kJ/m²-I		kJ/K (26) (27) (27) (27) (28) (29) (30) (31) (32)
ELEN Doors Windo Windo Floor Floor Walls Roof Total a Party v Interna * for win ** inclua	WENT ws Type ws Type ws Type ws Type area of e vall al floor dows and le the area	Gros area 41 2 3 83.1 41.3 Iements	8 5 , m ²	Openin m 10.13 0	gs 2 3 	A ,r 2 2.39 2.39 0.96 41.5 73.05 41.5 166.11 45 41.5	n ² x 1/ x 1/ x 1/ x 1/ x 1/ x 1/ x 1/ x 1/	W/m2 1.1 (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ 0.15 0.2 0.11 0	$\begin{bmatrix} K \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.0$	(W/k 2.2 2.74 2.74 1.1 6.225 14.61 4.56 0		kJ/m²-I		kJ/K (26) (27) (27) (27) (28) (29) (30) (31) (32) (324)
ELEN Doors Windo Windo Floor Walls Roof Total a Party v Interna * for win ** inclua Fabric	WENT ws Type ws Type ws Type ws Type area of e vall al floor dows and le the area	Gros area 4 1 2 2 3 3 (41.4) Iements roof winders on both ss, W/K =	8 5 , m ² ows, use e sides of in = S (A x	Openin m 10.13 0	gs 2 3 	A ,r 2 2.39 2.39 0.96 41.5 73.05 41.5 166.11 45 41.5	n ² x 1/ x 1/ x 1/ x 1/ x 1/ x 1/ x 1/ x 1/	W/m2 1.1 (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ 0.15 0.2 0.11 0 formula 1.	$\begin{bmatrix} K \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0.04 \end{bmatrix} = \begin{bmatrix} 0 \\$	(W/k 2.2 2.74 2.74 1.1 6.225 14.61 4.56 0	s given in	kJ/m²-I		kJ/K (26) (27) (27) (27) (28) (29) (30) (31) (32) (32d) (32d)
ELEN Doors Windo Windo Floor Walls Roof Total a Party v Interna * for win ** inclua Fabric Heat c	WENT ws Type ws Type ws Type ws Type area of e vall al floor dows and le the area heat los apacity	Gros area = 1 = 2 = 3 = 3 = 3 = 33.1 = 41.3 Iements roof winders as on both as on both as, W/K = Cm = S(8 (m ²) 8 5 , m ² bws, use e sides of in = S (A x (A x k)	Openin m 10.13 0 effective winternal walk U)	gs 2 3 mdow U-va s and part	A ,r 2 2.39 2.39 0.96 41.5 73.05 41.5 166.11 45 41.5	n ² x 1/ x 1/ x 1/ x 1/ x 2 x 2 B x 2 B x 2 B x 2 B x 2 B x 2 B x 2 B x 2 B x 2 B x 2 C x 1/ C X X 1/ C X X X X X X X X X X X X X X X X X X	W/m2 1.1 (1/(1.2)+ (1/(1.2)+ (1/(1.2)+ 0.15 0.2 0.11 0 formula 1.	$\begin{array}{c} \mathbf{K} \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ 0.04] = \\ \\ \end{bmatrix} = \\ \\ \end{bmatrix} \\ = \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	(W/k 2.2 2.74 2.74 1.1 6.225 14.61 4.56 0	[]]	kJ/m²-I	<	kJ/K (26) (27) (27) (27) (28) (29) (30) (31) (32) (32d) (32d)
ELEN Doors Windo Windo Floor Floor Walls Roof Total a Party v Interna * for win ** inclua Fabric Heat c Therm <i>For desi</i>	WENT ws Type ws Type ws Type ws Type area of e vall al floor dows and le the area heat los apacity al mass ign assess	Gros area a 1 a 2 a 3 a 3 a 1 a 2 a 3 a 3 a 1 a 2 a 3 a 1 a 1 a 3 a	ss (m²) 8 5 , m² ows, use e sides of in = S (A x A x k) ter (TMF	Openin m 10.13 0 effective win the ternal walk U) $P = Cm \div$ tails of the	gs 2 3 mdow U-va ds and part - TFA) ir	A ,n 2.39 2.39 0.96 41.5 73.05 41.5 166.10 45 41.5 alue calcula titions	n ² x 1/ x 1/ x 1/ x 1/ x 2 x 2 3 x 2 3 ated using	W/m2 1.1 [1/(1.2)+ [1/(1.2)+ [1/(1.2)+ 0.15 0.2 0.11 0 formula 1, (26)(30)	$\begin{bmatrix} K \\ 0.04 \end{bmatrix} = \begin{bmatrix} 0.0$	(W/ł 2.2 2.74 1.1 6.225 14.61 4.56 0 re)+0.04] a .(30) + (32 tive Value:	() () () () () () () () () () () () () (kJ/m²-I	<	kJ/K (26) (27) (27) (27) (28) (29) (30) (31) (32) (32) (32d) 1 (33) 75 (34)

	s of therma		are not kr	nown (36) =	= 0.15 x (3	1)								_
	fabric he								(33) +	(36) =			45.22	(37)
Ventila	ation hea	r	alculated	d monthly	y 1				. ,	= 0.33 × (25)m x (5) I	1	1	
(22)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(20)
(38)m=	40.5	40.26	40.02	38.89	38.69	37.72	37.72	37.53	38.09	38.69	39.11	39.56	J	(38)
Heat t	ransfer o	coefficie	nt, W/K	i	i		i	i	(39)m	= (37) + (38)m	i	1	
(39)m=	85.71	85.47	85.23	84.11	83.91	82.93	82.93	82.75	83.3	83.91	84.33	84.78		_
Heat I	oss para	ameter (H	HLP), W	/m²K						Average = = (39)m ÷	Sum(39)₁ · (4)	12 /12=	84.11	(39)
(40)m=	1.03	1.03	1.03	1.01	1.01	1	1	1	1	1.01	1.02	1.02		
Numb	er of day	/s in mo	nth (Tab	le 1a)						Average =	Sum(40)1	12 /12=	1.01	(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)
													1	
4. W	ater hea	tina ene	rav reau	irement:								kWh/ye	ear:	
													1	
	ned occι =∆			· [1 - evn		249 v (TF	-130)2)] + 0.0)013 x (⁻	TFA -13		52		(42)
	FA £ 13.	-	1 1.707	i i cyb	(0.0000	HU X (11	A 10.5	<i>[2]</i>			.5)			
								(25 x N)				.93		(43)
	e the annua re that 125	-				-	-	to achieve	a water us	se target o	t			
	_		-					A	Can	Oct	Nev	Dee	1	
Hot wa	Jan ter usage i	Feb	Mar day for ea	Apr ach month	May Vd.m = fa	Jun	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec	J	
(44)m=	_	104.87	100.91	96.95	93	89.04	89.04	93	96.95	100.91	104.87	108.83	1	
(++)///-	100.05	104.07	100.91	30.35	33	03.04	03.04	33			m(44) ₁₁₂ =		1187.19	(44)
Energy	content of	hot water	used - ca	culated m	onthly $= 4$.	190 x Vd,r	m x nm x E	0Tm / 3600					107.10	
(45)m=	161.39	141.15	145.65	126.98	121.84	105.14	97.43	111.8	113.14	131.85	143.92	156.29		
16 :				·		(antan O in	haven (40		Total = Su	m(45) ₁₁₂ =	=	1556.59	(45)
			- ·					boxes (46)					1	(10)
(46)m= Water	0 storage	0	0	0	0	0	0	0	0	0	0	0		(46)
	-) includir	na anv se	olar or W	/WHRS	storage	within sa	ame ves	sel		150	1	(47)
	imunity h	,		0 ,			0					100	1	()
		-			-			ombi boil	ers) ente	er '0' in (47)			
Water	storage	loss:											_	
a) If r	nanufact	turer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temp	erature f	actor fro	m Table	2b								0]	(49)
-	y lost fro		-					(48) x (49)) =			0]	(50)
	nanufact ater stor			•									1	(51)
	munity h	-				n/ntre/ue	, y)					0	J	(51)
	ne factor	-										0]	(52)
Temp	erature f	actor fro	m Table	2b								0]	(53)
Energ	y lost fro	om water	· storage	e, kWh/ye	ear			(47) x (51)	x (52) x (53) =		0]	(54)
Enter	(50) or	(54) in (5	55)									0]	(55)

Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contains	s dedicate	d solar sto	orage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	lix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(57)
Primar	ry circuit	loss (ar	nual) fro	om Table	e 3							0		(58)
Primar	ry circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
(mo	dified by	factor f	rom Tab	le H5 if t	here is s	olar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)
Combi	i 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	neat requ	uired for	water h	eating ca	alculated	for eacl	n month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	137.18	119.98	123.8	107.94	103.57	89.37	82.82	95.03	96.17	112.07	122.34	132.85		(62)
Solar DI	HW input o	calculated	using App	endix G o	r Appendix	H (negati	ve quantity	/) (enter '0	if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	NWHRS	applies	, see Ap	pendix (G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	t from w	ater hea	ter					-		-	-	-		
(64)m=	137.18	119.98	123.8	107.94	103.57	89.37	82.82	95.03	96.17	112.07	122.34	132.85		_
								Outp	out from w	ater heate	r (annual)₁	12	1323.1	(64)
Heat g	jains froi	m water	heating	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)n	ı] + 0.8 x	(46)m	+ (57)m	+ (59)m	1	
(65)m=	34.29	29.99	30.95	26.98	25.89	22.34	20.7	23.76	24.04	28.02	30.58	33.21		(65)
inclu	ude (57)	m in calo	culation	of (65)m	only if c	ylinder is	s in the o	dwelling	or hot w	ate <mark>r is</mark> fr	om com	munity h	neating	
5. Int	tern <mark>al g</mark> a	ains (see	e Ta <mark>ble (</mark>	5 and 5a):									
Metab	olic gain	s (Table	5), Wat	tts										
	Jan									_				
		Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	125.86	Feb 125.86	Mar 125.86	Apr 125.86	May 125.86	Jun 125.86	Jul 125.86	Aug 125.86	Sep 125.86	Oct 125.86	Nov 125.86	Dec 125.86		(66)
Lightin	125.86 Ig gains	125.86 (calcula	125.86 ted in Aj	125.86 opendix	125.86 L, equati	125.86 ion L9 oi	125.86 r L9a), a	125.86 Iso see	125.86 Table 5	125.86				(66)
Lightin	125.86 Ig gains	125.86 (calcula	125.86 ted in Aj	125.86 opendix	125.86	125.86 ion L9 oi	125.86 r L9a), a	125.86 Iso see	125.86 Table 5	125.86				(66) (67)
Lightin (67)m=	125.86 ng gains 22.67	125.86 (calcula 20.14	125.86 ted in Aj 16.38	125.86 opendix 12.4	125.86 L, equati	125.86 ion L9 oi 7.82	125.86 r L9a), a 8.45	125.86 Iso see 10.99	125.86 Table 5 14.75	125.86 18.73	125.86	125.86		
Lightin (67)m=	125.86 ng gains 22.67	125.86 (calcula 20.14	125.86 ted in Aj 16.38	125.86 opendix 12.4	125.86 L, equati 9.27	125.86 ion L9 oi 7.82	125.86 r L9a), a 8.45	125.86 Iso see 10.99	125.86 Table 5 14.75	125.86 18.73	125.86	125.86		
Lightin (67)m= Applia (68)m=	125.86 ng gains 22.67 nces ga 225.6	125.86 (calcula 20.14 ins (calc 227.94	125.86 ted in Ap 16.38 ulated ir 222.04	125.86 opendix 12.4 Append 209.48	125.86 L, equati 9.27 dix L, eq	125.86 ion L9 of 7.82 uation L 178.73	125.86 r L9a), a 8.45 13 or L1 168.77	125.86 Iso see 10.99 3a), also 166.43	125.86 Table 5 14.75 see Ta 172.33	125.86 18.73 ble 5 184.89	125.86 21.86	125.86 23.3		(67)
Lightin (67)m= Applia (68)m=	125.86 ng gains 22.67 nces ga 225.6	125.86 (calcula 20.14 ins (calc 227.94	125.86 ted in Ap 16.38 ulated ir 222.04	125.86 opendix 12.4 Append 209.48	125.86 L, equati 9.27 dix L, eq 193.63	125.86 ion L9 of 7.82 uation L 178.73	125.86 r L9a), a 8.45 13 or L1 168.77	125.86 Iso see 10.99 3a), also 166.43	125.86 Table 5 14.75 see Ta 172.33	125.86 18.73 ble 5 184.89	125.86 21.86	125.86 23.3		(67)
Lightin (67)m= Applia (68)m= Cookir (69)m=	125.86 ng gains 22.67 nces ga 225.6 ng gains 35.59	125.86 (calcula 20.14 ins (calc 227.94 (calcula 35.59	125.86 ted in Ap 16.38 ulated ir 222.04 ted in A	125.86 opendix 12.4 n Append 209.48 ppendix 35.59	125.86 L, equati 9.27 dix L, eq 193.63 L, equat	125.86 ion L9 of 7.82 uation L 178.73 ion L15	125.86 r L9a), a 8.45 13 or L1 168.77 or L15a)	125.86 Iso see ⁻ 10.99 3a), also 166.43), also se	125.86 Table 5 14.75 see Ta 172.33 ee Table	125.86 18.73 ble 5 184.89 5	125.86 21.86 200.74	125.86 23.3 215.64		(67) (68)
Lightin (67)m= Applia (68)m= Cookir (69)m=	125.86 ng gains 22.67 nces ga 225.6 ng gains 35.59	125.86 (calcula 20.14 ins (calc 227.94 (calcula 35.59	125.86 ted in Ap 16.38 ulated ir 222.04 tted in A 35.59	125.86 opendix 12.4 n Append 209.48 ppendix 35.59	125.86 L, equati 9.27 dix L, eq 193.63 L, equat	125.86 ion L9 of 7.82 uation L 178.73 ion L15	125.86 r L9a), a 8.45 13 or L1 168.77 or L15a)	125.86 Iso see ⁻ 10.99 3a), also 166.43), also se	125.86 Table 5 14.75 see Ta 172.33 ee Table	125.86 18.73 ble 5 184.89 5	125.86 21.86 200.74	125.86 23.3 215.64		(67) (68)
Lightin (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m=	125.86 ag gains 22.67 nces ga 225.6 ng gains 35.59 s and far 0	125.86 (calcula 20.14 ins (calc 227.94 (calcula 35.59 ns gains 0	125.86 ted in Ap 16.38 ulated ir 222.04 ted in A 35.59 (Table \$ 0	125.86 opendix 12.4 Appendi 209.48 ppendix 35.59 5a) 0	125.86 L, equati 9.27 dix L, eq 193.63 L, equat 35.59	125.86 ion L9 of 7.82 uation L 178.73 ion L15 35.59	125.86 r L9a), a 8.45 13 or L1 168.77 or L15a) 35.59	125.86 Iso see ⁻ 10.99 3a), also 166.43), also se 35.59	125.86 Table 5 14.75 see Ta 172.33 ee Table 35.59	125.86 18.73 ble 5 184.89 5 35.59	125.86 21.86 200.74 35.59	125.86 23.3 215.64 35.59		(67) (68) (69)
Lightin (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m=	125.86 125.86 22.67 nces ga 225.6 ng gains 35.59 s and fai 0 s e.g. ev	125.86 (calcula 20.14 ins (calc 227.94 (calcula 35.59 ns gains 0	125.86 ted in Ap 16.38 ulated ir 222.04 ted in A 35.59 (Table \$ 0	125.86 opendix 12.4 Appendi 209.48 ppendix 35.59 5a) 0	125.86 L, equati 9.27 dix L, eq 193.63 L, equat 35.59	125.86 ion L9 of 7.82 uation L 178.73 ion L15 35.59	125.86 r L9a), a 8.45 13 or L1 168.77 or L15a) 35.59	125.86 Iso see ⁻ 10.99 3a), also 166.43), also se 35.59	125.86 Table 5 14.75 see Ta 172.33 ee Table 35.59	125.86 18.73 ble 5 184.89 5 35.59	125.86 21.86 200.74 35.59	125.86 23.3 215.64 35.59		(67) (68) (69)
Lightin (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m=	125.86 ng gains 22.67 nces ga 225.6 ng gains 35.59 s and fai 0 s e.g. ev -100.69	125.86 (calcula 20.14 ins (calc 227.94 (calcula 35.59 ns gains 0 raporatic	125.86 ted in Ap 16.38 ulated ir 222.04 tted in A 35.59 (Table 9 0 n (nega -100.69	125.86 opendix 12.4 Append 209.48 ppendix 35.59 5a) 0 tive valu	125.86 L, equati 9.27 dix L, eq 193.63 L, equat 35.59 0 es) (Tab	125.86 ion L9 of 7.82 uation L 178.73 ion L15 35.59 0 le 5)	125.86 r L9a), a 8.45 13 or L1 168.77 or L15a) 35.59 0	125.86 Iso see ⁻ 10.99 3a), also 166.43), also se 35.59 0	125.86 Table 5 14.75 see Ta 172.33 ee Table 35.59 0	125.86 18.73 ble 5 184.89 5 35.59 0	125.86 21.86 200.74 35.59 0	125.86 23.3 215.64 35.59 0		(67) (68) (69) (70)
Lightin (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m=	125.86 ng gains 22.67 nces ga 225.6 ng gains 35.59 s and fai 0 s e.g. ev -100.69	125.86 (calcula 20.14 ins (calc 227.94 (calcula 35.59 ns gains 0 raporatic -100.69	125.86 ted in Ap 16.38 ulated ir 222.04 tted in A 35.59 (Table 9 0 n (nega -100.69	125.86 opendix 12.4 Append 209.48 ppendix 35.59 5a) 0 tive valu	125.86 L, equati 9.27 dix L, eq 193.63 L, equat 35.59 0 es) (Tab	125.86 ion L9 of 7.82 uation L 178.73 ion L15 35.59 0 le 5)	125.86 r L9a), a 8.45 13 or L1 168.77 or L15a) 35.59 0	125.86 Iso see ⁻ 10.99 3a), also 166.43), also se 35.59 0	125.86 Table 5 14.75 see Ta 172.33 ee Table 35.59 0	125.86 18.73 ble 5 184.89 5 35.59 0	125.86 21.86 200.74 35.59 0	125.86 23.3 215.64 35.59 0		(67) (68) (69) (70)
Lightin (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m= Water (72)m=	125.86 ng gains 22.67 nces ga 225.6 ng gains 35.59 s and far 0 s e.g. ev -100.69 heating 46.09	125.86 (calcula 20.14 ins (calc 227.94 (calcula 35.59 ns gains 0 raporatic -100.69 gains (T	125.86 ted in Ar 16.38 ulated ir 222.04 tted in A 35.59 (Table 5 0 (Table 5) 41.6	125.86 opendix 12.4 Appendi 209.48 ppendix 35.59 5a) 0 tive valu -100.69	125.86 L, equati 9.27 dix L, eq 193.63 L, equat 35.59 0 es) (Tab	125.86 ion L9 of 7.82 uation L 178.73 ion L15 35.59 0 le 5) -100.69 31.03	125.86 r L9a), a 8.45 13 or L1 168.77 or L15a) 35.59 0 -100.69 27.83	125.86 Iso see ⁻ 10.99 3a) , also 166.43), also se 35.59 0	125.86 Table 5 14.75 9 see Ta 172.33 9e Table 35.59 0 -100.69 33.39	125.86 18.73 ble 5 184.89 5 35.59 0 -100.69 37.66	125.86 21.86 200.74 35.59 0 -100.69 42.48	125.86 23.3 215.64 35.59 0 -100.69 44.64		(67)(68)(69)(70)(71)
Lightin (67)m= Applia (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m= Water (72)m=	125.86 ag gains 22.67 nces ga 225.6 ag gains 35.59 s and far 0 s e.g. ev -100.69 heating 46.09	125.86 (calcula 20.14 ins (calc 227.94 (calcula 35.59 ns gains 0 raporatic -100.69 gains (T 44.63	125.86 ted in Ar 16.38 ulated ir 222.04 tted in A 35.59 (Table 5 0 (Table 5) 41.6	125.86 opendix 12.4 Appendi 209.48 ppendix 35.59 5a) 0 tive valu -100.69	125.86 L, equati 9.27 dix L, eq 193.63 L, equat 35.59 0 es) (Tab	125.86 ion L9 of 7.82 uation L 178.73 ion L15 35.59 0 le 5) -100.69 31.03	125.86 r L9a), a 8.45 13 or L1 168.77 or L15a) 35.59 0 -100.69 27.83	125.86 Iso see 10.99 3a), also 166.43), also se 35.59 0 -100.69 31.93	125.86 Table 5 14.75 9 see Ta 172.33 9e Table 35.59 0 -100.69 33.39	125.86 18.73 ble 5 184.89 5 35.59 0 -100.69 37.66	125.86 21.86 200.74 35.59 0 -100.69 42.48	125.86 23.3 215.64 35.59 0 -100.69 44.64		(67)(68)(69)(70)(71)

