

## 7 GREENAWAY GARDENS, HAMPSTEAD, LONDON NW3

# ENERGY AND SUSTAINABILITY STATEMENT

JB/692: January 2021

 ME7 Ltd, Jorand House, Bebington Close, Billericay, Essex, CM12 0DT,

 Tel: +44(0)1277 353225
 Mb: +44(0)7412 601472

 Web: www.me7.ltd
 Email: info@me7.ltd

M&E Consultants

Energy Consultants

Please consider the environment before printing this document



## 7 GREENAWAY GARDENS, HAMPSTEAD, LONDON NW3

#### CONTENTS

Section	Description	Page
	Contents	2
	Introduction	4
		_
Section 1.0 - R	enewable Energy Statement	5
1.1	Executive Summary	7
1.2	Introduction	11
1.3	Planning Framework	12
1.4	Cooling Hierarchy	15
1.5	Baseline Energy Consumption & CO2 Emissions	22
1.6	Passive Design Measures/Efficient Services	23
1./	Combined Heat and Power	25
1.8	On-Site Renewable Energy Options	26
Section 2.0 - M	echanical Services	33
2.1	Incoming Utility Services	34
2.2	Design Conditions	34
2.3	Building Regulations Part L1A (2013/16)	34
2.4	Heating	35
2.5	Water Services	35
2.6	Recycled Rainwater	35
2.7	Natural Ventilation	36
2.8	Fresh Air Systems	36
2.9	Bathrooms, Cloakroom and Kitchen Ventilation	36
2.10	Comfort Cooling	36
2.11	Automatic Controls	36
2.12	Above Ground Drainage	37
2.13	Rainwater Drainage	37
2.14	Underground Drainage	37
Section 3.0 - El	ectrical Services	38
3.1	Incoming Utility Supply	39
3.2	Sub – Main Distribution	39
3.3	Final Circuit Distribution	39
3.4	Small Power Installation	39
3.5	Interior Lighting Installations	39
3.6	Exterior Lighting Installations	40
3.7	Audio Visual Systems	40
3.8	Security System	40
3.9	Fire Detection and Alarm System	40

Section	Description	Page
3.10	Earthing and Bonding	40
3.11	Lightning Protection	41
3.12	Electrical Appliances and Mechanical System Equipment	41
Section 4.0 - M	&E Sustainability Items	42
4.1	Daylighting	43
4.2	Recyclable Materials	43
4.3	Salvage/Reuse of Existing Materials	43
4.4	Life Cycle Costing	43
4.5	Noise and Vibration	44
4.6	Solar Gains	44
Section 5.0 - D	isclaimer	45
Appendices:		
(i)	SAP L1A 2013/16 Regulations DER Worksheet	46
(ii)	SAP L1A 2013/16 Regulations SAP Worksheet	68
(iii)	PEA – Predicted Energy Assessment (PRE-EPC)	91
(iv)	Energy RSU – Renewables & Sustainability Unit	93

#### INTRODUCTION

Our client is applying for planning permission to refurbish/ extend this family home and as part of the process; he is taking the opportunity to significantly enhance its sustainability; including the potential for renewable technologies. 7 Greenaway Gardens is proposed is to be constructed as a sustainable low carbon house, finished to a high quality and standard; whilst maintaining the original building features.

This report has been prepared by ME7 Ltd, to demonstrate how the development will achieve a low carbon status and covers the proposed sustainable design measures related to the building fabric and mechanical and electrical services.

The proposed building has been modelled using an accredited calculation methodology (SAP2012) and by an accredited energy assessor. Through use of appropriate passive and building fabric design as key points/measures below and energy saving measures, it is shown that the building will release lower net annual CO<sub>2</sub> emissions against baseline levels and satisfies the current Building Regulation Part L, The London Plan requirements and Camden Development Plan/ Camden City Plan: Strategic Policies requirements and The Camden Energy Efficiency & Adaption Guidance 2019,

Key points/measures proposed:

- A large CO<sub>2</sub> reduction of 69% (Cumulative), for the site over the baseline; confirming that the proposed refurbished dwelling exceeds the requirements of the Camden Local Plan, The Camden Energy Efficiency & Adaption Guidance 2019, The London Plan 2015 and the National Planning Policy Framework.
- Low NOx emissions from new efficient heating plant, complying with the London Plan.
- Reusing/recycling and salvage existing materials where possible.
- Reducing water consumption through rainwater harvesting and flow restrictors.
- Utilisation of natural shading, orientation and planting.
- Fabric insulation improvements.
- Providing double glazed windows to the new and existing elements low U values.
- Heat recovery ventilation to the entire building 80% efficiency.
- New materials to be responsibly sourced and life cycle reviewed.
- Inclusion of two renewable energy/ low carbon systems; a GSHP and PV system.
- Data logging/internal digital metering/control for efficient management of the building.

Owing to the above improvements over the minimum Part L requirements, the PEA (Predicted Energy Assessment – Outline EPC) for the proposed refurbished building is an energy efficiency rating of Grade C (76) and a CO2 impact rating of Grade C (73).

Included within the report is an appraisal of various renewable technologies, demonstrating their viability and appropriateness to the environment and nature of the development.

It is proposed that a vertical borehole GSHP system will be suitable for providing all of the space heating demand. Based on high efficiency water cooled condensors, with a COP of 6.29 for heating. Gas boilers for providing domestic hot water production top up and backup heating only. This combination will significantly reduce CO2 emissions and be well matched to the building. Apart from the GSHP and PV systems proposed, other renewable sources are not effective or suitable for the building.

Cooling is proposed to only some parts of the house and only at peak times, this will be provided by a vertical borehole GSHP system based on high efficiency water cooled condensors, with an EER of 5.60 for cooling.

A detailed description of the proposed electrical and mechanical systems is also included within the report, detailing the energy efficient and sustainable design measures to be incorporated.

Full assessment modelling/calculations/reports demonstrating compliance, including energy statement, SAP L1A and PEA (Pre-EPC); can be found in the main sections and appendices of this report. The M&E proposals outlined in this report are in line with the London Plan 2015, the National Planning Policy Framework, Camden Local Plan: 2017; for new dwellings and Building Regulations.

Section 1.0

## RENEWABLE ENERGY STATEMENT

ME7 LTD Jorand House, Bebington Close Billericay, Essex CM12 0DT

#### **ASSESSMENT INFORMATION**

**Prepared for:** 

**Prepared by:** Ondrej Gajdos

Date: Date: 15 January 2021

**Reviewed by:** 

## DISCLAIMER

The findings, conclusions and recommendations of this report are based on the information supplied. ME7 Ltd disclaims responsibility in respect of incorrect information imparted to them or for the actual performance of any of the building services installations.

This Report is prepared for the use of 7 Greenaway Gardens; a duty of care is not owed to other parties.

About the energy <u>Executive summary</u> About the energy statement

ME7 Ltd have been appointed to provide an Energy Statement for the proposed development.

This statement covers possible active and passive measures including renewable energy sources to make this development sustainable and environmentally friendly.

Specific requirements of London Plan on Energy Efficiency and Renewable Energy will be met through a combination of passive design features, energy efficient building services and renewable energy sources. This is to comply fully with the London Plan Policies and ensure they are following the "Energy Hierarchy". Specific London Plan policies about CO2 reduction and renewable energy will be met by implementation of passive measures, efficient services and renewable sources. This document has been prepared in line with the GLA Energy Team Guidance on Planning Energy Assessments.

Baseline and all estimated energy consumptions have been calculated using full SAP 2012 assessment of the development in accordance with Part L procedures.

The tables below show a summary of energy requirements for baseline scheme and reduction proposed to be achieved by passive measures, efficient services and on-site renewable energy sources. 
 Table 1: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for domestic buildings

	Carbon Dioxide Emission (Tonnes CO <sub>2</sub>	ns for domestic buildings 2 per annum)
	Regulated	Unregulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	30.1	2.6
After energy demand reduction (be lean)	28.5	2.6
After heat network connection (be clean)	28.5	2.6
After renewable energy (be green)	9.3	2.6

Table 2: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for domestic buildin

	Regulated domestic carbon dioxide savings						
	(Tonnes CO <sub>2</sub> per annum)	(%)					
Be lean: Savings from energy demand reduction	1.6	5%					
Be clean: Savings from heat network	0.0	0%					
Be green: Savings from renewable energy	19.2	64%					
Cumulative on site savings	20.9	69%					



Table 2 CAD			C		۲ <u>ـ</u>	1. :
Table 3: SAP	calculation s	pecification	for each	stage of	i the energ	gy merarchy

Specification	Notional Baseline	Efficient Baseline (Be Lean)	Proposed Development (Be Green)		
Basement/Lower ground floor adjacent to ground	0.22	0.22	0.22		
Existing external Wall U-value	1.45	1.45 (380+ mm solid brick wall)	1.45 (380+ mm solid brick wall)		
New basement walls (adjacent to ground)	0.28	0.26	0.26		
New LGF exposed walls	0.28	0.27	0.27		
New GF exposed walls	0.28	0.18	0.18		
Dormer cheeks	0.28	0.28	0.28		
Pitched Roof U-value	0.18	0.12	0.12		
Flat Roof U-value	0.18	0.15	0.15		
Entrance doors U-value	1.80	1.20	1.20		
Garage door U-value	1.80	0.33	0.33		
Sash Windows U-value	1.60	1.1 (existing single glazed windows upgraded with secondary low-e double glazing)	1.1 (existing single glazed windows upgraded with secondary low-e double glazing)		
New Windows and glazed doors U- value	1.60	0.87 (triple glazed Sky-Frame)	0.87 (triple glazed Sky-Frame)		
Rooflights	1.60	1.2 (double glazed)	1.2 (double glazed)		
Space Heating and DHW System	Gas boiler, SEDBUK 2009 efficiency 88%, underfloor heating, time and temperature zone control	Gas boiler, SEDBUK 2009 efficiency 90%, underfloor heating, time and temperature zone control	MCS certified ground source heat pump, underfloor heating, time and temperature zone control		
Ventilation System	Natural with intermittent mechanical extracts	MVHR with SFP of 1.2 W/l.s or lower, heat recovery efficiency 80% or higher	MVHR with SFP of 1.2 W/l.s or lower, heat recovery efficiency 80% or higher		
Energy Efficient Lighting	75%	100%	100%		
Renewable energy sources			PV system (PV tiles) with a total peak output of 6 kWp on SE/SW facing pitched roof		
% Improvement in CO2 over Building regulations compliant baseline	0.0%	5.4%	69%		

The London Plan approach of "Be lean" – "Be clean" – "Be green" is fully adopted by implementing:

- Passive measures (low U-values, air permeability, avoidance of thermal bridging by accredited details)
- High efficiency services, i.e., boilers, low energy lights, high efficiency ventilation
- Renewable sources: ground source heat pump, Photovoltaic system peak output of 6 kWp,

Excluded renewable sources are:

- Solar hot water
- Biomass
- Wind turbines

#### SAP result summary of the proposed development

DOMESTI	DOMESTIC ENERGY CONSUMPTION AND CO2 ANALYSIS													
Unit identifier (e.g. plot	Model total	REGULATED ENERGY CONSUMPTION PER UNIT (kWh p.a.) - 'BE GREEN' SAP DER WORKSHEET							REGULATED CO2 EMISSIONS PER UNIT					
number, dwelling type etc.)	floor area (m²)	Space Heating (Heat Source 1)	Domestic Hot Water (Heat Source 1)	Electricity generated by renewable (-)	Lighting	Auxiliary	Cooling	Space Heating	Domestic Hot Water	Electricity generated by renewable	Lighting	Auxiliary	SAP 10.0 CO <sub>2</sub> emissions (kgCO <sub>2</sub> p.a.)	Calculated DER SAP 10.0 (kgCO <sub>2</sub> / m <sup>2</sup> )
House	1070.4	34829	1577	-4940	1498	6817	32.98	8,115	367	-1,151	349	1,588	9,277	8.7



The proposed development will achieve:

- 69% overall domestic regulated CO2 reduction against 2013 Part L1B compliant baseline
- 5.4% domestic regulated CO2 reduction by energy efficiency measures (Be Lean)
- 64% domestic regulated CO2 reduction by renewable sources (Be Green)

INTRODUCTION BACKGROUND

ME7 Ltd have been appointed to provide an Energy Statement for the proposed development.

This statement covers possible active and passive measures including renewable energy sources to make this development sustainable and environmentally friendly.

# DESCRIPTION OF THE SITE

The project at 7 Greenaway Gardens site includes a refurbishment and extension of an existing detached house.



PLANNING FRAMEWORK

NATIONAL DOLLCY	
NATIONAL POLICY	<ul> <li>DCLG sets out basis for local policies in section 14 of National Planning Policy Framework. It requires new development to be planned in ways that can help to reduce greenhouse gas emissions, such as through its location, orientation and design. To help increase the use and supply of renewable and low carbon energy and heat, plans are encouraged to: <ul> <li>a) provide a positive strategy for energy from these sources, that maximises the potential for suitable development, while ensuring that adverse impacts are addressed satisfactorily (including cumulative landscape and visual impacts);</li> <li>b) consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for co-locating potential heat customers and suppliers.</li> </ul> </li> </ul>
CAMDEN LOCAL PLAN 1. 2.	For the works on existing buildings of more than 500 m2, Camden Local Plan policy CC1 requires: All development to reduce carbon dioxide emissions through following the steps in the energy hierarchy 20% reduction in carbon dioxide emissions from on-site renewable energy technologies Local Plan Policy CC2 discourages active cooling (air conditioning). Air conditioning will only be permitted where thermal modelling demonstrates a clear need for it after all preferred measures are incorporated in line with the London Plan cooling hierarchy
THE LONDON PLAN 3. 4. 5.	The London Plan is the name given to the Mayor's spatial development strategy. The current version of London Plan was published in March 2016, with new guidance on energy updated in 2018 in line with new draft London Plan. The aim is to develop London as an exemplary sustainable world city, based on three interwoven themes. Strong, diverse long term economic growth Social inclusivity to give all Londoners the opportunity to share in London's future success Fundamental improvements in London's environment and use of resources. Specific requirements on development sustainability are set out in the following policies:

# POLICY 5.2 MINIMISING CO2 EMISSIONS

Development proposals should make the fullest contribution to minimising carbon dioxide emissions in accordance with the following energy hierarchy:

- 1. Be lean: use less energy
- 2. Be clean: supply energy efficiently
- 3. Be green: use renewable energy

Major developments are required to meet the following targets for CO2 reduction against building regulations Target Emission Rate (TER): Residential buildings:

reordenenen bane	
Year	Improvement on 2010 Building Regulations
2010 - 2013	25 per cent
2013 - 2016	40 per cent
2016 - 2031	Zero carbon

Non-domestic buildings:

Year	Improvement on 2010 Building Regulations
2010 - 2013	25 per cent
2013 - 2016	40 per cent
2016 - 2019	As per building regulations
requirements	
2019 - 2031	Zero carbon

## ZERO CARBON POLICY

As outlined in the Housing SPG, from 1 October 2016 the Mayor applies a zero-carbon standard to new residential development. Zero carbon requirement applies to homes forming part of major development applications. The residential element of the application is required to achieve at least a 35 per cent reduction in regulated carbon dioxide emissions (beyond Part L 2013) on-site. The remaining regulated carbon dioxide emissions, to 100 per cent, are to be off-set through a cash in lieu contribution to the relevant borough to be ring fenced to secure delivery of carbon dioxide savings elsewhere (in line with policy 5.2E). The new draft London Plan includes a new recommended carbon offset price of £95 per tonne for a period of 30 years.

Policy 5.6 - Decentralised Energy in Development Proposals

> Development proposals should evaluate the feasibility of Combined Heat and Power (CHP) systems, and where a new CHP system is appropriate also examine opportunities to extend the system beyond the site boundary to adjacent sites. Major development proposals should select energy systems in accordance with the following hierarchy:

- 1. Connection to existing heating or cooling networks
- 2. Site wide CHP network
- 3. Communal heating and cooling

Potential opportunities to meet the first priority in this hierarchy are outlined in the London Heat Map tool. Where future network opportunities are identified, proposals should be designed to connect to these networks.

# Policy 5.7 - Renewable Energy

The Mayor seeks to increase the proportion of energy generated from renewable sources, and expects that the projections for installed renewable energy capacity outlined in the Climate Change Mitigation and Energy Strategy and in supplementary planning guidance will be achieved in London. Within the framework of the energy hierarchy (see Policy 5.2), major development proposals should provide a reduction in expected carbon dioxide emissions through the use of on-site renewable energy generation, where feasible. There is a presumption that all major development proposals will seek to reduce carbon dioxide emissions by at least 20 per cent through the use of on-site renewable energy generation wherever feasible.

Policy 5.9 – Overheating and Cooling

> Major development proposals should reduce potential overheating and reliance on air conditioning systems and demonstrate this in accordance with the following cooling hierarchy:

- 1. minimise internal heat generation through energy efficient design
- 2. reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation and green roofs and walls
- 3. manage the heat within the building through exposed internal thermal mass and high ceilings
- 4. passive ventilation
- 5. mechanical ventilation
- 6. active cooling systems (ensuring they are the lowest carbon options)

**COOLING HIERARCHY** 

SUMMARY

To fully comply with London Plan Policy 5.9 and Camden Plan Policy CC2, a dynamic thermal simulation has been carried out to ascertain a need for mechanical cooling. The dynamic simulation was done for all bedrooms and ground floor Kitchen/Dining/Reception area. After implementing all previous steps in the cooling hierarchy, the tested rooms still don't achieve thermal comfort criteria required by CIBSE TM59. Mechanical cooling is therefore proposed for the building.

# RESIDENTIAL CRITERIA CIBSE TM59

Compliance is based on passing both of the following two criteria:

#### Criterion 1a: Hours of Exceedance (He):

For living rooms, kitchens and bedrooms:

the number of hours during which DT is greater than or equal to one degree (K) during the period May to September inclusive shall not be more than 3 per cent of occupied hours.

#### **Criterion 1b:**

For bedrooms only:

to guarantee comfort during the sleeping hours the operative temperature in the bedroom from 10 pm to 7 am shall not exceed 26 °C for more than 1% of annual hours. (Note: 1% of the annual hours between 22:00 and 07:00 for bedrooms is 32 hours, so 33 or more hours above 26 °C is recorded as a failure).

#### **DYNAMIC SIMULATIONS**

The analysis was carried out using Design Builder v6 -Energy Plus v8 engine. The 3D model is based on the architectural drawings and specifications.

Thermal mass and U-values used in the dynamic simulation are based on architect specification, as shown in Table 3.

Weather data used for the simulation is the main CIBSE TM49 weather file (DSY1) for the 'future near extreme summer'.

3d model used for the dynamic simulation



## **INTERNAL DESIGN CONDITIONS**

Occupancy in the main Kitchen / Living / Dining area is set to 10 people. All other internal design conditions are modelled as per CIBSE TM59 Table 2:

 Double bedroom
 2 people at 70% gains from 11 pm to 8 am
 Peak load of 80 W from 8 am to 11 pm

 2 people at full gains from 8 am to 9 am and from 10 pm to 11 pm
 Base load of 10 W during the sleeping hours

l person at full gain in the bedroom from 9 am to 10 pm

Lighting is modelled as 2 W/m2 from 6pm to 11pm.

#### SOLAR SHADING

All windows and glazed doors are modelled with internal blinds, which are modelled as closed when the solar irradiance exceeds  $120\ W/m2$ 

# THERMAL MASS

Existing retained uninsulated solid brick walls represent relatively high thermal mass, which assists with overheating prevention. Having most of the habitable rooms in the existing part of house makes it impossible to effectively increase the thermal mass.

## VENTILATION

Ventilation strategy has been chosen in line with London Plan Cooling hierarchy and with energy efficiency impacts in mind. It is proposed to install whole house mechanical balanced supply and extract ventilation with heat recovery, which shall be able to achieve at least 4 l/s.person flow rate in habitable rooms. The proposed strategy will ensure optimal balance in capital cost, occupant comfort in terms of fresh air and thermal comfort while reducing the cooling requirements. This is included in the dynamic thermal modelling.

Natural ventilation through openable windows has also been modelled, with all windows open in the model, as per CIBSE TM59 guidance

		Criterion A	Criterion B	
Floor	Zone	(%)	(hr)	Pass/Fail
0GF	Kit-din-rec	29.81	N/A	Fail
1st	Bed1	0.36	50	Fail
1st	Bed2	0.55	61	Fail
1st	BedM	0.86	33	Fail
2nd	Bed3	0.45	44	Fail
2nd	Bed4	0.41	43.5	Fail
2nd	Bed5	0.71	35.5	Fail
2nd	Bed6	0.42	44	Fail

# **OVERHEATING SIMULATION RESULTS**

















ACTIVE COOLING

As all habitable rooms fail on the overheating assessment against CIBSE TM59 criteria, after implementing all previous steps in the cooling hierarchy, it is proposed to install a mechanical cooling system using ground source heat pump. This is considered to be the most efficient way of active cooling as the heat extracted from house will be transmitted by a closed loop GSHP directly to the ground.

Periods with the highest cooling demand will match the periods with the highest electricity yield from solar photovoltaics system. It is therefore estimated, that most of the electricity demand for ground source cooling will be supplied by PV (on-site renewable source). The active cooling will therefore be a zero or near-zero CO2 emission process.

BASELINE ENERGY CONSUMPTION CO2 EMISSIONS

> Energy assessment using SAP 2012 has been carried out on the proposed house with extension, using notional baseline specification achieving compliance with 2012 Part L1B. The specification is set out in Table 6 above.

> As a result of the baseline energy calculation, the following values of energy and  $CO_2$  emissions have been obtained. SAP10 carbon emission factors have been used for the  $CO_2$  emissions calculation.

DOMESTIC ENERGY CONSUMPTION AND CO <sub>2</sub> ANALYSIS										
Unit identifier (e.g. plot	Model total	REGULATED ENERGY CONSUMPTION PER UNIT (kWh p.a.) - TER WORKSHEET				REGULATED CO <sub>2</sub> EMISSIONS PER UNIT				
number, dwelling type etc.)	floor area (m²)	Space Heating	Domestic Hot Water	Lighting	Auxiliary	Space Heating	Domestic Hot Water	Lighting	Auxiliary	SAP 10.0 CO <sub>2</sub> emissions (kgCO <sub>2</sub> p.a.)
House	1070.4	130146	4053	1498	6862.31	27,331	851	349	1,599	30,130



BE LEAN: PASSIVE DESIGN MEASURES AND EFFICIENT SERVICES

> Number of passive design measures and measures improving energy efficiency of building services have been included in the design to help to reduce the CO2 emissions. Full specification of the efficient baseline is described in Table 3. The following table shows results obtained with the improvements over the notional baseline

DOMESTIC ENERGY CONSUMPTION AND CO <sub>2</sub> ANALYSIS												
Unit identifier (e.g. plot number, dwelling type etc.)	Model total floor area (m²)	REGULAT	ED ENERGY CO LEAN' S/	NSUMPTIO	N PER UNIT (K) RKSHEET	Wh p.a.) - 'BE	REGULATED CO <sub>2</sub> EMISSIONS PER UNIT					
		Space Heating	Domestic Hot Water (Heat Source 1)	Lighting	Auxiliary	Cooling	Space Heating CO <sub>2</sub> emissions (kgCO <sub>2</sub> p.a.)	Domestic Hot Water CO <sub>2</sub> emissions (kgCO <sub>2</sub> p.a.)	Lighting CO <sub>2</sub> emissions (kgCO <sub>2</sub> p.a.)	Auxiliary CO <sub>2</sub> emissions (kgCO <sub>2</sub> p.a.)	SAP 10.0 CO <sub>2</sub> emissions (kgCO <sub>2</sub> p.a.)	Calculated DER SAP 10.0 (kgCO <sub>2</sub> / m <sup>2</sup> )
House	1070.4	122362	4053	1498	6862	19.72	25,696	851	349	1,599	28,500	26.6



# BE CLEAN: HEATING INFRASTRUCTURE

# LONDON HEAT MAP

The London Heat Map (shown below) has been consulted to establish the possibility of connecting to heating infrastructure. There are no existing networks present within connectable range of the scheme, therefore a connection is not possible.



BE CLEAN: COMBINED HEAT AND POWER

# GENERAL INFORMATION

Although not using any renewable energy source, gas CHP helps to reduce CO2 emissions by delivering heat and electricity locally and reducing the losses that normally occur by conventional power plants. Produced electricity can be exported to grid if the on-site demand is lower than production.



RECOMMENDATIONS SPECIFIC TO THIS DEVELOPMENT

CHP is not considered suitable due to low electricity carbon factor in SAP10 and small size of development

## BE GREEN: ON-SITE RENEWABLE ENERGY SOURCES

SOLAR HOT WATER

# **GENERAL INFORMATION**

Solar hot water systems for dwellings use collector which provides a separate heating circuit for hot water cylinder. This is usually backed up by electric immersion heater or other source of heat.

- Two types of collectors are available:
- Flat Plate less expensive, less efficient
- Evacuated Tube more expensive and more efficient





RECOMMENDATIONS SPECIFIC TO THIS DEVELOPMENT

A solar hot water system has been considered. However, Photovoltaic tile panels are preferable due to smaller visual impact in the conservation area and similar CO2 saving.

# AIR SOURCE HEAT PUMPS

# GENERAL INFORMATION

An air source heat pump extracts heat from the outside air in the same way that a fridge extracts heat from its inside. It can extract heat from the air even when the outside temperature is as low as minus  $15^{\circ}$  C.

On 17 December 2008, the European Parliament adopted the EU Directive on promoting the use of energy from renewable sources. For the first time however, in addition to geothermal energy, aerothermal and hydrothermal energy are also recognised as renewable energy sources.

There are two main types of ASHP:

## AIR-TO-WATER SYSTEM

Air-to-water system uses the heat to warm water. Heat pumps heat water to a lower temperature than a standard boiler system would, so they are more suitable for underfloor heating systems than radiator systems. Although some ASHP systems are capable of heating the water to the higher temperature, the efficiency is higher when using low temperature underfloor heating or low temperature fan convectors.





#### AIR-TO-AIR SYSTEM

Air-to-air system uses the heat to warm the indoor air. The air is heated through individual fan-coils or centrally and then distributed to rooms via ductwork.



RECOMMENDATIONS SPECIFIC TO THIS DEVELOPMENT

.

Air source heat pumps have been ruled out due to lower efficiency and visual impacts compared to the proposed GSHP system.

# BE GREEN: ON-SITE RENEWABLE ENERGY SOURCE

## SOLAR PHOTOVOLTAICS

# **GENERAL INFORMATION**

This system uses semi-conductor cells to convert solar energy into electricity. Two main types of PV panels are available: - Monocrystalline – More expensive and more efficient - Polycrystalline – Less expensive and less efficient Depending on type, the output of 1 kWp (kilowatt peak) can be achieved by panels with area between 6 and 20 m2.

The use of PV panels generally requires relatively large unshaded roof area where they can be mounted facing south, ideally having between 30° and 40° inclination.



RECOMMENDATIONS SPECIFIC TO THIS DEVELOPMENT

It is proposed to install a PV system with total peak output of 6 kWp, with integrated PV tiles panels facing south (SE/SW). The system will comprise 400 No PV tiles, requiring a roof area of 40.8 m2

## **GROUND SOURCE HEAT PUMP**

**GENERAL INFORMATION** 

Ground source heat pumps use a buried ground loop which transfers heat from the ground into the building through heating distribution system. GSHP technology can be used both for heating and cooling. Two main types of GSHP are available:

- Horizontal loop is suitable for applications where sufficient area is available to accommodate horizontally buried pipes



- Vertical loop system can be used where ground space is limited, but will require boreholes typically 15-150m deep, and is consequently more expensive to install than horizontal systems.



#### **RECOMMENDATIONS SPECIFIC TO THIS DEVELOPMENT**

It is proposed to install an MCS-certified ground source heat pump system Mitsubishi Ecodan CRHV-P600YA. This system will provide space heating through wet underfloor heating and domestic hot water through indirect DHW cylinders. **BIOMASS / BIOFUELS** 

**GENERAL INFORMATION** 

Producing energy from biomass has both environmental and economic advantages. It is a carbon neutral process as the CO2 released when energy is generated from biomass is balanced by that absorbed during the fuel's production.

There are two main ways of using biomass to heat a domestic property:

- Standalone stoves providing space heating for a room. These can be fuelled by logs or pellets but only pellets are suitable for automatic feed. Generally, they are 6-12 kW in output, and some models can be fitted with a back boiler to provide water heating.

- Boilers connected to central heating and hot water systems. These are suitable for pellets, logs or chips, and are generally larger than 15 kW.

RECOMMENDATIONS SPECIFIC TO THIS DEVELOPMENT

Biofuels are ruled out due to negative impact on air quality and environmental issues surrounding liquid biofuels as currently there are no established standards relating to the sustainability of biofuels.

## BE GREEN: ON-SITE RENEWABLE ENERGY SOURCE

WIND ENERGY

**GENERAL INFORMATION** 

Wind power is a clean, renewable source of energy which produces no carbon dioxide emissions or waste products. The turbines can have horizontal or vertical axis (Darrieus type). Wind turbines use the wind's lift forces to rotate aerodynamic blades that turn a rotor which creates electricity. Most small wind turbines generate direct current (DC) electricity and are not connected to the national grid. A special inverter and controller are required to convert DC electricity to AC at a quality and standard acceptable to the grid if the turbine is to be connected to national grid.

# RECOMMENDATIONS SPECIFIC TO THIS DEVELOPMENT

Wind energy systems will not be considered due to negative visual effects, interference, flicker and noise risk. Exposure to wind would be limited by surrounding buildings.

Section 2.0

# **MECHANICAL SERVICES**

#### 2.1 INCOMING UTILITY SERVICES

New gas and water utility supplies/ meters will be provided to the building. The gas meter will be external to the building in a ventilated space and the water meter externally in an underground pit. (Soil conditions will confirm the water pipe material).

These will be sized to meet the demands of the building.

An additional kW/hr gas sub-meter will be provided with a remote visual display installed to assist in energy monitoring and management as part of the BMS/ audio visual system.

An additional water flow meter (I/s) will be provided with a remote visual display installed to assist in water monitoring and management as part of the BMS/ audio visual system.

#### 2.2 DESIGN CONDITIONS

External temperatures:

Winter	-8°C saturated
Summer	32°C (DB) 20°C (WB)

Internal Temperatures:

Living Rooms	21°C
Kitchen/Dining	21°C
Bedrooms	19°C
Bathrooms	23°C
Hall/Circulation	19°C
Stores/Plant	16°C

#### 2.3 BUILDING REGULATIONS PART L1A (2013/16)

The current part 'L1A' of the Building Regulations (2013/16), consists of minimum requirements for dwellings, briefly consisting of the following:

- Walls, roofs and ceilings need to have adequate resistance to loss of heat.
- Sufficient control needs to be provided for occupants to vary lighting levels, to avoid unnecessary energy use and maximise natural daylight.
- Adequate user control should be available for heating and cooling to avoid unnecessary energy use and maximise passive measures.

Part 'L1A' of the Building Regulations (April 2013/16), is also concerned with the conservation of fuel and power and its aim is to maximum the possible contribution that can be made to the Government's target for reducing CO<sub>2</sub> production whilst allowing flexibility for designers. This philosophy will be followed in our designs.

The measures to be implemented/ investigated to reduce energy consumption are:

- Specifying an efficient heating system and if gas boilers utilised, these are to be high efficiency condensing boilers with very low NOX levels.
- Optimising the boiler selection for the building occupancy and reducing energy consumption through controls and management.
- Installing responsive controls and sub-zoning of the building to allow the part load, low energy and economical use of the system. (Adaptive to user occupancy).
- Review of thermal insulation techniques, limits and air tightness.
- Review of renewable energy sources to comply with the limits dictated by The Local Planning Authority and The London Plan.
- Minimising the effect of solar gain in a passive manner, to provide comfort conditions.
- Limiting fan power usage to noted requirements.
- Reviewing extract fan systems and utilising heat recovery and passive natural ventilation where possible.
- If cooling is utilised, to provide through a very efficient system and utilised only at peak times.

#### 2.4 HEATING

The main space heating system will be led by a high efficiency Mitsubishi GSHP system (Vertical borehole). With backup/ top up condensing boilers with ultra-low NOX levels (Broag Remeha Quinta ACE). All of the main space heating load will be produced by the GSHP system with a 6.29 COP.

The GSHP/ boiler systems will serve LTHW pressurised supplies to the majority of underfloor heating systems in the principal living and bedroom areas. Radiators to secondary areas and towel rails to bathrooms will be served via a separate summer circuit. LTHW supplies will also provide the heat for the HWS system and the pool water/ AHU.

All internal pipework to be copper insulated and pex to underfloor systems.

All flues to discharge above main roof level by balanced/ separate flues. Fresh air and plantroom cooling via louvers at LGF.

All heating zones/spaces will be provided with zone valves, re-heaters, thermostat control or TRV's (Thermostatic radiator valves), to ensure efficient energy use.

All heating zones/spaces will also be controlled by user interface controls to programme occupancy, holiday periods and set back times; again to ensure efficient energy use.

Future heating network pipework connections and plate heat exchanger space to be included within the scheme.

#### 2.5 WATER SERVICES

A fully pressurised water system will be provided throughout the property to ensure continuity of supply. If after testing a mains water pressure system is acceptable; this will be adopted. The system is to be installed in copper pipework to the sanitary/kitchen appliances.

The general pressure available throughout the system will be approximately 3 bar at the mixers/taps with flow rates accommodated to the sanitary appliances and shower mixer valves in accordance with the Part 'G' calculator; low flow/restrictors.

The system will operate on a variable speed pump principle to maintain a constant pressure throughout the system and limit energy use. Pressure regulating devices will be required to some areas. All sanitary fittings/plant will be individually and zone valved. All pipework to be copper insulated.

Consideration will be given to a leak detection system to provide early warning of any leaks in the systems, to minimise any water loss.

#### 2.5.1 Domestic Cold Water

Sufficient cold water will be stored and boosted to provide continuity of supply. Filtered mains drinking water will be provided to the main kitchens and certain points.

A water softener will be provided within the main LGF plantroom providing softened water to the hot water cylinders, as well as all the baths and shower accommodation. (Softened water will ensure optimum energy performance due to limiting scale build up in plant/pipework).

#### 2.5.2 DOMESTIC HOT WATER

Hot water cylinders located in the LGF plantroom will be provided with boosted and conditioned cold water. The hot water cylinders will be complete with a pumped return system, complete with back up and top up by the boiler system.

Hot water production shall be strictly controlled by weather compensation, timeclock control for occupancy holiday times and maximisation of plant duty. (Conditioned water will ensure optimum performance due to limiting scale build up in plant/pipework).

All basins, baths and sinks will be protected by TMV2/3 valves (Thermostatic mixing valves), above the minimum Part 'G' requirements.

#### 2.6. RECYCLED RAINWATER

The rainwater recycling drainage system will provide recycled rain water for irrigation supplies. This will reduce the reliance on treated mains water. Filters and UV shall be provided to the system.

#### 2.7 NATURAL VENTILATION

Background habitable room ventilation is generally to be provided by MVHR systems to improve energy efficiency and heat recovery.

Rapid ventilation to spaces will be provided by openable windows/ continuous ventilation.

Consideration will be given to a PSV (Passive stack ventilation), system to bathrooms (wet areas), with humiditycontrolled trickle vents to habitable spaces.

#### 2.8 FRESH AIR SYSTEMS

Habitable rooms located within the LGF area with no windows will also be provided with fresh air by mechanical ventilation heat recovery units with highly efficient counter flow heat exchangers. Mechanical ventilation system will be fully compliant with Part 'F' of the Building Regulations. Ductwork to be pre-insulated PVC and galvanised steel with insulation or Kool duct.

The swimming pool hall will have an AHU with heat recovery/ humidity control ventilation (By others).

#### 2.9 BATHROOMS, CLOAKROOMS, STORE AND KITCHEN VENTILATION

The general space MVHR units units will also be provided for the purposes of extracting air from sanitary accommodation, kitchen and utility ventilation.

#### 2.10 COMFORT COOLING

Firstly, the building has been designed to limit heat gains by; orientation, thermal mass, insulation, full house MVHR ventilation provision, tree shading, semi underground spaces and overhanging slabs/ roofs.

Cooling may also be considered to some rooms/spaces, noting the dynamic simulations noting over-heating.

This is proposed to be via a high efficiency Mitsubishi WR2 GSHP system (5.6 EER), with vertical boreholes. The water-cooled condensers will be located in the rear garden LGF plantroom.

The type of cooling for each room will be provided by fancoils mounted either within joinery or false wall/ceiling details.

Pre-insulated discharge ductwork will be attached to these units to discharge through high induction linear grilles incorporated within joinery and wall finishes at high level. The system will have very low noise levels, which is generally to be targeted at NR25 throughout the building.

A refrigerant gas sensor system will be incorporated to provide safety/protection in accordance with FGAS requirements, to all bedrooms and other rooms/spaces. Internal pipework to be copper insulated, externally PE pipework.

Each room/space will have individual control via a remote room controller to each fan coil, controlled via a discrete room sensor for operation or modification to the set point of the controllers. Cooling and heating will be automatically controlled to ensure no system fighting and undue energy use (interlocked). Overall occupancy and holiday controls to also be provided to ensure efficient energy use and management.

#### 2.11 AUTOMATIC CONTROLS

Automatic control systems will be provided for all of the mechanical services. It is anticipated this will be installed as a complete BMS/ DDC electronic system supervised by a touch screen control/PC positioned within the LGF plantroom.

The client will also have the facility for zoned overrun of various systems and time switch control separate to the main plantroom, via a PC interlink situated within the study and phone app.

Full remote off-site access will also be provided via a modem to this system enabling an ongoing maintenance contract to be provided with the system installers and for the occupiers to efficiently control the systems.

The system will have remote interface modules which will allow the client operation of the heating and cooling, lighting and other systems via the audio-visual keypads. Where this is not provided, individual room control will be provided with more basic visual/manual controls.

Controls are to be zoned to provide more efficiency, occupancy control and management.
#### 2.12 ABOVE GROUND DRAINAGE

The above ground drainage system shall be provided to serve all the sanitaryware accommodation.

It is anticipated that in the house cast iron/HDPE silent pipework will be provided, fully insulated for both thermal and acoustic reasons, with individual local run-outs to the sanitary accommodation being in Upvc pipework. Installation of leak detection systems will be considered to detect leaking water hidden in areas such as voids and shower trays etc. This is being considered to protect the building fabric and internal fixtures and fittings.

#### 2.13 RAINWATER DRAINAGE

All rainwater pipes will be routed from roof level to drain points at ground/ lower ground floor levels. All roof outlets will be sized to take a rainfall intensity of 108 mm per hour. All pipes shall have access before connecting to underground drains. All external rainwater stacks are to be either aluminium or cast iron and where installed internally, the stacks/drains shall be HDPE and thermally/ acoustically insulated. Rainwater will be partly collected for irrigation reuse.

#### 2.14 UNDERGROUND DRAINAGE

Surface water will be reduced to 50% of the existing un-restricted run off rate, by a large surface water attenuation tank and hydrobrake system with pumps. All flat surface areas will have a rainfall intensity of 75mm/Hr.

All LGF areas will be fully pumped drainage and have a backup UPS supply.

All drainage pipes under the building will be cast iron, externally in Upvc/ clayware.

Surface water will be partly collected for irrigation reuse.

Section 3.0

### ELECTRICAL SERVICES

### 3.1 INCOMING UTILITY SUPPLY

The existing main incoming TP&N supply connection may be reused to serve the property; which will be sized to suit the anticipated maximum building load.

The energy usage at the incoming position will be measured and inter-linked to the AV system providing the end-user with accurate power consumption data displayed on a visual display screen. This facility will provide the owner with a user-friendly interface for energy monitoring and management within the house. The PV system electrical load is envisaged to be utilised on site, possibly with battery storage. A PV generation meter will be installed.

#### 3.2 SUB-MAIN DISTRIBUTION

Sub-main distribution boards will be installed to serve various areas within the building. This will reduce cable material costs and installation time. Sub metering to Part L will be provided.

The local sub-distribution boards will incorporate suitably rated MCBs and RCBOs to suit the circuit type and loading. Separate dedicated feeds will be supplied to life safety systems, such as fire alarm equipment in suitable fire rated cabling.

Sub-main distribution cabling will be multi-core armoured with XLPE outer sheath and LSOH inner sheath with copper conductors.

Adequate spare capacity will be provided within the distribution network for any future expansion of the system, avoiding the need for any significant re-modification works at a later period.

### **3.3 FINAL CIRCUIT DISTRIBUTION**

Final circuit distribution cabling will be multi-core flat twin & earth XLPE/LSOH sheathed copper conductors and will not be of the PVC/PVC type.

The XLPE (cross-linked polyethylene) cable material offers superior electrical performance to PVC and the LSOH insulation produces 'low smoke and fumes' when exposed to fire.

RCBOs will be used which combine Residual Current and Overcurrent protection within a single device. Consequently, each circuit will be individually RCD protected avoiding any nuisance tripping of unaffected circuits as would be the case if a split load distribution arrangement were adopted whereby many circuits are protected by a single RCD.

#### 3.4 SMALL POWER INSTALLATIONS

Single and twin 13A Switched Socket outlets will be provided at various positions within the property for general purpose use and to serve fixed electrical equipment.

The outlets will be positioned to offer the greatest flexibility for different interior space planning options and will be mounted at a suitable height for ease of access conforming to the Building Regulation Part M requirements.

Where the room/spaces are used as 'home offices' (e.g., where computers, printers etc. are installed causing potential earth leakage currents) then socket outlets will be of the Dual Earth connection type.

13A switched/un-switched fused connection units with neon lamps will be installed to serve various fixed items of electrical equipment.

All small power faceplate outlets will be sourced from a reputable manufacturer such as 'MK Electric' incorporating the required electrical safety standards and allowing ease of installation.

#### 3.5 INTERIOR LIGHTING INSTALLATIONS

The lighting scheme will utilise the latest low energy compact fluorescent and long-life LED/CFL lighting technologies in order to achieve a minimum of 100% low energy lighting throughout the property, exceeding the requirement as stipulated in the Building Regulations Part L.

Dimming control will be provided to the majority of the lighting systems in the form of pre-set scene setting controlled from individual wall plates in each room/space and via a wireless/ hardwired visual display screen as part of the AV control system.

Consideration is also being given to allow energy usage from the lighting system to be monitored via the AV system. In room/spaces with sufficient natural lighting, day-linked control of the artificial lighting is also being evaluated. Computational daylight investigation will be carried to principle living areas to ascertain the benefit of day-linked dimming controls.

Room/spaces which are not lit by natural daylight, in particular escape routes and the LGF/ basement areas will incorporate emergency standby lighting with up to 3hr battery back-up. Consideration for additional emergency lighting to all escape routes will be taken.

Special attention will be made to bathrooms and the pool area lighting scheme, ensuring the correct level of Ingress Protection (IP) rating is provided in accordance with the 'zoning' requirements of the IEE Regulations.

### 3.6 EXTERIOR LIGHTING INSTALLATIONS

The external lighting installation will comprise of a combination of low energy compact fluorescent and LED lighting. (Light outputs will not exceed Regulations).

Luminaires will be mounted inground and away from the building for night time perimeter security lighting and will be of the wall-wash type to avoid direct light pollution into the neighbouring community.

Ground recessed and low-level ground mounted garden amenity lighting will also be provided which will be limited in numbers to avoid excessive lighting and light pollution to the night sky.

All external lighting will be daylight-linked via an adjustable external photocell and only switch on during periods of insufficient daylight. Manually adjustable time-clock control will also be provided to allow the occupier to adjust the time period and to switch off the lighting when not required.

#### **3.7 AUDIO VISUAL SYSTEMS**

The Audio-Visual installation will generally include the following systems:

- Lighting control and management via user-friendly wireless/hardwired touch screen visual display panels located throughout building to occupier's requirement.
- Building energy monitoring via touch screen panels with scope for split monitoring of various loads e.g., lighting & power.
- Heating, comfort cooling and ventilation control via touch screen panels.
- Terrestrial and Satellite TV installation and control. For signal reception each TV will receive a single CAT6 cable input allowing multi-service viewing. Conventional coax cabling will not be installed saving on material and installation cost.
- Hardwired broadband and telephone service in CAT6 cabling.
- CCTV security monitoring around the vicinity of the building in CAT6 cabling with digital recording facility.
- Security, audio and visual access control systems to main building entrances.

#### 3.8 SECURITY SYSTEM

A wired intruder alarm system will be provided comprising suitable room/space movement detectors, magnetic contacts to perimeter doors and window/door break glass detection. The system will be linked to a 24hr central monitoring station via a dedicated IP line/ 4G and GSM backup. The design and installation will conform to ACPO policy and DD243 requirements for police response service.

#### 3.9 FIRE DETECTION AND ALARM SYSTEM

The building may come under the requirements of BS5839 Part 6. The final installation design will be agreed with the relevant parties, including the Local Fire Office (Fire Brigade) and Local Council District Surveyor.

To provide the highest degree of life and property protection a 'Type L1' category system may be employed and be appropriately zoned, allowing the local fire brigade to promptly identify the location/source of fire occurrence. The system will have the appropriate level of standby battery back-up to operate under mains power failure. All cabling will be fire rated to the appropriate required standard. The system will be linked to a 24hr central monitoring station via a dedicated IP line/ 4G and GSM backup.

Generally, an aspirating Vesda ASD smoke detection system will be provide to all FOH areas with remote sounders. BOH areas will be standard smoke detectors incorporating base sounder units, except within the kitchen areas – these will be heat detectors; to avoid nuisance alarm conditions. The plant room/ kitchen areas and rooms with gas fires will also have carbon monoxide (CO) detectors installed; either by Eco gas monitoring on the Vesda system or 7- year battery units locally.

#### 3.10 EARTHING & BONDING

All extraneous conductive parts will be bonded to the main building earth terminal with main equipotential and supplementary earth bonds as required.

Supplementary earth bonding will be provided to areas of increased electric shock risk including bathrooms, shower rooms, swimming pool area and plant rooms.

A separate additional earth electrode system will be provided for earth bonding of the swimming pool areas as required by the IEE Regulations.

#### **3.11 LIGHTNING PROTECTION**

A lightning protection system will be installed to prevent damage to the building structure and mitigate; injury to people, physical damage (e.g., fire, explosion) and failure of internal electrical systems.

The system will be designed to intercept the lightning strike and safely discharge the high voltage current to earth via a network of lightning rods and metal conductors or the building frame, connected to an earth electrode designed to provide a low resistance path to earth. Roof tapes to be set to the underside of the roof tiles and down conductors generally set behind rainwater pipes.

To protect sensitive electronic equipment within the property from damage and failure resulting from transient over voltages (surges), caused by lightning strikes; a suitable surge arrester will be installed at the main supply intake and all sub – boards on data/phone lines and for sensitive equipment.

#### 3.12 ELECTRICAL APPLIANCES & MECHANICAL SYSTEM EQUIPMENT

Most 'white goods', including the refrigerator/freezer, cooker, microwave oven, washing machine/dryer and dishwasher will be 'A' rated (or higher) energy efficient items under the EU energy label classification. Other major electrical plant, including condenser units and water booster pumps sets will be selected where available and or practicable to incorporate energy efficient motors and intelligent energy saving controls.

Section 4.0

### **M&E SUSTAINABILITY ITEMS**

### **4.1 DAYLIGHTING**

The proposed house has high levels of natural daylighting due to the glazing areas.

All main habitable rooms (Living rooms, kitchen and study), will achieve the minimum daylight factors and view of the sky.

#### **4.2 RECYCLABLE MATERIALS**

Each product/material for the M&E services shall be evaluated against Environmental impacts and life cycle costing. The following is a typical list of proposed M&E materials/products that will be utilised;

- Water pipework •
- Copper (Recyclable). - Brass (Recyclable).

- Valves
- Electrical cables
- PVC twin & earth (XLPE/LSF) (Recyclable) Pipework insulation
  - Rock wool (Recyclable)
- Pipework Insulation •
- Phenolic foam (Recyclable)
- Concrete Portland cement based (Recyclable) • Light fittings – LED's/compact fluorescent - (Recyclable) •

#### **4.3 SALVAGE/REUSE OF EXISTING MATERIALS**

Each existing material/product will be evaluated for possible salvage/reuse when existing items/materials are removed for the proposed works.

Reuse will have priority over salvage; an economic, viability and safety assessment will be made for each item/material.

#### **4.4 LIFE CYCLE COSTING**

Each product/material proposed shall be evaluated on a life cycle costing basis. Recyclable materials shall be utilised where possible in preference to non-Recyclable.

The particular areas of the life cycle to be addressed for M&E Services are:





Decommissioning/Recycling.

Below is a graph indicating the lift cycle phases;

Typically, the majority of the life of a material/product is spent in the Operation/Maintenance phase. It is in this phase that it creates the value contribution but also absorbs the vast proportion of the costs through maintenance and energy usage.

Products/materials shall be selected on the basis of particularly reducing the impact of this phase, for example, a pump, by selecting long term reliability and low energy usage over initial cost.

The ease and speed of building/installing different products/systems shall also be compared to reduce this phase.

#### **4.5 NOISE & VIBRATION**

Noise and vibration associated with moving mechanical services plant, e.g., Pumps, fans, condensers, pipes/ducts, lifts and boilers shall be limited to acceptable levels as follows;

- Pumps: Inverter drives providing slow low impact start/stop cycles, intelligent controls, anti-vibration couplings/supports, dense block wall constructed plantrooms.
- Fans: Low speed intermittent/ MVHR ventilation fans, flexible duct connections, remote plantroom/cupboard mounting, attenuators and anti-vibration fixings.

Boilers/ GSHP: Low noise units and internally mounted within plant areas.

Pipes: Anti-vibration/flexible couplings to plant, expansion joints/anchors and smooth bends/straight lines.

Ducts: Inline attenuators, anti-vibration/flexible couplings to plant, and smooth bends/straight lines.

An Acoustic Consultant shall further advise on noise, vibration and acoustic items.

#### 4.6 SOLAR GAINS

In compliance with the new Part 'L' of the Building Regulations (April 2013/16 edition) solar gains shall be reduced by the building being designed to limit heat gains by; orientation, thermal mass, provision of green roofs, tree shading, semi underground spaces, overhanging slabs/roofs and higher performance double glazed windows with solar tinting/low emissivity coating and Argon gas filled cavities to the South, East & West Elevations.

Additionally, internal blinds to the South, East & West Elevations may be provided as part of the development for occupiers to assist in compliance with Solar Gains.

#### Section 5.0

#### DISCLAIMER

This non-assignable report has been prepared solely for the client as a pre-planning report for the proposed development. The contents and views expressed in this report remain the copyright and opinion of ME7 Ltd. The client is to check and verify the contents with no admission of liability, duty of care or warranty to any Third Party.

This report is based on the information provided/available at the time of production.

ME7 January 2021

APPENDIX (i)

SAP L1A 2013/16 REGULATIONS

(DER Worksheet)

		User Details:					
Assessor Name: Software Name:	Ondrej Gajdos Stroma FSAP 2012	Stroma Softwa	a Numb are Vers	ber: sion:	STRO Versio	006629 n: 1.0.5.12	
	Pr	operty Address	Be Gree	n			
Address :	7 Greenaway Gardens, LON	DON, NW3 7DJ	6				
1. Overall dwelling dime	ensions:						
Bacoment		Area(m <sup>2</sup> )	1	Av. Height(	(m)	Volume(m <sup>3</sup>	)
Dasement		73.8	(1a) x	2.5	(28) =	184.5	(3a)
Ground floor		429.4	(1b) x	3.8	(2b) =	1631.72	(3b)
First floor		232.6	(1c) x	3.55	(2c) =	825.73	(3c)
Second floor		215.8	(1d) x	3.1	(2d) =	668.98	(3d)
Third floor		118.8	(1e) x	3.35	(2e) =	397.98	(3e)
Total floor area TFA = (1	1a)+(1b)+(1c)+(1d)+(1e)+(1n)	1070.4	(4)				
Dwelling volume			(3a)+(3b)+	+(3c)+(3d)+(3e	)+(3n) =	3708.91	(5)
2. Ventilation rate:						5 	
	main secondary	other		total		m <sup>a</sup> per hou	r
Number of chimneys		• 0	=	0	x 40 =	0	(6a)
Number of open flues	0 + 0	+ 0	i - F	0	x 20 =	0	(6b)
Number of intermittent fa	ans			0	x 10 =	0	(7a)
Number of passive vents	5			0	x 10 =	0	(76)
Number of flueless gas t	fires		F	0	x 40 =	0	(7c)
						, ,	1.04
					Air ch	anges per ho	DULL
Infiltration due to chimne	eys, flues and fans = (6a)+(6b)+(7a	s)+(7b)+(7c) =	Г	0	+ (5) =	0	(8)
If a pressurisation test has	been carried out or is intended, proceed	to (17), otherwise o	ontinue froi	m (9) to (16)	8 8		_
Number of storeys in t	the dwelling (ns)				00000000000000	0	(9)
Additional infiltration			10100000000		[(9)-1]x0.1 =	0	(10)
Structural inflitration: (	0.25 for steel or timber frame or t	0.35 for masonr	y constru	iction	1	0	(11)
If both types of wall are p deducting areas of open	present, use the value corresponding to t ings); if equal user 0.35	ne greater wall area	a (ater				
If suspended wooden	floor, enter 0.2 (unsealed) or 0.1	I (sealed), else	enter 0		1	0	(12)
If no draught lobby, er	nter 0.05, else enter 0					0	(13)
Percentage of window	s and doors draught stripped				Ì	0	(14)
Window infiltration		0.25 - [0.2	x (14) + 10	•O] =	Ì	0	(15)
Infiltration rate		(8) + (10) -	+ (11) + (12	2) + (13) + (15)	-	0	(16)
Air permeability value	, q50, expressed in cubic metres	per hour per so	quare me	tre of envel	ope area	15	(17)
If based on air permeab	ility value, then (18) = {(17) + 20]+(8)	), otherwise (18) = (	16)			0.75	(18)
Air permeability value appli	es if a pressurisation test has been done	or a degree air per	meability is	being used		5.000 an	19
Number of sides shelter	ed				1	2	(19)
Shelter factor		(20) = 1 - [	0.075 x (19	=[((		0.85	(20)
Infiltration rate incorpora	ting shelter factor	(21) = (18)	) x (20) =		Ī	0.64	(21)