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

Orienta	tion:	Access F Table 6d	actor	Area m²			Flux Table	6a			g_ able 6b		Tal	FF ole 6c			Gains (W)	
North	0.9x	0.77	x	2.3	39	×Г	10.63	}	x		0.76	x		0.8		=	10.71	(74)
North	0.9x	0.77	x	2.3	39	×	20.32	2	X		0.76	x		0.8		=	20.46	(74)
North	0.9x	0.77	x	2.3	39	×	34.53	;	x		0.76	x		0.8		=	34.77	(74)
North	0.9x	0.77	x	2.3	39	×	55.46	6) x		0.76	x		0.8		=	55.85	(74)
North	0.9x	0.77	x	2.3	39	×	74.72	2	x		0.76	x		0.8		=	75.24	(74)
North	0.9x	0.77	x	2.3	39	×	79.99)	x		0.76	x		0.8		=	80.55	(74)
North	0.9x	0.77	x	2.3	39	x	74.68	}	x		0.76	x		0.8		=	75.2	(74)
North	0.9x	0.77	x	2.3	39	×	59.25	5	x		0.76	x		0.8		=	59.66	(74)
North	0.9x	0.77	x	2.3	39	×	41.52	2	x		0.76	x		0.8		=	41.81	(74)
North	0.9x	0.77	x	2.3	39	×	24.19)	x		0.76	x		0.8		=	24.36	(74)
North	0.9x	0.77	x	2.3	39	×	13.12	2	x		0.76	x		0.8		=	13.21	(74)
North	0.9x	0.77	x	2.3	39	×	8.86		x		0.76	x		0.8		=	8.93	(74)
South	0.9x	0.77	x	2.3	39	x	46.75	5	x		0.76	x		0.8		=	94.16	(78)
South	0.9x	0.77	x	2.3	39	×	76.57	,	x		0.76	x		0.8		=	154.21	(78)
South	0.9x	0.77	x	2.3	39	×	97.53	}	x		0.76	x		0.8		=	196.44	(78)
South	0.9x	0.77	x	2.3	39	×[110.2	3	x		0.76	X		0.8		=	222.01	(78)
South	0.9x	0.77	×	2.3	39	×	114.8	7	x		0.76	×		0.8		=	231.35	(78)
South	0.9x	0.77	×	2.3	39	×	110.5	5] ×		0.76	x		0.8		=	222.65	(78)
South	0.9x	0.77	x	2.3	39	x	108.0	1	x		0.76	x		0.8		=	217.54	(78)
South	0.9x	0.77	x	2.3	39	×	104.8	9	x		0.76	×		0.8		=	211.26	(78)
South	0.9x	0.77	×	2.3	39	×	101.8	9	×		0.76	x		0.8		=	205.2	(78)
South	0.9x	0.77	x	2.3	39	×	82.59)	x		0.76	x		0.8		=	166.33	(78)
South	0.9x	0.77	x	2.3	39	×	55.42	2	x		0.76	×		0.8		=	111.61	(78)
South	0.9x	0.77	x	2.3	39	x	40.4		x		0.76	x		0.8		=	81.36	(78)
ĭ	ains ir 112.81	n watts, ca	lculated 256.8	for eac 315.19	h month 352.34	1	0.02 33	7.32	<mark>n(83)</mark> 309		. <mark>m(74)m</mark> 276.77	<mark>(82)n</mark> 209.′	-	134.73	96.8	22	l	(83)
(83)m= Total q		internal a							309	.22	270.77	209.	13	134.73	90.0	52		(00)
(84)m=	467.93		597.57	635.31	650.79	r Ì	·	3.13	579	0.33	558	511.	16	460.56	441.	.16		(84)
`´L				I	ļ													
		ernal temp e during h					rea fron	n Tak		Th1							21	(85)
-		actor for g	• •			-			JIE 9	,	(0)						21	(85)
Otilisa	Jan	<u> </u>	Mar	Apr	May	r`—		Jul	Δ	ug	Sep	00	+	Nov	D	ес		
(86)m=	1	1	0.99	0.97	0.91			.59	0.6	-	0.86	0.98		1	1	_		(86)
(87)m=	19.89	al temperative 20.03	20.25	20.54	20.78	1	i).99	20.	- T	20.89	20.5	7	20.17	19.8	86		(87)
												20.0	<u> </u>	20.17	10.0			()
Temp (88)m=	20.06	e during h 20.06	eating p 20.06	20.07	20.07	1	<u> </u>	m Ta).08	able 9 20.	- T	2 (°C) 20.08	20.0	7	20.07	20.0	17		(88)
										.03	20.00	20.0	'	20.07	20.0	51		(00)
r		actor for ga		1		1	<u> </u>		r Ó	-	0.0	0.0-	,	4			l	(89)
(89)m=	1	1	0.99	0.96	0.88	0.	69 0	.48	0.5	52	0.8	0.97		1	1			(09)

Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to 7	7 in Tabl	e 9c)				
(90)m=	19.03	19.19	19.41	19.69	19.92	20.06	20.08	20.08	20.02	19.73	19.33	19.02		(90)
				•	•		•		f	LA = Livin	g area ÷ (4	4) =	0.36	(91)
Moon	intorno	Itompor	atura (fo	r tho wh	olo dwo	lling) – fl	Ι Λ Ν Τ1	+ (1 – fL	Δ) ν Τ2					
(92)m=	19.34	19.49	19.71	20	20.23	20.38	20.41	20.41	20.33	20.03	19.64	19.32		(92)
				_			_	4e, whe			10.04	10.02		(02)
(93)m=	19.34	19.49	19.71	20	20.23	20.38	20.41	20.41	20.33	20.03	19.64	19.32		(93)
` '		ting requ	I		20.20	20.00	20.41	20.41	20.00	20.00	15.04	10.02		(00)
		· ·			ro obtoin	od at at	on 11 of		o oo tho	+ Ti m_('	76)m.on	d ro oolo	ulata	
				using Ta		ieu al si	epiioi	Table 9	J, SU IIIA	u 11,m=(<i>r o)</i> m an	u re-calc	uiale	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa		tor for g				••••	•••	,g	000	•••		200		
(94)m=	1	0.99	0.99	0.96	0.89	0.72	0.52	0.56	0.82	0.97	0.99	1		(94)
	l gains.	hmGm	L . W = (9	1 4)m x (8-	1 4)m									
(95)m=	466.76	540.47	588.91	609.39	576.21	449.59	311.94	325.41	455.67	494.4	457.98	440.37		(95)
Month	lv aver	i age exte	rnal tem		i e from Ta	ı able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
		e for me						x [(93)m						
(97)m=		1247.29	1126.17	933.25		479.19	315.94	331.64	519.26	791.24	1057.22	1281.99	-	(97)
` '								24 x [(97]			L			
(98)m=	611.98	474.98	399.73	233.18	104.04	0				220.85	431.45	626.17		
(00)	011.00		000.10	200.10		Ů			l per year				3102.37	(98)
								Tota	i per year	(Kvvi //year) = Sum(9	0)15,912 =	3102.37	(30)
-														-
Space	e h <mark>eatin</mark>	g require	ement in	kWh/m²	²/year								37.38	(99)
		g require			²/year								37.38	(99)
8c. Sp	bace co	oling rec	uiremer	nt	²/year <u>See Tal</u>	ple 10b							37.38	(99)
8c. Sp	bace co	oling rec	uiremer	nt		ole 10b Jun	Jul	Aug	Sep	Oct	Nov	Dec	37.38	(99)
8c. Sr Calcu	bace co lated fo Jan	oling rec r June, C Feb	uiremer July and Mar	nt August. Apr	See Tal May	Jun		Aug and exte					37.38	(99)
8c. Sr Calcu	bace co lated fo Jan	oling rec r June, C Feb	uiremer July and Mar	nt August. Apr	See Tal May	Jun							37.38	(99)
8c. Sr Calcu Heat I (100)m=	Dace co lated fo Jan oss rate	oling red r June, C Feb e Lm (ca	July and July and Mar Iculated 0	August. August. Apr using 25	See Tal May 5°C inter	Jun nal temp	perature	and exte	ernal ten	nperatur	e from T	able 10)	37.38	
8c. Sr Calcu Heat I (100)m=	Dace co lated fo Jan oss rate	oling rec r June, C Feb e Lm (ca 0	July and July and Mar Iculated 0	August. August. Apr using 25	See Tal May 5°C inter	Jun nal temp	perature	and exte	ernal ten	nperatur	e from T	able 10)	37.38	
8c. Sp Calcu Heat I (100)m= Utilisa (101)m=	Dace co lated fo Jan oss rate 0 tion fac	oling rec r June, C Feb e Lm (ca 0 ttor for lc	July and Mar Iculated 0 oss hm 0	August. Apr using 25 0	See Tal May 5°C inter	Jun nal temp 779.58 0.87	oerature 613.71	and exte	ernal ten 0	nperatur 0	e from T 0	able 10) 0	37.38	(100)
8c. Sp Calcu Heat I (100)m= Utilisa (101)m=	Dace co lated fo Jan oss rate 0 tion fac	oling rec r June, C Feb e Lm (ca 0 ttor for lc	July and Mar Iculated 0 oss hm 0	August. Apr using 25 0	See Tal May 5°C inter 0	Jun nal temp 779.58 0.87	oerature 613.71	and exte	ernal ten 0	nperatur 0	e from T 0	able 10) 0	37.38	(100)
8c. Sp Calcu Heat I (100)m= Utilisa (101)m= Usefu (102)m=	lated fo Jan oss rate 0 ation fac 0 I loss, h 0	oling rec r June, C Feb e Lm (ca 0 ttor for lc 0 mLm (W 0	July and Mar Iculated 0 oss hm 0 Vatts) = 0	nt August. Apr using 25 0 0 (100)m > 0	See Tal May 5°C inter 0 (101)m	Jun nal temp 779.58 0.87 681.59	0.94 574.56	and exte 628.89 0.92	o 0 0	nperatur 0	e from T 0	able 10) 0	37.38	(100) (101)
8c. Sp Calcu Heat I (100)m= Utilisa (101)m= Usefu (102)m=	lated fo Jan oss rate 0 ation fac 0 I loss, h 0	oling rec r June, C Feb e Lm (ca 0 ttor for lc 0 mLm (W 0	July and Mar Iculated 0 oss hm 0 Vatts) = 0	nt August. Apr using 25 0 0 (100)m > 0	See Tal May 5°C inter 0 (101)m	Jun nal temp 779.58 0.87 681.59	0.94 574.56	and exte 628.89 0.92 579.65	o 0 0	nperatur 0	e from T 0	able 10) 0	37.38	(100) (101)
8c. Sp Calcu Heat I (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space	lated fo Jan oss rate 0 ttion fac 0 1 loss, h 0 (solar g 0 e coolin	oling rec r June, C Feb e Lm (ca 0 etor for lc 0 mLm (W 0 gains ca 0 g require	July and Mar Iculated 0 oss hm 0 Vatts) = 0 Iculated 0 ement for	August. Apr using 29 0 (100)m > (100)m > for appli 0 <i>r month,</i>	See Tal May 5°C inter 0 (101)m (101)m (cable we 0 , whole c	Jun nal temp 779.58 0.87 681.59 eather re 829.43	0.94 0.94 574.56 egion, se 798.1	and exte 628.89 0.92 579.65 ee Table	ernal ten 0 0 10) 0	nperatur 0 0 0	e from T 0 0 0	able 10) 0 0 0 0 0		(100) (101) (102)
8c. Sp Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1	lated fo Jan oss rate 0 ttion fac 0 1 loss, h 0 (solar g 0 e coolin	oling rec r June, C Feb e Lm (ca 0 etor for lc 0 mLm (W 0 gains ca 0 g require	July and Mar Iculated 0 oss hm 0 Vatts) = 0 Iculated 0 ement for	August. Apr using 25 0 (100)m > 0 for appli 0	See Tal May 5°C inter 0 (101)m (101)m (cable we 0 , whole c	Jun nal temp 779.58 0.87 681.59 eather re 829.43 <i>welling,</i>	berature 613.71 0.94 574.56 egion, se 798.1 continue	and exte 628.89 0.92 579.65 ee Table 772.2 ous (kW	ernal ten 0 0 10) 0	nperatur 0 0 0	e from T 0 0 0	able 10) 0 0 0 0 0		(100) (101) (102)
8c. Sp Calcu Heat I (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space	lated fo Jan oss rate 0 ttion fac 0 1 loss, h 0 (solar g 0 e coolin	oling rec r June, C Feb e Lm (ca 0 etor for lc 0 mLm (W 0 gains ca 0 g require	July and Mar Iculated 0 oss hm 0 Vatts) = 0 Iculated 0 ement for	August. Apr using 29 0 (100)m > (100)m > for appli 0 <i>r month,</i>	See Tal May 5°C inter 0 (101)m (101)m (cable we 0 , whole c	Jun nal temp 779.58 0.87 681.59 eather re 829.43	0.94 0.94 574.56 egion, se 798.1	and exte 628.89 0.92 579.65 ee Table 772.2	ernal ten 0 0 10) 0	nperatur 0 0 0	e from T 0 0 0	able 10) 0 0 0 0 0		(100) (101) (102)
8c. Sp Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m=	lated fo Jan oss rate 0 ttion fac 0 1 loss, h 0 (solar e 0 (solar e 0 e coolin 04)m to 0	oling rec r June, C Feb e Lm (ca 0 tor for lo 0 mLm (W 0 gains ca 0 g require zero if (0	July and Mar Iculated 0 oss hm 0 Vatts) = 0 Iculated 0 Iculated 0 ement fo 104)m <	August. Apr using 29 0 (100)m > 0 (100)m > 0 for appli 0 r month, < 3 × (98	See Tal May 5°C inter 0 (101)m 0 (101)m 0 (cable we 0 , whole c)m	Jun nal temp 779.58 0.87 681.59 eather re 829.43 <i>welling,</i>	berature 613.71 0.94 574.56 egion, se 798.1 continue	and exte 628.89 0.92 579.65 ee Table 772.2 ous (kW	ernal ten 0 10) 0 (h) = 0.0 Total	0 0 24 x [(10 0 = Sum(e from T 0 0 0 0 0 0 3) <i>m</i> – (0 104)	able 10) 0 0 0 0 102)m] : 0		(100) (101) (102) (103)
8c. Sp Calcu Heat ((100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m= Coolec	ace co lated fo Jan oss rate 0 tion fac 0 l loss, h 0 (solar g 0 e coolin 04)m to 0	oling rec r June, C Feb e Lm (ca 0 ttor for lc 0 mLm (W 0 gains ca 0 grequire zero if (0	uiremenJuly andMarIculated0 0 0 0 0 0 Iculated0 0 0 0 0 0 0 0 0 0 0 0	August. Apr using 25 0 0 (100)m > 0 for appli 0 r month, 3 × (98 0	See Tal May 5°C inter 0 (101)m 0 (101)m 0 (cable we 0 , whole c)m	Jun nal temp 779.58 0.87 681.59 eather re 829.43 <i>welling,</i>	berature 613.71 0.94 574.56 egion, se 798.1 continue	and exte 628.89 0.92 579.65 ee Table 772.2 ous (kW	ernal ten 0 10) 0 (h) = 0.0 Total	0 0 0 24 x [(10	e from T 0 0 0 0 0 0 3) <i>m</i> – (0 104)	able 10) 0 0 0 0 102)m] : 0	< (41)m	(100) (101) (102) (103)
8c. Sp Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= <i>Space</i> set (1 (104)m= Coolecc Intermi	lated fo Jan oss rate 0 ttion fac 0 1 loss, h 0 (solar g 0 (solar g 0 e coolin 04)m to 0	oling rec r June, C Feb e Lm (ca 0 tor for lc 0 mLm (W 0 gains ca 0 g require zero if (0 n actor (Ta	July and Mar Iculated 0 oss hm 0 Vatts) = 0 lculated 0 ement fo 104)m < 0	August. Apr using 29 0 (100)m > 0 (100)m > 0 for appli 0 or month, 3 × (98 0	See Tal May 5°C inter 0 (101)m 0 (101)m 0 (cable we 0 (whole c)m 0	Jun nal temp 779.58 0.87 681.59 eather re 829.43 <i>welling,</i> 106.44	berature 613.71 0.94 574.56 egion, se 798.1 continue 166.31	and exte 628.89 0.92 579.65 ee Table 772.2 ous (kW 143.25	ernal ten 0 10) 0 (h) = 0.0 Total f C =	0 0 0 24 x [(10 0 = Sum(cooled a	e from T 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	able 10) 0 0 0 0 0 102)m] : 0 1) =	< (41)m 416.01	(100) (101) (102) (103)
8c. Sp Calcu Heat ((100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m= Coolec	ace co lated fo Jan oss rate 0 tion fac 0 l loss, h 0 (solar g 0 e coolin 04)m to 0	oling rec r June, C Feb e Lm (ca 0 ttor for lc 0 mLm (W 0 gains ca 0 grequire zero if (0	uiremenJuly andMarIculated0 0 0 0 0 0 Iculated0 0 0 0 0 0 0 0 0 0 0 0	August. Apr using 25 0 0 (100)m > 0 for appli 0 r month, 3 × (98 0	See Tal May 5°C inter 0 (101)m 0 (101)m 0 (cable we 0 , whole c)m	Jun nal temp 779.58 0.87 681.59 eather re 829.43 <i>welling,</i>	berature 613.71 0.94 574.56 egion, se 798.1 continue	and exte 628.89 0.92 579.65 ee Table 772.2 ous (kW	ernal ten 0 10) 0 /h) = 0.0 Total f C = 0	0 0 0 24 x [(10 0 = Sum(cooled a	e from T 0 0 0 0 0 0 0 0 0 0 1 0 4 0 1 0 4 0 0	able 10) 0 0 0 0 102)m] : 0	< (41)m 416.01	(100) (101) (102) (103) (104) (105)
8c. Sp Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m= Coolec Intermi (106)m=	lated fo Jan oss rate 0 ttion fac 0 1 loss, h 0 (solar g 0 (solar g 0 (solar g 0 (solar g 0 (solar g 0 (solar g 0 (solar g 0 (solar g 0) (solar g (solar g 0) (solar g (solar g (solar g 0) (solar g (oling rec r June, C Feb e Lm (ca 0 tor for lo 0 mLm (W 0 gains ca 0 g require 2 zero if (0 n actor (Ta 0	uiremen July and Mar Iculated 0 pss hm 0 vatts) = 0 vatts) = 0 lculated 0 lculated 0 lculated 0 able 10b 0	August. Apr using 29 0 (100)m > (100)m > for appli 0 for appli 0 r month, 3 × (98 0) 0	See Tal May 5°C inter 0 (101)m (101)m 0 (101)m (101)m 0 (101)m (10)m (10)m	Jun nal temp 779.58 0.87 681.59 eather re 829.43 <i>welling,</i> 106.44	0.94 574.56 egion, se 798.1 continue 166.31 0.25	and exte 628.89 0.92 579.65 ee Table 772.2 ous (kW 143.25	ernal ten 0 10) 0 /h) = 0.0 Total f C = 0	0 0 0 24 x [(10 0 = Sum(cooled a	e from T 0 0 0 0 0 0 0 0 0 0 1 0 4 0 1 0 4 0 0	able 10) 0 0 0 0 0 102)m] : 0 1) =	< (41)m 416.01	(100) (101) (102) (103)
8c. Space Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m= Coolecc Intermi (106)m= Space	lated fo Jan oss rate 0 ttion fac 0 1 loss, h 0 (solar g 0 e coolin 0 0 fraction ttency f 0 cooling	oling rec r June, C Feb e Lm (ca 0 tor for lo 0 tor for lo 0 mLm (W 0 gains ca 0 g require 2 ero if (0 n actor (Ta 0 n	uiremenJuly andMarIculated0 0 0 0 July and0 0	August. Apr using 2! 0 (100)m > (100)m > 0 for appli 0 r month, 3 × (98 0) 0 month =	See Tal May 5°C inter 0 (101)m 0 (101)m 0 (cable we 0 (cable we (cable we)) (cable	Jun nal temp 779.58 0.87 681.59 eather re 829.43 <i>dwelling,</i> 106.44 0.25 × (105)	0.94 574.56 29ion, se 798.1 <i>continue</i> 166.31 0.25 × (106)r	and exte 628.89 0.92 579.65 ee Table 772.2 ous (kW 143.25 0.25	ernal ten 0 0 10) 0 /h) = 0.0 f C = 0 Total f C = 0 Total	0 0 0 24 x [(10 0 = Sum(cooled a 0 1 = Sum(e from T 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	able 10) 0 0 0 0 0 102)m]; 0 = 4) = 0 = 0	<i>x (41)m</i> <u>416.01</u> 1	(100) (101) (102) (103) (104) (105)
8c. Sp Calcu Heat (100)m= Utilisa (101)m= Usefu (102)m= Gains (103)m= Space set (1 (104)m= Coolec Intermi (106)m=	lated fo Jan oss rate 0 ttion fac 0 1 loss, h 0 (solar g 0 (solar g 0 (solar g 0 (solar g 0 (solar g 0 (solar g 0 (solar g 0 (solar g 0) (solar g (solar g 0) (solar g (solar g (solar g 0) (solar g (oling rec r June, C Feb e Lm (ca 0 tor for lo 0 mLm (W 0 gains ca 0 g require 2 zero if (0 n actor (Ta 0	uiremen July and Mar Iculated 0 pss hm 0 vatts) = 0 /atts) = 0 lculated 0 lculated 0 lculated 0 able 10b 0	August. Apr using 29 0 (100)m > (100)m > for appli 0 for appli 0 r month, 3 × (98 0) 0	See Tal May 5°C inter 0 (101)m (101)m 0 (101)m (101)m 0 (101)m (10)m (10)m	Jun nal temp 779.58 0.87 681.59 eather re 829.43 <i>welling,</i> 106.44	0.94 574.56 egion, se 798.1 continue 166.31 0.25	and exte 628.89 0.92 579.65 ee Table 772.2 ous (kW 143.25	ernal ten 0 0 10) 0 (h) = 0.0 0 Total f C = 0 Total 0 Total 0	0 0 0 24 x [(10 0 = Sum(cooled a	e from T 0 0 0 0 0 0 0 0 0 0 0 0 0	able 10) 0 0 0 0 0 102)m] : 0 +) = 0	<i>x (41)m</i> <u>416.01</u> 1	(100) (101) (102) (103) (104) (105)

Space cooling requirement in kWh/m²/year	(107) ÷ (4) =	1.25	(108)
8f. Fabric Energy Efficiency (calculated only ι	under special conditions, see section 11)		
Fabric Energy Efficiency	(99) + (108) =	38.63	(109)



				User D	etails:						
Assessor Name: Software Name:	Stroma FS	SAP 201			Softwa	a Num are Ver	sion:	d Estado		n: 1.0.0.28	
Address :			P	roperty <i>i</i>	Address	: 3 Bed E	Innance	d Fabric			
1. Overall dwelling dime	nsions:										
				Area	a(m²)		Av. Hei	ght(m)		Volume(m ³)	
Ground floor					. ,	(1a) x	r	.5	(2a) =	121.92	(3a)
First floor				4	·8.77	(1b) x	2	.5	(2b) =	121.92	(3b)
Total floor area TFA = (1	a)+(1b)+(1c)+	(1d)+(1e)+(1n	ı)	7.54	(4)			1		J
Dwelling volume				L		(3a)+(3b)	+(3c)+(3d)+(3e)+	.(3n) =	243.85	(5)
2. Ventilation rate:]
2. Ventilation rate.	main		econdar	у	other		total			m ³ per hour	
Number of chimneys	heating	n +	eating 0] + [0] = [0	x 4	40 =	0	(6a)
Number of open flues	0	+	0] + [0] = [0	x 2	20 =	0	(6b)
Number of intermittent fa	ns						3	x 1	0 =	30	(7a)
Number of passive vents							0	x 1	0 =	0	(7b)
Number of flueless gas fi	res						0	x 4	40 =	0	(7c)
									Air ch	anges per hou	ı r
Infiltration due to chimne							30		÷ (5) =	0.12	(8)
If a pressurisation test has b			ed, proceed	d to (17), d	otherwise o	continue fro	om (9) to (16)			
Number of storeys in the Additional infiltration	ie dw <mark>eiling</mark> (n	5)						[[(9)-	1]x0.1 =	0	(9) (10)
Structural infiltration: 0	.25 for steel o	r timber f	frame or	0.35 foi	r masoni	ry constr	uction	1(0)	.1.0	0	(11)
if both types of wall are pl			ponding to	the great	er wall are	a (after			I	-], ,
deducting areas of openin If suspended wooden f	0 // 1		ed) or 0.	1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en				. (000.0	, e.e.e	0				0	(13)
Percentage of windows			ripped							0	(14)
Window infiltration					0.25 - [0.2	2 x (14) ÷ 1	= [00			0	(15)
Infiltration rate					(8) + (10)	+ (11) + (1	2) + (13) +	- (15) =		0	(16)
Air permeability value,				•	•	•	etre of e	nvelope	area	5	(17)
If based on air permeabil	-						. , .			0.37	(18)
Air permeability value applie Number of sides sheltere		on test has	s been don	e or a deg	gree air pe	rmeability	is being us	sed		2	(19)
Shelter factor					(20) = 1 -	[0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorporat	ing shelter fac	ctor			(21) = (18) x (20) =				0.32	(21)
Infiltration rate modified f	or monthly wir	nd speed									-
Jan Feb	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Tab	le 7									
(22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		

Wind F	actor (2	22a)m =	(22)m ÷	4										
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjuste	ed infiltr	ation rat	e (allowi	ing for sl	helter ar	nd wind s	speed) =	= (21a) x	(22a)m		-			
	0.4	0.4	0.39	0.35	0.34	0.3	0.3	0.29	0.32	0.34	0.36	0.37		
		<i>ctive air</i> al ventila	-	rate for t	the appl	icable ca	ise	•						
				endix N (2	23h) - (23	a) x Emv (e	equation (N5)) othe	rwise (23h) - (23a)		L	0	(23a)
	If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0	(23b) (23c)
					•					2h)m + ((23h) x [L 1 – (23c)	-	(200)
(24a)m=	0	0		0	0	0	0	0		0	0	0]	(24a)
b) If	balance	ed mech	anical ve	entilation	without	heat red	covery (u MV) (24t)m = (22	2b)m + (23b)	·		
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If v	whole h	iouse ex	tract ver	ntilation of	or positi	ve input v	ventilati	on from	outside		1			
i	f (22b)r	n < 0.5 >	< (23b), t	then (24	c) = (23	b); other	wise (24	c) = (22	b) m + 0	.5 × (23k	o)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,						ve input erwise (2				0.5]				
(24d)m=	0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57		(24d)
Effec	ctive air	change	rate - er	nter (24a	a) or (24	b) or (24	c) or (24	ld) in bo	x (25)					
(25)m=	0.58	0.58	0.58	0.56	0.56	0.55	0.55	0.54	0.55	0.56	0.56	0.57		(25)
3. Hea	at l <mark>osse</mark>	s and he	eat l <mark>oss</mark>	paramet	er: 🔫									
ELEN		Gros	ss	Openir	ngs	Net Ar		U-val W/m2		AXU		k-value kJ/m²·K		A X k kJ/K
Doors		alea	(m²)		ז ²	A ,r	П- х	1.1		(W/ 2.31		KJ/11-•N		(26)
Window	ws Type	9 1				2.39	=	/[1/(1.2)+		2.74	4			(27)
Windows Type 2					2.39								(27)	
Windows Type 3					1.44 x1/[1/(1.2)+0.04] = 1.65								(27)	
Windows Type 4					1.44		/[1/(1.2)+		1.65				(27)	
Windows Type 5						3.15 x1/[1/(1.2)+0.04] = 3.61								(27)
Floor						48.77	7 X	0.15	=	7.3155	5		7 [(28)
Walls		12	5	19.1	3	105.8	7 X	0.2	=	21.17			i —	(29)
Roof		48.7	77	0		48.77	7 X	0.11	=	5.36			i —	(30)
Total a	rea of e	elements	s, m²			222.5	4				'		J	(31)
Party w	vall					45	x	0	=	0			7 [(32)
Internal floor					48.77	7						i —	(32d)	
							lated using	g formula t	1/[(1/U-valı	ıe)+0.04] a	as given in	paragraph	3.2	
			sides of ir = S (A x		iis and pai	TITIONS		(26)(30) + (32) =			Г	55.66	(33)
Fabric heat loss, $W/K = S (A \times U)$ Heat capacity Cm = S(A × k)							((28)(30) + (32) + (32a)(32e) =						22416.99	

Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f

250

(35)