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com

Page 1 of 21

Jan         Feb         Mar         Apr         May         Jun         Jul         Aug         Sep         Oct         Nov         Dec           Aonthly average wind speed from Table 7         22ms         5.1         5         4.9         4.4         4.3         3.8         3.7         4         4.3         4.5         4.7           Mind Factor (22a)m = (22)m + 4         22amm         1.27         1.25         1.23         1.1         1.08         0.95         0.92         1         1.08         1.12         1.18           Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m         0.55         0.64         0.69         0.72         0.75           Calculate effective air change rate for the applicable case if mechanical ventilation         0.5         0.5         (23a)           If balanced mechanical ventilation with heat recovery (MV/RR) (24a)m = (22b)m + (23b) × [1 - (23c) + 100]         24a)m         0.90         0<	Infiltrati	on rate	modifie	d for mo	onthly wir	nd speed									
Anothily average wind speed from Table 7 22m <sup>2</sup> 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7 Wind Factor (22a)m = (22)m + 4 22a)m <sup>2</sup> 1.27 1.26 1.23 1.1 1.08 0.95 0.95 0.92 1 1.08 1.12 1.18 volusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m 0.81 0.8 0.76 0.7 0.69 0.61 0.61 0.59 0.64 0.69 0.72 0.75 Calculate effective air change rate for the applicable case If mechanical ventilation: 1 exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a) 1 balanced with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 - (23c) + 100] 24a)m <sup>2</sup> 0.97 0.96 0.94 0.86 0.85 0.77 0.77 0.75 0.8 0.85 0.88 0.91 (24a) b) If balanced mechanical ventilation without heat recovery (MVV) (24b)m = (22b)m + (23b) 24a)m <sup>2</sup> 0.9 0.94 0.86 0.85 0.77 0.77 0.75 0.8 0.85 0.88 0.91 (24a) c) if whole house extract ventilation or positive input ventilation from outside if (22b)m 4.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b) 24com <sup>2</sup> 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	[	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Monthly	avera	ge wind	speed f	rom Tab	le 7									
Mnd Factor (22a)m = (22)m + 4         22a)m=       1.27       1.25       1.23       1.1       1.08       0.95       0.92       1       1.08       1.12       1.18         vdjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m       0.61       0.68       0.72       0.75         calculate effective air change rate for the applicable case       0.5       0.64       0.69       0.72       0.75         calculate effective air change rate for the applicable case       0.5       0.63       0.65       0.63         if balanced mechanical ventilation       0.5       0.77       0.75       0.8       0.85       0.86       0.81       0.6         24a)m=       0.97       0.96       0.94       0.86       0.85       0.77       0.77       0.75       0.8       0.85       0.86       0.81       (24)         b) If balanced mechanical ventilation without heat recovery (MVV) (24b)m = (22b)m + (23b)       10       0	(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 Pactor (22a)m = (22)m + 4         22a)m = 1.27       1.25       1.23       1.1       1.08       0.95       0.92       1       1.08       1.12       1.18         Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m       0.61       0.69       0.72       0.75         Calculate effective air change rate for the applicable case       if mechanical ventilation:       0.5       (23a)         If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a)       0.5       (23a)         If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 - (23c) + 100]       0.5       (24a)m         0.97       0.96       0.94       0.86       0.85       0.77       0.75       0.8       0.85       0.81       (24a)m         b) If balanced mechanical ventilation without heat recovery (MVV) (24b)m = (22b)m + (23b)       (24a)m       (24b)m				(22)	10										
22a)med       1.27       1.25       1.23       1.1       1.08       0.96       0.92       1       1.08       1.12       1.18         Adjusted infiltration rate (allowing for shelter and wind speed) = (21a) x (22a)m         0.61       0.8       0.76       0.7       0.69       0.61       0.61       0.59       0.64       0.69       0.72       0.75         Calculate effective air change rate for the applicable case         f mechanical ventilation:         if exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a)       0.5       (23a)         if balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 - (23c) + 100]       0.5       (24a)m=         0.97       0.96       0.94       0.86       0.85       0.77       0.75       0.8       0.85       0.88       0.91       (24a)m         b) If balanced mechanical ventilation without heat recovery (MVV) (24b)m = (22b)m + (23b)       0 <t< td=""><td>VVind F</td><td>actor (2</td><td>22a)m =</td><td>(22)m +</td><td>4</td><td><b>1</b></td><td></td><td>-</td><td></td><td></td><td></td><td>-</td><td>· · · · ·</td><td></td><td></td></t<>	VVind F	actor (2	22a)m =	(22)m +	4	<b>1</b>		-				-	· · · · ·		
Adjusted infiltration rate (allowing for shelter and wind speed) = $(21a) \times (22a)m$ 0.61       0.8       0.78       0.7       0.69       0.61       0.61       0.69       0.72       0.75         Calculate effective air change rate for the applicable case       0.5       0.64       0.69       0.72       0.75         If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a)       0.5       (23a)         If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 - (23c) + 100]       68       (24a)m         0.97       0.96       0.94       0.86       0.85       0.77       0.75       0.8       0.86       0.81       (24b)m         b) If balanced mechanical ventilation with heat recovery (MV/HR) (24a)m = (22b)m + (23b)       (24b)m       (24b)m       (24b)m       (24c)       (24b)m       (25b)m + (23b)       (24c)       (24b)m       (24c)       (24b)m       (24c)       (22b)m + (23b)       (24c)       (24b)m       (24c)       (24c	(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		
0.81       0.8       0.78       0.7       0.69       0.61       0.51       0.59       0.64       0.69       0.72       0.75         Calculate effective air change rate for the applicable case if mechanical ventilation: If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a)       0.5       (23a)         If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =       0.68       0.63       0.72       0.76         24a)m       0.97       0.96       0.94       0.85       0.77       0.77       0.75       0.8       0.85       0.81       0.82         24a)m       0.97       0.96       0.94       0.85       0.77       0.77       0.75       0.8       0.85       0.84       0.81       0.81       0.85<	Adjuste	d infiltr	ation rat	e (allow	ing for sl	helter and	d wind s	speed) =	(21a) x	(22a)m					
Calculate effective air change fate for the applicable case if mechanical ventilation: 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) = a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = $(22b)m + (23b) \times [1 - (23c) + 100]$ 24a)m= $0.97$ 0.96 0.94 0.88 0.85 0.77 0.77 0.75 0.8 0.85 0.88 0.91 (24b) b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = $(22b)m + (23b)$ 24b)m= $0$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		0,81	0.8	0.78	0.7	0.69	0.61	0.61	0.59	0.64	0.69	0.72	0.75		
If mechanical ventilation:       0.5       (23)         If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a)       0.5       (23)         If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =       68       (23)         (24)       0.97       0.96       0.94       0.86       0.85       0.77       0.77       0.75       0.8       0.85       0.88       0.91       (24)         (24)       0.97       0.96       0.94       0.86       0.85       0.77       0.77       0.75       0.8       0.85       0.88       0.91       (24)         (24)       0 <td>Calcula</td> <td>te effec</td> <td>ctive air</td> <td>change</td> <td>rate for t</td> <td>he applic</td> <td>able ca</td> <td>se</td> <td>S11</td> <td></td> <td></td> <td>1</td> <td></td> <td></td> <td>_</td>	Calcula	te effec	ctive air	change	rate for t	he applic	able ca	se	S11			1			_
If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a)       0.5       (23a)         If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =       68       (23a)         a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 - (23c) + 100]       (24a)m=       0.97       0.96       0.94       0.86       0.85       0.77       0.77       0.75       0.8       0.85       0.91       (24a)m=         24a)m=       0       0       0       0       0       0       0       0       0       0       (24a)m=         24a)m=       0 <td>lf me</td> <td>chanica</td> <td>al ventila</td> <td>ation:</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>L</td> <td>0.5</td> <td>(23a</td>	lf me	chanica	al ventila	ation:									L	0.5	(23a
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × $[1 - (23c) + 100]$ 24a)m 0.97 0.96 0.94 0.86 0.85 0.77 0.77 0.75 0.8 0.85 0.88 0.91 (24a) b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b) 24b)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	lf exha	iust air h	eat pump	using App	endix N, (3	23b) = (23a	)×Fm∨(	equation (I	N5)) , other	rwise (23b)	) = (23a)		[	0.5	(23b
a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 - (23c) + 100]       (24a)m=         24a)m=       0.97       0.96       0.94       0.86       0.85       0.77       0.77       0.75       0.8       0.86       0.91       (24a)m         24a)m=       0.97       0.96       0.94       0.86       0.85       0.77       0.77       0.75       0.8       0.86       0.91       (24a)m         b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)       (24b)m=       0 </td <td>lf bala</td> <td>nced with</td> <td>heat reco</td> <td>overy: effic</td> <td>iency in %</td> <td>allowing fo</td> <td>or in-use t</td> <td>factor (from</td> <td>n Table 4h)</td> <td>) =</td> <td></td> <td></td> <td>Ĩ</td> <td>68</td> <td>(23c)</td>	lf bala	nced with	heat reco	overy: effic	iency in %	allowing fo	or in-use t	factor (from	n Table 4h)	) =			Ĩ	68	(23c)
24a)m=       0.97       0.96       0.94       0.86       0.85       0.77       0.77       0.75       0.8       0.85       0.88       0.91       (24)         b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b)       (24)	a) If t	alance	d mech	anical v	entilation	with hea	t recov	erv (MV	HR) (24a	a)m = (22	2b)m + (	23b) × [	1 - (23c)	+ 1001	
b) If balanced mechanical ventilation without heat recovery (MV) $(24b)m = (22b)m + (23b)$ 24b)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(24a)m=	0.97	0.96	0.94	0.86	0.85	0.77	0.77	0.75	0.8	0.85	0.88	0.91		(24a
24b)m=       0 <td>b) If t</td> <td>alance</td> <td>d mech</td> <td>anical v</td> <td>entilation</td> <td>without</td> <td>heat red</td> <td>covery (1</td> <td>MV) (24b</td> <td>m = (22)</td> <td>2b)m + (</td> <td>23b)</td> <td></td> <td></td> <td></td>	b) If t	alance	d mech	anical v	entilation	without	heat red	covery (1	MV) (24b	m = (22)	2b)m + (	23b)			
<ul> <li>c) If whole house extract ventilation or positive input ventilation from outside if (22b)m &lt; 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)</li> <li>24cjm = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0</li></ul>	(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b)	c) If y	whole h		tract ver	atilation	or positiv	e innut	ventilativ	on from c	uteide					
24c)m=       0 </td <td>if</td> <td>(22b)n</td> <td>n &lt; 0.5 &gt;</td> <td>(23b)</td> <td>then (24</td> <td>c) = <math>(23b)</math></td> <td>): other</td> <td>wise (24</td> <td>c) = (22b)</td> <td>m + 0</td> <td>5 × (23ł</td> <td>0</td> <td></td> <td></td> <td></td>	if	(22b)n	n < 0.5 >	(23b)	then (24	c) = $(23b)$	): other	wise (24	c) = (22b)	m + 0	5 × (23ł	0			
d) If natural ventilation or whole house positive input ventilation from loft         if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = $0.5 + [(22b)m^2 \times 0.5]$ 24d)m=       0 <t< td=""><td>(24c)m=</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td></td><td>(24c</td></t<>	(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c
a) in natural ventiliation of whole nouse positive input ventiliation non- if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m <sup>2</sup> x 0.5]       (24c)         24d)m=       0 <td< td=""><td>41.16</td><td>atural</td><td>untilati</td><td>on or ut</td><td>ole hour</td><td>a noritiv</td><td>- innut</td><td>ventilati</td><td>on from I</td><td><b>a</b>0</td><td></td><td>10</td><td></td><td></td><td></td></td<>	41.16	atural	untilati	on or ut	ole hour	a noritiv	- innut	ventilati	on from I	<b>a</b> 0		10			
(24d)m = 0       <	u) n i	(22b)n	n = 1 th	en (24d)	m = (22)	b)m othe	rwise (2	24d)m =	0.5 + 1(2)	2b)m <sup>2</sup> x	0.51				
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25)         25/m= 0.97 0.96 0.94 0.86 0.85 0.77 0.77 0.75 0.8 0.85 0.88 0.91         3. Heat losses and heat loss parameter:         ELEMENT Gross openings Net Area (m²)         0.97       0.96 0.94       0.85 0.77 0.77 0.75 0.8 0.85 0.88 0.91       (25)         3. Heat loss parameter:         ELEMENT Gross area (m²)       Openings Met Area (U-value (W/K))       A X U (W/K)       k-value kJ/m²-K       A X k (J/K)         Openings 1.324       ×       1.2       =       3.888       (26)         Openings 1.324       ×       1.2       =       3.048       (26)         Openings 1.324       ×       1.2       =       3.048       (26)	(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24d
25 m=       0.97       0.96       0.94       0.86       0.85       0.77       0.77       0.75       0.8       0.85       0.88       0.91       (25)         3 Heat losses and heat loss parameter:         ELEMENT Gross area (m <sup>2</sup> )       Openings m <sup>2</sup> Net Area A,m <sup>2</sup> U-value W/m2K       A X U (W/K)       k-value kJ/m <sup>2</sup> -K       A X k (J/K)         Ooors Type 1       3.24       ×       1.2       =       3.888       (26)         Ooors Type 2       6.14       ×       0.33       =       2.0262       (26)         Ooors Type 3       2.54       ×       1.2       =       3.048       (26)	Effec	tive air	change	rate - er	nter (24a	) or (24b	) or (24	c) or (24	d) in box	(25)					
3. Heat loss parameter:         ELEMENT Gross Openings m²         area (m²)       m²         Marcing       Marcing         A,m²       W/m2K         W/m2K       (W/K)         W/m2K       (W/K)         Marcing       Marcing         Marc	(25 m=	0.97	0.96	0.94	0.86	0.85	0.77	0.77	0.75	0.8	0.85	0.88	0.91		(25)
3 Heat loss parameter:         ELEMENT Gross Openings m²       Net Area A,m²       U-value A X U K-value (W/K) KJ/m²-K       A X k KJ/K         Doors Type 1       3.24       ×       1.2       =       3.888       (26)         Doors Type 2       6.14       ×       0.33       =       2.0262       (26)         Doors Type 3       2.54       ×       1.2       =       3.048       (26)	- second				1000000	(Service)		2000	10000000		1 100000	2707-00 L	Cannot.		
ELEMENT         Gross area (m²)         Openings m²         Net Area A,m²         U-value W/m2K         A X U (W/K)         k-value kJ/m²-K         A X k kJ/K           Doors Type 1         3.24         X         1.2         =         3.888         (26)           Doors Type 2         6.14         X         0.33         =         2.0262         (26)           Doors Type 3         2.54         X         1.2         =         3.048         (26)	3. Hea	it losse	s and he	eat loss	paramet	ent									
Doors Type 1         3.24         ×         1.2         =         3.888         (26)           Doors Type 2         6.14         ×         0.33         =         2.0262         (26)           Doors Type 3         2.54         ×         1.2         =         3.048         (26)	ELEM	ENT	Gros	ss (m²)	Openir m	igs 1 <sup>2</sup>	Net Ar	rea m²	U-valu W/m2	ue K	A X U (W/	K)	k-value kJ/m <sup>z</sup> -K		AXk kJ/K
Doors Type 2         6.14         ×         0.33         =         2.0262         (26)           Doors Type 3         2.54         ×         1.2         =         3.048         (26)	Doors 1	Type 1					3.24	×	1.2	=	3.888				(26)
Doors Type 3 254 x 12 = 3.048 (26)	Doors 1	Type 2					6.14	×	0.33	-	2.0262	2			(26)
	Doors T	Type 3					254	×	12	=	3.048				(26)

2.98

2.29

1.68

2.37

1.76

3.83

1.34

0.3

0.46

0.57

x

1.2

x1/[1/( 1.1 )+ 0.04] =

x1/[1/( 1.1 )+ 0.04] =

x1/[1/( 1.1 )+ 0.04] =

x1/[1/(1.1)+0.04] =

x1/[1/(1.1)+0.04] =

x1/[1/(1.1)+0.04] =

x1/[1/( 1.1 )+ 0.04] =

x1/[1/(0.87)+0.04] =

x1/[1/(0.87)+0.04] =

=

3.576

2.41

1.77

2.5

1.85

4.04

1.41

0.32

0.39

0.48

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com

Doors Type 4

Windows Type 1

Windows Type 2

Windows Type 3

Windows Type 4

Windows Type 5

Windows Type 6

Windows Type 7

Windows Type 8

Windows Type 9

Page 2 of 21

(26)

(27)

(27)

(27)

(27)

(27)

(27)

(27)

(27)

(27)

Windows Type 10	6.67	x8/[1/(0.87)+0.04] = 5.61	(27)
Windows Type 11	2.07	x1/[1/( 1.1 )+ 0.04] = 2.18	(27)
Windows Type 12	2.07	x1/[1/( 0.87 )+ 0.04] = 1.74	(27)
Windows Type 13	2.22	xh[1/(0.87)+0.04] = 1.87	(27)
Windows Type 14	1.82	x1/[1/(1.1)+0.04] = 1.92	(27)
Windows Type 15	1.82	xl/[1/( 0.87 )+ 0.04] = 1.53	(27)
Windows Type 16	2.2	x1/[1/( 1.1 )+ 0.04] = 2.32	(27)
Windows Type 17	3.08	xl/[1/(0.87)+0.04] = 2.59	(27)
Windows Type 18	0.95	x1/[1/(1.1)+0.04] = 1	(27)
Windows Type 19	2	x1/[1/(1.1)+0.04] = 2.11	(27)
Windows Type 20	7.38	xl/[1/(0.87)+0.04] = 6.2	(27)
Windows Type 21	10.59	x8[11( 0.87 )+ 0.04] = 8.9	(27)
Windows Type 22	3.83	xl/[1/(0.87)+0.04] = 3.22	(27)
Windows Type 23	13.1	xl/[1/(0.87)+0.04] = 11.01	(27)
Windows Type 24	3.96	xl/[1/(0.87)+0.04] = 3.33	(27)
Windows Type 25	1.38	xl/[1/( 0.87 )+ 0.04] = 1.16	(27)
Windows Type 26	2.25	x1{1/(0.87)+0.04] = 1.89	(27)
Windows Type 27	23.96	xl/[1/(0.87)+0.04] = 20.14	(27)
Windows Type 28	4.13	x1[1/(0.87)+0.04] = 3.47	(27)
Windows Type 29	2.19	st[1/( 0.87 )+ 0.04] = 1.84	(27)
Windows Type 30	2.2	xl/[1/(0.87)+0.04] = 1.85	(27)
Windows Type 31	2.26	x1/[1/(1.1)+0.04] = 2.38	(27)
Windows Type 32	2.2	x1f(1/(1,1)+0.04] = 2.32	(27)
Windows Type 33	2.19	x1/[1/( 1.1 )+ 0.04] = 2.31	(27)
Windows Type 34	2.93	x1f[1/( 1.1 )+ 0.04] = 3.09	(27)
Windows Type 35	1.49	x1/[1/( 1.1 )+ 0.04] = 1.57	(27)
Windows Type 36	2.03	x8[1/( 0.87 )+ 0.04] = 1.71	(27)
Rooflights Type 1	4.472	x1/[1/(1.2) + 0.04] = 5.3664	(27b)
Rooflights Type 2	2.043	x1/[1/(1.2) + 0.04] = 2.4516	(27b)
Rooflights Type 3	5.52	x1/[1/(1.2) + 0.04] = 6.624	(27b)
Rooflights Type 4	9.2736	x1[1/(1.2) + 0.04] = 11.12832	(27b)
Rooflights Type 5	7.696	x1/[1/(1.2) + 0.04] = 9.235201	(27b)
Floor	503.2	x 0.22 = 110.704	(28)
Walls Type1 172.48 61.38	111.1	x 0.27 = 30	(29)
Walls Type2 326.33 0	326.33	x 0.26 = 84.85	(29)
Walls Type3 431.67 82.39	349.28	x 1.45 = 506.46	(29)
Walls Type4 73.13 36.72	36.41	x 0.18 = 6.55	(29)
Walls Type5 39.8 17.76	22.04	× 0.28 = 6.17	(29)
Walls Type6 5.6 3.08	2.52	x 0.28 = 0.71	(29)

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com

Page 3 of 21

Roof	Type1	369	.4	32.3	5	337.0	5 X	0.15	=	50.56				(30)
Roof	Type2	11.	7	7.7		4	×	0.15	=	0.6		_		(30)
Roof	Туре3	172	.7	0		172.7	7 X	0.12	=	20.72	ī F		ī 🥅	(30)
Total a	area of e	lements	i, m²			2106.0	D1	5-00-						(31)
* for wir	ndows and	roof wind	ows, use e	fective wi	ndow U-w	alue calcul	ated using	formula 1	/[(1/U-valu	ie)+0.04] a	is given in	paragraph	3.2	
** includ	de the area	as on both	sides of in	nternal wal	ls and par	titions						2		-
Fabric	heat los	ss, W/K	= S (A x	U)				(26)(30)	) + (32) =		armideeas	Constant -	1047.9	(33)
Heat o	apacity	Cm = S	(Axk)	25 (2)	STREET.	198 - 53	5		((28).	.(30) + (3	2) + (32a).	(32e) =	0	(34)
Therm	al mass	parame	ter (TM	P = Cm -	+ TFA) ii	1 kJ/m²K	6		Indica	tive Value	Medium	L	250	(35)
For des	ign assess used inste	sments wh ad of a de	ere the de tailed calc	tails of the ulation.	construct	ion aré no	t known pr	ecisely the	indicative	values of	TMP in Ta	able 11		
Therm	al bridge	es:S(L	x Y) cal	culated	using Ap	pendix	к					r	315.9	(36)
if details	s of therma	al bridging	are not kr	wwn (36) +	0.05 x (3	1)								_
Total f	abric he	at loss							(33) +	(36) =		[	1363.8	(37)
Ventila	ation hea	at loss ca	alculated	monthl	у		s		(38)m	= 0.33 × (	(25)m x (5)	5		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	1190.66	1171.16	1151.65	1054.12	1034.61	937.08	937.08	917.57	976.09	1034.61	1073.63	1112.64		(38)
Heat t	ransfer o	coefficier	nt, W/K		22	80 X		674. 	(39)m	= (37) + (	38)m	20 - 10 20		
(39)m=	2554.47	2534.96	2515.45	2417.92	2398.42	2300.88	2300.88	2281.38	2339.9	2398.42	2437.43	2476.44		
	25- 	R i			<u>.</u>	24 - X	0 E		1	Average =	Sum(39)	/12=	2413.05	(39)
Heat I	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m +	- (4)			
(40)m=	2,39	2.37	2.35	2.26	2.24	2.15	2.15	2.13	2.19	2.24	2.28	2.31		10000
Numb	er of day	/s in mo	nth (Tab	le 1a)					2	Average =	Sum(40)	u/12=	2.25	(40)
- TOILE	Jan	Feb	Mar	Apr	May	Jun	did	Aug	Sen	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
( ) + per														
	a franciska marka	Total Contractor	Local Contractor									1100.0		
4. VV	ater heat	ting ene	rgy requ	irementi								kvvh/ye	arte	
Assum	ned occu	pancy,	N					2011 - 723			4	13		(42)
IF TE	A > 13.	9, N = 1	+ 1.76 x	[1 - exp	(-0.0003	349 x (TI	FA -13.9	)2)] + 0.0	0013 x (	TFA -13	.9)			
Annua	averad	e hot wa	ater usad	ae in litre	es per da	av Vd.av	erade =	(25 x N)	+ 36		13	2.37		(43)
Reduce	the annua	al average	hot water	usage by	5% if the c	twelling is	de signed t	to achieve	a water us	se target o				1930.00
not mor	e that 125	litres per j	person pe	r day (all w	ater use,	hot and co	Vd)							
11.000	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat	er usage i	n litres per	r day for ea	sch month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m=	145.61	140.31	135.02	129.72	124.43	119.13	119.13	124.43	129.72	135.02	140.31	145.61		-
Energy	content of	bot water	used - cal	iculated m	onthly = 4	190 x Vd /	n x nm x [	Tm / 3600	1 kiA/b/mor	Total = Su th (see Ta	m(44). ∈=	- 100 L	1588.43	(44)
1177 J		400.00		400.0	402.00	440.00	430.00		454.07	470.44	400.57	000 40		
(45)m=	215.93	188.85	194.88	169.9	163.02	140.68	130.36	149.59	151.37	1/6.41	192.57	209.12	0080.60	(45)
lf instan	taneous w	ater heati	ng at point	of use (no	hot wate	storage),	enter 0 in	boxes (46	) to (61)	i otal = Su	milab) - n -	- L	2002.09	(45)
(46)m=	32.39	28.33	29.23	25.49	24.45	21.1	19.55	22.44	22.71	26.46	28.89	31.37		(46)
Water	storage	loss:										1.1.000000		1
Storag	e volum	e (litres)	) includir	ng any se	olar or V	WHRS	storage	within sa	ame ves	sel		1000		(47)
											-			

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com

Page 4 of 21

If com Otherv Water	nunity h vise if no storage	eating a stored loss:	nd no ta hot wate	ink in dw er (this ir	velling, e Icludes i	nter 110 nstantar	litres in neous co	(47) mbi boil	ers) ente	er '0' in (	47)		r	
a) ii ii Tommo	anuiaci	urers or	- Teble	OSS TACK	DI IS KNO	WIT (KVVI	vuay).				-	6		(46)
Tempe	rature t	actor fro	m i able	20	27222						0.	54		(49)
b) If m	/ lost fro	im water urer's de	storage	, kvvh/ye vlinder i	ear loss fact	or is not	known.	(48) x (49)	) =		3.	24	i.	(50)
Hot wa	ter stor	age loss	factor fr	om Tabl	le 2 (kW	h/litre/da	iy)				1	0	Ê	(51)
If com	nunity h	eating s	ee secti	on 4.3			22				<u> </u>		L.	
Volum	e factor	from Ta	ble 2a								11 00	0		(52)
Tempe	erature f	actor fro	m Table	2b							Ŭ 80	0	l.	(53)
Energy	lost fro	m water	storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	. 8	0		(54)
Enter	(50) or (	(54) in (5	55)								3.	24		(55)
Water	storage	loss cal	culated f	for each	month			((56)m = (	55) × (41)r	m				
(56)m=	100.44	90.72	100.44	97.2	100.44	97.2	100.44	100.44	97.2	100.44	97.2	100.44		(56)
If cylinde	er contain	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) - (	H11)] + (5	0), else (5)	7)m = (56)	m where (	H11) is fro	m Append	ix H	
(57)m=	100.44	90.72	100.44	97.2	100.44	97.2	100.44	100.44	97.2	100.44	97.2	100.44	6	(57)
Primar	v circuit	loss (an	nual) fro	om Table	3	50					U W	0		(58)
Primar	y circuit	loss cal	culated 1	for each	month (	59)m = (	58) + 36	5 × (41)	m				15	
(mo	dified by	factor fr	rom Tab	le H5 if t	here is s	solar wat	er heatir	ng and a	cylinder	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	8	(59)
Combi	loss ca	culated	for each	month	(61)m =	(60) + 36	35 × (41)	)m				64 - S	15	
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	2	(61)
Total h	est rem	uired for	water by	eating ca	louister	for eac	h month	(62)m =	0.85 × (	45)m +	(46)m +	(57)m +	(59)m + (61)n	
(82)m=	339.63	300 59	318 58	289.61	286.73	260.39	254.06	273 29	271.09	300 12	312.28	332.82	(55)	(62)
Solar Di	Winnut	batelusted	using Ann	endix G or	Annendix	H (negative	ve quantity	() (enter '0	if no sola	contribut	ion to wate	r heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	AAAHRS	annlies	see An	nendiv (	2)	Controot	ion to wate	a (realing)		
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	<sup>1</sup>	(63)
Output	from w	ater hea	ter											
(64)m=	339.63	300 59	318 58	289.61	286 73	260.39	254.06	273 29	271.09	300.12	312 28	332.82	8	
(0.1/11)	000.00	000,00	010.00	200.01	200.70	200.00	101.00	Outr	ut from we	ater heater	(annual).	DOL. OL	3539.18	(64)
Liest a	alaa faa		h an the a	1.10.00	anth 0.2	c · 10 ec	v /AE\ma	4 (84)	1.00	I AR Im	+ (E7)m	+ (60)m	1	1000
Heat g	ains iro	n water	neating.	KVVN/M	169.47	5 [0.85	^ (45)m	+ (01)	140.0 x	157.00	+ (57)m	+ (59)m	r -	(es)
(00)m=	1/0.76	152.18	163.76	152.20	153.17	142.54	142.31	148.7	146.1	157,62	159.8	168.49		(65)
inclu	ide (57)	m in cald	culation	of (65)m	only if c	ylinder i	s in the d	twelling	or hot w	ater is fr	om com	munity h	eating	
5. Int	ernal ga	iins (see	Table 5	i and 5a	);									
Metab	olic gain	s (Table	5), Wat	ts									e.	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	S	
(66)m=	206.67	206.67	206.67	206,67	206.67	206.67	206.67	206.67	206.67	206.67	206.67	206.67	6	(66)
Lightin	g gains	(calcula	ted in Ap	opendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	84.81	75.33	61.26	46.38	34.67	29.27	31.62	41.11	55.17	70.06	81.77	87.16		(67)
Applia	nces ga	ins (calc	ulated in	Append	tix L, eq	uation L	13 or L1	3a), also	see Tal	ble 5				
(68)m=	951.33	961.21	936.33	883.37	816.52	753,69	711.71	701.84	726.72	779.68	846,53	909,36		(68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com

Page 5 of 21

(69)m=	43.67	43.67	43.67	43.67	43.67	43.67	43.67	43.67	43.67	43.67	43.67	43.67		(69)
Pumps	and fa	ns gains	(Table !	5a)										
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses	se.g. ev	/aporatio	n (nega	tive valu	es) (Tab	ole 5)				50				
(71)m=	-165.34	-165.34	-165.34	-165.34	-165.34	-165.34	-165.34	-165.34	-165.34	-165,34	-165.34	-165.34		(71)
Water	heating	gains (T	Table 5)		23 47									
(72)m=	229.51	226.46	220.11	211.47	205.87	197.98	191.27	199.87	202.92	211.85	221.94	226.47		(72)
Total i	nternal	gains =				(68	5)m + (67)n	n + (68)m	+ (69)m +	(70)m + (7	1)m + (72)	m		
(73)m=	1353.66	1350.99	1305,7	1229.22	1145.06	1068.93	1022.61	1030.81	1072.81	1149.59	1238.24	1311		(73)
6. So	lar gain	<b>2</b>		/								··· ···		
Solar g	ains are	calculated	using sola	r flux from	Table 6a	and asso	ciated equa	ations to c	onvert to th	e applicat	le orientati	ion.		
Orienta	ation:	Access F Table 6d	actor	Area m <sup>2</sup>		FI	ux Ible 6a		g_ Table 6b	Т	FF able 6c		Gains (W)	
Northea	ast n ov	0.77			~ 1		44.70		0.63	- - Г	0.7	<b>-</b> - r	24.60	(75)
Northes	ist o ov	0.77	<u> </u>		28	° ==	11.28	lî⊨	0.63	╡ऀ╞	0.7		31.59	(75)
Northes	ist o ov	0.77	^	1.0	00		11.28	tî⊨	0.63	╡∁╞	0.7		11.59	(75)
Northea	ast o ev	0.77	= *	4.	76	Ĵ	11.20	l€⊨	0.63	╡┊╞	0.7	-	48.03	(75)
Northea	ist n ov	0.77	= 0		20	°⊨	11.20	łî⊨	0.03	╡┊╞	0.7	=  ]	12.19	(75)
Northea	ist o gy	0.77	_ ĵ		24	÷=	11.20	tî⊨	0.03	╡┊╞	0.7		13.21	(75)
Northea	ast nov	0.77			2	°⊨	11.20	tî⊨	0.03	╡┊╞	0.7		10.00	(75)
Northea	ast o av	0.77	= ĵ	20	13	° 🛏	11.20	lî⊨	0.57	╡┊╞	0.8	=	20.3	(75)
Northea	ist 0.9x	0.77	x	2	20	<u>_</u>	22.97	tî⊨	0.63	╡┊╞	0.7	= -	64 29	(75)
Northea	ast 0.9x	0.77		1	58	2 <u>–</u>	22.97	╏┊┝	0.63	╡ <sub>╺</sub> ╞	0.7		23.58	(75)
Northea	ast 0.9x	0.77	x	23	37	× —	22.97	i 🗜	0.63	╡╷╞	0.7	- i	99.81	(75)
Northea	ist 0.9x	0.77	×	1	76	×	22.97	i . F	0.63	╡╷╞	0.7	-	24.71	(75)
Northea	st 0.9x	0.77	×	3.0	83	×	22.97	i . E	0.63		0.7	-	26,88	(75)
Northea	ast 0.9x	0.77	×	13	34	×	22.97	×	0.63	Ξ×Γ	0.7	- i	28.22	(75)
Northea	st 0.9x	0.77	×	0	3	×	22.97	i . F	0.63	٦×٢	0.7		2.11	(75)
Northea	st 0.9x	0.54	x	2.0	03	x	22.97	×	0.57		0.8	=	41.33	(75)
Northea	ast 0.9x	0.77	×	2.3	29	×	41.38	i × 🗖	0.63	×	0.7	=	115.84	(75)
Northea	ast 0.9x	0.77	x	1.0	58	x	41.38	i×⊏	0.63	1×	0.7	=	42.49	(75)
Northea	st o.9x	0.77	×	2.3	37	×	41.38	i × 🗆	0.63	×	0.7	=	179.82	(75)
Northea	ust 0.9x	0.77	×	1.3	76	×	41.38	i × 🗖	0.63	×	0.7	=	44.51	(75)
Northea	ast 0.9x	0.77	×	3.0	83	×	41.38	i × 🗖	0.63	٦×٢	0.7		48.43	(75)
Northea	st o.9x	0.77	×	1.3	34	x	41.38	×	0.63	×	0.7	=	50.84	(75)
Northea	st 0.9x	0.77	×	0	3	×	41.38	×	0.63	×	0.7	=	3,79	(75)
Northea	ast 0.9x	0.54	×	2.0	03	x	41.38	×	0.57	×	0.8	=	74.46	(75)
Northea	st 0.9x	0.77	×	2.	29	×	67.96	×	0.63	×	0.7	=	190.24	(75)
Northea	ast 0.9x	0.77	×	1.0	58	×	67.96	×	0.63	×	0.7	=	69.78	(75)
Northea	st 0.9x	0.77	×	2.3	37	x	67.96	×	0.63	×	0.7	=	295.32	(75)
Northea	ast 0.9x	0.77	×	1.3	76	x	67.96	×	0.63	x	0.7	=	73.1	(75)

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com

Northeast 0.9x	0.77	×	3.83	×	67.96	×	0.63	×	0.7	=	79.54	(75)
Northeast 0.9x	0.77	×	1.34	×	67.96	Ī×Ī	0.63	<b>1</b> × [	0.7	] = [	83.49	(75)
Northeast 0.9x	0.77	×	0.3	] × [	67.96	] × [	0.63	] × [	0.7	] = [	6.23	(75)
Northeast 0.9x	0.54	×	2.03	×	67.96	] × [	0.57	] × [	0.8	=	122.29	(75)
Northeast 0.9x	0.77	×	2.29	×	91.35	] × [	0.63	×	0.7	=	255.72	(75)
Northeast 0.9x	0.77	×	1.68	×	91,35	] × [	0.63	×	0.7	=	93,8	(75)
Northeast 0.9x	0.77	×	2.37	×	91.35	] × [	0.63	) × [	0.7	=	396.97	(75)
Northeast 0.9x	0.77	×	1.76	×	91.35	] × [	0.63	× [	0.7	] = [	98.27	(75)
Northeast 0.9x	0.77	×	3.83	×	91.35	×	0.63	) × [	0.7	=	106.92	(75)
Northeast 0.9x	0.77	×	1.34	×	91.35	×	0.63	×	0.7		112.22	(75)
Northeast 0.9x	0.77	×	0.3	×	91.35	×	0.63	×	0.7	=	8.37	(75)
Northeast 0.9x	0.54	× [	2.03	×	91.35	] × [	0.57	] × [	0.8	] = [	164.38	(75)
Northeast 0.9x	0.77	×	2.29	x	97.38	×	0.63	×	0.7	=	272.62	(75)
Northeast 0.9x	0.77	×	1.68	×	97.38	×	0.63	×	0.7	=	100	(75)
Northeast 0.9x	0.77	×	2.37	×	97.38	] × [	0.63	×	0.7	] = [	423.22	(75)
Northeast 0.9x	0.77	×	1.76	x	97.38	×	0.63	×	0.7	=	104.76	(75)
Northeast 0.9x	0.77	×	3.83	×	97.38	] * [	0.63	×	0.7	=	113.99	(75)
Northeast 0.9x	0.77	×	1.34	×	97.38	×	0.63	×	0.7	=	119.64	(75)
Northeast 0.9x	0.77	x	0.3	x	97.38	) × [	0.63	×	0.7	=	8.93	(75)
Northeast 0.9x	0.54	×	2.03	×	97.38	×	0.57	×	0.8	=	175.25	(75)
Northeast 0.9x	0.77	×	2.29	×	91,1	) × [	0,63	×	0.7	=	255.03	(75)
Northeast 0.9x	0.77	x	1.68	x	91.1	×	0.63	×	0.7	=	93,55	(75)
Northeast 0.9x	0.77	×	2.37	×	91.1	×	0.63	×	0.7	=	395.91	(75)
Northeast 0.9x	0.77	×	1.76	×	91.1	] × [	0.63	] × [	0.7	] = [	98	(75)
Northeast 0.9x	0.77	×	3.83	×	91.1	×	0.63	×	0.7	=	106.63	(75)
Northeast 0.9x	0.77	×	1.34	×	91.1	×	0.63	×	0.7	=	111.92	(75)
Northeast 0.9x	0.77	× [	0.3	×	91.1	] × [	0.63	×	0.7	=	8.35	(75)
Northeast 0.9x	0.54	×	2.03	×	91.1	] × [	0.57	×	0.8	=	163.94	(75)
Northeast 0.9x	0.77	×	2.29	×	72.63	×	0.63	×	0.7	=	203.31	(75)
Northeast 0.9x	0.77	×	1.68	×	72.63	) × [	0.63	×	0.7	=	74.58	(75)
Northeast 0.9x	0.77	×	2.37	×	72.63	] × [	0.63	] × [	0.7		315.62	(75)
Northeast 0.9x	0.77	×	1.76	×	72.63	×	0.63	×	0.7		78.13	(75)
Northeast 0.9x	0.77	×	3.83	×	72.63	] × [	0.63	×	0.7	=	85.01	(75)
Northeast 0.9x	0.77	×	1.34	×	72.63	] × [	0.63	] × [	0.7	=	89.23	(75)
Northeast 0.9x	0.77	×	0.3	×	72.63	×	0.63	×	0.7	=	6.66	(75)
Northeast 0.9x	0.54	्र	2.03	×	72.63	] × [	0.57	×	0.8	=	130.69	(75)
Northeast 0.9x	0.77	ं×	2.29	×	50.42	×	0.63	×	0.7	=	141.15	(75)
Northeast 0.9x	0.77	×	1.68	×	50.42	×	0.63	×	0.7	=	51.77	(75)
Northeast 0.9x	0.77	×	2.37	×	50.42	× [	0.63	×	0.7	=	219.12	(75)
Northeast 0.9x	0.77	×	1.76	×	50.42	] × [	0.63	×	0.7	=	54.24	(75)
Northeast 0.9x	0.77	×	3.83	×	50.42	] × [	0.63	×	0.7	=	59.02	(75)

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com

Page 7 of 21

Northeast 0.9x	0.77	×	1.34	×	50.42	×	0.63	<b>x</b>	0.7	=	61.95	(75)
Northeast 0.9x	0.77	×	0.3	] × [	50.42	] × [	0.63	×	0.7	] - C	4.62	(75)
Northeast 0.9x	0.54	×	2.03	×	50.42	] × [	0.57	×	0.8	=	90.73	(75)
Northeast 0.9x	0.77	×	2.29	×	28.07	] × [	0.63	x	0.7	=	78.57	(75)
Northeast 0.9x	0.77	×	1,68	×	28.07	] × [	0.63	×	0.7	=	28.82	(75)
Northeast 0.9x	0.77	×	2,37	] × [	28.07	] × [	0.63	] × [	0.7	=	121.97	(75)
Northeast 0.9x	0.77	×	1.76	x	28.07	] × [	0.63	) × [	0.7	=	30.19	(75)
Northeast 0.9x	0.77	×	3.83	× [	28.07	] × [	0.63	) × [	0.7	=	32.85	(75)
Northeast 0.9x	0.77	×	1,34	×	28.07	×	0.63	×	0.7	] = [	34.48	(75)
Northeast 0.9x	0.77	x	0.3	×	28.07	] × [	0.63	×	0.7	=	2.57	(75)
Northeast 0.9x	0.54	×	2.03	×	28.07	] × [	0.57	×	0.8	] = [	50.51	(75)
Northeast 0.9x	0.77	×	2.29	] × [	14.2	] × [	0.63	) × [	0.7	] = [	39,74	(75)
Northeast 0.9x	0.77	×	1.68	×	14.2	] × [	0.63	X [	0.7		14.58	(75)
Northeast 0.9x	0.77	×	2.37	×	14.2	×	0.63	×	0.7	=	61.7	(75)
Northeast 0.9x	0.77	×	1.76	×	14.2	] × [	0.63	X [	0.7	=	15.27	(75)
Northeast 0.9x	0.77	×	3.83	×	14.2	× [	0.63	×	0.7	=	16.62	(75)
Northeast 0.9x	0.77	×	1.34	] × [	14.2	] × [	0.63	] × [	0.7	=	17.44	(75)
Northeast 0.9x	0.77	] × [	0.3	] × [	14.2	×	0.63	×	0.7	=	1.3	(75)
Northeast 0.9x	0.54	×	2.03	×	14.2	] × [	0.57	×	0.8	] = [	25.55	(75)
Northeast 0.9x	0.77	×	2.29	×	9.21	×	0.63	) × [	0.7	=	25.79	(75)
Northeast 0.9x	0.77	×	1.68	×	9.21	×	0.63	×	0.7	=	9.46	(75)
Northeast 0.9x	0.77	- × [	2.37	×	9.21	] × [	0.63	×	0.7	] = [	40.04	(75)
Northeast 0.9x	0.77	×	1,76	×	9.21	×	0.63	×	0,7	=	9.91	(75)
Northeast 0.9x	0.77	×	3.83	] × [	9.21	] × [	0.63	×	0.7	] = [	10.79	(75)
Northeast 0.9x	0.77	×	1.34	×	9.21	×	0.63	×	0.7	] = [	11.32	(75)
Northeast 0.9x	0.77	×	0.3	×	9.21	×	0.63	×	0.7	=	0.84	(75)
Northeast 0.9x	0.54	×	2.03	) × [	9.21	] × [	0.57	] × [	0.8	] = [	16.58	(75)
Southeast 0.9x	0.77	×	0.95	×	36,79	×	0.63	×	0.7	- [	10.68	(77)
Southeast 0.9x	0.77	×	2	×	36.79	×	0.63	×	0.7	=	22.49	(77)
Southeast 0.9x	0.77	) × [	0.95	) × [	62.67	] × [	0.63	) × [	0.7	] = [	18.2	(77)
Southeast 0.9x	0.77	×	2	] × [	62.67	] × [	0.63	) × [	0.7	] = [	38.31	(77)
Southeast 0.9x	0.77	×	0.95	×	85.75	] × [	0.63	) × [	0.7	] = [	24.9	(77)
Southeast 0.9x	0.77	×	2	× [	85.75	) × [	0.63	×	0.7	- [	52.41	(77)
Southeast 0.9x	0.77	×	0.95	×	106.25	×	0.63	×	0.7	- [	30.85	(77)
Southeast 0.9x	0.77	×	2	×	106.25	×	0.63	x	0.7	=	64.94	(77)
Southeast 0.9x	0.77	×	0.95	×	119.01	×	0.63	×	0.7	] = [	34.55	(77)
Southeast 0.9x	0.77	×	2	×	119.01	×	0.63	× [	0.7	- [	72.74	(77)
Southeast 0.9x	0.77	×	0.95	×	118.15	×	0.63	×	0.7	=	34,3	(77)
Southeast 0.9x	0.77	×	2	×	118.15	] × [	0.63	×	0.7	=	72.22	(77)
Southeast 0.9x	0.77	×	0.95	×	113.91	×	0.63	×	0.7	=	33.07	(77)
Southeast 0.9x	0.77	×	2	) × [	113.91	×	0.63	×	0.7	=	69.62	(77)

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com

Page 8 of 21

Southeast 0.9x	0.77	×	0.95	×	104.39	×	0.63	x	0.7	=	30.31	(77)
Southeast 0.9x	0.77	×	2	×	104.39	×	0.63	] × [	0.7	] = [	63.81	(77)
Southeast 0.9x	0.77	×	0.95	×	92.85	] × [	0.63	×	0.7	=	26.96	(77)
Southeast 0.9x	0.77	x	2	×	92.85	] × [	0.63	×	0.7	=	56.75	(77)
Southeast 0.9x	0.77	×	0.95	×	69.27	] × [	0.63	×	0.7	] = [	20.11	(77)
Southeast 0.9x	0.77	×	2	] × [	69.27	] × [	0.63	×	0.7	=	42.34	(77)
Southeast 0.9x	0.77	×	0.95	×	44.07	] × [	0.63	] × [	0.7		12.8	(77)
Southeast 0.9x	0.77	×	2	] × [	44.07	] × [	0.63	×	0.7		26.94	(77)
Southeast 0.9x	0.77	×	0.95	×	31,49	×	0.63	×	0.7	=	9.14	(77)
Southeast 0.9x	0.77	×	2	×	31.49	] × [	0.63	] × [	0.7	=	19.25	(77)
Southwesto.9x	0.77	×	7.38	] × [	36.79	ונ	0.57	×	0.8	=	85.81	(79)
Southwesto.9x	0.77	×	10.59	×	36.79	] [	0.57	] × [	0.8		123.13	(79)
Southwesto.9x	0.77	×	3.83	×	36.79	ĪĒ	0.57	×	0.8	=	89.06	(79)
Southwesto.9x	0.77	×	2.25	×	36.79	ונ	0.57	] × [	0.8	=	52.32	(79)
Southwesto.9x	0.77	×	23.96	×	36.79	ī Ē	0.57	] × [	0.8	=	278.59	(79)
Southwesto.9x	0.77	×	4.13	×	36.79	וו	0.57	×	0.8	=	96.04	(79)
Southwesto, 9x	0.77	×	2.19	] × [	36.79	i C	0.57	] × [	0.8	=	50.93	(79)
Southwesto.9x	0.77	×	2.2	×	36.79	ונ	0.57	×	0.8	=	25.58	(79)
Southwesto.9x	0.77	x	2,26	×	36.79		0.63	×	0.7	=	127.06	(79)
Southwesto.9x	0.77	×	2.2	] × [	36.79	וכ	0.63	] × [	0.7	=	24.74	(79)
Southwesto.9x	0.77	×	2.19	×	36.79	] [	0.63	) × [	0.7	] = [	24.63	(79)
Southwesto.9x	0.77	×	2.93	×	36.79	ונ	0.63	] × [	0.7	=	65.89	(79)
Southwesto.9x	0.77	×	1.49	×	36,79	] [	0.63	×	0.7	=	16,75	(79)
Southwesto.9x	0.77	×	7.38	×	62.67	] [	0.57	] × [	0.8	=	146.16	(79)
Southwesto.9x	0.77	×	10.59	×	62.67	] [	0.57	) × [	0.8	=	209.74	(79)
Southwesto 9x	0.77	×	3.83	] × [	62.67	] [	0.57	] × [	0.8	=	151.71	(79)
Southwesto.9x	0.77	×	2.25	×	62.67	] [	0.57	×	0.8	=	89.12	(79)
Southwesto.9x	0.77	×	23.96	×	62.67	] [	0.57	×	0.8	=	474.54	(79)
Southwesto.9x	0.77	×	4.13	] × [	62.67		0.57	] × [	0.8	=	163.59	(79)
Southwesto.9x	0.77	×	2.19	×	62.67	] [	0.57	×	0.8	=	86.75	(79)
Southwesto.9x	0.77	×	2.2	×	62.67	] [	0.57	×	8.0	=	43,57	(79)
Southwest0.9x	0.77	×	2.26	× [	62.67	] [	0.63	] × [	0.7	] = [	216.44	(79)
Southwest0.9x	0.77	×	2.2	×	62.67	] [	0.63	) × [	0.7	-	42.14	(79)
Southwesto.9x	0.77	×	2.19	x	62.67	] [	0.63	×	0.7	=	41.95	(79)
Southwest0.9x	0.77	×	2.93	×	62.67	] [	0.63	×	0.7	] = [	112.24	(79)
Southwest	0.77	×	1.49	×	62.67	] [	0.63	] × [	0.7	=	28.54	(79)
Southwesto 9x	0.77	×	7.38	×	85.75	] [	0.57	×	0.8	=	199.99	(79)
Southwesto.9x	0.77	×	10.59	×	85.75		0.57	×	0.8	=	286.97	(79)
Southwest0.9x	0.77	×	3.83	×	85.75	] [	0.57	×	0.8	=	207.57	(79)
Southwesto.9x	0.77	×	2.25	×	85.75	] [	0.57	×	0.8	=	121.94	(79)
Southwesto.9x	0.77	×	23.96	×	85.75	] [	0.57	×	0.8		649.28	(79)

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com

Page 9 of 21

Southwesto.9x	0.77	×	4.13	×	85.75	Ιſ	0.57	×	0.8	=	223.83	(79)
Southwesto, 9x	0.77	- ×	2.19	ī × ī	85.75	ίī	0.57	ī × ī	0.8	ī - Ē	118.69	(79)
Southwesto 9x	0.77	×	2.2	×	85.75	İĪ	0.57	] × [	0.8	=	59,62	(79)
Southwesto.9x	0.77	x	2.26	×	85.75	ĪĪ	0.63	] × [	0.7	=	296.14	(79)
Southwest <sub>0.9x</sub>	0.77	×	2.2	×	85.75	İĪ	0.63	×	0.7	] = [	57.66	(79)
Southwesto.9x	0.77	×	2.19	×	85.75	Ī	0.63	] × [	0.7	=	57.39	(79)
Southwesto.9x	0.77	×	2.93	×	85.75	Ī	0.63	) × [	0.7	=	153.57	(79)
Southwest0.9x	0.77	×	1.49	×	85.75	I	0.63	×	0.7	] = [	39.05	(79)
Southwesto 9x	0.77	×	7.38	×	106.25	1 [	0.57	] × [	0.8		247.79	(79)
Southwesto.9x	0.77	×	10.59	×	106.25	1 [	0.57	×	0.8		355.57	(79)
Southwest0.9x	0.77	×	3.83	×	106.25	1 [	0.57	×	0.8	=	257,19	(79)
Southwest0.9x	0.77	×	2.25	×	106.25	1 [	0.57	] × [	0.8	- [	151.09	(79)
Southwesto.9x	0.77	×	23.96	×	106.25	1 [	0.57	) × [	0.8	=	804.49	(79)
Southwest0.9x	0.77	×	4.13	×	106.25	1 [	0.57	×	0.8	=	277.34	(79)
Southwest0.9x	0.77	×	2.19	×	106.25	1 [	0.57	) × [	0.8	=	147.06	(79)
Southwesto.9x	0.77	×	2.2	×	106.25	1 [	0.57	] × [	0.8		73.87	(79)
Southwesto.9x	0.77	×	2.26	×	106.25	1 [	0.63	] × [	0.7	=	366.93	(79)
Southwesto 9x	0.77	×	2.2	×	106.25	1 [	0.63	× [	0.7	=	71.44	(79)
Southwesto.9x	0.77	×	2.19	×	106.25	1 [	0.63	] × [	0.7	=	71.11	(79)
Southwesto.9x	0.77	×	2.93	×	106.25	1 [	0.63	] × [	0.7	] = [	190.29	(79)
Southwest0.9x	0.77	×	1,49	×	106.25	1 [	0.63	] × [	0.7	=	48.38	(79)
Southwesto.9x	0.77	×	7.38	×	119.01	1 [	0.57	) × [	0.8	=	277.55	(79)
Southwesto.9x	0.77	×	10.59	×	119.01	1 [	0.57	×	0.8	] = [	398.27	(79)
Southwesto.9x	0.77	×	3.83	×	119.01	1 [	0.57	] × [	0.8	=	288.08	(79)
Southwesto.9x	0.77	×	2.25	×	119.01	1 [	0.57	) × [	0.8	1	169.24	(79)
Southwest0.9x	0.77	×	23.96	×	119.01	1 [	0.57	× [	0.8	] = [	901.1	(79)
Southwesto.9x	0.77	×	4.13	×	119.01	1 [	0.57	) × [	0.8	=	310.64	(79)
Southwesto.9x	0.77	×	2.19	×	119.01	1 [	0.57	) × [	0.8		164.72	(79)
Southwesto.9x	0.77	×	2.2	×	119.01	1 [	0.57	] × [	0.8		82.74	(79)
Southwest0.9x	0.77	×	2.26	×	119.01	1 [	0.63	) × [	0.7	] = [	410.99	(79)
Southwesto.9x	0.77	×	2.2	×	119.01	1 [	0.63	] × [	0.7		80.02	(79)
Southwesto.9x	0.77	×	2.19	×	119.01	1 [	0.63	] × [	0.7		79.65	(79)
Southwesto.9x	0.77	×	2.93	×	119.01	1 [	0.63	×	0.7	=	213.14	(79)
Southwest0.9x	0.77	× [	1.49	×	119.01	Ì	0.63	] × [	0.7	=	54.19	(79)
Southwesto.9x	0.77	×	7.38	×	118.15	1 [	0.57	) × [	0.8	=	275.54	(79)
Southwesto.9x	0.77	x	10.59	×	118.15	Ī	0.57	] × [	0.8	=	395.39	(79)
Southwesto.9x	0.77	×	3.83	×	118.15	] [	0.57	x	0.8	=	286	(79)
Southwesto.9x	0.77	×	2.25	×	118.15	lĪ	0.57	×	0.8	=	168.01	(79)
Southwesto.9x	0.77	×	23.96	×	118.15	ן ו	0.57	×	0.8	=	894.58	(79)
Southwesto.9x	0.77	×	4.13	×	118.15	ΙĪ	0.57	×	0.8	=	308.4	(79)
Southwesto.9x	0.77	×	2.19	×	118.15	l	0.57	×	0.8	=	163,53	(79)

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com

Page 10 of 21

Southwesto.9x	0.77	×	2.2	×	118.15	] [	0.57	×	0.8	=	82.14	(79)
Southwesto.9x	0.77	x	2.26	ī × ī	118.15	i i	0.63	ī × Ī	0.7	ī - Ē	408.02	(79)
Southwest0.9x	0.77	×	2.2	] × [	118.15	i i	0.63	×	0.7	] = [	79.44	(79)
Southwesto.9x	0.77	×	2.19	×	118.15	Ì	0.63	×	0.7	=	79.08	(79)
Southwesto.9x	0.77	x	2,93	] × [	118.15	i i	0.63	×	0.7	ī = Ē	211.59	(79)
Southwesto.9x	0.77	×	1.49	] × [	118.15	i i	0.63	×	0.7		53.8	(79)
Southwest0.9x	0.77	×	7.38	×	113.91	Ì	0.57	×	0.8	=	265.65	(79)
Southwesto 9x	0.77	×	10.59	] × [	113,91	] [	0.57	×	0.8	=	381.2	(79)
Southwest0.9x	0.77	×	3.83	] × [	113.91	1 [	0.57	×	0.8	=	275.73	(79)
Southwesto.9x	0.77	×	2.25	) × [	113.91	] [	0.57	×	0.8	] = [	161.98	(79)
Southwesto.9x	0.77	×	23.96	×	113.91	] [	0.57	×	0.8	=	862.47	(79)
Southwest0.9x	0.77	×	4.13	] × [	113.91	1 [	0.57	×	0.8	] = [	297.33	(79)
Southwesto.9x	0.77	×	2.19	_ × [	113.91	] [	0.57	×	0.8	] - [	157.66	(79)
Southwesto.9x	0.77	x	2.2	×	113.91	] [	0.57	×	0.8	() (i) (i) (i) (i) (i) (i) (i) (i) (i) (	79.19	(79)
Southwesto.9x	0.77	×	2.26	] × [	113.91	] [	0.63	×	0.7	=	393.38	(79)
Southwest0.9x	0.77	x	2.2	×	113.91	] [	0.63	×	0.7	=	76.59	(79)
Southwesto 9x	0.77	x	2.19	×	113.91	] [	0.63	×	0.7	=	76.24	(79)
Southwesto.9x	0.77	×	2.93	×	113.91	] [	0.63	×	0.7	=	204	(79)
Southwesto.9x	0.77	x	1.49	×	113.91	] [	0.63	x	0.7	=	51.87	(79)
Southwesto.9x	0.77	×	7.38	<b>x</b>	104.39	] [	0.57	×	0.8	=	243.45	(79)
Southwesto, 9x	0,77	×	10,59	×	104.39	1 [	0.57	×	0.8	=	349.35	(79)
Southwesto.9x	0.77	×	3.83	] × [	104.39	] [	0.57	x	0.8	=	252.69	(79)
Southwest0.9x	0.77	x	2.25	×	104.39	] [	0.57	x	0.8	=	148.45	(79)
Southwest <sub>0,9x</sub>	0.77	×	23,96	×	104.39	] [	0.57	×	0.8	] = [	790.4	(79)
Southwest0.9x	0.77	x	4.13	] × [	104.39	] [	0.57	×	0.8	] = [	272.48	(79)
Southwesto.9x	0.77	x	2.19	×	104.39	] [	0.57	×	0.8	=	144.49	(79)
Southwesto.9x	0.77	×	2.2	×	104.39	] [	0.57	×	0.8	=	72.57	(79)
Southwesto.9x	0.77	×	2.26	_ × [	104.39	] [	0.63	×	0.7	] = [	360.5	(79)
Southwest0.9x	0.77	×	2.2	×	104.39	] [	0.63	×	0.7		70.19	(79)
Southwesto.9x	0.77	×	2.19	×	104.39	] [	0.63	×	0.7	] = [	69.87	(79)
Southwest0.9x	0.77	×	2.93	×	104.39	] [	0.63	×	0.7	=	186.95	(79)
Southwest0.9x	0.77	×	1.49	) × [	104.39	] [	0.63	×	0.7	] = [	47.54	(79)
Southwesto.9x	0.77	×	7.38	×	92.85	] [	0.57	×	0.8		216.54	(79)
Southwesto.9x	0.77	×	10.59	×	92.85	] [	0.57	×	0.8	=	310.73	(79)
Southwest0.9x	0.77	×	3.83	×	92.85	] [	0.57	×	0.8	=	224.76	(79)
Southwesto.9x	0.77	×	2.25	×	92.85	] [	0.57	×	0.8	=	132.04	(79)
Southwesto.9x	0.77	×	23.96	×	92.85	] [	0.57	×	0.8	=	703.03	(79)
Southwesto.9x	0.77	×	4.13	×	92.85	] [	0.57	×	0.8	=	242.36	(79)
Southwesto.9x	0.77	×	2.19	×	92.85	] [	0.57	×	0.8	=	128.52	(79)
Southwesto.9x	0.77	×	2.2	×	92.85	] [	0.57	×	8.0	=	64.55	(79)
Southwesto.9x	0.77	×	2.26	×	92.85	] [	0.63	×	0.7	=	320.66	(79)