Indicative Value: Medium

can be u	ised inste	ad of a de	tailed calc	ulation.										
Therma	al bridge	əs : S (L	x Y) cal	culated u	using Ap	pendix l	<						11.13	(36)
if details	of therma	al bridging	are not kn	own (36) =	= 0.15 x (3	1)								
Total fa	abric he	at loss							(33) +	(36) =			66.79	(37)
Ventila	tion hea	at loss ca	alculated	monthl	y				(38)m	= 0.33 × (25)m x (5)		-	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	46.81	46.55	46.3	45.13	44.91	43.88	43.88	43.7	44.27	44.91	45.35	45.82		(38)
Heat tr	ansfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m		-	
(39)m=	113.6	113.34	, 113.09	111.92	111.7	110.67	110.67	110.49	111.07	111.7	112.14	112.61]	
							I	I		L Average =	Sum(39)1	/12=	111.92	(39)
Heat lo	oss para	meter (H	HLP), W	′m²K					(40)m	= (39)m ÷	(4)			
(40)m=	1.16	1.16	1.16	1.15	1.15	1.13	1.13	1.13	1.14	1.15	1.15	1.15		
Numbe	er of day	/s in moi	nth (Tab	le 1a)			•		,	Average =	Sum(40)1.	12 /12=	1.15	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
													1	
4 10/-	1	•												
4. vva	iter neat	ling ener	rgy requ	irement:								kWh/y	ear:	
		ipancy,										.72]	(42)
			+ 1.76 x	[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13.	9)			
	A £ 13.9		atorusa	no in litre	e por da	w Vd av	erage =	(25 × NI)	+ 36		10	2.00	1	(42)
							designed t			se target o		3.89	J	(43)
not more	e that 125	litres per j	person pe	r day (all w	ater use, l	hot and co	ld)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage il	n litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)				•		
(44)m=	114.28	110.12	105.97	101.81	97.66	93.5	93.5	97.66	101.81	105.97	110.12	114.28		
							1	1		Total = Su	m(44) ₁₁₂ =	=	1246.68	(44)
Energy o	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	m x nm x D	0Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m=	169.47	148.22	152.95	133.35	127.95	110.41	102.31	117.4	118.81	138.46	151.14	164.12		
		_								Total = Su	m(45) ₁₁₂ =	=	1634.59	(45)
lf instant	aneous w	ater heatii	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46) to (61)				-	
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0		(46)
	storage												1	
-		. ,					storage		ame ves	sel		150		(47)
	•	-			-) litres in	• •			47)			
			not wate	er (this in	iciudes i	nstantar	neous co	nod idmo	ers) ente	er 'O' in (47)			
	storage		eclared I	oss facto	or is kno	wn (kWł	n/dav).					0	1	(48)
,			m Table				/ddy).]]	
								(40) (40)				0]	(49)
			-	, kWh/ye cylinder l		or is not		(48) x (49)) =			0		(50)
				om Tabl								0	1	(51)
		-	ee secti		(• /				L	-	J	()
Volume	e factor	from Ta	ble 2a									0]	(52)
Tempe	rature f	actor fro	m Table	2b								0]	(53)

		om water (54) in (5	-	e, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54) (55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)r	m	L		1	
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(56)
	er contain	L s dedicate	l d solar sto	l orage, (57)	l m = (56)m	x [(50) – (H11)] ÷ (50	0), else (5 ⁻	7)m = (56)	m where (L H11) is fro	I om Appenc	lix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(57)
Primar	y circuit	loss (ar	nual) fro	om Table	e 3							0]	(58)
	•			for each	,		. ,	• •						
•		r	r	1	r	i	1		ı cylindei		r í		1	(50)
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(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 req	uired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	I
(62)m=	144.05	125.99	130.01	113.34	108.76	93.85	86.96	99.79	100.99	117.69	128.47	139.51		(62)
Solar DI	HW input	calculated	using App	endix G o	r Appendix	H (negati	ve quantity	v) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	NWHRS	applies	, see Ap	pendix (G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(63)
Output	from w	ater hea	ter										1	
(64)m=	144.05	125.99	130.01	113.34	108.76	93.85	86.96	99.79	100.99	117.69	128.47	139.51		-
								Outp	out from wa	ater heate	r (annual)₁	12	1389.41	(64)
Heat g	ains fro	m water	heating	, kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (61)m	1] + 0.8 x	(46)m	+ (57)m	+ (59)m]	
(65)m=	36.01	31.5	32.5	28.34	27.19	23.46	21.74	24.95	25.25	29.42	32.12	34.88		(65)
inclu	ide (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	neating	
5. Int	ternal ga	ains (see	e Table 5	5 and <mark>5a</mark>):									
Metab	olic gair	s (Table	e 5), Wat	tts								-		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	135.78	135.78	135.78	135.78	135.78	135.78	135.78	135.78	135.78	135.78	135.78	135.78		(66)
Lightin	g gains	(calcula	ted in A	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	22.66	20.12	16.36	12.39	9.26	7.82	8.45	10.98	14.74	18.71	21.84	23.29]	(67)
Applia	nces ga	ins (calc	ulated ir	n Append	dix L, eq	uation L	13 or L1	3a), also	see Tal	ble 5				
(68)m=	252.29	254.91	248.31	234.27	216.54	199.87	188.74	186.12	192.72	206.77	224.5	241.16		(68)
Cookir	ng gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a)	, also se	e Table	5		-		
(69)m=	36.58	36.58	36.58	36.58	36.58	36.58	36.58	36.58	36.58	36.58	36.58	36.58		(69)
Pumps	and fai	ns gains	(Table :	5a)										
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses	s e.g. ev	vaporatio	n (nega	tive valu	es) (Tab	le 5)			•			•		
(71)m=	-108.62	-108.62	-108.62	-108.62	-108.62	-108.62	-108.62	-108.62	-108.62	-108.62	-108.62	-108.62		(71)
Water	heating	gains (T	able 5)									!	1	
(72)m=	48.4	46.87	43.69	39.36	36.54	32.59	29.22	33.53	35.06	39.55	44.61	46.88		(72)
Total i	nternal	gains =	:	!		(66)	m + (67)m	u + (68)m +	⊦ (69)m + ((70)m + (7	1)m + (72))m	1	
(73)m=	387.08	385.64	372.1	349.75	326.08	304.01	290.15	294.37	306.26	328.76	354.68	375.06]	(73)
	lar gains	S:		1	1		1	L	1	l		1	4	

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

Orientation:	Access Factor Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North 0.9	x 0.77	x	2.39	x	10.63	×	0.76	x	0.8	=	21.42	(74)
North 0.9	x 0.77	x	1.44	x	10.63	x	0.76	x	0.8	=	12.9	(74)
North 0.9	x 0.77	x	2.39	x	20.32	x	0.76	x	0.8	=	40.93	(74)
North 0.9	x 0.77	x	1.44	x	20.32	x	0.76	x	0.8	=	24.66	(74)
North 0.9	× 0.77	x	2.39	x	34.53	x	0.76	x	0.8	=	69.54	(74)
North 0.9	× 0.77	x	1.44	x	34.53	×	0.76	x	0.8	=	41.9	(74)
North 0.9	x 0.77	x	2.39	x	55.46	×	0.76	x	0.8	=	111.71	(74)
North 0.9	x 0.77	x	1.44	x	55.46	x	0.76	x	0.8	=	67.3	(74)
North 0.9	x 0.77	x	2.39	x	74.72	x	0.76	x	0.8	=	150.48	(74)
North 0.9	x 0.77	x	1.44	x	74.72	×	0.76	x	0.8	=	90.67	(74)
North 0.9	x 0.77	x	2.39	x	79.99	×	0.76	x	0.8	=	161.09	(74)
North 0.9	x 0.77	x	1.44	x	79.99	×	0.76	x	0.8	=	97.06	(74)
North 0.9	x 0.77	x	2.39	x	74.68	x	0.76	x	0.8	=	150.4	(74)
North 0.9	x 0.77	x	1.44	x	74.68	×	0.76	x	0.8	=	90.62	(74)
North 0.9	x 0.77	x	2.39	x	59.25	×	0.76	x	0.8	=	119.32	(74)
North 0.9	× 0.77	x	1.44	×	59.25	X	0.76	X	0.8	=	71.89	(74)
North 0.9	x 0.77	x	2.39	x	41.52	x	0.76	x	0.8	=	83.62	(74)
North 0.9	x 0.77	x	1.44	x	41.52	×	0.76	x	0.8	=	50.38	(74)
North 0.9	x 0.77	x	2.39	x	24.19	x	0.76	x	0.8	=	48.72	(74)
North 0.9	x 0.77	x	1.44	×	24.19	×	0.76	x	0.8	=	29.35	(74)
North 0.9	x 0.77	x	2.39	×	13.12	×	0.76	×	0.8	=	26.42	(74)
North 0.9	x 0.77	x	1.44	x	13.12	x	0.76	x	0.8	=	15.92	(74)
North 0.9	x 0.77	x	2.39	x	8.86	×	0.76	x	0.8	=	17.85	(74)
North 0.9	x 0.77	x	1.44	x	8.86	x	0.76	x	0.8	=	10.76	(74)
South 0.9	x 0.77	x	2.39	x	46.75	×	0.76	x	0.8	=	94.16	(78)
South 0.9	x 0.77	x	1.44	x	46.75	×	0.76	x	0.8	=	28.37	(78)
South 0.9	x 0.77	x	3.15	x	46.75	×	0.76	x	0.8	=	62.05	(78)
South 0.9	x 0.77	x	2.39	x	76.57	×	0.76	x	0.8	=	154.21	(78)
South 0.9	x 0.77	x	1.44	x	76.57	x	0.76	x	0.8	=	46.46	(78)
South 0.9	x 0.77	x	3.15	x	76.57	×	0.76	x	0.8	=	101.62	(78)
South 0.9	x 0.77	x	2.39	x	97.53	×	0.76	x	0.8	=	196.44	(78)
South 0.9	× 0.77	x	1.44	x	97.53	x	0.76	x	0.8	=	59.18	(78)
South 0.9	x 0.77	x	3.15	x	97.53	x	0.76	x	0.8	=	129.45	(78)
South 0.9	x 0.77	x	2.39	x	110.23	×	0.76	x	0.8	=	222.01	(78)
South 0.9	x 0.77	x	1.44	x	110.23	×	0.76	x	0.8	=	66.88	(78)
South 0.9	x 0.77	x	3.15	×	110.23	×	0.76	x	0.8	=	146.31	(78)
South 0.9	x 0.77	x	2.39	×	114.87	×	0.76	x	0.8	=	231.35	(78)
South 0.9	x 0.77	x	1.44	×	114.87	×	0.76	x	0.8	=	69.7	(78)
South 0.9	x 0.77	X	3.15	x	114.87	×	0.76	x	0.8	=	152.46	(78)

South													
	0.9x	0.77	x	2.39	x	110.55	x	0.76	x	0.8	=	222.65	(78)
South	0.9x	0.77	x	1.44	x	110.55	x	0.76	×	0.8	=	67.07	(78)
South	0.9x	0.77	x	3.15	x	110.55	x	0.76	×	0.8	=	146.72	(78)
South	0.9x	0.77	x	2.39	×	108.01	x	0.76	×	0.8	=	217.54	(78)
South	0.9x	0.77	x	1.44	x	108.01	x	0.76	x	0.8	=	65.53	(78)
South	0.9x	0.77	x	3.15	×	108.01	x	0.76	x	0.8	=	143.36	(78)
South	0.9x	0.77	x	2.39	×	104.89	x	0.76	×	0.8	=	211.26	(78)
South	0.9x	0.77	x	1.44	×	104.89	x	0.76	x	0.8	=	63.64	(78)
South	0.9x	0.77	x	3.15	×	104.89	x	0.76	x	0.8	=	139.22	(78)
South	0.9x	0.77	x	2.39	×	101.89	x	0.76	×	0.8	=	205.2	(78)
South	0.9x	0.77	x	1.44	x	101.89	x	0.76	×	0.8	=	61.82	(78)
South	0.9x	0.77	x	3.15	×	101.89	x	0.76	×	0.8	=	135.23	(78)
South	0.9x	0.77	×	2.39	×	82.59	x	0.76	×	0.8	=	166.33	(78)
South	0.9x	0.77	×	1.44	×	82.59	×	0.76	×	0.8	=	50.11	(78)
South	0.9x	0.77	×	3.15	×	82.59	×	0.76	×	0.8	=	109.61	(78)
South	0.9x	0.77	×	2.39	×	55.42	x	0.76	×	0.8	=	111.61	(78)
South	0.9x	0.77	×	1.44	×	55.42	_ x	0.76	×	0.8	=	33.62	(78)
South	0.9x	0.77	×	3.15	X	55.42	x	0.76	x	0.8		73.55	(78)
South	0.9x	0.77	Ī×	2.39	X	40.4	x	0.76	x	0.8		81.36	(78)
South	0.9x	0.77	Ī×	1.44	×	40.4	ī 🔊	0.76	x	0.8	=	24.51	(78)
South		0.77	-	0.45	ī 🗸	40.4	ī/.		-				Ξ
South	0.9x	0.77	X	3.15		40.4	X	0.76	x	0.8	=	53.62	(78)
South	0.98	0.77	X	3.15		40.4		0.76	X	0.8	=	53.62	(78)
				for each mon	J ^ th	40.4	1	0.76 r = Sum(74)m		0.8	=	53.62	(78)
		watts, calcu			_	94.59 667.45	1	r = Sum(74)m			188.1	53.62	(78)
Solar ((83)m=	ains in 218.9	watts, calcu 367.88 49	Lated	for each mon	56	94.59 667.45	(83)m	r = Sum(74)m	.(82)m			53.62	
Solar ((83)m=	ains in 218.9	watts, calcu 367.88 49 nternal and	Lated	for each mon 614.22 694.6	5 6 n + (94.59 667.45	(83)m	n = Su m(74)m .34 536.24	.(82)m	2 261.12		53.62	
Solar g (83)m= Total g (84)m=	ains in 218.9 ains — i 605.98	watts, calcu 367.88 49 nternal and 753.51 86	lated 6.51 solar	for each mon 614.22 694.6 (84)m = (73)r	5 6 n + (73 9	94.59 667.45 83)m , watts	(83)m 605	n = Su m(74)m .34 536.24	(82)m 404.1	2 261.12	188.1	53.62	(83)
Solar ((83)m= Total g (84)m= 7. Me	ains in 218.9 ains – i 605.98 an inter	watts, calcu 367.88 49 nternal and 753.51 86 nal tempera	□ lated 6.51 solar i8.6 ture (for each mon 614.22 694.6 (84)m = (73)r 963.96 1020. (heating sease	5 6 n + (73 9 on)	94.59 667.45 83)m , watts	(83)m 605 899	r = Sum(74)m .34 536.24 .71 842.5	(82)m 404.1	2 261.12	188.1	21	(83)
Solar ((83)m= Total g (84)m= 7. Me Temp	ains in 218.9 ains – i 605.98 an inter erature	watts, calcu 367.88 49 nternal and 753.51 86 nal tempera during heat	Lated 6.51 solar i8.6 ture (for each mon 614.22 694.6 (84)m = (73)r 963.96 1020. (heating sease	5 6 n + (73 9 on)	94.59 667.45 83)m , watts 98.61 957.6 area from Tal	(83)m 605 899	r = Sum(74)m .34 536.24 .71 842.5	(82)m 404.1	2 261.12	188.1		(83) (84)
Solar ((83)m= Total g (84)m= 7. Me Temp	ains in 218.9 ains – i 605.98 an inter erature	watts, calcu 367.88 49 nternal and 753.51 86 nal tempera during heat	Lated 6.51 solar i8.6 ture (for each mon 614.22 694.6 (84)m = (73)r 963.96 1020. (heating sease eriods in the li	5 6 m + (73 9 on) iving ,m (s	94.59 667.45 83)m , watts 98.61 957.6 area from Tal	(83)m 605 899 ble 9	r = Sum(74)m .34 536.24 .71 842.5	(82)m 404.1	2 261.12 3 615.8	188.1		(83) (84)
Solar ((83)m= Total g (84)m= 7. Me Temp	ains in 218.9 ains – i 605.98 an inter erature	watts, calcu 367.88 49 nternal and 753.51 86 nal tempera during heat ctor for gains Feb N	lated 6.51 solar i8.6 ture (ing politications)	for each mon 614.22 694.6 (84)m = (73)r 963.96 1020. (heating seas eriods in the li iving area, h1	5 6 m + (73 9 on) iving ,m (s	94.59 667.45 83)m , watts 98.61 957.6 area from Tal ee Table 9a)	(83)m 605 899 ble 9	1 = Sum(74)m .34 536.24 .71 842.5 , Th1 (°C) ug Sep	 404.1; 732.8	2 261.12 3 615.8	188.1		(83) (84)
Solar ((83)m= Total g (84)m= 7. Me Temp Utilisa (86)m=	ains in 218.9 ains – i 605.98 an inter erature ation fac Jan 1	watts, calcu 367.88 49 nternal and 753.51 86 nal tempera during heat ctor for gains Feb M 0.99 0.	Lated 6.51 solar is8.6 ture (ing po ing po for li Mar 98	for each mon 614.22 694.6 $(84)m = (73)r$ 963.96 $1020.^{-1}$ (heating sease eriods in the line ving area, h1 Apr Ma 0.94 0.84	5 6 m + (73 9 on) ving ,m (s y	94.59 667.45 83)m , watts 98.61 957.6 area from Tal ee Table 9a) Jun Jul 0.67 0.5	(83)m 605 899 ble 9 A 0.5	I = Sum(74)m .34 536.24 .71 842.5 .71 842.5 , Th1 (°C) ug Sep .55 0.79	 404.12 732.84	2 261.12 3 615.8 Nov	188.1 563.16 Dec		(83) (84) (85)
Solar ((83)m= Total g (84)m= 7. Me Temp Utilisa (86)m=	ains in 218.9 ains – i 605.98 an inter erature ation fac Jan 1	watts, calcu 367.88 49 nternal and 753.51 86 nal tempera during heat ctor for gains Feb N 0.99 0.	Lated 6.51 solar is8.6 ture (ing po ing po for li Mar 98	for each mon 614.22 694.6 $(84)m = (73)r$ 963.96 $1020.^{-1}$ (heating sease eriods in the line ving area, h1 Apr Ma 0.94 0.84	5 6 n + (73 9 on) iving ,m (s y (follo	94.59 667.45 83)m , watts 98.61 957.6 area from Tal ee Table 9a) Jun Jul	(83)m 605 899 ble 9 A 0.5	= Sum(74)m .34 536.24 .71 842.5 , Th1 (°C) ug Sep .5 0.79 Table 9c)	 404.12 732.84	2 261.12 3 615.8 Nov 0.99	188.1 563.16 Dec		(83) (84) (85)
Solar ((83)m= Total g (84)m= 7. Me Temp Utilisa (86)m= Mean (87)m=	ains in 218.9 ains – i 605.98 an inter erature ation fac Jan 1 interna 19.76	watts, calcu 367.88 49 nternal and 753.51 86 nal tempera during heat ctor for gains Feb M 0.99 0. I temperatur 19.97 20	Lated 6.51 solar 8.6 ture (for li 98 98 re in l 0.24	for each mon 614.22 694.6 $(84)m = (73)r$ 963.96 $1020.^{\circ}$ 963.96 $1020.^{\circ}$ (heating sease eriods in the line eving area, h1 Apr Ma 0.94 0.84 iving area T1 20.57 20.57 20.83	5 6 m + (73 9 on) iving ,m (s y (follo 3 2	94.59 667.45 83)m , watts 98.61 957.6 area from Tal ee Table 9a) Jun Jul 0.67 0.5 ow steps 3 to 7 20.96 20.99	(83)m 605 899 ble 9 A 0.5 7 in T 20.	= Sum(74)m .34 536.24 .71 842.5 , Th1 (°C) ug Sep 55 0.79 Table 9c) 99 20.91	 404.1: 732.84 Oct 0.96	2 261.12 3 615.8 Nov 0.99	188.1 563.16 Dec 1		(83) (84) (85) (86)
Solar ((83)m= Total g (84)m= 7. Me Temp Utilisa (86)m= Mean (87)m= Temp	ains in 218.9 ains – i 605.98 an inter erature ation fac Jan 1 interna 19.76 erature	watts, calcu 367.88 49 nternal and 753.51 86 nal tempera during heat ctor for gains Feb M 0.99 0. I temperatur 19.97 20 during heat	Lated 6.51 solar is.6 ture (ing po for li Aar 98 re in l 0.24 ing po	for each mon 614.22 $694.6(84)m = (73)r963.96$ $1020.7(heating seaseeriods in the line)iving area, h1Apr Ma0.94$ $0.84iving area T120.57$ $20.83eriods in rest$	5 6 n + (73 9 9 oon) 9 viving 9 (follc 3 2 2 oof dw 9	94.59 667.45 83)m , watts 98.61 957.6 area from Tal ee Table 9a) Jun Jul 0.67 0.5 ow steps 3 to 7 20.96 20.99 velling from Ta	(83)m 605 899 ble 9 A 0.5 7 in T 20.	I = Sum(74)m .34 536.24 .71 842.5 .71 842.5 , Th1 (°C) ug Sep 55 0.79 Table 9c) 99 20.91 0, Th2 (°C)	 404.1: 732.84 Oct 0.96	2 261.12 3 615.8 Nov 0.99 20.09	188.1 563.16 Dec 1		(83) (84) (85) (86)
Solar ((83)m= Total g (84)m= 7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m=	ains in 218.9 ains – i 605.98 an inter erature ation fac Jan 1 interna 19.76 erature 19.95	watts, calcu 367.88 49 nternal and 753.51 86 nal tempera during heat ctor for gains Feb M 0.99 0. I temperatur 19.97 20 during heat 19.95 19	Lated 6.51 solar is.6 ture (ing po for li Aar 98 re in l 0.24 ing po 0.95	for each mon 614.22 694.6 $(84)m = (73)r$ 963.96 1020.7 (heating sease eriods in the line iving area, h1 Apr Ma 0.94 0.84 iving area T1 20.57 20.83 eriods in rest 19.96 19.96	5 6 n + (73 9 9 oon) 9 vving 9 (folloc 3 2 2 of dw 3	94.59 667.45 83)m , watts 98.61 957.6 area from Tal ee Table 9a) Jun Jul 0.67 0.5 ow steps 3 to 7 20.96 20.99 velling from Ta 19.97 19.97	(83)m 605 899 ble 9 A 0.5 7 in T 20. able 9	I = Sum(74)m .34 536.24 .71 842.5 .71 842.5 , Th1 (°C) ug Sep 55 0.79 Table 9c) 99 20.91 0, Th2 (°C)	 404.1; 732.84 Oct 0.96 20.56	2 261.12 3 615.8 Nov 0.99 20.09	188.1 563.16 Dec 1 19.72		(83) (84) (85) (85) (86) (87)
Solar ((83)m= Total g (84)m= 7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa	ains in 218.9 ains – i 605.98 an inter erature ation fac Jan 1 interna 19.76 erature 19.95 ation fac	watts, calcu 367.88 49 nternal and 753.51 86 nal tempera during heat ctor for gains Feb M 0.99 0. I temperatur 19.97 20 during heat 19.95 19	□ lated 6.51 solar i8.6 ture (ing po for li /ar 98 re in l 0.24 ing po 0.95 for r	for each mon 614.22 694.6 $(84)m = (73)r$ 963.96 $1020.^{\circ}$ 963.96 $1020.^{\circ}$ (heating sease eriods in the line tving area, h1 Apr Ma 0.94 0.84 iving area T1 20.57 20.57 20.83 eriods in rest 19.96 19.96 19.96	5 6 n + ((73 9 on) (ving (y ((follo 3 3 2 of dw 3 y (94.59 667.45 83)m , watts 98.61 957.6 area from Tal ee Table 9a) Jun Jul 0.67 0.5 ow steps 3 to 7 20.96 20.99 velling from Ta 19.97 19.97 ,m (see Table	(83)m 605 899 ble 9 A 0.t 7 in T 20. 3 ble 9 19. 99a)	= Sum(74)m .34 536.24 .71 842.5 , Th1 (°C) ug Sep j5 0.79 Gable 9c) 99 99 20.91 97 19.97	 404.1: 732.84 732.84 0.96 20.56 19.96	2 261.12 3 615.8 Nov 0.99 20.09 19.96	188.1 563.16 Dec 1 19.72 19.96		(83) (84) (85) (85) (86) (87) (88)
Solar ((83)m= Total g (84)m= 7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m=	ains in 218.9 ains – i 605.98 an inter erature ation fac 19.76 erature 19.95 ation fac 1	watts, calcu 367.88 49 nternal and 753.51 86 mal temperat during heat ctor for gains Feb M 0.99 0. I temperatur 19.97 20 during heat 19.95 19 ctor for gains 0.99 0.	□ lated 6.51 solar i8.6 ture (ing po for li /ar 98 re in l 0.24 ing po 0.95 for r 97	for each mon 614.22 694.6 $(84)m = (73)r$ 963.96 1020.7 963.96 1020.7 (heating sease eriods in the line eriods in the line 0.94 0.84 iving area T1 20.57 20.83 eriods in rest 19.96 19.96 19.96 0.92 0.79	5 6 n + (73 9 on) 9 9 ving 9 9 (folloc 3 2 of dw 3 2 g, h2 9 9	94.59 667.45 83)m , watts 98.61 957.6 area from Tal ee Table 9a) Jun Jul 0.67 0.5 ow steps 3 to 7 20.96 20.99 velling from Ta 19.97 19.97 ,m (see Table 0.58 0.39	(83)m 605 899 ble 9 ble 9 A 0.5 7 in T 20. 3 20. 19. 19. 9a) 0.2	= Sum(74)m .34 536.24 .71 842.5 .71 842.5 , Th1 (°C) ug Sep .5 0.79 Table 9c) 99 20.91 97 19.97 14 0.71	 404.1: 732.84 732.84 0.96 20.56 19.96 0.94	2 261.12 3 615.8 Nov 0.99 20.09	188.1 563.16 Dec 1 19.72		(83) (84) (85) (85) (86) (87)
Solar ((83)m= Total g (84)m= 7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean	ains in 218.9 ains – i 605.98 an inter erature ation fac Jan 1 interna 19.76 erature 19.95 ation fac 1 interna	watts, calcu 367.88 49 nternal and 753.51 86 nal temperation during heat ctor for gains Feb M 0.99 0. I temperatur 19.95 19 ctor for gains 0.99 0. I temperatur 19.95 19 ctor for gains	$\begin{bmatrix} ated \\ 6.51 \\ solar \\ as \\ as \\ as \\ as \\ b \\ b \\ b \\ c \\ as \\ b \\ c \\$	for each mon 614.22 694.6 $(84)m = (73)r$ 963.96 $1020.^{\circ}$ (heating sease eriods in the line iving area, h1 Apr Ma 0.94 0.84 iving area T1 20.57 20.83 eriods in rest 19.96 19.96 19.96 19.96 19.96 est of dwelling 0.92 0.79 he rest of dwelling 0.92 0.79	5 6 n + (73 9 9 on) 9 vving 9 (follc 3 2 2 of dw 3 3 2 of dw 3 blling 9	94.59 667.45 83)m , watts 98.61 957.6 area from Tal ee Table 9a) Jun Jul 0.67 0.5 ow steps 3 to 7 20.96 20.99 velling from Ta 19.97 19.97 ,m (see Table 0.58 0.39 T2 (follow ste	(83)m 605 899 ble 9 ble 9 A 0.5 7 in T 20. 3 ble 9 19. 0.2 9a) 0.2 eps 3	I = Sum(74)m .34 536.24 .71 842.5 .71 842.5 , Th1 (°C) ug Sep 5 0.79 5 0.79 5 0.79 6 Th2 (°C) 97 19.97 14 0.71 to 7 in Table	 .(82)m 404.1; 732.8; 732.8; 0.96 20.56 19.96 0.94 e 9c)	2 261.12 3 615.8 Nov 0.99 20.09 19.96 0.99	188.1 563.16 Dec 1 19.72 19.96		(83) (84) (84) (85) (85) (86) (87) (88) (88) (89)
Solar ((83)m= Total g (84)m= 7. Me Temp Utilisa (86)m= Mean (87)m= Temp (88)m= Utilisa (89)m=	ains in 218.9 ains – i 605.98 an inter erature ation fac 19.76 erature 19.95 ation fac 1	watts, calcu 367.88 49 nternal and 753.51 86 nal temperation during heat ctor for gains Feb M 0.99 0. I temperatur 19.95 19 ctor for gains 0.99 0. I temperatur 19.95 19 ctor for gains	□ lated 6.51 solar i8.6 ture (ing po for li /ar 98 re in l 0.24 ing po 0.95 for r 97	for each mon 614.22 694.6 $(84)m = (73)r$ 963.96 1020.7 963.96 1020.7 (heating sease eriods in the line eriods in the line 0.94 0.84 iving area T1 20.57 20.83 eriods in rest 19.96 19.96 19.96 0.92 0.79	5 6 n + (73 9 9 on) 9 vving 9 (follc 3 2 2 of dw 3 3 2 of dw 3 blling 9	94.59 667.45 83)m , watts 98.61 957.6 area from Tal ee Table 9a) Jun Jul 0.67 0.5 ow steps 3 to 7 20.96 20.99 velling from Ta 19.97 19.97 ,m (see Table 0.58 0.39	(83)m 605 899 ble 9 ble 9 A 0.5 7 in T 20. 3 20. 19. 19. 9a) 0.2	= Sum(74)m .34 536.24 .71 842.5 .71 842.5 , Th1 (°C) ug Sep j5 0.79 Gable 9c) 99 99 20.91 97 19.97 14 0.71 to 7 in Table 97 19.92	 .(82)m 404.1: 732.84 732.84 0.96 20.56 19.96 0.94 e 9c) 19.62	2 261.12 3 615.8 Nov 0.99 20.09 19.96 0.99	188.1 563.16 Dec 1 19.72 19.96 1 18.79		(83) (84) (85) (85) (86) (87) (88)

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

			_	_				-						
(92)m=	19.11	19.32	19.59	19.91	20.15	20.26	20.29	20.28	20.22	19.91	19.45	19.08		(92)
Apply		nent to t	he mear	n internal	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	19.11	19.32	19.59	19.91	20.15	20.26	20.29	20.28	20.22	19.91	19.45	19.08		(93)
8. Spa	ace hea	ting requ	uirement	t										
				mperatur		ed at ste	əp 11 of	Table 9t	o, so tha	t Ti,m=(76)m an	d re-calo	ulate	
the ut			<u> </u>	using Ta	1				-	-		_	I	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
			ains, hm	i i					. = .					(0.4)
(94)m=	1	0.99	0.97	0.92	0.8	0.6	0.42	0.47	0.73	0.94	0.99	1		(94)
	<u> </u>		<u>`````</u>	4)m x (84	r								I	(05)
(95)m=	603.56	744.85	842.46	885.21	816.89	603.66	404.78	423.86	619.15	690.74	609.95	561.58		(95)
	· ·	<u> </u>	i	perature	i	i					r		I	
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat				al tempe	1		- /		· ,	-			I	
(97)m=	1682.4		1480.56		944.05	626.9	407.84	429.11	680.09	1040.02	1384.49	1675.26		(97)
Space	e heatin	g require	ement fo	r each m	nonth, k\	Nh/mont	h = 0.02	24 x [(97))m – (95)m] x (4′	1)m		l	
(98)m=	802.66	597.55	474.75	250.19	94.6	0	0	0	0	259.87	557.67	828.58		_
								Tota	l per year	(kWh/year) = Sum(9	8)15,912 =	3865.85	(98)
Space	e heatin	g require	ement in	kWh/m²	²/year					_			39.63	(99)
_			uiremer											
				August.	See Tel	alo 10b								
Calcu	Jan	Feb	Mar	August. Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat I				using 25	· · ·			<u> </u>	· ·		-			
(100)m=	0		0			1040.32		839.7		0	0	0		(100)
` ´		tor for lo								-		-		. ,
(101)m=	0		0	0	0	0.91	0.95	0.94	0	0	0	0		(101)
			_	(100)m x	-		0100	0101			Ů			
(102)m=	0	0	0			943.25	780.07	786.8	0	0	0	0		(102)
	-	-	-	for appli	-				-	Ŭ	Ŭ	Ŭ		
(103)m=	0					1270.64	1220.5	1154.65	0	0	0	0	l	(103)
	Ŭ	, °	Ů	r month,	Ű				-	-	-	-	(41)m	(100)
				< 3 × (98)		iweining,	continue	ous (KV	(1) = 0.0	24 X [(/ C	<i>) – 111(</i>	102)111].	x (41)111	
(104)m=	0	0	0	0	0	235.72	327.68	273.68	0	0	0	0		
									Total	= Sum(104)	=	837.08	(104)
Cooled	l fractio	า									area ÷ (4		1	(105)
Intermi	ttency f	actor (Ta	able 10b)							,	,		
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		
I				1					Tota	l = Sum((104)	=	0	(106)
Space	cooling	requirer	ment for	month =	: (104)m	× (105)	× (106)r	n			,			
(107)m=	0	0	0	0	0	58.93	81.92	68.42	0	0	0	0		
								•	Total	= Sum(107)	=	209.27	(107)
Space	cooling	requirer	ment in l	wh/m²/y	/ear				(107)) ÷ (4) =			2.15	(108)
-	-	-		alculated		der spec	cial cond	litions se	· ,	. ,			-	
		y Efficier		arculateu	Formy un	der spel		mions, 30		+ (108) =	_		11 70	(109)
Fault	- Energ		су						(99)	+ (100) =	-		41.78	(109)

				User D	etails:						
Assessor Name: Software Name:	Stroma FS	AP 201	_		Softwa	a Num are Ver	sion:			on: 1.0.0.28	
			P	roperty <i>i</i>	Address	: 4 Bed E	Enhance	d Fabric	:		
Address :											
1. Overall dwelling dime	nsions:			A	- (2)		A 11.				
Ground floor					a(m²)	(1a) x	Av. Hei		(2a) =	Volume(m ³)	(3a)
				5				2.5]	141.68	
First floor				5	6.67	(1b) x	2	2.5	(2b) =	141.68	(3b)
Total floor area TFA = (1a	a)+(1b)+(1c)+	(1d)+(1e)+(1n	I) 1 ⁻	13.34	(4)					
Dwelling volume						(3a)+(3b))+(3c)+(3d)+(3e)+	.(3n) =	283.35	(5)
2. Ventilation rate:										•	-
	main heating		econdar eating	у	other		total			m ³ per hour	
Number of chimneys		<u>ה + ר</u>	0] + [0] = [0	x 4	40 =	0	(6a)
Number of open flues	0		0	ī + Г	0] = [0	x 2	20 =	0	(6b)
Number of intermittent fai	าร						4	x 1	0 =	40	(7a)
Number of passive vents							0	x 1	0 =	0	(7b)
Number of flueless gas fi	es						0	x 4	40 =	0	(7c)
									Air ch	anges per hou	ır
Infiltration due to chimney	s, flues and f	ans = (6	a)+(6b)+(7	<mark>a)+</mark> (7b)+(7c) =		40	<u>-</u>	÷ (5) =	0.14	(8)
If a pressurisation test has be			ed, proceed	d to (17), d	otherwise o	continue fro	om (9) to (16)			-
Number of storeys in th Additional infiltration	e dw <u>elling</u> (na	5)						[(0)	41-0-4	0	(9)
Structural infiltration: 0.	25 for steel o	timbor f	frame or	0 35 for	macon	n constr	uction	[(9)-	1]x0.1 =	0	(10) (11)
if both types of wall are pr							uction			0](,,)
deducting areas of openin	ngs); if equal user	0.35	_	-							_
If suspended wooden f			ed) or 0.	1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ent										0	(13)
Percentage of windows	and doors dr	aught st	ripped		0.05 10.0		001			0	(14)
Window infiltration						: x (14) ÷ 1 + (11) + (1		(15) -		0	(15)
Infiltration rate		مانه منه	ia matra				, , ,		o.ro.o	0	(16)
Air permeability value, If based on air permeabili				•	•	-	elle ol e	nvelope	area	4.5	(17)
Air permeability value applies	-						is beina us	sed		0.37	(18)
Number of sides sheltere					,	,	J			2	(19)
Shelter factor					(20) = 1 -	[0.075 x (1	9)] =			0.85	(20)
Infiltration rate incorporation	ng shelter fac	tor			(21) = (18) x (20) =				0.31	(21)
Infiltration rate modified for	or monthly wir	nd speed									
Jan Feb	Mar Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	eed from Tabl	e 7								_	
(22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		