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com

Page 11 of 21

Southwestore         0.77         x         2.19         x         92.85         0.83         x         0.77         x         2.19         x           Southwestore         0.77         x         2.39         x         92.85         0.63         x         0.77         x         1.40         x         92.85         0.63         x         0.77         x         1.42.28         70           Southwestore         0.77         x         1.53         x         66.27         0.67         x         0.88         =         92.15.11         70           Southwestore         0.77         x         2.35         x         66.27         0.57         x         0.8         =         92.16.17         70           Southwestore         0.77         x         2.36         x         66.27         0.57         x         0.8         =         93.6.7         70           Southwestore         0.77         x         2.36         x         66.27         0.57         x         0.8         =         44.6.7         70           Southwestore         0.77         x         2.26         x         66.27         0.65         x         0.7         <	Southwesto.9x	0.77	×	2.2	×	92.85	1 [	0.63	×	0.7	=	62.43	(79)
Southwesto or 0.77 × 2.03 × 92.85 0.63 × 0.7 = 169.29 79 Southwesto or 0.77 × 1.40 × 92.85 0.63 × 0.7 = 149.29 79 Southwesto or 0.77 × 1.38 × 09.27 0.67 × 0.8 = 107.67 79 Southwesto or 0.77 × 2.38 × 09.27 0.57 × 0.8 = 147.67 79 Southwesto or 0.77 × 2.38 × 09.27 0.57 × 0.8 = 147.67 79 Southwesto or 0.77 × 2.38 × 09.27 0.57 × 0.8 = 1407.87 79 Southwesto or 0.77 × 2.38 × 09.27 0.57 × 0.8 = 1407.87 79 Southwesto or 0.77 × 2.38 × 09.27 0.57 × 0.8 = 1407.87 79 Southwesto or 0.77 × 2.38 × 09.27 0.57 × 0.8 = 1407.87 79 Southwesto or 0.77 × 2.38 × 09.27 0.57 × 0.8 = 1408.87 79 Southwesto or 0.77 × 2.38 × 09.27 0.57 × 0.8 = 1408.87 79 Southwesto or 0.77 × 2.28 × 09.27 0.57 × 0.8 = 1408.87 79 Southwesto or 0.77 × 2.28 × 09.27 0.57 × 0.8 = 140.87 79 Southwesto or 0.77 × 2.28 × 09.27 0.57 × 0.8 = 140.87 79 Southwesto or 0.77 × 2.28 × 09.27 0.57 × 0.8 = 140.87 79 Southwesto or 0.77 × 2.28 × 09.27 0.57 × 0.8 = 140.87 79 Southwesto or 0.77 × 2.28 × 09.27 0.53 × 0.7 = 140.57 79 Southwesto or 0.77 × 2.38 × 00.27 0.53 × 0.7 = 140.57 79 Southwesto or 0.77 × 1.40 × 00.27 0.53 × 0.7 = 140.57 79 Southwesto or 0.77 × 1.40 × 00.27 0.53 × 0.7 = 13.54 79 Southwesto or 0.77 × 1.40 × 00.27 0.57 × 0.8 = 102.76 79 Southwesto or 0.77 × 1.40 × 00.27 0.57 × 0.8 = 102.76 79 Southwesto or 0.77 × 1.43 × 14407 0.57 × 0.8 = 102.76 79 Southwesto or 0.77 × 1.43 × 14407 0.57 × 0.8 = 106.86 79 Southwesto or 0.77 × 1.43 × 14407 0.57 × 0.8 = 106.87 79 Southwesto or 0.77 × 2.28 × 14407 0.57 × 0.8 = 106.87 79 Southwesto or 0.77 × 2.19 × 14407 0.57 × 0.8 = 105.77 79 Southwesto or 0.77 × 2.19 × 14407 0.57 × 0.8 = 105.77 79 Southwesto or 0.77 × 2.26 × 14407 0.57 × 0.8 = 105.77 79 Southwesto or 0.77 × 1.49 × 14407 0.57 × 0.8 = 179.79 Southwesto or 0.77 × 1.49 × 14407 0.57 × 0.8 = 179.79 Southwesto or 0.77 × 1.49 × 14407 0.57 × 0.8 = 179.79 Southwesto or 0.77 × 1.49 × 14407 0.57 × 0.8 = 179.79 Southwesto or 0.77 × 1.49 × 1344 0.57 × 0.8 = 179.79 Southwesto or 0.77 × 1.413 × 1344 0.57 × 0.8 = 173.49 Southwesto or 0.77 × 2.28 × 1	Southwesto.9x	0.77	×	2.19	] × [	92.85	ίĪ	0.63	×	0.7	=	62.15	(79)
Southwesto or         0.77         ×         1.49         ×         92.85         0.63         ×         0.77         =         42.28         70           Southwesto or         0.77         ×         10.59         ×         60.27         0.57         ×         0.8         =         101.64         77           Southwesto or         0.77         ×         10.59         ×         60.27         0.57         ×         0.8         =         101.67         77           Southwesto or         0.77         ×         2.25         ×         66.27         0.57         ×         0.8         =         048.5         77           Southwesto or         0.77         ×         2.20         ×         66.27         0.57         ×         0.8         =         04.6         77           Southwesto or         0.77         ×         2.20         ×         66.27         0.57         ×         0.8         =         04.6         77           Southwesto or         0.77         ×         2.20         ×         66.27         0.67         ×         0.8         0.7         =         14.6         79           Southwesto or         0.77	Southwesto.9x	0.77	×	2.93	×	92.85	ĺ	0.63	x	0.7	=	166.29	(79)
Southwesto 6x Southwesto 6x OATT × 10.59 × 66.27 Southwesto 6x OATT × 10.59 × 64.07 Southwesto 6x OATT × 10.59 × 64.07 Southwesto 6x OATT × 10.59 × 44.07 Southwesto 6x OATT × 10.59 X Southwesto 6x OATT × 10.59 × 44.07 Southwesto 6x OATT × 10.59 X Southwesto 6x OATT × 10.50 X Southwesto 6x OATT × 10.59 X Southwesto 6x OATT × 10.50 X Southwesto 6x OA	Southwesto 9x	0.77	x	1.49	×	92.85	ΙĒ	0.63	x	0.7	=	42.28	(79)
Southwesdo ge         0.77         ×         10.59         ×         68.27         0.57         ×         0.8         =         231.81         79           Southwesdo ge         0.77         ×         3.83         ×         669.27         0.57         ×         0.8         =         167.67         170           Southwesdo ge         0.77         ×         23.96         ×         669.27         0.57         ×         0.8         =         167.67         170           Southwesdo ge         0.77         ×         2.10         ×         669.27         0.57         ×         0.88         =         168.67         170           Southwesdo ge         0.77         ×         2.20         ×         669.27         0.63         ×         0.63         *         0.7         =         239.21         70           Southwesdo ge         0.77         ×         2.21         ×         669.27         0.63         ×         0.77         =         144.67         70           Southwesdo ge         0.77         ×         1.40         ×         669.27         0.63         ×         0.63         *         0.7         *         144.67         70	Southwest0.9x	0.77	×	7.38	] × [	69.27	ĺĒ	0.57	×	0.8	] = [	161.54	(79)
Southwest) 9x         0.77         x         3.83         x         66.27         0.57         x         0.8         =         167.67         70           Southwest) 9x         0.77         x         2.26         x         66.27         0.57         x         0.8         =         95.5         170           Southwest) 9x         0.77         x         4.13         x         66.27         0.57         x         0.8         =         524.46         170           Southwest) 9x         0.77         x         2.19         x         66.27         0.57         x         0.8         =         66.87         170           Southwest) 9x         0.77         x         2.20         x         66.27         0.63         x         0.77         =         248.16         70           Southwest) 9x         0.77         x         2.20         x         66.27         0.63         x         0.77         =         44.36         70           Southwest) 9x         0.77         x         2.93         x         44.07         0.63         x         0.77         =         112.405         70           Southwest) 9x         0.77         x	Southwesto.9x	0.77	×	10.59	- × [	69.27	ÌĒ	0.57	x	0.8	-	231.81	(79)
Southwesdo ge         0.77         ×         2.25         ×         68.27         0.57         ×         0.8         =         98.5         179           Southwesdo ge         0.77         ×         23.96         ×         66.27         0.57         ×         0.8         =         524.46         179           Southwesdo ge         0.77         ×         2.10         ×         66.27         0.57         ×         0.8         =         66.88         179           Southwesdo ge         0.77         ×         2.20         ×         66.27         0.57         ×         0.8         =         44.16         179           Southwesdo ge         0.77         ×         2.20         ×         66.27         0.63         ×         0.77         =         24.95         179           Southwesdo ge         0.77         ×         2.24          66.27         0.63         ×         0.77         =         14.40         79           Southwesdo ge         0.77         ×         1.49         ×         66.27         0.63         ×         0.77         =         14.44         79           Southwesdo ge         0.77         ×	Southwesto.9x	0.77	×	3.83	×	69.27	1 [	0.57	×	0.8	=	167.67	(79)
Southwesd, p.       0.77       x       23.96       x       69.27       0.57       x       0.8       =       524.46       79         Southwesd, p.       0.77       x       4.13       x       69.27       0.57       x       0.6       =       180.6       176         Southwesd, p.       0.77       x       2.19       x       69.27       0.57       x       0.6       =       64.16       79         Southwesd, p.       0.77       x       2.26       x       69.27       0.63       x       0.77       =       64.57       79         Southwesd, p.       0.77       x       2.26       x       69.27       0.63       x       0.7       =       64.57       79         Southwesd, p.       0.77       x       1.44       x       69.27       0.63       x       0.7       =       124.05       79         Southwesd, p.       0.77       x       1.48       x       64.27       0.657       x       0.6       124.05       79         Southwesd, p.       0.77       x       1.43       x       44.07       0.57       x       0.6       124.07       0.57       x       0	Southwest0.9x	0.77	×	2,25	] × [	69.27	1 [	0.57	×	8.0	] = [	98.5	(79)
Southwesd.0.ex       0.77       x       4.13       x       60.27       0.57       x       0.8       =       180.8       79         Southwesd.0.ex       0.77       x       2.19       x       60.27       0.57       x       0.8       =       64.16       79         Southwesd.0.ex       0.77       x       2.2       x       60.27       0.63       x       0.7       =       230.21       70         Southwesd.0.ex       0.77       x       2.26       x       60.27       0.63       x       0.7       =       443.61       79         Southwesd.0.ex       0.77       x       2.19       x       60.27       0.63       x       0.7       =       443.67       79         Southwesd.0.ex       0.77       x       2.19       x       60.27       0.63       x       0.7       =       112.405       79         Southwesd.0.ex       0.77       x       1.40       x       60.27       0.63       x       0.7       =       112.405       79         Southwesd.0.ex       0.77       x       1.40       x       44.07       0.57       x       0.8       =       112.40       <	Southwesto.9x	0.77	×	23,96	×	69.27	1 [	0.57	×	0.8	-	524.46	(79)
Southwesto ex 0.77 x 2.19 x 669.27 0.57 x 0.8 = 06.87 77 Southwesto ex 0.77 x 2.28 x 669.27 0.57 x 0.8 = 0.8 = 0.687 77 Southwesto ex 0.77 x 2.28 x 669.27 0.63 x 0.7 = 239.21 77 Southwesto ex 0.77 x 2.29 x 669.27 0.63 x 0.7 = 124.05 77 Southwesto ex 0.77 x 2.19 x 669.27 0.63 x 0.7 = 124.05 77 Southwesto ex 0.77 x 2.19 x 669.27 0.63 x 0.7 = 124.05 77 Southwesto ex 0.77 x 1.49 x 669.27 0.63 x 0.7 = 131.54 77 Southwesto ex 0.77 x 1.49 x 669.27 0.63 x 0.7 = 131.54 77 Southwesto ex 0.77 x 1.49 x 669.27 0.63 x 0.7 = 131.54 77 Southwesto ex 0.77 x 1.49 x 669.27 0.63 x 0.7 = 131.54 77 Southwesto ex 0.77 x 1.49 x 669.27 0.57 x 0.8 = 100.28 77 Southwesto ex 0.77 x 1.49 x 44.07 0.57 x 0.8 = 106.68 77 Southwesto ex 0.77 x 1.38 x 44.07 0.57 x 0.8 = 147.48 77 Southwesto ex 0.77 x 2.38 x 44.07 0.57 x 0.8 = 147.48 77 Southwesto ex 0.77 x 2.396 x 44.07 0.57 x 0.8 = 106.68 77 Southwesto ex 0.77 x 2.396 x 44.07 0.57 x 0.8 = 106.68 77 Southwesto ex 0.77 x 2.396 x 44.07 0.57 x 0.8 = 106.68 77 Southwesto ex 0.77 x 2.19 x 44.07 0.57 x 0.8 = 15.0 77 Southwesto ex 0.77 x 2.19 x 44.07 0.57 x 0.8 = 0.177 Southwesto ex 0.77 x 2.19 x 44.07 0.57 x 0.8 = 0.177 Southwesto ex 0.77 x 2.28 x 44.07 0.57 x 0.8 = 0.177 Southwesto ex 0.77 x 2.29 x 44.07 0.63 x 0.7 = 152.19 79 Southwesto ex 0.77 x 2.29 x 44.07 0.63 x 0.7 = 152.19 79 Southwesto ex 0.77 x 2.29 x 44.07 0.63 x 0.7 = 129.63 77 Southwesto ex 0.77 x 2.29 x 44.07 0.63 x 0.7 = 129.63 77 Southwesto ex 0.77 x 2.29 x 44.07 0.63 x 0.7 = 129.63 77 Southwesto ex 0.77 x 2.29 x 44.07 0.63 x 0.7 = 120.07 77 Southwesto ex 0.77 x 2.29 x 44.07 0.63 x 0.7 = 126.1 79 Southwesto ex 0.77 x 2.29 x 3.140 0.57 x 0.8 = 147.8 79 Southwesto ex 0.77 x 2.29 x 3.140 0.57 x 0.8 = 144.78 79 Southwesto ex 0.77 x 2.29 x 3.140 0.57 x 0.8 = 144.78 79 Southwesto ex 0.77 x 2.29 x 3.140 0.57 x 0.8 = 144.78 79 Southwesto ex 0.77 x 2.29 x 3.140 0.57 x 0.8 = 144.78 79 Southwesto ex 0.77 x 2.29 x 3.140 0.57 x 0.8 = 144.78 79 Southwesto ex 0.77 x 2.29 x 3.140 0.57 x 0.8 = 144.78 79 Southwesto ex	Southwesto.9x	0.77	×	4.13	×	69.27	] [	0.57	×	0.8	-	180,8	(79)
Southwesto & 0.77 × 2.2 × 69.27 0.57 × 0.8 = 44.8.16 79 Southwesto & 0.77 × 2.26 × 69.27 0.63 × 0.7 = 239.21 (79 Southwesto & 0.77 × 2.29 × 69.27 0.63 × 0.7 = 46.56 (79 Southwesto & 0.77 × 2.93 × 69.27 0.63 × 0.7 = 140.45 (79 Southwesto & 0.77 × 2.93 × 69.27 0.63 × 0.7 = 140.45 (79 Southwesto & 0.77 × 1.49 × 69.27 0.63 × 0.7 = 140.45 (79 Southwesto & 0.77 × 1.49 × 69.27 0.63 × 0.7 = 140.45 (79 Southwesto & 0.77 × 1.49 × 69.27 0.63 × 0.7 = 140.45 (79 Southwesto & 0.77 × 1.49 × 69.27 0.63 × 0.8 = 102.78 (79 Southwesto & 0.77 × 1.49 × 44.07 0.57 × 0.8 = 102.78 (79 Southwesto & 0.77 × 2.25 × 44.07 0.57 × 0.8 = 62.67 (79 Southwesto & 0.77 × 2.366 × 44.07 0.57 × 0.8 = 62.67 (79 Southwesto & 0.77 × 2.366 × 44.07 0.57 × 0.8 = 62.67 (79 Southwesto & 0.77 × 2.366 × 44.07 0.57 × 0.8 = 62.67 (79 Southwesto & 0.77 × 2.25 × 44.07 0.57 × 0.8 = 61 (79 Southwesto & 0.77 × 2.26 × 44.07 0.57 × 0.8 = 61 (79 Southwesto & 0.77 × 2.29 × 44.07 0.57 × 0.8 = 61 (79 Southwesto & 0.77 × 2.29 × 44.07 0.57 × 0.8 = 61 (79 Southwesto & 0.77 × 2.29 × 44.07 0.57 × 0.8 = 61 (79 Southwesto & 0.77 × 2.29 × 44.07 0.57 × 0.8 = 61 (79 Southwesto & 0.77 × 2.29 × 44.07 0.57 × 0.8 = 61 (79 Southwesto & 0.77 × 2.29 × 44.07 0.57 × 0.8 = 61 (79 Southwesto & 0.77 × 2.29 × 44.07 0.57 × 0.8 = 61 (79 Southwesto & 0.77 × 2.29 × 44.07 0.57 × 0.8 = 61 (79 Southwesto & 0.77 × 2.29 × 44.07 0.63 × 0.7 = 2.963 (79 Southwesto & 0.77 × 2.29 × 44.07 0.63 × 0.7 = 2.963 (79 Southwesto & 0.77 × 2.29 × 44.07 0.63 × 0.7 = 2.963 (79 Southwesto & 0.77 × 1.49 × 44.07 0.63 × 0.7 = 2.007 (79 Southwesto & 0.77 × 2.25 × 31.40 0.57 × 0.8 = 7.43 (79 Southwesto & 0.77 × 2.25 × 31.40 0.57 × 0.8 = 4.78 (79 Southwesto & 0.77 × 2.25 × 31.40 0.57 × 0.8 = 4.78 (79 Southwesto & 0.77 × 2.25 × 31.40 0.57 × 0.8 = 4.358 (79 Southwesto & 0.77 × 2.22 × 31.40 0.57 × 0.8 = 4.358 (79 Southwesto & 0.77 × 2.22 × 31.40 0.57 × 0.8 = 4.358 (79 Southwesto & 0.77 × 2.22 × 31.40 0.57 × 0.8 = 4.358 (79 Southwesto & 0.77 × 2.22 × 31.40 0.57 × 0.8 = 4.358 (79 Southwesto & 0.7	Southwest0.9x	0.77	× [	2.19	_ × [	69.27	1 [	0.57	×	0.8	] = [	95.87	(79)
Southwesto 9 0.77 × 2.26 × 69.27 0.63 × 0.7 = 239.21 79 Southwesto 9 0.77 × 2.19 × 69.27 0.63 × 0.7 = 44.57 79 Southwesto 9 0.77 × 2.19 × 69.27 0.63 × 0.7 = 44.57 79 Southwesto 9 0.77 × 2.93 × 69.27 0.63 × 0.7 = 124.05 79 Southwesto 9 0.77 × 1.49 × 69.27 0.63 × 0.7 = 124.05 79 Southwesto 9 0.77 × 1.49 × 69.27 0.63 × 0.7 = 124.05 79 Southwesto 9 0.77 × 1.49 × 69.27 0.63 × 0.7 = 124.05 79 Southwesto 9 0.77 × 1.55 × 44.07 0.57 × 0.8 = 102.78 79 Southwesto 9 0.77 × 3.83 × 44.07 0.57 × 0.8 = 147.48 79 Southwesto 9 0.77 × 3.83 × 44.07 0.57 × 0.8 = 62.67 79 Southwesto 9 0.77 × 2.25 × 44.07 0.57 × 0.8 = 62.67 79 Southwesto 9 0.77 × 2.19 × 44.07 0.57 × 0.8 = 633.68 79 Southwesto 9 0.77 × 2.19 × 44.07 0.57 × 0.8 = 611 79 Southwesto 9 0.77 × 2.19 × 44.07 0.57 × 0.8 = 611 79 Southwesto 9 0.77 × 2.28 × 44.07 0.57 × 0.8 = 115.03 79 Southwesto 9 0.77 × 2.29 × 44.07 0.57 × 0.8 = 611 79 Southwesto 9 0.77 × 2.29 × 44.07 0.57 × 0.8 = 611 79 Southwesto 9 0.77 × 2.29 × 44.07 0.57 × 0.8 = 611 79 Southwesto 9 0.77 × 2.29 × 44.07 0.57 × 0.8 = 155.9 79 Southwesto 9 0.77 × 2.29 × 44.07 0.63 × 0.7 = 296.5 79 Southwesto 9 0.77 × 2.93 × 44.07 0.63 × 0.7 = 296.5 79 Southwesto 9 0.77 × 1.49 × 44.07 0.63 × 0.7 = 20.07 79 Southwesto 9 0.77 × 2.29 × 31.49 0.57 × 0.8 = 73.43 79 Southwesto 9 0.77 × 2.25 × 31.49 0.57 × 0.8 = 73.43 79 Southwesto 9 0.77 × 2.25 × 31.49 0.57 × 0.8 = 73.43 79 Southwesto 9 0.77 × 2.25 × 31.49 0.57 × 0.8 = 74.27 79 Southwesto 9 0.77 × 2.25 × 31.49 0.57 × 0.8 = 74.27 79 Southwesto 9 0.77 × 2.29 × 31.49 0.57 × 0.8 = 74.27 79 Southwesto 9 0.77 × 2.25 × 31.49 0.57 × 0.8 = 14.78 79 Southwesto 9 0.77 × 2.25 × 31.49 0.57 × 0.8 = 14.78 79 Southwesto 9 0.77 × 2.25 × 31.49 0.57 × 0.8 = 14.27 79 Southwesto 9 0.77 × 2.25 × 31.49 0.57 × 0.8 = 12.89 79 Southwesto 9 0.77 × 2.25 × 31.49 0.57 × 0.8 = 12.17 79 Southwesto 9 0.77 × 2.25 × 31.49 0.57 × 0.8 = 12.17 79 Southwesto 9 0.77 × 2.29 × 31.49 0.63 × 0.7 = 12.17 79	Southwesto.9x	0.77	×	2.2	_ × [	69.27	] [	0.57	×	0.8	=	48.16	(79)
Southwesto, sr. 0.77 x 2.19 x 69.27 0.63 x 0.7 = 46.57 79 Southwesto, sr. 0.77 x 2.19 x 69.27 0.63 x 0.7 = 46.58 79 Southwesto, sr. 0.77 x 1.49 x 69.27 0.63 x 0.7 = 124.05 (79 Southwesto, sr. 0.77 x 1.49 x 69.27 0.63 x 0.7 = 124.05 (79 Southwesto, sr. 0.77 x 1.49 x 69.27 0.63 x 0.7 = 124.05 (79 Southwesto, sr. 0.77 x 1.49 x 69.27 0.657 x 0.8 = 1147.48 (79 Southwesto, sr. 0.77 x 10.59 x 44.07 0.57 x 0.8 = 1147.48 (79 Southwesto, sr. 0.77 x 10.59 x 44.07 0.57 x 0.8 = 102.78 (79 Southwesto, sr. 0.77 x 2.25 x 44.07 0.57 x 0.8 = 106.68 (79 Southwesto, sr. 0.77 x 2.25 x 44.07 0.57 x 0.8 = 62.67 (79 Southwesto, sr. 0.77 x 2.296 x 44.07 0.57 x 0.8 = 61.079 Southwesto, sr. 0.77 x 2.19 x 44.07 0.57 x 0.8 = 61.079 Southwesto, sr. 0.77 x 2.19 x 44.07 0.57 x 0.8 = 61.079 Southwesto, sr. 0.77 x 2.29 x 44.07 0.57 x 0.8 = 61.079 Southwesto, sr. 0.77 x 2.20 x 44.07 0.57 x 0.8 = 61.079 Southwesto, sr. 0.77 x 2.20 x 44.07 0.57 x 0.8 = 61.079 Southwesto, sr. 0.77 x 2.20 x 44.07 0.57 x 0.8 = 73.33.68 (79 Southwesto, sr. 0.77 x 2.20 x 44.07 0.57 x 0.8 = 71.5219 (79 Southwesto, sr. 0.77 x 2.29 x 44.07 0.63 x 0.7 = 29.63 (79 Southwesto, sr. 0.77 x 2.29 x 44.07 0.63 x 0.7 = 29.63 (79 Southwesto, sr. 0.77 x 2.29 x 44.07 0.63 x 0.7 = 29.63 (79 Southwesto, sr. 0.77 x 2.29 x 44.07 0.63 x 0.7 = 29.63 (79 Southwesto, sr. 0.77 x 2.29 x 44.07 0.63 x 0.7 = 20.07 (79 Southwesto, sr. 0.77 x 1.49 x 44.07 0.63 x 0.7 = 20.07 (79 Southwesto, sr. 0.77 x 1.49 x 44.07 0.63 x 0.7 = 20.07 (79 Southwesto, sr. 0.77 x 2.19 x 31.49 0.57 x 0.8 = 73.43 (79 Southwesto, sr. 0.77 x 2.25 x 31.49 0.57 x 0.8 = 44.78 (79 Southwesto, sr. 0.77 x 2.26 x 31.49 0.57 x 0.8 = 44.78 (79 Southwesto, sr. 0.77 x 2.29 x 31.49 0.57 x 0.8 = 44.78 (79 Southwesto, sr. 0.77 x 2.20 x 31.49 0.57 x 0.8 = 23.84 (79 Southwesto, sr. 0.77 x 2.20 x 31.49 0.57 x 0.8 = 21.89 (79 Southwesto, sr. 0.77 x 2.20 x 31.49 0.57 x 0.8 = 21.89 (79 Southwesto, sr. 0.77 x 2.20 x 31.49 0.57 x 0.8 = 21.89 (79 Southwesto, sr. 0.77 x 2.20 x 31.49 0.57 x 0.8 = 21.89 (79 Southwes	Southwesto.9x	0.77	×	2.26	×	69.27	] [	0.63	×	0.7	=	239.21	(79)
Southwesto.sx       0.77       x       2.19       x       69.27       0.63       x       0.7       =       46.36       79         Southwesto.sx       0.77       x       2.93       x       69.27       0.63       x       0.7       =       1124.05       79         Southwesto.sx       0.77       x       7.38       x       44.07       0.63       x       0.7       =       1124.05       79         Southwesto.sx       0.77       x       7.38       x       44.07       0.57       x       0.8       =       102.78       79         Southwesto.sx       0.77       x       1.353       x       44.07       0.57       x       0.8       =       106.68       79         Southwesto.sx       0.77       x       2.25       x       44.07       0.57       x       0.8       =       106.68       79         Southwesto.sx       0.77       x       2.19       x       44.07       0.57       x       0.8       =       115.03       79         Southwesto.sx       0.77       x       2.19       x       44.07       0.63       x       0.7       =       129.5       79<	Southwest0.9x	0.77	×	2.2	×	69.27	] [	0.63	×	0.7	-	46.57	(79)
Southwest0.9x       0.77       x       2.63       x       69.27       0.63       x       0.7       =       1124.05       79         Southwest0.9x       0.77       x       1.49       x       69.27       0.63       x       0.7       =       31.54       (79         Southwest0.9x       0.77       x       1.59       x       44.07       0.57       x       0.8       =       102.78       (79         Southwest0.9x       0.77       x       10.59       x       44.07       0.57       x       0.8       =       106.88       (79         Southwest0.9x       0.77       x       22.5       x       44.07       0.57       x       0.8       =       62.67       (79         Southwest0.9x       0.77       x       22.39       x       44.07       0.57       x       0.8       =       61.079       (79       Southwest0.9x       0.77       x       2.19       x       44.07       0.57       x       0.8       =       61.079       (79       Southwest0.9x       0.77       x       2.28       x       44.07       0.63       x       0.7       =       29.63       (79       Southwest0.9x <td>Southwesto.9x</td> <td>0.77</td> <td>ं×</td> <td>2.19</td> <td>×</td> <td>69.27</td> <td>] [</td> <td>0.63</td> <td>×</td> <td>0.7</td> <td>=</td> <td>46.36</td> <td>(79)</td>	Southwesto.9x	0.77	ं×	2.19	×	69.27	] [	0.63	×	0.7	=	46.36	(79)
Southwesto.gx       0.77       x       1.40       x       60.27       0.63       x       0.7       =       31.54       (79)         Southwesto.gx       0.77       x       7.38       x       44.07       0.57       x       0.8       =       102.78       (79)         Southwesto.gx       0.77       x       10.59       x       44.07       0.57       x       0.8       =       102.78       (79)         Southwesto.gx       0.77       x       3.83       x       44.07       0.57       x       0.8       =       622.67       (79)         Southwesto.gx       0.77       x       2.396       x       44.07       0.57       x       0.8       =       61.77       (79)         Southwesto.gx       0.77       x       2.19       x       44.07       0.57       x       0.8       =       61.79       (79)       Southwesto.gx       0.77       x       2.19       x       44.07       0.63       x       0.7       =       22.63       (79)       Southwesto.gx       0.77       x       2.28       x       44.07       0.63       x       0.7       =       29.63       (79)       Southwesto.	Southwesto 9x	0.77	×	2.93	×	69.27	] [	0.63	×	0.7	=	124.05	(79)
Southwesto.9x       0.77       x       7.38       x       44.07       0.57       x       0.8       =       102.78       (79)         Southwesto.9x       0.77       x       10.59       x       44.07       0.57       x       0.8       =       1147.48       (79)         Southwesto.9x       0.77       x       3.83       x       44.07       0.57       x       0.8       =       106.68       (79)         Southwesto.9x       0.77       x       22.5       x       44.07       0.57       x       0.8       =       62.87       (79)         Southwesto.9x       0.77       x       23.96       x       44.07       0.57       x       0.8       =       61.079       333.68       (79)         Southwesto.9x       0.77       x       2.19       x       44.07       0.57       x       0.8       =       61.079       79         Southwesto.9x       0.77       x       2.28       ×       44.07       0.63       x       0.7       =       29.63       (79)         Southwesto.9x       0.77       x       2.19       x       44.07       0.63       x       0.7       =	Southwest0.9x	0.77	_ × [	1.49	_ × [	69.27	1 [	0.63	×	0.7	=	31.54	(79)
Southwest0.0x       0.77       x       10.59       x       44.07       0.57       x       0.8       =       147.48       (79)         Southwest0.0x       0.77       x       3.83       x       44.07       0.57       x       0.8       =       106.68       (79)         Southwest0.0x       0.77       x       2.25       x       44.07       0.57       x       0.8       =       62.67       (79)         Southwest0.0x       0.77       x       2.396       x       44.07       0.57       x       0.8       =       333.68       (79)         Southwest0.0x       0.77       x       4.13       x       44.07       0.57       x       0.8       =       611       (79)         Southwest0.0x       0.77       x       2.19       x       44.07       0.63       x       0.7       =       152.19       (79)         Southwest0.0x       0.77       x       2.2       x       44.07       0.63       x       0.7       =       29.63       (79)         Southwest0.0x       0.77       x       2.19       x       44.07       0.63       x       0.7       =       29.63	Southwesto.9x	0.77	×	7.38	×	44.07	] [	0.57	×	0.8	=	102.78	(79)
Southwest0.9x       0.77       x       3.83       x       44.07       0.57       x       0.8       =       106.88       (79)         Southwest0.9x       0.77       x       2.25       x       44.07       0.57       x       0.8       =       62.67       (79)         Southwest0.9x       0.77       x       2.396       x       44.07       0.57       x       0.8       =       632.67       (79)         Southwest0.9x       0.77       x       4.13       x       44.07       0.57       x       0.8       =       611       (79)         Southwest0.9x       0.77       x       2.19       x       44.07       0.57       x       0.8       =       611       (79)         Southwest0.9x       0.77       x       2.26       x       44.07       0.63       x       0.7       =       152.19       (79)         Southwest0.9x       0.77       x       2.26       x       44.07       0.63       x       0.7       =       29.63       (79)         Southwest0.9x       0.77       x       2.19       x       44.07       0.63       x       0.7       =       29.63 <t< td=""><td>Southwesto.9x</td><td>0.77</td><td>×</td><td>10.59</td><td>×</td><td>44.07</td><td>] [</td><td>0.57</td><td>×</td><td>0.8</td><td>=</td><td>147.48</td><td>(79)</td></t<>	Southwesto.9x	0.77	×	10.59	×	44.07	] [	0.57	×	0.8	=	147.48	(79)
Southwesto, 9x       0.77       x       2.25       x       44.07       0.57       x       0.8       =       62.67       (79         Southwesto, 9x       0.77       x       23.96       x       44.07       0.57       x       0.8       =       333.68       (79         Southwesto, 9x       0.77       x       4.13       x       44.07       0.57       x       0.8       =       115.03       (79         Southwesto, 9x       0.77       x       2.19       x       44.07       0.57       x       0.8       =       61       (79         Southwesto, 9x       0.77       x       2.28       x       44.07       0.57       x       0.8       =       30.64       (79         Southwesto, 9x       0.77       x       2.28       x       44.07       0.63       x       0.7       =       29.63       (79         Southwesto, 9x       0.77       x       2.19       x       44.07       0.63       x       0.7       =       29.63       (79         Southwesto, 9x       0.77       x       2.19       x       44.07       0.63       x       0.7       =       20.07       <	Southwesto.9x	0.77	×	3.83	] × [	44.07	1 [	0.57	×	0.8	=	106.68	(79)
Southwest0.9x       0.77       x       23.96       x       44.07       0.57       x       0.8       =       333.68       (79)         Southwest0.9x       0.77       x       4.13       x       44.07       0.57       x       0.8       =       115.03       (79)         Southwest0.9x       0.77       x       2.19       x       44.07       0.57       x       0.8       =       61       (79)         Southwest0.9x       0.77       x       2.28       x       44.07       0.63       x       0.7       =       152.19       (79)         Southwest0.9x       0.77       x       2.28       x       44.07       0.63       x       0.7       =       29.63       (79)         Southwest0.9x       0.77       x       2.19       x       44.07       0.63       x       0.7       =       29.63       (79)         Southwest0.9x       0.77       x       2.19       x       44.07       0.63       x       0.7       =       29.63       (79)         Southwest0.9x       0.77       x       1.49       x       44.07       0.63       x       0.7       =       20.07       <	Southwest0.9x	0.77	_ × [	2.25	×	44.07	] [	0.57	×	0.8	=	62.67	(79)
Southwest0.9x       0.77       x       4.13       x       44.07       0.57       x       0.8       =       115.03       (79         Southwest0.9x       0.77       x       2.19       x       44.07       0.57       x       0.8       =       61       (79         Southwest0.9x       0.77       x       2.28       x       44.07       0.57       x       0.8       =       61       (79         Southwest0.9x       0.77       x       2.28       x       44.07       0.63       x       0.7       =       29.63       (79         Southwest0.9x       0.77       x       2.19       x       44.07       0.63       x       0.7       =       29.63       (79         Southwest0.9x       0.77       x       2.19       x       44.07       0.63       x       0.7       =       29.63       (79         Southwest0.9x       0.77       x       1.49       x       44.07       0.63       x       0.7       =       20.07       (79         Southwest0.9x       0.77       x       7.38       x       31.49       0.57       x       0.8       =       73.43       (79	Southwest0.9x	0.77	×	23.96	×	44.07	] [	0.57	×	0.8	=	333.68	(79)
Southwest0.9x       0.77       ×       2.19       ×       44.07       0.57       ×       0.8       =       61       (79         Southwest0.9x       0.77       ×       2.2       ×       44.07       0.57       ×       0.8       =       61       (79         Southwest0.9x       0.77       ×       2.26       ×       44.07       0.63       ×       0.7       =       152.19       (79         Southwest0.9x       0.77       ×       2.22       ×       44.07       0.63       ×       0.7       =       29.63       (79         Southwest0.9x       0.77       ×       2.19       ×       44.07       0.63       ×       0.7       =       29.5       (79         Southwest0.9x       0.77       ×       2.93       ×       44.07       0.63       ×       0.7       =       78.93       (79         Southwest0.9x       0.77       ×       1.49       ×       44.07       0.63       ×       0.7       =       20.07       (79         Southwest0.9x       0.77       ×       1.49       ×       31.49       0.57       ×       0.8       =       73.43       (79	Southwest0.9x	0.77	x	4.13	×	44.07	] [	0.57	×	0.8	=	115.03	(79)
Southwest0.9x       0.77       x       2.2       x       44.07       0.57       x       0.8       =       30.64       (79         Southwest0.9x       0.77       x       2.26       x       44.07       0.63       x       0.7       =       152.19       (79         Southwest0.9x       0.77       x       2.19       x       44.07       0.63       x       0.7       =       29.63       (79         Southwest0.9x       0.77       x       2.19       x       44.07       0.63       x       0.7       =       29.5       (79         Southwest0.9x       0.77       x       2.93       x       44.07       0.63       x       0.7       =       29.5       (79         Southwest0.9x       0.77       x       1.49       x       44.07       0.63       x       0.7       =       20.07       (79         Southwest0.9x       0.77       x       7.38       x       31.49       0.57       x       0.8       =       73.43       (79         Southwest0.9x       0.77       x       3.83       x       31.49       0.57       x       0.8       =       44.78       (79 <td>Southwesto.9x</td> <td>0.77</td> <td>×</td> <td>2.19</td> <td>×</td> <td>44.07</td> <td>] [</td> <td>0.57</td> <td>×</td> <td>0.8</td> <td></td> <td>61</td> <td>(79)</td>	Southwesto.9x	0.77	×	2.19	×	44.07	] [	0.57	×	0.8		61	(79)
Southwesto.9x       0.77       x       2.26       x       44.07       0.63       x       0.7       =       152.19       (79         Southwesto.9x       0.77       x       2.2       x       44.07       0.63       x       0.7       =       29.63       (79         Southwesto.9x       0.77       x       2.19       x       44.07       0.63       x       0.7       =       29.63       (79         Southwesto.9x       0.77       x       2.93       x       44.07       0.63       x       0.7       =       29.63       (79         Southwesto.9x       0.77       x       2.93       x       44.07       0.63       x       0.7       =       29.63       (79         Southwesto.9x       0.77       x       1.49       x       44.07       0.63       x       0.7       =       29.63       (79         Southwesto.9x       0.77       x       7.38       x       31.49       0.57       x       0.8       =       73.43       (79         Southwesto.9x       0.77       x       2.25       x       31.49       0.57       x       0.8       =       44.78       (79 </td <td>Southwest0.9x</td> <td>0.77</td> <td>×</td> <td>2.2</td> <td>×</td> <td>44.07</td> <td>] [</td> <td>0.57</td> <td>×</td> <td>0.8</td> <td>=</td> <td>30.64</td> <td>(79)</td>	Southwest0.9x	0.77	×	2.2	×	44.07	] [	0.57	×	0.8	=	30.64	(79)
Southwest0.9x       0.77       x       2.2       x       44.07       0.63       x       0.7       =       29.63       (79         Southwest0.9x       0.77       x       2.19       x       44.07       0.63       x       0.7       =       29.63       (79         Southwest0.9x       0.77       x       2.93       x       44.07       0.63       x       0.7       =       29.63       (79         Southwest0.9x       0.77       x       2.93       x       44.07       0.63       x       0.7       =       29.63       (79         Southwest0.9x       0.77       x       1.49       x       44.07       0.63       x       0.7       =       29.07       (79         Southwest0.9x       0.77       x       7.38       x       31.49       0.57       x       0.8       =       73.43       (79         Southwest0.9x       0.77       x       3.83       x       31.49       0.57       x       0.8       =       76.22       (79         Southwest0.9x       0.77       x       2.25       x       31.49       0.57       x       0.8       =       238.41       (79 </td <td>Southwesto.ex</td> <td>0.77</td> <td>×</td> <td>2.26</td> <td>×</td> <td>44.07</td> <td>] [</td> <td>0.63</td> <td>×</td> <td>0.7</td> <td>=</td> <td>152.19</td> <td>(79)</td>	Southwesto.ex	0.77	×	2.26	×	44.07	] [	0.63	×	0.7	=	152.19	(79)
Southwesto.9x       0.77       x       2.19       x       44.07       0.63       x       0.7       =       29.5       (79)         Southwesto.9x       0.77       x       2.93       x       44.07       0.63       x       0.7       =       29.5       (79)         Southwesto.9x       0.77       x       1.49       x       44.07       0.63       x       0.7       =       29.07       (79)         Southwesto.9x       0.77       x       7.38       x       31.49       0.57       x       0.8       =       73.43       (79)         Southwesto.9x       0.77       x       10.59       x       31.49       0.57       x       0.8       =       105.37       (79)         Southwesto.9x       0.77       x       2.25       x       31.49       0.57       x       0.8       =       44.78       (79)         Southwesto.9x       0.77       x       2.25       x       31.49       0.57       x       0.8       =       238.41       (79)         Southwesto.9x       0.77       x       2.19       x       31.49       0.57       x       0.8       =       62.19       <	Southwesto.9x	0.77	×	2.2	×	44.07	] [	0.63	x	0.7		29.63	(79)
Southwest0.9x       0.77       x       2.93       x       44.07       0.63       x       0.7       =       78.93       (79         Southwest0.9x       0.77       x       1.49       x       44.07       0.63       x       0.7       =       20.07       (79         Southwest0.9x       0.77       x       7.38       x       31.49       0.57       x       0.8       =       73.43       (79         Southwest0.9x       0.77       x       10.59       x       31.49       0.57       x       0.8       =       105.37       (79         Southwest0.9x       0.77       x       3.83       x       31.49       0.57       x       0.8       =       105.37       (79         Southwest0.9x       0.77       x       3.83       x       31.49       0.57       x       0.8       =       105.37       (79         Southwest0.9x       0.77       x       2.25       x       31.49       0.57       x       0.8       =       238.41       (79         Southwest0.9x       0.77       x       2.19       x       31.49       0.57       x       0.8       =       238.41 <td< td=""><td>Southwest0.9x</td><td>0.77</td><td>×</td><td>2.19</td><td>×</td><td>44.07</td><td>1 [</td><td>0.63</td><td>×</td><td>0.7</td><td>=</td><td>29.5</td><td>(79)</td></td<>	Southwest0.9x	0.77	×	2.19	×	44.07	1 [	0.63	×	0.7	=	29.5	(79)
Southwesto.9x       0.77       x       1.49       x       44.07       0.63       x       0.7       =       20.07       (79)         Southwesto.9x       0.77       x       7.38       x       31.49       0.57       x       0.8       =       73.43       (79)         Southwesto.9x       0.77       x       10.59       x       31.49       0.57       x       0.8       =       105.37       (79)         Southwesto.9x       0.77       x       3.83       x       31.49       0.57       x       0.8       =       105.37       (79)         Southwesto.9x       0.77       x       3.83       x       31.49       0.57       x       0.8       =       105.37       (79)         Southwesto.9x       0.77       x       2.25       x       31.49       0.57       x       0.8       =       244.78       (79)         Southwesto.9x       0.77       x       23.96       x       31.49       0.57       x       0.8       =       238.41       (79)         Southwesto.9x       0.77       x       2.19       x       31.49       0.57       x       0.8       =       238.41	Southwesto.9x	0.77	×	2.93	×	44.07	1 [	0.63	×	0.7	=	78.93	(79)
Southwest0.9x       0.77       x       7.38       x       31.49       0.57       x       0.8       =       73.43       (79         Southwest0.9x       0.77       x       10.59       x       31.49       0.57       x       0.8       =       73.43       (79         Southwest0.9x       0.77       x       3.83       x       31.49       0.57       x       0.8       =       76.22       (79         Southwest0.9x       0.77       x       2.25       x       31.49       0.57       x       0.8       =       76.22       (79         Southwest0.9x       0.77       x       2.25       x       31.49       0.57       x       0.8       =       244.78       (79         Southwest0.9x       0.77       x       2.26       x       31.49       0.57       x       0.8       =       238.41       (79         Southwest0.9x       0.77       x       4.13       x       31.49       0.57       x       0.8       =       43.58       (79         Southwest0.9x       0.77       x       2.19       x       31.49       0.57       x       0.8       =       21.89       (7	Southwesto.9x	0.77	×	1.49	×	44.07	1 [	0.63	×	0.7	=	20,07	(79)
Southwest0.9x       0.77       x       10.59       x       31.49       0.57       x       0.8       =       105.37       (79         Southwest0.9x       0.77       x       3.83       x       31.49       0.57       x       0.8       =       76.22       (79         Southwest0.9x       0.77       x       2.25       x       31.49       0.57       x       0.8       =       76.22       (79         Southwest0.9x       0.77       x       2.25       x       31.49       0.57       x       0.8       =       44.78       (79         Southwest0.9x       0.77       x       23.96       x       31.49       0.57       x       0.8       =       238.41       (79         Southwest0.9x       0.77       x       4.13       x       31.49       0.57       x       0.8       =       62.19       (79         Southwest0.9x       0.77       x       2.19       x       31.49       0.57       x       0.8       =       21.89       (79         Southwest0.9x       0.77       x       2.26       x       31.49       0.57       x       0.8       =       21.89       (	Southwesto.9x	0.77	×	7.38	× [	31.49	] [	0.57	×	0.8	=	73.43	(79)
Southwest0.9x       0.77       x       3.83       x       31.49       0.57       x       0.8       =       76.22       (79         Southwest0.9x       0.77       x       2.25       x       31.49       0.57       x       0.8       =       44.78       (79         Southwest0.9x       0.77       x       23.96       x       31.49       0.57       x       0.8       =       44.78       (79         Southwest0.9x       0.77       x       23.96       x       31.49       0.57       x       0.8       =       238.41       (79         Southwest0.9x       0.77       x       4.13       x       31.49       0.57       x       0.8       =       238.41       (79         Southwest0.9x       0.77       x       2.19       x       31.49       0.57       x       0.8       =       43.58       (79         Southwest0.9x       0.77       x       2.2       x       31.49       0.57       x       0.8       =       21.89       (79         Southwest0.9x       0.77       x       2.26       x       31.49       0.63       x       0.7       =       21.17       (7	Southwesto.9x	0.77	×	10.59	×	31.49	] [	0.57	×	0.8	=	105.37	(79)
Southwest0.9x       0.77       x       2.25       x       31.49       0.57       x       0.8       =       44.78       (79)         Southwest0.9x       0.77       x       23.96       x       31.49       0.57       x       0.8       =       238.41       (79)         Southwest0.9x       0.77       x       4.13       x       31.49       0.57       x       0.8       =       238.41       (79)         Southwest0.9x       0.77       x       4.13       x       31.49       0.57       x       0.8       =       82.19       (79)         Southwest0.9x       0.77       x       2.19       x       31.49       0.57       x       0.8       =       43.58       (79)         Southwest0.9x       0.77       x       2.2       x       31.49       0.57       x       0.8       =       21.89       (79)         Southwest0.9x       0.77       x       2.26       x       31.49       0.63       x       0.7       =       108.74       (79)         Southwest0.9x       0.77       x       2.20       x       31.49       0.63       x       0.7       =       21.17	Southwesto.9x	0.77	×	3.83	×	31.49	] [	0.57	×	0.8	=	76.22	(79)
Southwest0.9x       0.77       x       23.96       x       31.49       0.57       x       0.8       =       238.41       (79         Southwest0.9x       0.77       x       4.13       x       31.49       0.57       x       0.8       =       238.41       (79         Southwest0.9x       0.77       x       2.19       x       31.49       0.57       x       0.8       =       82.19       (79         Southwest0.9x       0.77       x       2.19       x       31.49       0.57       x       0.8       =       43.58       (79         Southwest0.9x       0.77       x       2.2       x       31.49       0.57       x       0.8       =       21.89       (79         Southwest0.9x       0.77       x       2.26       x       31.49       0.63       x       0.7       =       108.74       (79         Southwest0.9x       0.77       x       2.2       x       31.49       0.63       x       0.7       =       21.17       (79         Southwest0.9x       0.77       x       2.19       x       31.49       0.63       x       0.7       =       21.07       (79	Southwesto 9x	0.77	×	2.25	×	31.49	] [	0.57	×	8.0	=	44.78	(79)
Southwesto.9x       0.77       x       4.13       x       31.49       0.57       x       0.8       =       82.19       (79         Southwesto.9x       0.77       x       2.19       x       31.49       0.57       x       0.8       =       82.19       (79         Southwesto.9x       0.77       x       2.19       x       31.49       0.57       x       0.8       =       43.58       (79         Southwesto.9x       0.77       x       2.2       x       31.49       0.57       x       0.8       =       21.89       (79         Southwesto.9x       0.77       x       2.26       x       31.49       0.57       x       0.8       =       21.89       (79         Southwesto.9x       0.77       x       2.26       x       31.49       0.63       x       0.7       =       108.74       (79         Southwesto.9x       0.77       x       2.2       x       31.49       0.63       x       0.7       =       21.17       (79         Southwesto.9x       0.77       x       2.19       x       31.49       0.63       x       0.7       =       21.07       (79 <td>Southwesto.9x</td> <td>0.77</td> <td>×</td> <td>23.96</td> <td>×</td> <td>31.49</td> <td>] [</td> <td>0.57</td> <td>x</td> <td>0.8</td> <td>-</td> <td>238.41</td> <td>(79)</td>	Southwesto.9x	0.77	×	23.96	×	31.49	] [	0.57	x	0.8	-	238.41	(79)
Southwest0.9x       0.77       x       2.19       x       31.49       0.57       x       0.8       =       43.58       (79         Southwest0.9x       0.77       x       2.2       x       31.49       0.57       x       0.8       =       43.58       (79         Southwest0.9x       0.77       x       2.26       x       31.49       0.57       x       0.8       =       21.89       (79         Southwest0.9x       0.77       x       2.26       x       31.49       0.63       x       0.7       =       108.74       (79         Southwest0.9x       0.77       x       2.2       x       31.49       0.63       x       0.7       =       21.17       (79         Southwest0.9x       0.77       x       2.19       x       31.49       0.63       x       0.7       =       21.07       (79	Southwesto.gx	0,77	×	4.13	x	31.49	] [	0.57	x	0.8	=	82.19	(79)
Southwesto.9x       0.77       x       2.2       x       31.49       0.57       x       0.8       =       21.89       (79         Southwesto.9x       0.77       x       2.26       x       31.49       0.63       x       0.77       =       108.74       (79         Southwesto.9x       0.77       x       2.2       x       31.49       0.63       x       0.7       =       108.74       (79         Southwesto.9x       0.77       x       2.2       x       31.49       0.63       x       0.7       =       21.17       (79         Southwesto.9x       0.77       x       2.19       x       31.49       0.63       x       0.7       =       21.07       (79	Southwest0.9x	0.77	×	2.19	×	31.49	1 [	0.57	×	0.8	=	43.58	(79)
Southwesto.9x         0.77         x         2.26         x         31.49         0.63         x         0.7         =         108.74         (79           Southwesto.9x         0.77         x         2.2         x         31.49         0.63         x         0.7         =         108.74         (79           Southwesto.9x         0.77         x         2.2         x         31.49         0.63         x         0.7         =         21.17         (79           Southwesto.9x         0.77         x         2.19         x         31.49         0.63         x         0.7         =         21.07         (79	Southwesto.9x	0.77	×	2.2	×	31.49	] [	0.57	×	0.8	] = [	21.89	(79)
Southwest0.9x         0.77         x         2.2         x         31.49         0.63         x         0.7         =         21.17         (79)           Southwest0.9x         0.77         x         2.19         x         31.49         0.63         x         0.7         =         21.07         (79)	Southwesto.9x	0,77	×	2.26	×	31.49	] [	0.63	×	0,7	=	108.74	(79)
Southwest0.9x 0.77 x 2.19 x 31.49 0.63 x 0.7 = 21.07 (79	Southwest0.9x	0.77	×	2.2	×	31.49	1 [	0.63	×	0.7	=	21.17	(79)
	Southwesto.9x	0.77	×	2.19	×	31.49	] [	0.63	×	0.7	=	21.07	(79)