Wind F	actor (2	22a)m =	(22)m ÷	4										
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjust	ed infiltr	ation rat	· ·e (allow	ing for sl	nelter an	d wind s	speed) –	(21a) x	(22a)m					
/ lajuot	0.4	0.39	0.38	0.34	0.33	0.3	0.3	0.29	0.31	0.33	0.35	0.37		
			-	rate for t		cable ca	ise		I			L		
		al ventila											0	(23a)
			0 11	endix N, (2	, (, (<i>,, ,</i>	,	o) = (23a)			0	(23b)
			-	iency in %	-								0	(23c)
	r	i	î .	1	r	i	1	1	r i	<u>, </u>	1 1	1 – (23c)	÷ 100]	(0.1-)
(24a)m=		0	0	0	0	0	0	0	0	0	0	0	l	(24a)
		1	1	entilation	· · · · · ·	1	1	т <u>́</u>	ŕ	1	1		l	(24)
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0	l	(24b)
,				ntilation of the the the the the the the the the the	•	•				.5 x (23t	5)			
(24c)m=	r í	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If	natural	ventilati	u on or wh	l Iole hous	e positi	ve input	ventilatio	n from	I loft	ļ	ļ		1	
)m = (22						0.5]				
(24d)m=	0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57		(24d)
Effe	ctive air	change	rate - ei	nter (24a) or (24	o) or (24	c) or (24	d) in bo	x (25)					
(25)m=	0.58	0.58	0.57	0.56	0.56	0.54	0.54	0.54	0.55	0.56	0.56	0.57		(25)
3. He	at l <mark>osse</mark>	s and he	eat l <mark>oss</mark>	paramet	er: 🗹									
ELEN	IENT	Gro		Openin	igs	Net Ar		U-val		ΑXU		k-value		AXk
Deser		area	(m²)	r	¹²	A ,r		W/m2	2K	(VV/	K)	kJ/m²∙ł	<	kJ/K
Doors						2	×	1.1	=	2.2	4			(26)
	ws Type -					2.39	_ .	/[1/(1.2)+		2.74				(27)
	ws Type _					2.39		/[1/(1.2)+		2.74				(27)
	ws Type _					1.44		/[1/(1.2)+		1.65				(27)
	ws Type					1.44		/[1/(1.2)+		1.65				(27)
	ws Type					0.96	x1	/[1/(1.2)+	0.04] =	1.1				(27)
Windo	ws Type	e 6				3.15	x1	/[1/(1.2)+	0.04] =	3.61				(27)
Floor						56.67	7 X	0.15	=	8.5005	5			(28)
Walls		113.	52	20		93.52	2 X	0.18	=	16.83				(29)
Roof		56.6	67	0		56.67	7 X	0.1	=	5.67				(30)
Total a	area of e	lements	s, m²			226.8	6							(31)
Party v	wall					50	x	0	=	0				(32)
				effective wi nternal wal			lated using	g formula 1	1/[(1/U-valu	ue)+0.04] a	as given in	n paragraph	3.2	
Fabric	heat los	s, W/K	= S (A x	U)				(26)(30) + (32) =				53.81	(33)
Heat c	apacity	Cm = S	(A x k)						((28).	(30) + (3	2) + (32a).	(32e) =	13871.4	48 (34)
Therm	al mass	parame	eter (TMI	P = Cm -	÷ TFA) ir	ר kJ/m²K			Indica	ative Value	: Medium		250	(35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f

can be ι	ised inste	ad of a de	tailed calc	ulation.										
Therm	al bridge	es : S (L	x Y) cal	culated	using Ap	pendix I	<						11.34	(36)
			are not kn	own (36) =	= 0.15 x (3	1)								
	abric he									(36) =			65.15	(37)
Ventila	tion hea			l monthly	y I				. ,		25)m x (5) I		1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	54.12	53.83	53.55	52.23	51.99	50.84	50.84	50.63	51.29	51.99	52.48	53.01		(38)
Heat tr	ansfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	119.28	118.99	118.71	117.39	117.14	115.99	115.99	115.79	116.44	117.14	117.64	118.16		
						-	-	-			Sum(39)1	12 /12=	117.39	(39)
		· · ·	HLP), W/	i					. ,	= (39)m ÷			1	
(40)m=	1.05	1.05	1.05	1.04	1.03	1.02	1.02	1.02	1.03	1.03	1.04	1.04		
Numbe	er of day	vs in moi	nth (Tab	le 1a)						Average =	Sum(40)1.	12 /12=	1.04	(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	iter heat	ting ener	rgy requi	irement:								kWh/y	ear:	
													1	
		ipancy, l A N – 1		[1 - eyn	(-0.0003			(2)1 + 0)013 v (⁻	ΓFΔ _13		.83		(42)
	A £ 13.9		1.70 /		(0.0000		10.0	/2/] 1 0.0			,			
							erage =					6.84		(43)
		-		usage by . [•] day (all w		-	designed t Id)	to achieve	a water us	se target o	f			
not more													1	
Hot wat	Jan	Feb	Mar day for e	Apr Apr	May	Jun	Jul Table 1c x	Aug	Sep	Oct	Nov	Dec	J	
	-			-				· ·					1	
(44)m=	117.52	113.25	108.97	104.7	100.43	96.15	96.15	100.43	104.7	108.97	113.25	117.52		
Energy of	content of	hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x D)))))))))))))))))))			<mark>m(44)</mark> 112 = ables 1b, 1		1282.05	(44)
(45)m=	174.28	152.43	157.29	137.13	131.58	113.54	105.21	120.74	122.18	142.39	155.43	168.78	1	
(10)11-		102.10	101.20	101.10	101.00	110.01	100.21	120111			m(45) ₁₁₂ =		1680.97	(45)
lf instan	taneous w	ater heatii	ng at point	of use (no	hot water	^r storage),	enter 0 in	boxes (46						(- /
(46)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(46)
Water	storage	loss:					1	1			I	1	1	
Storag	e volum	e (litres)	includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		180		(47)
	•	-			-		litres in	• •						
			hot wate	er (this ir	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
	storage						. (1	
				oss facto	or is kno	wn (kvvr	n/day):					0]	(48)
			m Table									0		(49)
			-	, kWh/ye		or io not		(48) x (49)	=			0	J	(50)
,				cylinder l om Tabl								0	1	(51)
		-	ee secti		- (-11					•	J	(01)
	•	from Ta										0]	(52)
Tempe	erature f	actor fro	m Table	2b								0	1	(53)

•		om water (54) in (5	-	e, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54) (55)
	. ,			for each	month			((56)m = (55) × (41)ı	m		-	1	、
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0	1	(56)
	-	-	-	-	-	-		-	7)m = (56)	-	-	-	l lix H	、
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(57)
Prima	v circuit	loss (ar	nual) fro	om Table	e 3	-		-				0		(58)
Primar	y circuit	loss cal	culated	for each	month ((58) ÷ 36	• •					•	
(mo (59)m=	dified by	0 tactor f	rom Tab			olar wat	ter heatir	ng and a	cylinde	r thermo	stat)	0	1	(59)
				_					Ū	0	0	0	l	(00)
	r		r	1	,	, , I	65 × (41)	· · · · · · · · · · · · · · · · · · ·			-	<u> </u>	1	(04)
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(61)
	· · · ·	r				· · · · · ·		<u> </u>			<u> </u>	<u>, ,</u>	(59)m + (61)m 1	
(62)m=	148.14	129.56	133.7	116.56	111.84	96.51	89.43	102.62	103.85	121.03	132.11	143.46	J	(62)
	•		• • •					, ,	if no sola יר	r contribut	ion to wate	er heating)		
		r	r	r	r	· · ·	, see Ap	i	ŕ	0			1	(63)
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	J	(03)
		ater hea	i	110 50	444.04	06.54	00.42	102.62	103.85	121.03	122.14	143,46	1	
(64)m=	148.14	129.56	133.7	116.56	111.84	96.51	89.43		out from wa	_	132.11		1428.82	(64)
	in a fra		h a a tin a		anth 0 0		(15)							
			-	1		-			1] + 0.8 ×				, J 1	(65)
(65)m=	37.03	32.39	33.42	29.14	27.96	24.13	22.36	25.66	25.96	30.26	33.03	35.87	1	(03)
_						ylinder i	s in the d	dwelling	or hot w	ater is fr	om com	munity r	leating	
5. In	ternal ga	ains (see	e Table 5	5 and 5a):									
Metab		ns (Table											1	
(00)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(00)
									141.68	141.68	141.68	141.68	J	(66)
-		· · · · · · · · · · · · · · · · · · ·	· · · · · ·	1	· · · ·	1	r L9a), a	1					1	(07)
(67)m=	25.74	22.86	18.59	14.07	10.52	8.88	9.6	12.47	16.74	21.26	24.81	26.45		(67)
•••		<u>`</u>	r	· · ·	· · ·	ı — — —	r	· · · · · · · · · · · · · · · · · · ·	see Ta				1	
(68)m=	276.27	279.14	271.91	256.53	237.12	218.87	206.68	203.82	211.04	226.42	245.84	264.08	l	(68)
	<u> </u>	<u>`</u>			· · ·		· · · · ·		e Table			i	1	
(69)m=	37.17	37.17	37.17	37.17	37.17	37.17	37.17	37.17	37.17	37.17	37.17	37.17	J	(69)
Pumps	s and fa	ns gains	(Table :	5a)									1	
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	J	(70)
Losse	s e.g. e\	aporatic	on (nega	tive valu	es) (Tab	le 5)								
(71)m=	-113.34	-113.34	-113.34	-113.34	-113.34	-113.34	-113.34	-113.34	-113.34	-113.34	-113.34	-113.34		(71)
Water	heating	gains (T	able 5)										_	
(72)m=	49.78	48.2	44.93	40.47	37.58	33.51	30.05	34.48	36.06	40.67	45.87	48.21		(72)
Total i	internal	gains =				(66)	m + (67)m	n + (68)m -	+ (69)m + ((70)m + (7	1)m + (72))m	_	
(73)m=	417.29	415.7	400.93	376.58	350.72	326.77	311.83	316.28	329.35	353.85	382.02	404.24		(73)
6. So	lar gain:	s:												

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

Orientation:	Access Factor Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North 0.9	x 0.77	x	2.39	x	10.63	×	0.76	x	0.7	=	18.74	(74)
North 0.9	x 0.77	x	1.44	x	10.63	x	0.76	x	0.7	=	11.29	(74)
North 0.9	x 0.77	x	2.39	x	20.32	x	0.76	x	0.7	=	35.81	(74)
North 0.9	x 0.77	x	1.44	x	20.32	×	0.76	x	0.7	=	21.58	(74)
North 0.9	x 0.77	x	2.39	x	34.53	x	0.76	x	0.7	=	60.85	(74)
North 0.9	x 0.77	x	1.44	x	34.53	×	0.76	x	0.7	=	36.66	(74)
North 0.9	× 0.77	x	2.39	x	55.46	×	0.76	x	0.7	=	97.74	(74)
North 0.9	× 0.77	x	1.44	x	55.46	x	0.76	x	0.7	=	58.89	(74)
North 0.9	x 0.77	x	2.39	x	74.72	x	0.76	x	0.7	=	131.67	(74)
North 0.9	x 0.77	x	1.44	x	74.72	x	0.76	x	0.7	=	79.33	(74)
North 0.9	x 0.77	x	2.39	x	79.99	×	0.76	x	0.7	=	140.96	(74)
North 0.9	x 0.77	x	1.44	x	79.99	×	0.76	x	0.7	=	84.93	(74)
North 0.9	× 0.77	x	2.39	x	74.68	x	0.76	x	0.7	=	131.6	(74)
North 0.9	x 0.77	x	1.44	x	74.68	×	0.76	x	0.7	=	79.29	(74)
North 0.9	x 0.77	x	2.39	x	59.25	×	0.76	x	0.7	=	104.41	(74)
North 0.9	x 0.77	x	1.44	×	59.25	x	0.76	x	0.7	=	62.91	(74)
North 0.9	x 0.77	x	2.39	x	41.52	x	0.76	x	0.7	=	73.16	(74)
North 0.9	x 0.77	x	1.44	x	41.52	×	0.76	×	0.7	=	44.08	(74)
North 0.9	x 0.77	x	2.39	x	24.19	x	0.76	x	0.7	=	42.63	(74)
North 0.9	x 0.77	x	1.44	×	24.19	×	0.76	x	0.7	=	25.68	(74)
North 0.9	x 0.77	x	2.39	×	13.12	×	0.76	×	0.7	=	23.12	(74)
North 0.9	x 0.77	x	1.44	x	13.12	x	0.76	x	0.7	=	13.93	(74)
North 0.9	x 0.77	x	2.39	x	8.86	×	0.76	x	0.7	=	15.62	(74)
North 0.9	x 0.77	x	1.44	x	8.86	x	0.76	x	0.7	=	9.41	(74)
South 0.9	x 0.77	x	2.39	x	46.75	×	0.76	x	0.7	=	41.19	(78)
South 0.9	x 0.77	x	1.44	x	46.75	×	0.76	x	0.7	=	49.64	(78)
South 0.9	x 0.77	x	3.15	x	46.75	×	0.76	x	0.7	=	54.29	(78)
South 0.9	x 0.77	x	2.39	x	76.57	×	0.76	x	0.7	=	67.47	(78)
South 0.9	x 0.77	x	1.44	x	76.57	x	0.76	x	0.7	=	81.3	(78)
South 0.9	x 0.77	x	3.15	x	76.57	×	0.76	x	0.7	=	88.92	(78)
South 0.9	x 0.77	x	2.39	x	97.53	×	0.76	x	0.7	=	85.94	(78)
South 0.9	× 0.77	x	1.44	x	97.53	x	0.76	x	0.7	=	103.56	(78)
South 0.9	x 0.77	x	3.15	x	97.53	x	0.76	x	0.7	=	113.27	(78)
South 0.9	x 0.77	x	2.39	x	110.23	×	0.76	x	0.7	=	97.13	(78)
South 0.9	x 0.77	x	1.44	x	110.23	×	0.76	x	0.7	=	117.05	(78)
South 0.9	x 0.77	x	3.15	×	110.23	×	0.76	x	0.7	=	128.02	(78)
South 0.9	x 0.77	x	2.39	×	114.87	×	0.76	x	0.7	=	101.22	(78)
South 0.9	x 0.77	x	1.44	×	114.87	×	0.76	x	0.7	=	121.97	(78)
South 0.9	x 0.77	x	3.15	x	114.87	×	0.76	x	0.7	=	133.4	(78)