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com

Page 12 of 21

Southwesto.9x	0.77	×	2.93	×	31.49	ΊГ	0.63	×	0.7	=	56.39	(79)
Southwesto, 9x	0.77	×	1,49	Ī×Ī	31.49	īĒ	0.63	ī × Ē	0.7	ī = [	14.34	(79)
Northwest 0.9x	0.77	×	0.46	] × [	11.28	] × [	0.57	] × [	0.8	=	4.92	(81)
Northwest 0.9x	0.77	×	0.57	×	11.28	] × [	0.57	×	0.8	=	4.06	(81)
Northwest 0.9x	0.77	×	6.67	×	11.28	] × [	0.57	×	0.8	=	23.78	(81)
Northwest 0.9x	0.77	×	2.07	) × [	11,28	] × [	0.63	×	0.7	=	14.28	(81)
Northwest 0.9x	0.77	×	2.07	) × [	11.28	] * [	0.57	) × [	0.8	=	7.38	(81)
Northwest 0.9x	0.77	×	2.22	×	11.28	] × [	0.57	] × [	0.8	] = [	7.92	(81)
Northwest 0.9x	0.77	×	1.82	×	11,28	×	0.63	] × [	0.7	=	6.28	(81)
Northwest 0.9x	0.77	×	1.82	×	11.28	×	0.57	×	0.8	. = .	6.49	(81)
Northwest 0.9x	0.77	×	2.2	×	11.28	] × [	0.63	] × [	0.7	=	7.59	(81)
Northwest 0.9x	0.77	× [	3.08	×	11.28	] × [	0.57	] × [	0.8	=	10.98	(81)
Northwest 0.9x	0.77	×	13.1	×	11.28	] × [	0.57	×	0.8	*	46.71	(81)
Northwest 0.9x	0.77	×	3.96	×	11.28	×	0.57	) × [	0.8	=	14.12	(81)
Northwest 0.9x	0.77	×	1.38	×	11.28	] × [	0.57	) × [	0.8	] = [	4.92	(81)
Northwest 0.9x	0.77	×	0.46	×	22.97	×	0.57	×	0.8		10.02	(81)
Northwest 0.9x	0.77	×	0.57	) × [	22.97	] × [	0.57	] × [	0.8	=	8.27	(81)
Northwest 0.9x	0.77	×	6.67	×	22.97	×	0.57	×	0.8	=	48.41	(81)
Northwest 0.9x	0.77	×	2.07	×	22.97	] × [	0.63	] × [	0.7	=	29.06	(81)
Northwest 0.9x	0.77	×	2.07	×	22.97	] × [	0.57	] × [	0.8	=	15.02	(81)
Northwest 0.9x	0.77	×	2.22	×	22,97	) × [	0.57	_ × [	0.8	=	16.11	(81)
Northwest 0.9x	0.77	×	1.82	×	22.97	×	0.63	×	0.7	=	12.77	(81)
Northwest 0.9x	0.77	- × [	1.82	×	22.97	] × [	0.57	×	0.8	=	13.21	(81)
Northwest 0.9x	0.77	×	2.2	) × [	22.97	] × [	0.63	] × [	0.7	=	15.44	(81)
Northwest 0.9x	0.77	×	3.08	×	22.97	×	0.57	×	0.8	=	22.35	(81)
Northwest 0.9x	0.77	×	13.1	×	22.97	×	0.57	× [	0.8	=	95.08	(81)
Northwest 0.9x	0.77	] × [	3.96	×	22.97	] × [	0.57	) × [	0.8	=	28.74	(81)
Northwest 0.9x	0.77	×	1.38	×	22.97	] × [	0.57	×	0.8	=	10.02	(81)
Northwest 0.9x	0.77	×	0.46	×	41.38	×	0.57	×	0.8		18.04	(81)
Northwest 0.9x	0.77	×	0.57	×	41.38	) × [	0.57	×	0.8	=	14.91	(81)
Northwest 0.9x	0.77	×	6.67	<b>×</b>	41.38	] × [	0.57	] × [	0.8	=	87.22	(81)
Northwest 0.9x	0.77	×	2.07	×	41.38	] × [	0.63	×	0.7		52.35	(81)
Northwest 0.9x	0.77	×	2.07	×	41.38	) × [	0.57	×	0.8	=	27.07	(81)
Northwest 0.9x	0.77	×	2.22	×	41.38	] × [	0.57	] × [	0.8	=	29.03	(81)
Northwest 0.9x	0.77	×	1.82	×	41.38	] × [	0.63	×	0.7	=	23.02	(81)
Northwest 0.9x	0.77	्र	1.82	×	41.38	] × [	0.57	×	0.8	. = .	23.8	(81)
Northwest 0.9x	0.77	×	2.2	×	41.38	×	0.63	×	0.7	=	27.82	(81)
Northwest 0.9x	0.77	×	3.08	×	41.38	×	0.57	×	0.8	=	40.27	(81)
Northwest 0.9x	0.77	×	13.1	×	41.38	×	0.57	×	8.0	=	171.3	(81)
Northwest 0.9x	0.77	×	3.96	×	41.38	×	0.57	×	0.8	=	51.78	(81)
Northwest 0.9x	0.77	×	1.38	×	41.38	×	0.57	×	0.8	=	18.04	(81)

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com

Page 13 of 21

Northwest 0.9x	0.77	×	0.46	×	67.96		0.57	×	0.8	=	29.63	(81)
Northwest 0.9x	0.77	×	0.57	Ī×Ī	67.96	ī × Ē	0.57	ī × Ē	0.8	ī = [	24.48	(81)
Northwest 0.9x	0.77	×	6.67	] × [	67.96	] × [	0.57	] × [	0.8	=	143.24	(81)
Northwest 0.9x	0.77	×	2.07	×	67.96	] × [	0.63	×	0.7	=	85.98	(81)
Northwest 0.9x	0.77	×	2.07	×	67.96	] × [	0.57	×	0.8	=	44.45	(81)
Northwest 0.9x	0.77	×	2.22	×	67.96	] × [	0.57	] × [	0.8	=	47.67	(81)
Northwest 0.9x	0.77	×	1.82	×	67.96	] × [	0.63	×	0.7	=	37.8	(81)
Northwest 0.9x	0.77	×	1.82	×	67.96	] × [	0.57	×	0.8	] = [	39.08	(81)
Northwest 0.9x	0.77	×	2.2	×	67.96	×	0.63	] × [	0.7	=	45.69	(81)
Northwest 0.9x	0.77	×	3.08	×	67.96	×	0.57	×	0.8		66.14	(81)
Northwest 0.9x	0.77	×	13.1	×	67.96	×	0.57	×	0.8	=	281.32	(81)
Northwest 0.9x	0.77	×	3.96	×	67.96	] × [	0.57	] × [	0.8	] = [	85.04	(81)
Northwest 0.9x	0.77	×	1.38	×	67.96	×	0.57	×	0.8	=	29.63	(81)
Northwest 0.9x	0.77	×	0.46	×	91.35	×	0.57	×	0.8	=	39.84	(81)
Northwest 0.9x	0.77	×	0.57	×	91.35	] × [	0.57	) × [	0.8	] = [	32.91	(81)
Northwest 0.9x	0.77	×	6.67	×	91.35	×	0.57	×	0.8		192.54	(81)
Northwest 0.9x	0.77	×	2.07	×	91.35	] × [	0.63	] × [	0.7	=	115.57	(81)
Northwest 0.9x	0.77	×	2.07	×	91.35	×	0.57	×	0.8	=	59.75	(81)
Northwest 0.9x	0.77	×	2.22	×	91.35	] × [	0.57	] × [	0.8	=	64.08	(81)
Northwest 0.9x	0.77	×	1.82	×	91.35	] × [	0.63	] × [	0.7	=	50.81	(81)
Northwest 0.9x	0.77	×	1.82	×	91,35	×	0.57	×	0.8	=	52.54	(81)
Northwest 0.9x	0.77	×	2.2	×	91.35	] × [	0.63	] × [	0.7	=	61.42	(81)
Northwest 0.9x	0.77	×	3.08	×	91.35	×	0.57	×	0.8	] = [	88.91	(81)
Northwest 0.9x	0.77	×	13.1	×	91,35	] × [	0.57	] × [	0.8	=	378.15	(81)
Northwest 0.9x	0.77	×	3.96	×	91.35	] × [	0.57	×	0.8		114.31	(81)
Northwest 0.9x	0.77	×	1.38	×	91.35	×	0.57	×	0.8	] = [	39,84	(81)
Northwest 0.9x	0.77	×	0.46	×	97.38	] × [	0.57	×	0.8	=	42.47	(81)
Northwest 0.9x	0.77	×	0.57	×	97.38	] × [	0.57	×	0.8	-	35.08	(81)
Northwest 0.9x	0.77	×	6.67	×	97.38	] × [	0.57	] × [	0.8		205.26	(81)
Northwest 0.9x	0.77	×	2.07	×	97.38	] × [	0.63	×	0.7	=	123.21	(81)
Northwest 0.9x	0.77	×	2.07	× [	97.38	] × [	0.57	] × [	0.8	=	63.7	(81)
Northwest 0.9x	0.77	×	2.22	) × [	97.38	] × [	0.57	] × [	0.8		68.32	(81)
Northwest 0.9x	0.77	×	1.82	<b>.</b>	97.38	×	0.63	×	0.7	=	54.17	(81)
Northwest 0.9x	0.77	×	1.82	×	97.38	] × [	0.57	] × [	0.8	=	56.01	(81)
Northwest 0.9x	0.77	×	2.2	×	97.38	] × [	0.63	] × [	0.7	=	65,48	(81)
Northwest 0.9x	0.77	्र	3.08	×	97.38	] × [	0.57	) × [	0.8	=	94,78	(81)
Northwest 0.9x	0.77	×	13.1	×	97.38	×	0.57	×	0.8	=	403.14	(81)
Northwest 0.9x	0.77	×	3.96	×	97.38	×	0.57	×	0.8	=	121.87	(81)
Northwest 0.9x	0.77	×	1.38	×	97.38	×	0.57	×	0.8	=	42.47	(81)
Northwest 0.9x	0.77	×	0.46	×	91,1	×	0.57	×	0.8	=	39.73	(81)
Northwest 0.9x	0.77	×	0.57	×	91,1		0.57	×	0.8	=	32.82	(81)

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com

Page 14 of 21

Northwest 0.9x	0.77	×	6.67	×	91.1	×	0.57	×	0.8	=	192.02	(81)
Northwest 0.9x	0.77	×	2.07	] × [	91.1	Ī×Ī	0.63	٦× ۲	0.7	] = [	115.26	(81)
Northwest 0.9x	0.77	×	2.07	] × [	91.1	] × [	0.57	×	0.8	] = [	59.59	(81)
Northwest 0.9x	0.77	×	2.22	×	91.1	] × [	0.57	×	0.8	=	63.91	(81)
Northwest 0.9x	0.77	×	1.82	] × [	91.1	] × [	0.63	×	0.7	=	50.67	(81)
Northwest 0.9x	0.77	×	1.82	×	91.1	) × [	0.57	×	0.8	=	52.4	(81)
Northwest 0.9x	0.77	×	2.2	] × [	91.1	] * [	0.63	×	0.7	=	61.25	(81)
Northwest 0.9x	0.77	×	3.08	×	91.1	] × [	0.57	×	0.8	=	88.67	(81)
Northwest 0.9x	0.77	×	13.1	×	91.1	×	0.57	×	0.8	=	377.13	(81)
Northwest 0.9x	0.77	×	3.96	×	91.1	] × [	0.57	×	0.8	=	114	(81)
Northwest 0.9x	0.77	×	1.38	×	91.1	×	0.57	×	0.8	=	39.73	(81)
Northwest 0.9x	0.77	× [	0.46	×	72.63	] × [	0.57	] × [	0.8	=	31.67	(81)
Northwest 0.9x	0.77	×	0.57	×	72.63	] × [	0.57	×	0.8	=	26.16	(81)
Northwest 0.9x	0.77	×	6.67	×	72.63	×	0.57	×	0.8	=	153.08	(81)
Northwest 0.9x	0.77	×	2.07	×	72.63	] × [	0.63	) × [	0.7	] = [	91.89	(81)
Northwest 0.9x	0.77	×	2.07	×	72.63	) × [	0.57	×	0.8	=	47.51	(81)
Northwest 0.9x	0.77	×	2.22	] × [	72.63	] * [	0.57	×	0.8	=	50.95	(81)
Northwest 0.9x	0.77	×	1.82	×	72.63	] × [	0.63	×	0.7	=	40.4	(81)
Northwest 0.9x	0.77	×	1.82	×	72.63	] × [	0.57	×	0.8	=	41.77	(81)
Northwest 0.9x	0.77	×	2.2	×	72.63	] × [	0.63	×	0.7	=	48.83	(81)
Northwest 0.9x	0.77	×	3.08	×	72,63	] × [	0,57	×	0.8	=	70.69	(81)
Northwest 0.9x	0.77	×	13.1	] × [	72.63	] × [	0.57	×	0.8	=	300.65	(81)
Northwest 0.9x	0.77	×	3.96	×	72.63	×	0.57	×	0.8	=	90.88	(81)
Northwest 0.9x	0.77	×	1:38	×	72.63	] × [	0.57	] × [	0.8	=	31.67	(81)
Northwest 0.9x	0.77	×	0.46	] × [	50.42	] × [	0.57	×	0.8	=	21.99	(81)
Northwest 0.9x	0.77	×	0.57	×	50.42	×	0.57	×	0.8	] = [	18.16	(81)
Northwest 0.9x	0.77	] × [	6.67	×	50.42	] × [	0.57	×	0.8	=	106.28	(81)
Northwest 0.9x	0.77	×	2.07	×	50.42	] × [	0.63	×	0.7	=	63.79	(81)
Northwest 0.9x	0.77	×	2.07	] × [	50.42	] × [	0.57	×	0.8	=	32.98	(81)
Northwest 0.9x	0.77	×	2.22	×	50.42	] × [	0.57	×	0.8	=	35.37	(81)
Northwest 0.9x	0.77	×	1.82	×	50.42	] × [	0.63	] × [	0.7		28.04	(81)
Northwest 0.9x	0.77	×	1.82	] × [	50.42	] * [	0.57	×	0.8	=	29	(81)
Northwest 0.9x	0.77	×	2.2	×	50.42	×	0.63	×	0.7	=	33.9	(81)
Northwest 0.9x	0.77	× [	3.08	×	50.42	] × [	0.57	] × [	0.8	=	49.07	(81)
Northwest 0.9x	0.77	×	13,1	×	50.42	] × [	0.57	×	0.8	=	208.73	(81)
Northwest 0.9x	0.77	×	3.96	×	50.42	] × [	0.57	×	0.8	=	63.1	(81)
Northwest 0.9x	0.77	×	1,38	×	50.42	×	0.57	×	0.8	=	21,99	(81)
Northwest 0.9x	0.77	×	0.46	×	28.07	×	0.57	×	0.8	=	12.24	(81)
Northwest 0.9x	0.77	×	0.57	×	28.07	×	0.57	×	0.8	=	10.11	(81)
Northwest 0.9x	0.77	×	6.67	×	28.07	×	0.57	×	0.8	=	59.16	(81)
Northwest 0.9x	0.77	×	2,07	×	28.07	] * [	0.63	×	0.7	=	35.51	(81)