	_								_							
South	0.9x	0.77	x	2.3	9	x	1	10.55	x		0.76	x	0.7	=	97.41	(78)
South	0.9x	0.77	x	1.4	4	x	1	10.55	x		0.76	x	0.7	=	117.38	(78)
South	0.9x	0.77	x	3.1	5	x	1	10.55	x		0.76	×	0.7	=	128.38	(78)
South	0.9x	0.77	x	2.3	89	x	1	08.01	x		0.76	×	0.7	=	95.17	(78)
South	0.9x	0.77	x	1.4	4	x	1	08.01	x		0.76	x	0.7	=	114.69	(78)
South	0.9x	0.77	x	3.1	5	x	1	08.01	x		0.76	×	0.7	=	125.44	(78)
South	0.9x	0.77	x	2.3	9	x	1	04.89	x		0.76	×	0.7	=	92.43	(78)
South	0.9x	0.77	x	1.4	4	x	1	04.89	x		0.76	×	0.7	=	111.38	(78)
South	0.9x	0.77	x	3.1	5	x	1	04.89	x		0.76	×	0.7	=	121.82	(78)
South	0.9x	0.77	x	2.3	9	x	1	01.89	x		0.76	×	0.7	=	89.78	(78)
South	0.9x	0.77	x	1.4	4	x	1	01.89	x		0.76	×	0.7	=	108.18	(78)
South	0.9x	0.77	x	3.1	5	x	1	01.89	x		0.76	×	0.7	=	118.32	(78)
South	0.9x	0.77	x	2.3	9	x	6	32.59	x		0.76		0.7	=	72.77	(78)
South	0.9x	0.77	x	1.4	4	x	6	32.59	x		0.76		0.7	=	87.69	(78)
South	0.9x	0.77	x	3.1	5	x	6	32.59	x		0.76		0.7	=	95.91	(78)
South	0.9x	0.77	x	2.3	39	x	5	5.42	x		0.76		0.7	=	48.83	(78)
South	0.9x	0.77	x	1.4	4	x	5	5.42	x		0.76		0.7	=	58.84	(78)
South	0.9x	0.77	x	3.1	5	x	5	5.42	x		0.76	x	0.7	=	64.36	(78)
South	0.9x	0.77	×	2.3	39	x		40.4	x		0.76	x	0.7	-	35.6	(78)
South	0.9x	0.77	×	1.4	4	x		40.4	×		0.76	x	0.7	=	42.89	(78)
South	0.9x	0.77	×	3.1	5	x		40.4	x		0.76	x	0.7	=	46.92	(78)
Solar g	ains in	watts, calo	culated	for eacl	h month	1			(83)m	ı = Su	m(74)m	.(82)m				
(83)m=	189.06	322.27	445.07	564 <mark>.15</mark>	647.64		651	624.21	559	.95	485.61	356.95	226.41	161.87		(83)
Total g	ains – ii	nternal an	d solar	(84)m =	= (73)m	+ (8	83)m	, watts	-							
(84)m=	606.35	737.97 8	846.01	940.73	998.37	97	77.77	936.04	876	.23	814.96	710.8	608.43	566.12		(84)
7. Me	an inter	nal tempe	rature	(heating	seasor	า)										
Temp	erature	during he	ating p	eriods ir	n the livi	ng	area	from Tab	ole 9,	, Th1	(°C)				21	(85)
Utilisa	ation fac	tor for gai	ns for l	iving are	ea, h1,m	า (s	ee Ta	ble 9a)								
	Jan	Feb	Mar	Apr	May		Jun	Jul	A	ug	Sep	Oct	Nov	Dec		
(86)m=	1	1	0.99	0.96	0.88	(0.71	0.54	0.5	59	0.84	0.98	1	1		(86)
Mean	interna	l temperat	ure in l	living are	ea T1 (f	ollo	w ste	ps 3 to 7	7 in T	able	9c)				-	
(87)m=	19.83	<u> </u>	20.25	20.56	20.82	-	20.96	20.99	20.		20.9	20.56	20.13	19.8]	(87)
Tomp	oratura	during he		oriode ir		- dw	olling	from To) Th	2 (°C)				1	
	20.04	<u> </u>	20.04	20.05	20.06	-	20.06	20.06	20.		20.06	20.06	20.05	20.05	1	(88)
(88)m=						I									J	
(88)m=																
Utilisa		tor for gai			<u> </u>	1		r	ŕ	10	0.77	0.07	4	4	1	(80)
Utilisa (89)m=	1	1	0.99	0.95	0.84	(0.63	0.43	0.4		0.77	0.97	1	1]	(89)
Utilisa (89)m= Mean	1 interna	1 I temperat	0.99 ture in t	0.95 the rest	0.84 of dwell	ling	0.63 T2 (f	0.43 ollow ste	0.4	to 7	in Table	e 9c)	1]	
Utilisa (89)m=	1	1 I temperat	0.99	0.95	0.84	ling	0.63	0.43	0.4	to 7	in Table	e 9c) 19.7	1 19.28 ing area ÷ (4	18.94	0.4	(89) (90) (91)

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

(92)m=	19.31	19.48	19.73	20.04	20.29	20.41	20.43	20.43	20.36	20.04	19.61	19.28		(92)
Apply	adjustn	nent to t	he mear	internal	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	19.31	19.48	19.73	20.04	20.29	20.41	20.43	20.43	20.36	20.04	19.61	19.28		(93)
8. Spa	ace hea	ting requ	uirement											
				•		ned at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	culate	
the ut			or gains				1				1	1	1	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
1		-	ains, hm	i							<u> </u>			(0.4)
(94)m=	1	0.99	0.98	0.95	0.85	0.66	0.47	0.52	0.8	0.97	1	1		(94)
1	<u> </u>		W = (94)	rí 🔪	· · · · · ·	04445	440.50	450.70	0.40.0		005.57	505.00	1	(05)
(95)m=	605.2	733.76	832.13	891.35	847.42	644.45	440.59	459.76	648.3	686.92	605.57	565.38		(95)
	· · · ·	<u> </u>	ernal tem	i		i	40.0	40.4		40.0		10	l	(00)
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
1				ai tempe 1308.04		Lm , W =	<u> </u>		r í í	-	4 470 05	4700.04	l	(07)
ì í I			1570.82			673.77	444.44	466.59	728.94	1105.82		1782.31		(97)
· ·		<u> </u>	r	r		Wh/mont			í í		r –	005.4	l	
(98)m=	881.71	673	549.58	300.02	117.89	0	0	0	0	311.66	624.01	905.4		
								Tota	l per year	(kWh/yeai	r) = Sum(9	8)15,912 =	4363.27	(98)
Space	e heatin	g require	ement in	kWh/m ²	/year								38.5	(99)
8c. Sp	bace co	oling rec	uiremer	nt 📃										
Calcu	lated for	r June, J	July and	August.	See Tal	ble 10b						-		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat I	oss rate	e Lm (ca	lculated	using 2	5°C inter	rnal temp	perature	and exte	ernal ten	nperatur	e from T	able 10)		
(100)m=	0	0	0	0	0	1090.34	858.35	879.99	0	0	0	0		(100)
Utilisa	ition fac	tor for lo	oss hm											
(101) <mark>m=</mark>	0	0	0	0	0	0.9	0.95	0.93	0	0	0	0		(101)
Usefu	l loss, h	mLm (V	Vatts) = ((100)m x	(101)m	•					ī		L	
(102)m=	0	0	0	0	0	980.76	815.61	820.41	0	0	0	0		(102)
Gains	(solar g	gains ca	lculated	for appli	cable w	eather re	egion, se	e Table	10)		i	i		
(103)m=	0	0	0	0	0	1254.81			0	0	0	0		(103)
	•		e <i>ment fo</i> (104)m <			dwelling,	continue	ous (kW	h) = 0.0	24 x [(10	03)m – (102)m]:	x (41)m	
(104)m=	0	0	0	0	0	197.31	288.68	234.7	0	0	0	0		
									Total	= Sum(104)	=	720.69	(104)
Cooled	fractior	า									area ÷ (4	4) =	1	(105)
Intermi	ttency fa	actor (Ta	able 10b)		-	-		_		-			
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		
-									Tota	l = Sum((104)	=	0	(106)
Space	cooling	requirer	ment for	month =	(104)m	× (105)	× (106)r	n						
(107)m=	0	0	0	0	0	49.33	72.17	58.67	0	0	0	0		
									Total	= Sum(107)	=	180.17	(107)
Space	cooling	requirer	ment in k	(Wh/m²/y	/ear				(107)) ÷ (4) =			1.59	(108)
8f. Fab	ric Ener	gy Effici	iency (ca	alculated	l only un	ider spec	cial cond	litions, s	ee sectio	on 11)				
Fabric	Energy	/ Efficier	псу						(99) -	+ (108) =	=		40.09	(109)

				User D	etails:						
Assessor Name: Software Name:	Stroma FS	AP 201			Strom Softwa	a Num are Ver	sion:			n: 1.0.0.28	
Property Address: 5 Bed Enhanced FAbric Address :											
1. Overall dwelling dime	nsions:										
				Area	a(m²)		Av. Hei	aht(m)		Volume(m ³)	
Ground floor						(1a) x		.7	(2a) =	202.5	(3a)
First floor					75	(1b) x	2.	41	(2b) =	180.75	(3b)
Total floor area TFA = (1a		1									
Dwelling volume	383.25	(5)									
2. Ventilation rate:],,									
	main		econdar	у	other		total			m ³ per hour	
Number of chimneys	heating 0	h □+ [eating 0] + [0	7 = Г	0	x 4	40 =	0	(6a)
Number of open flues	0		0] + [_	0	」] = 「	0	x 2	20 =	0	(6b)
Number of intermittent far	าร						4	x 1	0 =	40	(7a)
Number of passive vents	0	(7b)									
Number of flueless gas fir	es					Ē	0	x 4	40 =	0	(7c)
Air changes per hour											
Infiltration due to chimney							40		÷ (5) =	0.1	(8)
If a pressurisation test has be			d, proceed	d to (17), d	otherwise o	continue fro	om (9) to (16)			- 1
Number of storeys in th Additional infiltration	ie aw <u>eiling</u> (n:	5)						[[(9)-	1]x0.1 =	0	(9) (10)
Structural infiltration: 0.	25 for steel o	[.] timber f	rame or	0.35 foi	r masoni	rv constr	uction	[(0)	170.1 -	0	(10)
if both types of wall are pr	esent, use the va	lue corres								-], ,
deducting areas of openin If suspended wooden fl	0 // 1		ed) or 0	1 (seale	ad) else	enter 0				0	(12)
If no draught lobby, ent		•	00) 01 0.		, oloo					0	(12)
Percentage of windows			ripped							0	(14)
Window infiltration					0.25 - [0.2	2 x (14) ÷ 1	= [00			0	(15)
Infiltration rate					(8) + (10)	+ (11) + (1	2) + (13) +	- (15) =		0	(16)
Air permeability value,	q50, expresse	ed in cub	ic metre	s per ho	our per s	quare m	etre of e	nvelope	area	4.5	(17)
If based on air permeabili	•									0.33	(18)
Air permeability value applies		on test has	been don	e or a deg	gree air pe	rmeability	is being us	sed			1
Number of sides sheltered Shelter factor	a				(20) = 1 -	[0.075 x (1	9)] =			2	(19) (20)
Infiltration rate incorporati	ng shelter fac	tor			(21) = (18		/-			0.28	(21)
Infiltration rate modified for monthly wind speed											
i i i	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe											
<u> </u>	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		

Wind F	actor (2	22a)m =	(22)m ÷	4										
(22a)m=	1.27	1.25	1.23	1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
Adjuste	ed infiltr	ation rat	te (allow	ing for sl	nelter ar	nd wind s	speed) =	(21a) x	(22a)m		•	8		
	0.36	0.35	0.34	0.31	0.3	0.27	0.27	0.26	0.28	0.3	0.32	0.33		
			-	rate for	he appl	icable ca	se		!					
		al ventila		e e alle a NL (C) (00-)			0	(23a)
						a) × Fmv (e)) = (23a)			0	(23b)
			-	-	-	for in-use f							0	(23c)
,		1	1	1	i	1	r	1	ŕ	1	r <u>, -</u>	1 – (23c)	÷ 100]	
(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24a)
<i>,</i>		1	1	1	1	heat red	, <u> </u>	<u>г, с</u>	ŕ	, <u> </u>	, 		I	
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
,					•	ve input				F (00)	`			
	· ,	1	r í	<u> </u>	, <u> </u>	o); other	· · · ·	<u>, ,</u>	ŕ	· · ·	ŕ		l	(24a)
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,						ve input erwise (2				0.51				
(24d)m=	, <i>,</i>	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.55		(24d)
						b) or (24	L					0100		, ,
(25)m=	0.56	0.56	0.56	0.55	0.55	0.54	0.54	0.53	0.54	0.55	0.55	0.55		(25)
(20)11-	0.00	0.00	0.00	0.00	0.00	0.01		0.00		0.00	0.00	0.00		(/
3. Hea	at l <mark>osse</mark>	es and he	eat l <mark>oss</mark>	paramet	er:						_			
ELEN	IENT	Gro	ss (m²)	Openir	gs 2	Net Ar A ,r		U-val W/m2		A X U (W/		k-value kJ/m²·ł		A X k kJ/K
Doors		alea	(11-)			2.1		1.1		2.31		KJ/111-•1	`	(26)
Window	NS TVD	⊃ 1				2.39	=	/[1/(1.2)+		2.74	4			(23)
Window							<u> </u>	/[1/(1.2)+			\exists			
						2.39	-			2.74	\dashv			(27)
	ws Type					3.78	=	/[1/(1.2)+	-	4.33				(27)
Window						2.39		/[1/(1.2)+		2.74				(27)
Window						1.44	x1	/[1/(1.2)+	0.04] =	1.65				(27)
Window	ws Type	e 6				0.96	x1	/[1/(1.2)+	0.04] =	1.1				(27)
Window	ws Type	e 7				1.44	x1	/[1/(1.2)+	0.04] =	1.65				(27)
Floor						75	x	0.15	=	11.25				(28)
Walls		18	0	31.2	4	148.7	6 X	0.18	=	26.78	ן ר		\neg	(29)
Roof		75	5	0		75	×	0.1	=	7.5	ז ד		= =	(30)
Total a	rea of e	elements	s, m²			330					L			(31)
				effective w	ndow U-v		ated using	g formula 1	l/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	3.2	
** includ	e the are	as on both	sides of i	nternal wa	ls and par	titions	-							

Fabric heat loss, $W/K = S (A \times U)$	(26)(30) + (32) =	81.2	(33)
Heat capacity $Cm = S(A \times k)$	((28)(30) + (32) + (32a)(32e) =	37189.4	(34)
Thermal mass parameter (TMP = $Cm \div TFA$) in kJ/m ² K	Indicative Value: High	450	(35)

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f

can be ι	ised inste	ad of a dei	tailed calc	ulation.										
Therm	al bridge	es : S (L	x Y) cal	culated	using Ap	pendix l	<						16.5	(36)
if details	f details of thermal bridging are not known (36) = 0.15 x (31) $ (33) + (36) =$													
Total fa	abric he	at loss							(33) +	(36) =			97.7	(37)
Ventila	tion hea	at loss ca	alculated	monthl	y				(38)m	= 0.33 × (25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	71.29	70.98	70.67	69.23	68.97	67.71	67.71	67.47	68.19	68.97	69.51	70.08]	(38)
Heat tr	ansfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	169	168.68	168.38	166.93	166.67	165.42	165.42	165.18	165.9	166.67	167.21	167.78]	
											Sum(39)1.	12 /12=	166.94	(39)
	· ·	meter (H	· · · · · · · · · · · · · · · · · · ·	1						= (39)m ÷	· (4)		1	
(40)m=	1.13	1.12	1.12	1.11	1.11	1.1	1.1	1.1	1.11	1.11	1.11	1.12		
Average = Sum(40) ₁₁₂ /12= Number of days in month (Table 1a)											1.11	(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)
			1	1		1		1			1	1	J	
4 Wa	ter heat	ting ener	rav reau	irement:								kWh/ye	ear:	
													-	
		ipancy, I		[1 - exp	(0.0002		- 120		012 v /			.93		(42)
	A > 13.3 A £ 13.9		+ 1.70 X	[i - exp	(-0.0003	949 X (11	-A - 13.9)2)]+0.0	JU 13 X (IFA - 13.	.9)			
			ater usag	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		109	9.36		(43)
	Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of													
not more	ot more that 125 litres per person per day (all water use, hot and cold)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage il	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)				-		
(44)m=	120.29	115.92	111.54	107.17	102.79	98.42	98.42	102.79	107.17	111.54	115.92	120.29		
_								_ /			m(44) ₁₁₂ =		1312.26	(44)
Energy of	content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D	01m / 3600) kWh/mor	th (see Ta	ables 1b, 1	c, 1d)	1	
(45)m=	178.39	156.02	161	140.36	134.68	116.22	107.69	123.58	125.06	145.74	159.09	172.76		
If instan	tonoouou	otor hooti	na of point	of use (no	hot water	r otorogo)	ontor 0 in	hovon (16		Fotal = Su	m(45) ₁₁₂ =	=	1720.58	(45)
				· ·				· ·	. ,	r	i	i	1	
(46)m=	0 storage	0	0	0	0	0	0	0	0	0	0	0	J	(46)
	-		includir	ng any so	alar or M	///HRS	storana	within sa	ame ves	ما		210	1	(47)
0		```		ink in dw			0			501		210]	(47)
		•		er (this in	•			```	ers) ente	er 'O' in (47)			
	storage		not wate			notantai					.,			
	-		eclared I	oss facto	or is kno	wn (kWł	n/day):					0]	(48)
		actor fro				,	• /					0]	(49)
					ar			(48) x (49)) =			0]	(50)
Energy lost from water storage, kWh/year (48) x (49) = 0 (50) b) If manufacturer's declared cylinder loss factor is not known:											(00)			
,				om Tabl								0]	(51)
	•	eating s		on 4.3									-	
		from Tal										0	ļ	(52)
Temperature factor from Table 2b											(53)			