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com

Page 15 of 21

Northwest 0.9x	0.77	x	2.07	×	28.07	×	0.57	×	0.8	=	18.36	(81)
Northwest 0.9x	0.77	×	2.22	] × [	28.07	×	0.57	×	0.8	] = [	19.69	(81)
Northwest 0.9x	0.77	×	1.82	×	28.07	×	0.63	x	0.7	] = [	15.61	(81)
Northwest 0.9x	0.77	×	1.82	×	28.07	×	0.57	×	0.8	=	16.14	(81)
Northwest 0.9x	0.77	X	2.2	×	28.07	×	0.63	×	0.7	] = [	18.87	(81)
Northwest 0.9x	0.77	×	3.08	×	28.07	×	0.57	x	0.8	] = [	27.32	(81)
Northwest 0.9x	0,77	×	13.1	×	28.07	×	0.57	×	0.8	] = [	116.19	(81)
Northwest 0.9x	0.77	] × [	3.96	×	28.07	×	0.57	×	0.8	] = [	35.12	(81)
Northwest 0.9x	0.77	×	1.38	×	28.07	×	0.57	x	0.8	=	12.24	(81)
Northwest 0.9x	0,77	×	0.46	×	14.2	×	0.57	×	0.8	] = [	6.19	(81)
Northwest 0.9x	0.77	×	0.57	×	14.2	×	0.57	×	0.8	=	5.11	(81)
Northwest 0.9x	0.77	×	6.67	×	14.2	×	0.57	×	0.8	=	29.92	(81)
Northwest 0.9x	0.77	×	2.07	×	14.2	×	0.63	×	0.7	=	17.96	(81)
Northwest 0.9x	0.77	×	2.07	×	14.2	×	0.57	×	0.8	] = [	9.29	(81)
Northwest 0.9x	0.77	×	2.22	×	14.2	×	0.57	x	0.8	=	9.96	(81)
Northwest 0.9x	0.77	×	1.82	×	14.2	×	0.63	×	0.7	] = [	7.9	(81)
Northwest 0.9x	0.77	] × [	1.82	] × [	14.2	] × [	0.57	×	0.8	] = [	8.17	(81)
Northwest 0.9x	0.77	- × [	2.2	×	14.2	×	0.63	x	0.7	=	9.55	(81)
Northwest 0.9x	0.77	×	3.08	×	14.2	×	0.57	x	0.8	] = [	13.82	(81)
Northwest 0.9x	0.77	x	13.1	×	14.2	×	0.57	×	0.8	=	58.77	(81)
Northwest 0.9x	0.77	×	3.96	x	14.2	×	0.57	×	0.8	=	17.77	(81)
Northwest 0.9x	0.77	] × [	1.38	×	14.2	×	0.57	×	0.8	] = [	6.19	(81)
Northwest 0.9x	0.77	x	0.46	×	9.21	×	0.57	×	0.8	=	4.02	(81)
Northwest 0.9x	0.77	×	0.57	×	9.21	×	0.57	×	0.8	=	3.32	(81)
Northwest 0.9x	0.77	- × [	6.67	×	9.21	×	0.57	×	0.8	] = [	19.42	(81)
Northwest 0.9x	0.77	×	2.07	×	9.21	×	0.63	×	0.7	=	11.66	(81)
Northwest 0.9x	0.77	×	2.07	×	9.21	×	0.57	×	0.8	- [	6,03	(81)
Northwest 0.9x	0.77	×	2.22	×	9.21	×	0.57	×	0.8	=	6.46	(81)
Northwest 0.9x	0.77	×	1.82	×	9.21	×	0.63	×	0.7	=	5.13	(81)
Northwest 0.9x	0.77	×	1.82	×	9.21	×	0.57	×	0.8	=	5.3	(81)
Northwest 0.9x	0,77	×	2.2	×	9.21	×	0.63	×	0.7	=	6.2	(81)
Northwest 0.9x	0.77	×	3.08	×	9.21	×	0.57	×	0.8	=	8.97	(81)
Northwest 0.9x	0.77	×	13.1	×	9.21	×	0.57	×	0.8	=	38.14	(81)
Northwest 0.9x	0.77	×	3.96	×	9.21	×	0.57	×	0.8	] = [	11.53	(81)
Northwest 0.9x	0.77	×	1.38	×	9.21	×	0.57	x	0.8	] = [	4.02	(81)
Rooflights 0.9x	1	×	4.47	×	26	×	0.63	×	0.7	=	46.15	(82)
Rooflights 0.9x	1	×	2.04	×	26	×	0.63	×	0.7	] = [	21.08	(82)
Rooflights 0.9x	1	×	5.52	×	26	×	0.63	x	0.7	] = [	170.89	(82)
Rooflights 0.9x	1	×	9.27	×	26	×	0.63	×	0.7	=	95.7	(82)
Rooflights 0.9x	1	×	7.7	×	26	×	0.63	×	0.7	=	79,42	(82)
Rooflights 0.9x	1	×	4.47	×	54	×	0.63	×	0.7	] = [	95.85	(82)

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com

Page 16 of 21

Rooflights 0.9x	1	×	2.04	] × [	54		0.63	×	0.7	=	43.79	(82)
Rooflights 0.9x	1	1×	5.52	ī × ī	54	ī×ī	0.63	ī × ī	0.7	ī - Ē	354.92	(82)
Rooflights 0.9x	1	1 × [	9.27	ī×ī	54	ī×ī	0.63	ī × ī	0.7	ī = [	198.76	(82)
Rooflights 0.9x	1	×	7.7	] × [	54	] × [	0.63	X	0.7	] = [	164.95	(82)
Rooflights 0.9x	1	×	4.47	Ī×Ē	96	Ī×Ī	0.63	ī × ī	0.7	1 = [	170.39	(82)
Rooflights 0.9x	1	×	2.04	×	96	] × [	0.63	×	0.7	=	77.84	(82)
Rooflights 0.9x	1	×	5.52	×	96	] × [	0.63	×	0.7	=	630.98	(82)
Rooflights 0.9x	1	×	9.27	×	96	] × [	0.63	×	0.7	] = [	353.35	(82)
Rooflights 0.9x	1	×	7.7	×	96	×	0.63	] × [	0.7	=	293.24	(82)
Rooflights 0.9x	1	×	4.47	×	150	] × [	0.63	×	0.7	- [	266.24	(82)
Rooflights 0.9x	1	×	2,04	×	150	×	0.63	×	0.7	=	121.63	(82)
Rooflights 0.9x	1	×	5.52	×	150	] × [	0.63	_ × [	0.7	] = [	985.9	(82)
Rooflights 0.9x	1	×	9.27	×	150	- × [	0.63	×	0.7	=	552.1	(82)
Rooflights 0.9x	1	×	7.7	×	150	×	0.63	× [	0.7	=	458.18	(82)
Rooflights 0.9x	1	×	4.47	×	192	] × [	0.63	×	0.7	- [	340.79	(82)
Rooflights 0.9x	1	×	2.04	×	192	×	0.63	×	0.7		155.69	(82)
Rooflights 0.9x	1	×	5.52	×	192	] × [	0.63	_ × [	0.7	=	1261.95	(82)
Rooflights 0.9x	1	×	9.27	×	192	×	0.63	×	0.7	=	706.69	(82)
Rooflights 0.9x	1	×	7.7	×	192	] × [	0.63	_ × [	0.7	=	586.47	(82)
Rooflights 0.9x	1	×	4.47	<b>×</b>	200	] × [	0.63	] × [	0.7	=	354.99	(82)
Rooflights 0.9x	1	×	2.04	×	200	×	0.63	×	0.7	=	162.17	(82)
Rooflights 0.9x	1	x	5.52	×	200	) × [	0.63	×	0.7	=	1314.53	(82)
Rooflights 0.9x	1	×	9.27	×	200	] × [	0.63	×	0.7	=	736.14	(82)
Rooflights 0.9x	1	×	7.7	×	200	] × [	0.63	) × [	0.7	=	610.91	(82)
Rooflights 0.9x	1	×	4.47	×	189	] × [	0.63	×	0.7		335.46	(82)
Rooflights 0.9x	1	×	2,04	×	189	×	0.63	× [	0.7	=	153.25	(82)
Rooflights 0.9x	1	×	5.52	×	189	] × [	0.63	_ × [	0.7	=	1242.23	(82)
Rooflights 0.9x	1	×	9.27	×	189	] × [	0.63	×	0.7	=	695.65	(82)
Rooflights 0.9x	1	×	7.7	] × [	189	] × [	0.63	) × [	0.7	-	577.31	(82)
Rooflights 0.9x	1	×	4.47	×	157	] × [	0.63	×	0.7	=	278.67	(82)
Rooflights 0.9x	1	×	2.04	× [	157	] × [	0.63	_ × [	0.7		127.31	(82)
Rooflights 0.9x	1	×	5.52	×	157	] × [	0.63	× [	0.7		1031.91	(82)
Rooflights 0.9x	1	×	9.27	×	157	×	0.63	×	0.7	=	577.87	(82)
Rooflights 0.9x	1	×	7.7	×	157	] × [	0.63	) × [	0.7	=	479.56	(82)
Rooflights 0.9x	1	×	4.47	×	115	] × [	0.63	) × [	0.7	=	204.12	(82)
Rooflights 0.9x	1	्रः	2.04	] × [	115	] × [	0.63	×	0.7	=	93.25	(82)
Rooflights 0.9x	1	×	5.52	×	115	×	0.63	×	0.7	=	755.86	(82)
Rooflights 0.9x	1	×	9.27	×	115	×	0.63	) × [	0.7	=	423.28	(82)
Rooflights 0.9x	1	×	7.7	×	115	X	0.63	×	0.7	=	351.27	(82)
Rooflights 0.9x	1	×	4.47	×	66	] × [	0.63	×	0.7	=	117.15	(82)
Rooflights 0.9x	1	×	2.04	×	66	] × [	0.63	×	0.7	=	53.52	(82)

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com

Page 17 of 21

Roofligh	hts 0.9x	1	x	5.	52	x	66	1×	0.63	×	0.7	=	433.8	(82)
Roofligh	hts 0.9x	1	×	9.3	27	×	66	i × 🗖	0.63	ī × ī	0.7	=	242.93	(82)
Roofligh	hts 0.9x	1	×	7	7	×	66	i × 🗖	0.63	٦×٢	0.7	=	201.6	(82)
Roofligh	hts 0.9x	1	x	4.	47	×	33	i × 🗖	0.63	T × F	0.7	=	58.57	(82)
Roofligh	hts 0.9x	1	×	2.0	04	×	33	i×⊏	0.63	×	0.7	=	26,76	(82)
Roofligh	hts 0.9x	1	×	5.	52	×	33	i × 🗖	0.63	ī × ī	0.7	- 1	216.9	(82)
Roofligh	hts 0.9x	1	×	9.	27	×	33	i × 🗖	0.63	ī × ī	0,7	=	121.46	(82)
Roofligh	hts 0.9x	1	×	7	7	×	33	i × 🗖	0.63		0.7	- T	100.8	(82)
Roofligh	hts 0.9x	1	×	4,	47	×	21	i × 🗖	0.63	×	0.7	- 1	37.27	(82)
Roofligh	hts 0.9x	1	×	2.0	D4	x	21	i × 🗖	0.63	×	0.7	- ī	17.03	(82)
Roofligh	hts 0.9x	1	×	5.	52	×	21	1 * 🗖	0.63	×	0.7		138.03	(82)
Roofligh	hts 0.9x	1	×	9.	27	x	21	i × 🗖	0.63	×	0.7	=	77.29	(82)
Roofligh	hts 0.9x	1	×	7	7	×	21	i × 🗖	0.63	ī × Ē	0.7	=	64.15	(82)
						-						_		
Solar g	ains in	watts, ca	alculated	for eac	h month	0		(83)m = 5	um(74)m	(82)m				
(83) <b>m</b> =	1819.11	3356.68	5219.66	7422.57	9116.52	9385.16	8910.42	7607.74	5982.83	3884.53	2227.29	1524.69		(83)
Total g	jains – i	nternal a	and solar	(84)m :	= (73)m	+ (83)m	, watts							
(84)m=	3172.77	4707.67	6525.36	8651.8	10261.58	10454.09	9933.03	8638.56	7055.64	5034.11	3465.53	2835.68		(84)
7. Me	an inter	nal tem	erature	(heating	season	ù.								
Temp	erature	during t	neating p	eriods i	n the livi	ng area	from Ta	ble 9. Th	1 (°C)			Г	21	(85)
Utilisa	ation fac	tor for a	ains for	iving an	ea h1.m	i (see Ta	able 9a)							a straight
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	1	1	1	0.98	0.95	0.87	0.77	0.83	0.96	0.99	1	1		(86)
Mean	interna	Itemner	ature in	living ar	ea T1 /f	ollow ste	ns 3 to	7 in Tabl	e 9c)					
(87)m=	18.79	18.96	19.29	19.78	20.22	20.6	20,77	20,73	20,39	19.82	19.25	18.81		(87)
-									10/101					
emp	10.00	auring r	10.11	10.17	10.18	dwelling	19.74	able 9, 1	10.21	10.18	10.15	10.13		(88)
(00)(11-	10,00	10.1	19.11	19.17	10.10	10.24	10,24	10.25	10.21	18.10	19,10	10.13		(50)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	ee Table	9a)						21007
(89)m=	1	1	0.99	0.97	0.91	0.77	0.55	0.64	0.91	0.99	1	1		(89)
Mean	interna	l temper	ature in	the rest	of dwell	ing T2 (f	ollow ste	eps 3 to	7 in Tabl	e 9c)				
(90)m=	16.23	16.5	16.98	17.72	18.36	18.89	19.06	19.05	18.64	17.8	16,95	16.29		(90)
									1	LA = Livir	ng area = (+	4) =	0.03	(91)
Mean	interna	l temper	ature (fo	r the wh	nole dwe	lling) = f	LA × T1	+ (1 – fl	A) × T2					
(92)m=	16.31	16.58	17.06	17.79	18.42	18.95	19.12	19.1	18.69	17.86	17.03	16.37		(92)
Apply	adjustr	nent to t	he mear	interna	Itemper	ature fro	m Table	e 4e, who	ere appro	opriate				
=m(69)	16.31	16.58	17.06	17.79	18.42	18.95	19.12	19.1	18.69	17.86	17.03	16.37		(93)
8. Sp	ace hea	ting req	uirement											
Set Ti	i to the i	mean int	ternal ter	nperatu	re obtair	ned at st	ep 11 of	Table 9	b, so tha	t Ti,m=(	(76)m an	d re-calcu	late	
the ut	Jan	Eah	Mar	Apr	May	Jun	,hil	Aur	Sen	Oct	Nov	Dec		
Utilies	ation fac	tor for a	aine hm	. Apr	ivialy	Jun	301	Aug	Seb	Ull	1400	Dec		
(94)m=	1	1	0.99	0.96	0.89	0.74	0.53	0.62	0.89	0.98	1	1		(94)
Usefu	d gains	hmGm	W = (9	4)m x (8	4)m		1919 B.	1.404.90						1. 1. 1. 1. 1.
(95)m=	3169.17	4690.35	6448.87	8321.1	9150.88	7761.42	5301.66	5360.75	6263.09	4953.96	3457.34	2833.55		(95)
1						1		1			1			100

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com

Page 18 of 21

Month	nly avera	age exte	ernal tem	perature	e from T	able 8								
96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	oss rate	for me	an interr	al temp	erature,	Lm , W	=[(39)m	x [(93)m-	- (96)m	1	•	-		
97)m=	30690,31	29600.08	26551.89	21490.82	16119.94	10007.49	5795.82	6160.69	10748.26	17414.4	24194.59	30130.83		(97)
Space	e heating	g requir	ement fo	r each r	nonth, k	Wh/mon	th = 0.02	24 x [(97)	)m – (95	5)m] x (4	1)m	50 a		
98)m=	20475.73	16739.34	14956.64	9482.2	5184.98	0	0	0	0	9270.57	14930.82	20309.18		
								Tota	l per year	(kWh/yea	r) = Sum(9	8)=	111349.45	(98)
Space	e heating	a requir	ement in	kWh/m	²/vear							ī	104.03	(99)
-			NOTING WILLIAM	100										1
Color	ratee cou	ung rei	urenter	August	Con To	bla 10b								
Calcu	lated to	Ech	July and	August.	May	bie tub	hal	Aur	See	Oat	Nov	Dee		
Heat	Jan	Feb	Iniar	Apr Ucing 2	5°C into	Jun	Jui	Aug	Sep arnal tar	Oci	NOV	oble 10)		
100m	oss rate	CIII (Ca	nculated			21628 3	17028 53	17338 46	naiter	nperatu				(100
L Million	tion for	low for 1		v	Ū	21020.5	17020,00	17 330.40	<u> </u>			v		(100
Utilisa	tion fac	tor for it	ossnm			0.61	0.50	0.62						(101
101)m=	0	0	0	0	0	0.51	0.59	0,53	U	U	U	U		(101)
Usetu	l loss, h	mLm (V	Vatts) =	(100)m ;	x (101)m	l Lizana en	Long to a	Lavar ar	-		1 .			(400
102)m=	0	0	0	0	0	11086.13	10094.24	9167.25	0	0	0	0		(102)
Gains	(solar g	jains ca	lculated	for appl	icable w	eather re	egion, se	e Table	10)		1			
103)m=	0	0	0	0	0	11997.98	11407.72	9984.3	0	0	0	0	l Mediate de la	(103
Space	e cooling	g require	ement fo	r month	, whole o	dwelling,	continue	ous ( kW	(h) = 0.0	)24 x [(1	03)m – ('	102)m ] x	(41)m	
set (1	04)m to	zero ir	(104)m <	0 0 0	i)m	868.63	077 32							
104)m=	U	U	U	U	0	000.03	977.23	0	-	0	0	U I		7
Coolod	fraction								fota	I = Sum	(104)		1633.76	(104
ntermi	tency f	i actor (T	able 10b	N					10-	coolea	area + (*	- L	0.65	(105)
106)m=	0	0		0	0	0.25	0.25	0.25	0	0	0	0		
120,00								0.20	Tota	I = Sum	(104)			1/108
Space	cooling	require	ment for	month =	= (104)m	× (105)	× (106)r		7018	1 – Quii	( 1007)	- L	8	
107)m=	0	0	0	0	0	107.34	159.77	0	0	0	0	0		
	2 - 3 - 5 - 5 2	2530	1.00		1.5		10000	1 . E	Tota	= Sum	(107)	=	267.1	(107
	a a a mar an								(407		(		207.1	-
space	cooling	require	ment in I	cvvn/m*/	year		Concernance of the Owner of the		(107	) + (4) =			0.25	(108)
la Ene	ergy req	uiremei	nts – Ind	ividual h	leating s	ystems	including	micro-C	HP)					
Space	e heatin	ng:				memore								192322
Fracti	on of sp	ace hea	at from s	econdar	y/supple	ementary	/ system					L	0	(201
Fracti	on of sp	ace hea	at from m	nain syst	tem(s)			(202) = 1 -	- (201) =				1	(202
Fracti	on of tot	tal heati	ng from	main sy	stem 1			(204) = (2)	02) × (1 –	(203)]=		- F	1	(204
Efficie	ency of n	nain sp	ace heat	ing syst	em 1							ħ	319.7	(206
Efficie	ency of s	econda	rv/suppl	ementar	v heatin	a system	n %					ł	0	(208
Coolin	an Sucto	m Enar	av Effici	onou Po	tic	gojoten						ŀ		-
COOM	ig syste	an chei	BA EUICE	епсу ка					2000		2012200		8.1	(209)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space	e heating	g requir	ement (c	alculate	d above	)								
	20475.73	16739.34	14956.64	9482.2	5184.98	0	0	0	0	9270.57	14930.82	20309.18		

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com

Page 19 of 21

(211)m = {[(98	8)m x (20	14)] } x 1	100 + (20	06)			1.1.1.1						(211)
6404.67	5235.95	4678.34	2965.97	1621.83	0	0	0	0	2899.77	4670.26	6352.57		22
			1070474102210				Tota	il (kWh/ye	ar) =Sum()	211),	<i>j</i> =	34829.36	(211)
Space heating	ng fuel (s	econdar	y), kWh	/month									
= {[(98)m x (2	01)]}x 1	00 + (20	(8)										
(215)ma 0	U	Ų	0	0	U	U	Tota	U (MADa	u ar) = Sami	215)	-	~	(215)
	20						Tute	ii (Keana Jea	ar) - Sont	210), 18 1		U	(215)
Output from v	g vater hea	ter (calc	ulated a	hove)									
339.63	300.59	318.58	289.61	286.73	260.39	254.06	273.29	271.09	300.12	312.28	332.82		
Efficiency of v	vater hea	iter										224.4	(216)
(217)m= 224.4	224.4	224.4	224.4	224.4	224.4	224.4	224.4	224.4	224.4	224.4	224.4		(217)
Fuel for water	heating,	kWh/m	onth	N.1									
(219)m = (64)	133.95	141.97	129.06	127.77	116.04	113.22	121.79	120.81	133.74	139.16	148.32		
	0.0		1751575	1.00	145303		Tota	al = Sum(2	19a), _ =	100010	0.0000000	1577.18	(219)
Space coolin	ig fuel, k	Wh/mor	nth.										
(221)m = (107	7)m÷ (20	9)	9939 										
(221)m= 0	0	0	0	0	13.25	19.72	0	0	0	0	0		-
							Tota	al = Sum(2	21), =			32.98	(221)
Annual totals	s .	1010235	22774A2S						k	Wh/yea	r 1	kWh/year	-
Space heating	g tuel use	ed, main	system	1								34829.36	1
Water heating	g fuel use	d									1	1577.18	
Space cooling	g fuel use	bd										32.98	
Electricity for	pumps, f	ans and	electric	keep-ho	t								
mechanical	ventilatio	n - balar	nced, ext	tract or p	ositive i	nput fror	n outsid	e			6787.31		(230a)
central heati	ng pump	i.									30		(230c)
Total electricit	ty for the	above I	wh/vea	ar			sum	of (230a)	(230g) =			6817.31	(231)
Electricity for	liabtina			50				S 11	8.995			1407.73	(232)
Electricity for	ingritung	u Di la										1407.75	(202)
Electricity ger	nerated b	yPvs	CAMPERIDADE		NOV DESCRIPTION OF	NO FROM COLOR		1. C.				-4819.18	(233)
12a CO2 er	nissions -	– Individ	ual heat	ing syste	ems incl	uding mi	cro-CHF	10					
					Er kV	nergy Vh/year			Emiss kg CO	ion fac 2/kWh	tor	Emissions kg CO2/yea	ar
Space heating	g (main s	ystem 1	)		(21	1) x			0.5	19	=	18076.44	(261)
Space heating	g (second	dary)			(21	5) x			0.5	19		0	(263)
Water heating	1				(21	9) x			0.5	19	=	818.55	(264)
Space and wa	ater heati	ng			(26	1) + (262)	+ (263) + (	(264) =				18894 99	(265)
Space cooling					(22	1) x	a description of	Avtucles	0.5	19	=	17 11	(266)
Electricity for	oumos f	ans and	electric	keen-ho	t (23	1) x			0.6	19	=	3529.49	(267)
Electricity for	liahtina		5105010	noop no	(23	2) ×			0.0	10	=	3330,10	1(268)
Licothony for	guing				120	19 19 19 19 19 19 19 19 19 19 19 19 19 1			0.5	19	· .	111.32	(200)

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com

Page 20 of 21

Item 1	0.519 =	-2501.16	(269)
Total CO2, kg/year	sum of (265)(271) =	20726.45	(272)
Dwelling CO2 Emission Rate	(272) + (4) =	19.36	(273)
El rating (section 14)		75	(274)

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com

**APPENDIX (ii)** 

### SAP L1A 2013/16 REGULATIONS

(SAP Worksheet)

		User Details:					
Assessor Name: Software Name:	Ondrej Gajdos Stroma FSAP 2012	Strom Softw	a Num are Ver	ber: sion:	STRO Versio	006629 n: 1.0.5.12	
	Pre	operty Address	: Be Gre	en			
Address :	7 Greenaway Gardens, LONI	DON, NW3 7D	J				
1. Overall dwelling dimen	nsions						
2		Area(m <sup>2</sup> )	- S	Av. Height(	m)	Volume(m <sup>a</sup>	)
Basement		73.8	(1a) x	2.5	(2a) =	184.5	(3a)
Ground floor		429.4	(1b) x	3.8	(2b) =	1631.72	(3b)
First floor		232.6	(1c) x	3.55	(2c) =	825.73	(3c)
Second floor		215.8	(1d) x	3.1	(2d) =	668.98	(3d)
Third floor		118.8	(1e) x	3.35	(2e) =	397.98	(3e)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1n)	1070.4	(4)	201			1.1
Dwelling volume			(3a)+(3b)	)+(3c)+(3d)+(3e)	+(3n) =	3708.91	(5)
2. Ventilation rate:	2244 60					n 10: 75	
	main secondary heating heating	other		total		m <sup>a</sup> per hou	r.
Number of chimneys	0 + 0	+ 0	] = [	0	x 40 =	0	(6a)
Number of open flues	0 + 0	+ 0	i - F	0	x 20 =	0	(6b)
Number of intermittent far	יייש איז גער איז איז איז איז איז איז איז איז איז איז		- F	0	x 10 =	0	(7a)
Number of passive vents			Ē	0	x 10 =	0	(7b)
Number of flueless gas fir	es		Ē	0	x 40 =	0	(7c)
			_		Airch	anges per bo	
Infiltration due to chimney	is flues and fans = $(6a)+(6b)+(7a)$	(+(7b)+(7c) =	Ē			anges per ne	
If a pressurisation test has be	en carried out or is intended, proceed	to (17), otherwise	continue fr	0 om (9) to (16)	+ (5) =	0	(6)
Number of storeys in th	e dwelling (ns)		5.5707H (859.657		1	0	(9)
Additional infiltration					[(9)-1]x0.1 =	0	(10)
Structural infiltration: 0.	25 for steel or timber frame or (	0.35 for mason	ry constr	uction		0	(11)
if both types of wall are pro deducting areas of opening	esent, use the value corresponding to t as): if equal user 0.35	he greater wall are	oa (after				0.0002
If suspended wooden fi	oor, enter 0.2 (unsealed) or 0.1	(sealed), else	enter 0			0	(12)
If no draught lobby, ent	er 0.05, else enter 0				1	0	(13)
Percentage of windows	and doors draught stripped				1	0	(14)
Window infiltration		0.25 - [0.	2 x (14) + 1	00] =	1	Ô	(15)
Infiltration rate		(8) + (10)	+(11)+(1	2) + (13) + (15)	-	0	(16)
Air permeability value,	q50, expressed in cubic metres	per hour per s	quare m	etre of envelo	ope area	15	(17)
If based on air permeabili	ty value, then (18) = [(17) + 20]+(8)	, otherwise (18) =	(16)			0.75	(18)
Air permeability value applies	s if a pressurisation test has been done	or a degree air pe	meability i	is being used			
Number of sides sheltered	d				1	2	(19)
Shelter factor		(20) = 1 -	(0.075 x (1	8)]=		0.85	(20)
Infiltration rate incorporati	ng shelter factor	(21) = (18	i) x (20) =			0.64	(21)

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com

Page 1 of 22

Infiltrat	ion rate	modifie	d for mo	onthly with	nd speed	i								
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthi	y avera	ge wind	speed fi	rom 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		
Adjust	ed infiltr	ation rat	e (allow	ing for s	helter an	d wind s	sneed) =	: (21a) x	(22a)m					
	0.81	0.8	0.78	0.7	0.69	0.61	0.61	0.59	0.64	0.69	0.72	0.75		
Calcul	ate effe	ctive air	change	rate for l	he appli	cable ca	se							
If me	echanica	al ventila	ation:		222.00-022.00	0.052/00/20			1723112222	10022305		L	0.5	(23a)
lf exh	aust air h	eat pump	using App	endix N, (	23b) = (23a	ı)×Fm∨(	equation (	N5)), other	rwise (23b	) = (23a)		Ľ	0.5	(23b)
If bala	anced with	h heat reco	overy: effic	sency in %	allowing t	or in-use t	actor (from	n Table 4h	) =			L	68	(23c)
a) If	balance	ed mech	anical v	entilation	with he	at recov	ery (MV	HR) (24a	i)m = (22	2b)m + (	23b) × [	1 – (23c) -	- 100]	1102010
24a)m=	0.97	0,96	0.94	0.86	0.85	0.77	0.77	0.75	0.8	0.85	0.88	0.91		(24a)
b) If	balance	ed mech	anical v	entilation	without	heat red	covery (	MV) (24b	)m = (22	2b)m + (	23b)			
24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If	whole h	iouse ex	tract ver	ntilation	or positiv	e input	ventilation	on from o	outside	1000000	920			
	f (22b)n	n < 0.5 »	< (23b),	then (24	c) = (23b	); other	wise (24	c) = (22b	o) m + 0.	5 × (23b	)			1220
24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If	natural f (22b)n	ventilati	on or wh	nole hour $m = (22)$	se positiv	ve input	ventilati	on from 1 0.5 + $I/2$	oft 2h\m² v	0.51				
24d)m=	0	0	0	0	0	0	0	0.0 + [(2	0	0.0,	0	0		(24d)
Fffee	tive air	change	rate - er	nter (24a	a) or (24b	) or (24	c) or (24	(d) in bo	(25)					
25)m=	0.97	0.96	0.94	0.86	0.85	0.77	0.77	0.75	0.8	0.85	0.88	0.91		(25)
			-											
3.He	at losse	is and hi	eat loss	paramet	er:				See A					141444
ELEN	IENT	Gros	ss (m²)	Openir	ngs 1 <sup>2</sup>	Net Ar	n²	U-valu W/m2	le K	A X U	K)	k-value kJ/m²-K		A X k kJ/K
Doors	Type 1					3.24	×	1.2	=	3.888				(26)
Doors	Type 2					6.14	×	0.33	=	2.0262	2			(26)
Doors	Туре З					2.54	×	1.2	-	3.048				(26)
Doors	Type 4					2.98	×	1.2	-	3.576				(26)
Mindo	ws Type	e 1				2.29	×	1/(1.1.)+	0.04] =	2.41	-			(27)
Mndo	ws Type	2				168		W(1/( 1.1 )+	0.041 =	1.77	=			(27)
Mindo	ws Type	- 3				2.97		1/1/(1.1.)+	0.041 =	2.5	=			(27)
Mindo	ws Type	. 4				1.70	=	11/1 1.1 >+	0.041 =	4.95	=			(27)
Mindo	we Ture					1.70	= 0	1/1/1 1 1 1	0.041 -	1,00	=			(27)
Mada	wa Type					3.83		and the present	0.04	4.04				(27)
vindo	ws type	= 0				1.34	X	111(1.1)+	0.04] =	1.41				(27)