•	•	om water (54) in (5	-	e, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0]	(54) (55)
		loss cal		for each	month			((56)m = (55) × (41)r	m		-	1	
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0	1	(56)
			-	-		-	H11)] ÷ (50	-	-	-	-] lix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0]	(57)
Primar	y circuit	loss (ar	nnual) fro	om Table	e 3							0]	(58)
Primar	y circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	65 × (41)	m					
•		1	r	1	here is s	r	er heatir	<u> </u>	<u> </u>		, 1		1	()
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(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	neat req	uired for	water h	eating ca	alculated	for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	Ì
(62)m=	151.63	132.62	136.85	119.31	114.48	98.79	91.54	105.04	106.3	123.88	135.22	146.84		(62)
Solar DI	HW input	calculated	using App	endix G or	r Appendix	: H (negati	ve quantity	v) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	NWHRS	applies	, see Ap	pendix C	G)				1	
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Outpu	t from w	ater hea	ter											
(64)m=	151.63	132.62	136.85	119.31	114.48	98.79	91.54	105.04	106.3	123.88	135.22	146.84		_
								Outp	out from wa	ater heate	r (annual)₁	12	1462.49	(64)
Heat g	ains fro	m water	heating	, kWh/m	onth 0.2	5 ′ [0.85	× (45)m	+ (61)m	n] + 0.8 x	(46)m	+ (57)m	+ (59)m]	
(65)m=	37.91	33.15	34.21	29.83	28.62	24.7	22.88	26.26	26.57	30.97	33.81	36.71		(65)
inclu	ude (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	neating	
5. In	ternal ga	ains (see	e Table 5	5 and 5a):									
Metab	<u>olic gair</u>	ns (Table	<u>5), Wat</u>	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	146.71	146.71	146.71	146.71	146.71	146.71	146.71	146.71	146.71	146.71	146.71	146.71		(66)
Lightin	g gains	(calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5		-	-	_	
(67)m=	28.87	25.64	20.85	15.79	11.8	9.96	10.77	13.99	18.78	23.85	27.83	29.67		(67)
Applia	nces ga	ins (calc	ulated ir	n Append	dix L, eq	uation L	13 or L1	3a), alsc	see Tal	ble 5				
(68)m=	320.52	323.85	315.47	297.62	275.1	253.93	239.79	236.46	244.84	262.69	285.21	306.38		(68)
Cookir	ng gains	(calcula	ted in A	ppendix	L, equat	tion L15	or L15a)	, also se	e Table	5	-			
(69)m=	37.67	37.67	37.67	37.67	37.67	37.67	37.67	37.67	37.67	37.67	37.67	37.67		(69)
Pumps	s and fa	ns gains	(Table !	5a)							-		-	
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losse	s e.g. ev	vaporatic	n (nega	tive valu	es) (Tab	le 5)						•		
(71)m=	-117.37	-117.37	-117.37	-117.37	-117.37	-117.37	-117.37	-117.37	-117.37	-117.37	-117.37	-117.37		(71)
Water	heating	gains (T	able 5)											
(72)m=	50.95	49.34	45.98	41.43	38.47	34.3	30.76	35.3	36.91	41.63	46.95	49.34		(72)
Total i	internal	gains =	:			(66)	m + (67)m	ı + (68)m +	+ (69)m + ((70)m + (7	1)m + (72))m		
(73)m=	467.36	465.84	449.32	421.85	392.38	365.21	348.33	352.77	367.55	395.17	427.01	452.41]	(73)
6. So	lar gains	S:											۱ 	

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

Orientation:	Access Factor Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
North 0.9	x 0.77	x	2.39	x	10.63	×	0.76	x	0.7	=	28.11	(74)
North 0.9	x 0.77	x	1.44	x	10.63	x	0.76	x	0.7	=	11.29	(74)
North 0.9	x 0.77	x	2.39	x	20.32	x	0.76	x	0.7	=	53.72	(74)
North 0.9	x 0.77	x	1.44	x	20.32	×	0.76	x	0.7	=	21.58	(74)
North 0.9	x 0.77	x	2.39	x	34.53	x	0.76	x	0.7	=	91.28	(74)
North 0.9	x 0.77	x	1.44	x	34.53	×	0.76	x	0.7	=	36.66	(74)
North 0.9	x 0.77	x	2.39	x	55.46	x	0.76	x	0.7	=	146.62	(74)
North 0.9	x 0.77	x	1.44	x	55.46	x	0.76	x	0.7	=	58.89	(74)
North 0.9	x 0.77	x	2.39	x	74.72	x	0.76	x	0.7	=	197.5	(74)
North 0.9	x 0.77	x	1.44	x	74.72	x	0.76	x	0.7	=	79.33	(74)
North 0.9	x 0.77	x	2.39	x	79.99	×	0.76	x	0.7	=	211.43	(74)
North 0.9	x 0.77	x	1.44	x	79.99	×	0.76	x	0.7	=	84.93	(74)
North 0.9	x 0.77	x	2.39	x	74.68	x	0.76	x	0.7	=	197.4	(74)
North 0.9	x 0.77	x	1.44	x	74.68	×	0.76	x	0.7	=	79.29	(74)
North 0.9	x 0.77	x	2.39	x	59.25	×	0.76	x	0.7	=	156.61	(74)
North 0.9	x 0.77	x	1.44	x	59.25	X	0.76	x	0.7	=	62.91	(74)
North 0.9	x 0.77	x	2.39	x	41.52	x	0.76	x	0.7	=	109.75	(74)
North 0.9	x 0.77	x	1.44	x	41.52	×	0.76	×	0.7	=	44.08	(74)
North 0.9	x 0.77	x	2.39	x	24.19	x	0.76	x	0.7	=	63.94	(74)
North 0.9	x 0.77	x	1.44	x	24.19	×	0.76	x	0.7	=	25.68	(74)
North 0.9	x 0.77	x	2.39) x	13.12	×	0.76	×	0.7	=	34.68	(74)
North 0.9	× 0.77	x	1.44	x	13.12	x	0.76	x	0.7	=	13.93	(74)
North 0.9	x 0.77	x	2.39	x	8.86	×	0.76	x	0.7	=	23.43	(74)
North 0.9	x 0.77	x	1.44	x	8.86	x	0.76	x	0.7	=	9.41	(74)
South 0.9	x 0.77	x	2.39	x	46.75	×	0.76	x	0.7	=	123.58	(78)
South 0.9	x 0.77	x	3.78	x	46.75	×	0.76	x	0.7	=	65.15	(78)
South 0.9	x 0.77	x	1.44	x	46.75	×	0.76	x	0.7	=	24.82	(78)
South 0.9	x 0.77	x	2.39	x	76.57	×	0.76	x	0.7	=	202.4	(78)
South 0.9	x 0.77	x	3.78	×	76.57	x	0.76	x	0.7	=	106.7	(78)
South 0.9	x 0.77	x	1.44	x	76.57	x	0.76	x	0.7	=	40.65	(78)
South 0.9	x 0.77	x	2.39	×	97.53	×	0.76	x	0.7	=	257.82	(78)
South 0.9	× 0.77	x	3.78	x	97.53	x	0.76	x	0.7	=	135.92	(78)
South 0.9	x 0.77	x	1.44	x	97.53	x	0.76	x	0.7	=	51.78	(78)
South 0.9	x 0.77	X	2.39	x	110.23	×	0.76	x	0.7	=	291.39	(78)
South 0.9	x 0.77	x	3.78	x	110.23	×	0.76	x	0.7	=	153.62	(78)
South 0.9	-	x	1.44	×	110.23	×	0.76	x	0.7	=	58.52	(78)
South 0.9	x 0.77	x	2.39	×	114.87	×	0.76	x	0.7	=	303.65	(78)
South 0.9		x	3.78	×	114.87	×	0.76	x	0.7	=	160.08	(78)
South 0.9	x 0.77	x	1.44	×	114.87	×	0.76	x	0.7	=	60.98	(78)

	_									_				
South	0.9x	0.77	x	2.39		× 1	10.55	x	0.76	x	0.7	=	292.22	(78)
South	0.9x	0.77	x	3.78	1	× 1	10.55	x	0.76	x	0.7	=	154.06	(78)
South	0.9x	0.77	x	1.44	1	× 1	10.55	×	0.76	x	0.7	=	58.69	(78)
South	0.9x	0.77	x	2.39	1	× 1	08.01	x	0.76	x	0.7	=	285.52	(78)
South	0.9x	0.77	x	3.78	:	× 1	08.01	x	0.76	x	0.7	=	150.52	(78)
South	0.9x	0.77	x	1.44		× 1	08.01	x	0.76	x	0.7	=	57.34	(78)
South	0.9x	0.77	x	2.39		× 1	04.89	x	0.76	x	0.7	=	277.28	(78)
South	0.9x	0.77	x	3.78	:	× 1	04.89	x	0.76	x	0.7	=	146.18	(78)
South	0.9x	0.77	x	1.44	:	× 1	04.89	x	0.76	x	0.7	=	55.69	(78)
South	0.9x	0.77	x	2.39		× 1	01.89	x	0.76	x	0.7	=	269.33	(78)
South	0.9x	0.77	x	3.78	:	× 1	01.89	x	0.76	x	0.7	=	141.99	(78)
South	0.9x	0.77	x	1.44		× 1	01.89	x	0.76	x	0.7	=	54.09	(78)
South	0.9x	0.77	x	2.39	;	× [32.59	x	0.76	x	0.7	=	218.31	(78)
South	0.9x	0.77	x	3.78	;	× [8	32.59	x	0.76	x	0.7	=	115.09	(78)
South	0.9x	0.77	x	1.44	;	× [8	32.59	x	0.76	x	0.7	=	43.84	(78)
South	0.9x	0.77	x	2.39		x E	55.42	x	0.76	x	0.7	=	146.49	(78)
South	0.9x	0.77	x	3.78	;	×Ę	55.42	x	0.76	x	0.7	=	77.23	(78)
South	0.9x	0.77	x	1.44		× Ę	55.42	x	0.76	x	0.7	=	29.42	(78)
South	0.9x	0.77	×	2.39		×	40.4	x	0.76	x	0.7	-	106.79	(78)
South	0.9x	0.77	×	3.78		×	40.4	x	0.76	x	0.7	=	56.3	(78)
South	0.9x	0.77	×	1.44		× 📃	40.4	x	0.76	x	0.7	=	21.45	(78)
Solar (gains in	watts, calo	culated	for each r	month			(83)m	r = Sum(74)m	<mark>(8</mark> 2)m				
(83)m=	301.47	519.95	729.76	936.99 1	080.91	1087.3	1042.33	932	.53 801	579.4	362.23	257.27		(83)
Total g	jains – i	nternal and	d solar	(84)m = (73)m +	· (83)m	, watts							
(84)m=	768.83	985.79 1	179.08	1358.84 1	473.29	1452.51	1390.66	1285	5.29 1168.55	974.6	5 789.25	709.68		(84)
7. Me	an inter	nal tempe	rature	(heating s	eason)									
Temp	erature	during hea	ating p	eriods in t	he livin	g area	from Tab	ble 9,	Th1 (°C)				21	(85)
Utilis	ation fac	tor for gain	ns for I	iving area	h1,m	(see Ta	able 9a)			-		-		
	Jan	Feb	Mar	Apr	May	Jun	Jul	A	ug Sep	Oct	Nov	Dec		
(86)m=	1	1	1	0.99	0.92	0.72	0.52	0.5	69 0.89	1	1	1		(86)
Mear	interna	l temperat	ure in l	iving area	T1 (fo	llow ste	ps 3 to 7	7 in T	able 9c)					
	Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c)									20.71	20.41	20.19		(87)
(87)m=	(87)m= 20.21 20.33 20.51 20.74 20.92 20.99 21 21 20.96 20.71 20.41 20.19 (87) Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)													
	20.21				est of a	dwelling	from Ta	able 9) Th2 (°C)					
		during hea		eriods in r	est of 0	dwelling 20	from Ta	able 9		19.99	19.99	19.99]	(88)
Temp (88)m=	erature 19.98	during hea	ating p 19.98	eriods in r 19.99	19.99	20	20	20		19.99	19.99	19.99]	(88)
Temp (88)m= Utilisa	erature 19.98 ation fac	during hea 19.98	ating p 19.98 ns for r	eriods in r 19.99 est of dwe	19.99 elling, h	20 n2,m (se	20 ee Table	20 9a)	0 20	I	_]	
Temp (88)m= Utilisa (89)m=	Derature 19.98 ation fac	during hea 19.98 ctor for gain	ating p 19.98 ns for r 1	eriods in r 19.99 est of dwe 0.98	19.99 elling, h 0.86	20 n2,m (se 0.61	20 ee Table 0.4	20 9a) 0.4	20 20 46 0.8	0.99	19.99	19.99 1]	(88) (89)
Temp (88)m= Utilisa (89)m= Mear	berature 19.98 ation fac 1 interna	during hea 19.98 ctor for gain 1 temperat	ating p 19.98 ns for r 1 ure in 1	eriods in r 19.99 est of dwe 0.98 he rest of	19.99 elling, h 0.86 dwellir	20 n2,m (se 0.61 ng T2 (f	20 ee Table 0.4 ollow ste	20 9a) 0.4 eps 3	20 20 6 0.8 to 7 in Tab	0.99 le 9c)	1	1]]	(89)
Temp (88)m= Utilisa (89)m=	Derature 19.98 ation fac	during hea 19.98 ctor for gain 1 temperat	ating p 19.98 ns for r 1	eriods in r 19.99 est of dwe 0.98 he rest of	19.99 elling, h 0.86	20 n2,m (se 0.61	20 ee Table 0.4	20 9a) 0.4	20 20 6 0.8 to 7 in Tab 0 19.98	0.99 le 9c) 19.76	1	1 19.24	0.33	

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

(92)m=	19.57	19.7	19.88	20.11	20.27	20.33	20.33	20.33	20.31	20.08	19.78	19.56		(92)
Apply	adjustn	nent to t	he mear	n internal	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	19.57	19.7	19.88	20.11	20.27	20.33	20.33	20.33	20.31	20.08	19.78	19.56		(93)
8. Spa	ace hea	ting requ	uirement											
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a														
the ut	ilisation	i	<u> </u>	using Ta				-					I	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
		<u> </u>	ains, hm								i		I	()
(94)m=	1	1	1	0.98	0.88	0.65	0.44	0.5	0.83	0.99	1	1		(94)
	U		``````````````````````````````````````	4)m x (84	<i>,</i>								I	
(95)m=	768.83	985.59	1176.72			938.9	617.04	648.69	970.25	968.42	789.17	709.68		(95)
	nly aver	age exte	ernal tem	perature	e from Ta	able 8							l .	
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
1		1		al tempe		Lm , W =	=[(39)m :	x [(93)m	– (96)m]				
(97)m=	2581.24	2496.32	2252.74	1870.73	1429.02	947.56	617.35	649.59	1029.48	1579.45	2119.94	2576.42		(97)
Space	e heatin	g require	ement fo	r each m	nonth, k\	Nh/mont	h = 0.02	24 x [(97))m – (95)m] x (4	1)m			
(98)m=	1348.43	1015.21	800.56	387.25	97.94	0	0	0	0	454.61	958.15	1388.85		
								Tota	l per year	(kWh/year) = Sum(9	8)15,912 =	6451.01	(98)
Space	e heatin	a reauire	ement in	kWh/m²	/vear								43.01	(99)
_					,									
			uiremer		0. T.I									
Calcu		Feb	Mar	August. Apr	See Tar May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hoat	Jan			using 25				<u> </u>	· ·		-			
(100)m=	035 1416					1554.92		1255.34						(100)
` ´		tor for lo				1004.02	1224.00	1200.04		0	0	0		()
(101)m=	0			0	0	0.95	0.99	0.97	0	0	0	0		(101)
					-		0.99	0.97	0	0	0	0		(101)
(102)m=	1 10SS, N 0	m∟m (v o	valls) = 0	(100)m x	(101)m	1479.97	1206.09	1221.45	0	0	0	0		(102)
	-	-	_	-	_				_	0	0	0		(102)
1	(solar (\int_{0}^{0}		for appli		1823.3	1748.1	1627.4		0		0	l	(103)
(103)m=	, end	Ů	Ů	0	v				0	0	0	0	(11)	(103)
				r month, : 3 × (98)		iweiling,	continue	ous (kvv	(n) = 0.0.	24 X [(10)3)m – (1	102)m] :	x (41)m	
(104)m=	0	0	0	0	0	247.2	403.26	302.03	0	0	0	0		
· · ·									Total	= Sum(1.04)	=	952.49	(104)
Cooled	I fraction	า									area ÷ (4		1	(105)
			able 10b)								,		
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		
									Total	l = Sum((104)	=	0	(106)
Space	cooling	requirer	ment for	month =	(104)m	× (105)	× (106)r	n		· ·				
(107)m=	0	0	0	0	0	61.8	100.81	75.51	0	0	0	0		
I									Total	= Sum(107)	=	238.12	(107)
Space	cooling	requirer	ment in l	wh/m²/y	/ear				(107)) ÷ (4) =			1.59	(108)
-	-	•		alculated		der spec	cial cond	litions se	. ,	. ,				
		y Efficier		aroundteu	-only un					+ (108) =	_		44.59	(109)
	Linerg		юу						(99).	- (100) =	-		44.09	(109)



THINKING ABOUT TOMORROW

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