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com

Windows Type 7

Windows Type 8

Windows Type 9

(27)

(27)

(27)

0.3

0.46

0.57

x1/[1/(1.1)+0.04] =

x1/[1/(0.87)+0.04] =

x1/[1/(0.87)+0.04] =

0.32

0.39

0.48

Windows Type 10	6.67	x8/[1/( 0.87 )+ 0.04] = 5.61	(27)
Windows Type 11	2.07	x1/[1/(1,1)+0.04] = 2.18	(27)
Windows Type 12	2.07	xl/[1/(0.87)+0.04] = 1.74	(27)
Windows Type 13	2.22	x8/[1/( 0.87 )+ 0.04] = 1.87	(27)
Windows Type 14	1.82	x1/[1/(1.1)+0.04] = 1.92	(27)
Windows Type 15	1.82	x1[1/(0.87)+0.04] = 1.53	(27)
Windows Type 16	2.2	x1/[1/(1.1)+0.04] = 2.32	(27)
Windows Type 17	3.08	x1/[1/(0.87)+0.04] = 2.59	(27)
Windows Type 18	0.95	$\times 1/[1/(1.1) + 0.04] = 1$	(27)
Windows Type 19	2	x1/[1/(1.1)+0.04] = 2.11	(27)
Windows Type 20	7.38	x8/[1/(0.87)+0.04] = 6.2	(27)
Windows Type 21	10.59	x8/[1/(0.87)+0.04] = 8.9	(27)
Windows Type 22	3.83	xl/[1/( 0.87 )+ 0.04] = 3.22	(27)
Windows Type 23	13,1	xh[1/(0.87)+0.04] = 11.01	(27)
Windows Type 24	3.96	xd/[1/( 0.87 )+ 0.04] = 3.33	(27)
Windows Type 25	1.38	x1[1/(0.87)+0.04] = 1.16	(27)
Windows Type 26	2.25	x8/[1/(0.87)+0.04] = 1,89	(27)
Windows Type 27	23.96	x8/[1/(0.87)+0.04] = 20.14	(27)
Windows Type 28	4.13	xl/[1/(0.87)+0.04] = 3.47	(27)
Windows Type 29	2.19	x1/[1/(0.87)+0.04] = 1.84	(27)
Windows Type 30	2.2	x8/[1/(0.87)+0.04] = 1.85	(27)
Windows Type 31	2.26	x1/[1/(1.1)+0.04] = 2.38	(27)
Windows Type 32	2.2	x1/[1/(1.1)+0.04] = 2.32	(27)
Windows Type 33	2.19	x1/[1/(1.1)+0.04] = 2.31	(27)
Windows Type 34	2.93	x1/[1/(1.1)+0.04] = 3.09	(27)
Windows Type 35	1.49	x1/[1/( 1.1 )+ 0.04] = 1.57	(27)
Windows Type 36	2.03	x1{1/(0.87)+0.04] = 1.71	(27)
Rooflights Type 1	4.472	x1/[1/(1.2) + 0.04] = 5.3664	(27b)
Rooflights Type 2	2.043	x1/[1/(1.2) + 0.04] = 2.4516	(27b)
Rooflights Type 3	5.52	x1/[1/(1.2) + 0.04] = 6.624	(27b)
Rooflights Type 4	9.2736	x1/[1/(1.2) + 0.04] = 11.12832	(27b)
Rooflights Type 5	7.696	x1/[1/(1.2) + 0.04] = 9,235201	(27b)
Floor	503.2	x 0.22 = 110.704	(28)
Walls Type1 172.48 61.38	111.1	x 0.27 = 30	(29)
Walls Type2 326.33 0	326.33	x 0.26 = 84.85	(29)
Walls Type3 431.67 82.39	349.28	x 1.45 = 506.46	(29)
Walls Type4 73.13 36.72	36.41	x 0.18 = 6.55	(29)
Walls Type5 39.8 17.76	22.04	× 0.28 = 6.17	(29)
Walls Type6 5.6 3.08	252	× 0.28 = 0.71	(29)

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com

Page 3 of 22

Roof T														
	ype1	369	4	32.3	5	337.0	5 ×	0.15		50.56	2			(30)
Roof T	ype2	11.	7	7.7		4	×	0.15	=	0.6	ī Ē			(30)
Roof T	уре3	172	7	0		172.7	7 ×	0.12	=	20.72	<b>-</b> 1		ī —	(30)
Total a	rea of el	ements	, m²	2.		2106.0	01		10					(31)
• for win	dows and	roof winde	ows, use e	fective wi	ndow U-va	lue calcul	ated using	formula 1	/[(1/U-val.	e)+0.04] a	is given in	paragraph	3.2	
** includ	e the area	s on both	sides of ir	itemal wal	is and part	titions								-
Fabric heat loss, W/K = S (A x U)								(26)(30) + (32) =					1047.9	(33)
Heat capacity Cm = S(A x k )								((28)(30) + (32) + (32a)(32e) =					0	(34)
Therm	al mass	parame	ter (TMF	<sup>2</sup> = Cm -	+ TFA) ir	h kJ/m²K			Indica	tive Value	: Medium		250	(35)
can be L	gn assess ised instea	ments wh ad of a del	ere the de ailed calci	tails of the ulation.	construct	ion are not	t known pr	ecisely the	Indicative	values of	TMP in Ta	able 11		
Therm	al bridge	s:S(L	x Y) cal	culated i	using Ap	pendix I	к					ſ	315.9	(36)
il details	oftherma	l bridging	are not kn	own (36) =	0.05 x (3	1)							1	_
Total fa	abric hea	at loss							(33) +	(36) =		[	1363.8	(37)
Ventila	tion hea	t loss ca	alculated	monthl	у				(38)m	= 0.33 × (	25)m x (5)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	1190.66	1171.16	1151.65	1054.12	1034.61	937.08	937.08	917.57	976.09	1034.61	1073.63	1112.64		(38)
Heat tr	ansfer c	oefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	2554.47	2534.96	2515.45	2417.92	2398.42	2300.88	2300.88	2281.38	2339.9	2398.42	2437.43	2476.44	(	
	93 5211460 8046				440 A					Average =	Sum(39)	e/12=	2413.05	(39)
	ss bara	meter (F	11 P1 \00	m K					(40)m	= (39)m +	(4)			
Heat Id	0.00	0.07	0.05	0.00	2.24	0.45	0.45	0.40	2.10	0.04	0.00	0.04		
(40)m=	2.39	2.37	2.35	2.26	2.24	2.15	2.15	2.13	2.19	2.24	2.28	2.31	2.26	(45)
Heat Ic (40)m= Numbe	2.39 er of day	2.37 s in mor	2.35	2.26 le 1a)	2.24	2.15	2.15	2.13	2.19	2.24 Average =	2.28 Sum(40)	2.31 ±/12=	2.25	(40)
Heat Ic (40)m= Numbe	2.39 er of day Jan	2.37 s in mor	2.35 nth (Tab Mar	2.26 le 1a) Apr	2.24 May	2.15 Jun	2.15 Jul	2.13 Aug	2.19 Sep	2.24 Average = Oct	2.28 Sum(40), Nov	2.31 u/12= Dec	2.25	(40)
(40)m= Numbe (41)m=	2.39 er of day Jan 31	2.37 s in mor Feb 28	2.35 hth (Tab Mar 31	2.26 le 1a) Apr 30	2.24 May 31	2.15 Jun 30	2.15 Jul 31	2.13 Aug 31	2.19 Sep 30	2.24 Average = Oct 31	2.28 Sum(40) Nov 30	2.31 =/12= Dec 31	2,25	(40)
Heat Ic (40)m= Numbe (41)m=	2.39 er of day Jan 31	2.37 s in mor Feb 28	2.35 hth (Tab Mar 31	2.26 le 1a) Apr 30	2.24 May 31	2.15 Jun 30	2.15 Jul 31	2.13 Aug 31	2.19 Sep 30	2.24 Average = Oct 31	2.28 Sum(40), Nov 30	2.31 = /12= Dec 31	2.25	(40)
Numbe	2.39 er of day Jan 31	2.37 s in mor Feb 28	2.35 nth (Tab Mar 31	2.26 le 1a) Apr 30	2.24 May 31	2.15 Jun 30	2.15 Jul 31	2.13 Aug 31	2.19 Sep 30	2.24 Average = Oct 31	2.28 Sum(40) Nov 30	2.31 #/12= Dec 31	2.25	(40) (41)
(40)m= Numbe (41)m= 4. Wa	2.39 er of day Jan 31 Iter heat	2.37 s in mor Feb 28	2.35 hth (Tab Mar 31	2.26 le 1a) Apr 30	2.24 May 31	2.15 Jun 30	2.15 Jul 31	2.13 Aug 31	2.19 Sep 30	2.24 Average = Oct 31	2.28 Sum(40), Nov 30	2.31 /12= Dec 31 KWh/ye	2.25 ar	(40) (41)
(40)m= Numbe (41)m= 4. Wa Assum	2.39 Fr of day Jan 31 Iter heat	2.37 s in mor Feb 28 ing ener	2.35 hth (Tab Mar 31	2.26 le 1a) Apr 30	2.24 May 31	2.15 Jun 30	2.15 Jul 31	2.13 Aug 31	2.19 Sep 30	2.24 Average = Oct 31	2.28 Sum(40), Nov 30	2.31 	2.25 ar	(40) (41) (42)
(40)m= Numbe (41)m= (41)m= Assum if TF if TF	2.39 er of day Jan 31 (er heat ed occu A > 13.9 A £ 13.9	2.37 s in mor Feb 28 ng ener pancy, I ), N = 1 ), N = 1	2.35 hth (Tab Mar 31 gy requi	2.26 le 1a) Apr 30 rement	2.24 May 31	2.15 Jun 30	2.15 Jul 31	2.13 Aug 31 )2)] + 0.(	2.19 Sep 30	2.24 Average = Oct 31 TFA -13.	2.28 Sum(40) Nov 30 4. 9)	2.31 */12= Dec 31 KWh/ye 13	2.25 ar	(40) (41) (42)
(40)m= Numbe (41)m= 4. Wa Assum if TF if TF Annual	2.39 er of day Jan 31 ler heat ed occu A > 13.9 A £ 13.9 averag	2.37 s in mor Feb 28 pancy, f 0, N = 1 0, N = 1 e hot wa	2.35 Inth (Tab Mar 31 Inth (Tab Mar 31 Inth (Tab Mar 31 Inth (Tab	2.26 le 1a) Apr 30	2.24 May 31 (-0.0003	2.15 Jun 30 849 x (TF	2.15 Jul 31 FA -13.9 erage =	2.13 Aug 31 )2)] + 0.0	2.19 Sep 30 0013 x ( + 36	2.24 Average = Oct 31 TFA -13.	2.28 Sum(40), Nov 30 4. 9)	2.31 	2.25 at	(40) (41) (42) (43)
(40)m= Numbe (41)m= 4. Wa Assum if TF if TF Annual Reduce	2.39 er of day Jan 31 ter heat ed occu A > 13.9 A £ 13.9 average the annua blat 125	2.37 s in mor Feb 28 ng eneo pancy, l 0, N = 1 0, N = 1 e hot wa (average	2.35 hth (Tab Mar 31 gy requ N + 1.76 x hter usage	2.26 le 1a) Apr 30 rement [1 - exp ge in litre	2.24 May 31 (-0.0003	2.15 Jun 30 349 x (Tf	2.15 Jul 31 FA -13.9 erage = de signed t	2.13 Aug 31 )2)] + 0.0 (25 x N)	2.19 Sep 30 0013 x ( + 36 a water u	2.24 Average = Oct 31 TFA -13.	2.28 Sum(40), 30 4. 9)	2.31 + /12= Dec 31 KWh/ye 13 2.37	2.25 ar	(40) (41) (42) (43)
(40)m= (41)m= (41)m= (41)m= (41)m= (41)m= (41)m= (41)m= (41)m= (41)m= (41)m= (41)m= (41)m= (41)m= (41)m= (41)m= (40)m= (40)m= (40)m= (40)m= (40)m= (40)m= (40)m= (40)m= (40)m= (40)m= (40)m= (40)m= (40)m= (41)m= (4	2.39 er of day Jan 31 (cr heat ed occu A > 13.9 A £ 13.9 a verag the annua that 125	2.37 s in mor Feb 28 pancy, f ), N = 1 ), N = 1 e hot wa <i>l average</i> <i>iltres per</i> j	2.35 hth (Tab Mar 31 gy requinations y + 1.76 x hor water person per	2.26 le 1a) Apr 30 rement [1 - exp ge in litre usage by day (ai w	2.24 May 31 (-0.0003 esper da 5% if the d ster use, i	2.15 Jun 30 349 x (TF	2.15 Jul 31 =A -13.9 erage = designed t	2.13 Aug 31 )2)] + 0.( (25 x N) o achieve	2.19 Sep 30 0013 x ( + 36 a water to	2.24 Average = Oct 31 TFA -13.	2.28 Sum(40) Nov 30 4. 9)	2.31 e /12= Dec 31 k/Wh/ye 13 2.37	2.25 ar	(40) (41) (42) (43)
(40)m= (40)m= (41)m= 4. W/2 Assum if TF Annual Reduce not more	2.39 er of day Jan 31 (er heat ed occu A > 13.9 A £ 13.9 a verag the annua o that 125 Jan	2.37 s in mor Feb 28 pancy, I 2, N = 1 2, N = 1 2, N = 1 e hot wa <i>l average</i> <i>itres per j</i> Feb	2.35 hth (Tab Mar 31 9 required 1.76 x 1.76 x atter usag hot water person per Mar day for each	2.26 le 1a) Apr 30 remente [1 - exp ge in litre usage by a day (aif w Apr	2.24 May 31 (-0.0003 esperda 5% if the d ater use, i May	2.15 Jun 30 349 x (TF ay Vd,av twelling is hot and co Jun	2.15 Jul 31 FA -13.9 erage = designed t kd) Jul Table 1c x	2.13 Aug 31 )2)] + 0.( (25 x N) o achieve Aug (43)	2.19 Sep 30 0013 x ( + 36 a water to Sep	2.24 Average = Oct 31 TFA -13. se larget o	2.28 Sum(40), 30 4. 9) 13.	2.31 	2.25 ar	(40) (41) (42) (43)
(40)m= (40)m= (41)m= (4	2.39 er of day Jan 31 ter heat ed occu A > 13.9 averag the annua that 125 Jan er usage it	2.37 s in mor Feb 28 ng ener 28 ng ener 10, N = 1 0, N = 1 e hot wa (average litres per) Feb	2.35 hth (Tab Mar 31 gy requinations y + 1.76 x hot water berson per Mar day for examples	2.26 le 1a) Apr 30 rement [1 - exp ge in litre usage by a r day (all w Apr sch month	2.24 May 31 (-0.0003 esper da 5% if the d vater use, I May Vd, m = fa	2.15 Jun 30 349 x (TF ay Vd,av fiveling is not and co Jun ctor from 1	2.15 Jul 31 =A -13.9 erage = designed t id) Jul Table 1c x	2.13 Aug 31 )2)] + 0.( (25 x N) o achieve (43) (43)	2.19 Sep 30 0013 x ( + 36 a water 42 Sep	2.24 Average = Oct 31 TFA -13. se larget o Oct	2.28 Sum(40) 30 4. 9) 13: Nov	2.31 */12= Dec 31 KWh/ye 13 2.37 Dec	2.25 ar	(40) (41) (42) (43)
(40)m= (40)m= (41)m= (41)m= 4 W/ Assum if TF if TF Annual Reduce not more Hot wate (44)m=	2.39 er of day Jan 31 (cr heat ed occu A > 13.9 A £ 13.9 a verag the annua that 125 Jan er usage in 145.61	2.37 s in mor Feb 28 28 28 28 28 28 28 28 28 28 28 28 28	2.35 hth (Tab Mar 31 gy requinations y + 1.76 x hor water box water	2.26 le 1a) Apr 30 rement [1 - exp ge in litre usage by day (af w Apr ach month 129.72	2.24 May 31 (-0.0003 esperda 5% if the a ster use, I May Vd, m = fa 124.43	2.15 Jun 30 349 x (TF ay Vd,av fivelling is hot and co Jun ctor from 3 119.13	2.15 Jul 31 =A -13.9 erage = designed t id) Jul Table 1c x 119.13	2.13 Aug 31 )2)] + 0.0 (25 x N) o achieve Aug (43) 124.43	2.19 Sep 30 0013 x ( + 36 a water (2 Sep 129.72	2.24 Average = Oct 31 TFA -13. se target o Oct 135.02	2.28 Sum(40) Nov 30 4. 9) 13 Nov	2.31 e /12= Dec 31 k/Wh/ye 13 2.37 Dec 145.61	2.25 ar	(40) (41) (42) (43)
(40)m= (40)m= (41)m= (41)m= (41)m= Assum if TF Annual Reduce not more Hot wate (44)m= Energy of	2.39 er of day Jan 31 ler heat ed occu A > 13.9 A £ 13.9 averag the annua that 125 Jan r usage in 145.61	2.37 s in mor Feb 28 ng ener 28 ng ener 29 ng ener 20 ng ener 20 10 10 10 10 10 10 10 10 10 10 10 10 10	2.35 nth (Tab Mar 31 9 required 1.76 x ater usag hot water berson per Mar day for es 135.02 used - cal	2.26 le 1a) Apr 30 rement [1 - exp ge in litre usage by a day (all w Apr ach month 129.72 culated mo	2.24 May 31 (-0.0003 es per da 5% if the d ater use, I Vd,m = fa 124.43 onthly = 4.	2.15 Jun 30 349 x (TF ay Vd,av fivelling is foot and co Jun clor from 3 119.13	2.15 Jul 31 FA -13.9 erage = designed t id) Jul Table 1c x 119.13 n x nm x D	2.13 Aug 31 )2)] + 0.0 (25 x N) o achieve Aug (43) 124.43	2.19 Sep 30 0013 x ( + 36 a water u Sep 129.72	2.24 Average = Oct 31 TFA -13. se target o Oct 135.02 Total = Sum nth (see Ta	2.28 Sum(40) Nov 30 4. 9) 13: Nov 140.31 m(44), p = ables 1b, 1	2.31 = /12= Dec 31 KWh/ye 13 2.37 Dec 145.61 = c, 1d)	2.25 ar 1588.43	(40) (41) (42) (43)
(40)m= (40)m= (41)m= (41)m= (41)m= Assum if TF if TF Annua <i>Reduce</i> not more (44)m= <i>Energy</i> of (45)m=	2.39 er of day Jan 31 ter heat ed occu A > 13.9 A £ 13.9 averag the annua that 125 Jan er usage in 145.61	2.37 s in mor Feb 28 pancy, I 2, N = 1 0, N = 1 0, N = 1 e hot wa (average litres per ) Feb 10tres per 140.31 hot water 188.85	2.35 hth (Tab Mar 31 gy requinations with the second	2.26 le 1a) Apr 30 rement [1 - exp usage by : day (all w Apr ach month 129.72 culated mo	2.24 May 31 (-0.0003 es per da 5% if the d vd; m = fa 124.43 onthly = 4. 163.02	2.15 Jun 30 349 x (Tf ay Vd,av fwelling is foot and co Jun ctor from 1 119.13 190 x Vd,r 140.68	2.15 Jul 31 =A -13.9 erage = designed t id) Jul Table 1c x 119.13 n x nm x D 130.36	2.13 Aug 31 (25 x N) o achieve (43) 124.43 (7m / 3600 149.59	2.19 Sep 30 0013 x ( + 36 a water w Sep 129.72 <i>kWh/mor</i> 151.37	2.24 Average = Oct 31 TFA -13. se larget o Oct 135.02 Total = Sunth (see Tai	2.28 Sum(40) Nov 30 4. 9) 13: Nov 140.31 m(44) - 10 sb/es 1b, 1 192.57	2.31 */12= Dec 31 KWh/ye 13 2.37 Dec 145.61 * (145.61 * 2.09.12	2.25 ar 1588.43	(40) (41) (42) (43)
(40)m= (41)m= (41)m= (41)m= (41)m= Assum if TF Annual Reduce not more Hot wate (44)m= Energy of (45)m=	2.39 er of day Jan 31 (cr heat ed occu A > 13.9 A £ 13.9 a verag the annua that 125 Jan r usage in 145.61 xontent of 215.93	2.37 s in mor Feb 28 28 28 28 28 28 28 28 28 28 28 28 28	2.35 hth (Tab Mar 31 gy requinations y requinations hor water box wate	2.26 le 1a) Apr 30 rement [1 - exp ge in litre usage by day (all w Apr ach month 129.72 culated mo	2.24 May 31 (-0.0003 esper da 5% if the a ster use, I May Vd,m = fa 124.43 onthly = 4. 163.02	2.15 Jun 30 349 x (TF ay Vd,av fivelling is hot and co Jun ctor from 3 119.13 190 x Vd,n 140.68	2.15 Jul 31 FA -13.9 erage = designed t id) Jul Table 1c x 119.13 n x nm x D 130.36	2.13 Aug 31 )2)] + 0.( (25 x N) o achieve (43) 124.43 07m / 3600 149.59	2.19 Sep 30 0013 x ( + 36 a water (k Sep 129.72 kWh/moi 151.37	2.24 Average = Oct 31 TFA -13. se target of Oct 135.02 Total = Sun 176.41 Total = Sun	2.28 Sum(40) Nov 30 4. 9) 13: Nov 140.31 m(44): ===================================	2.31 e /12= Dec 31 k/Wh/ye 13 2.37 Dec 145.61 e c, 1d) 209.12	2.25 ar 1588.43 2082.69	(40) (41) (42) (43) (43)
(40)m= (40)m= (41)m= (41)m= (41)m= Assum if TF Annual Reduce not more Hot wate (44)m= Energy of (45)m=	2.39 er of day Jan 31 (er heat ed occu A > 13.5 A £ 13.5 averag the annua that 125 Jan 145.61 145.61 215.93	2.37 s in mor Feb 28 ng ener 28 ng ener 29 ng ener 20 ng ener 20 10 10 10 10 10 10 10 10 10 10 10 10 10	2.35 nth (Tab Mar 31 gy requinations with the second	2.26 le 1a) Apr 30 remente [1 - exp ge in litre usage by a day (all w Apr ach month 129.72 culated mo 169.9 of use (no	2.24 May 31 (-0.0003 es per da 5% if the d vater use, i May Vd,m = fa 124.43 onthly = 4. 163.02 o hot water	2.15 Jun 30 349 x (TF ay Vd,av fivelling is foot and co Jun 119.13 190 x Vd,r 140.68 r storage),	2.15 Jul 31 FA -13.9 erage = designed t id) Jul Table 1c x 119.13 n x nm x D 130.36 enter 0 in	2.13 Aug 31 )2)] + 0.0 (25 x N) o achieve (43) 124.43 07m / 3600 149.59 boxes (46)	2.19 Sep 30 0013 x ( + 36 a water u: Sep 129.72 129.72 0 kWh/mon 151.37	2.24 Average = Oct 31 TFA -13. se target o Oct 135.02 Total = Su nth (see Ta 176.41 Total = Su	2.28 Sum(40) Nov 30 4. 9) 13: Nov 140.31 m(44): u = bbles 1b, 1 192.57 m(45): u =	2.31 • /12= Dec 31 KWh/ye 13 2.37 Dec 145.61 = c. 1d) 209.12	2.25 ar 1588.43 2082.69	(40) (41) (42) (43) (43)
Heat Id (40)m= Number (41)m= (41)m= Assum if TF if TF Annua Reduce not more Hot wate (44)m= Energy of (45)m= If instant (46)m=	2.39 er of day Jan 31 ter heat ed occu A > 13.9 A £ 13.9 averag the annua that 125 Jan er usage in 145.61 215.93 aneous w 32.39	2.37 s in mor Feb 28 ng ener 28 ng ener 28 ng ener 10, N = 1 0, N = 1 0, N = 1 e hot wa (average litres per) Feb 10tres per) 140.31 hot water 188.85 ater heatil 28.33	2.35 nth (Tab Mar 31 gy requinations ster usage hot water verson per Mar day for ex 135.02 used - cal 194.88 ng at point 29.23	2.26 le 1a) Apr 30 rement [1 - exp usage by : day (all w Apr ach month 129.72 culated mo 169.9 of use (no	2.24 May 31 (-0.0003 es per da 5% if the d ater use, I May Vd,m = fa 124.43 onthly = 4. 163.02 o hot water 24.45	2.15 Jun 30 349 x (Tf ay Vd,av fwelling is foot and co Jun ctor from 1 119.13 190 x Vd,r 140.68 rstorage), 21.1	2.15 Jul 31 =A -13.9 erage = designed t do Jul Table 1c x 119.13 n x nm x D 130.36 enter 0 in 19.55	2.13 Aug 31 (25 x N) o achieve (43) 124.43 (7m / 3600 149.59 boxes (46) 22.44	2.19 Sep 30 0013 x ( + 36 a water u Sep 129.72 ) kWh/mor 151.37 ) to (61) 22.71	2.24 Average = Oct 31 TFA -13. se larget o Oct 135.02 Total = Su th (see Ta 176.41 Total = Su 26.46	2.28 Sum(40), Nov 30 4. 9) 13: Nov 140.31 m(44), u = sb/es 1b, f 192.57 m(45), u = 28.89	2.31 */12= Dec 31 KWh/ye 13 2.37 Dec 145.61 = c. 1d) 209.12 = 31.37	2.25 ar 1588.43 2082.69	(40) (41) (42) (43) (43) (44) (45) (46)

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com

Page 4 of 22
If comr Otherw Water a) If m	nunity h vise if no storage anufacti	eating a stored loss: urer's de	ind no ta hot wate eclared l	nk in dw er (this in oss facto	velling, e icludes i or is kno	nter 110 nstantar wn (kWh	litres in neous co n/day):	(47) mbi boil	ers) ent	er '0' in (	47)	6		(48)	
Tempe	rature fa	actor fro	m Table	2b			-				0	54		(49)	
Energy b) If m	lost fro anufact	m water urer's de	storage	, kWh/ye	ear oss fact	or is not	known:	(48) x (49	=		3	24		(50)	
Hot wa If comr	ter stora nunity h	age loss eating s	factor fr	om Tabl on 4.3	e 2 (kW	h/litre/da	iy)				()	0		(51)	
Volume	e factor	from Ta	ble 2a	24							<u> </u>	0		(52)	
Tempe	rature ta	actor fro	m lable	20								0		(53)	
Energy	lost fro	m water	storage	e, kWh/ye	ear			(47) x (51)	) x (52) x (	(53) =	. 8	0		(54)	
Enter	(50) or (	54) in (5									3.	24		(55)	
vvater	storage	loss cal	culated 1	for each	month			((56)m = (	55) × (41)	m					
(56)m=	100.44	90.72	100.44	97.2	100.44	97.2	100.44	100.44	97.2	100.44	97.2	100.44		(56)	
If cylinde	r contains	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 Appendi	×H		
(57)m=	7/m=         100.44         90.72         100.44         97.2         100.44         100.44         100.44														
Primar	rimary circuit loss (annual) from Table 3 0 (58) rimary circuit loss calculated for each month (59)m = (58) + 365 × (41)m														
Primar	rimary circuit loss (annual) from Table 3 [00] rimary circuit loss calculated for each month (59)m = (58) + 365 × (41)m (modified by factor from Table H5 if there is solar water beating and a cylinder thermostat)														
(mod	Primary circuit loss calculated for each month (59)m = (58) + 365 × (41)m (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)														
(59)m=	Primary circuit loss calculated for each month (59)m = (58) + 365 × (41)m         (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)         59/m=       23.26       21.01       23.26       22.51       23.26       23.26       22.51       23.26       22.51       23.26       25.51       25.51														
Combi	$P_{m} = \begin{bmatrix} 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) \\ P_{m} = \begin{bmatrix} 23.26 & 21.01 & 23.26 & 22.51 & 23.26 & 22.51 & 23.26 & 22.51 & 23.26 & (59) \\ P_{m} = \begin{bmatrix} 23.26 & 21.01 & 23.26 & 22.51 & 23.26 & 22.51 & 23.26 & (59) \\ P_{m} = \begin{bmatrix} 23.26 & 21.01 & 23.26 & 22.51 & 23.26 & (59) \\ P_{m} = \begin{bmatrix} 23.26 & 21.01 & 23.26 & 22.51 & 23.26 & (59) \\ P_{m} = \begin{bmatrix} 23.26 & 21.01 & 23.26 & 22.51 & 23.26 & (59) \\ P_{m} = \begin{bmatrix} 23.26 & 21.01 & 23.26 & 22.51 & 23.26 & (59) \\ P_{m} = \begin{bmatrix} 23.26 & 21.01 & 23.26 & 22.51 & 23.26 & (59) \\ P_{m} = \begin{bmatrix} 23.26 & 21.01 & 23.26 & 22.51 & 23.26 & (59) \\ P_{m} = \begin{bmatrix} 23.26 & 22.51 & 23.26 & 22.51 & 23.26 & (59) \\ P_{m} = \begin{bmatrix} 23.26 & 22.51 & 23.26 & 22.51 & 23.26 & (59) \\ P_{m} = \begin{bmatrix} 23.26 & 22.51 & 23.26 & 22.51 & 23.26 & (59) \\ P_{m} = \begin{bmatrix} 23.26 & 22.51 & 23.26 & 22.51 & 23.26 & (59) \\ P_{m} = \begin{bmatrix} 23.26 & 22.51 & 23.26 & 22.51 & 23.26 & (59) \\ P_{m} = \begin{bmatrix} 23.26 & 22.51 & 23.26 & 22.51 & 23.26 & (59) \\ P_{m} = \begin{bmatrix} 23.26 & 22.51 & 23.26 & 22.51 & 23.26 & (59) \\ P_{m} = \begin{bmatrix} 23.26 & 22.51 & 23.26 & 22.51 & 23.26 & (59) \\ P_{m} = \begin{bmatrix} 23.26 & 22.51 & 23.26 & 22.51 & 23.26 & (59) \\ P_{m} = \begin{bmatrix} 23.26 & 22.51 & 23.26 & 22.51 & (59) \\ P_{m} = \begin{bmatrix} 23.26 & 22.51 & 23.26 & 22.51 & (59) \\ P_{m} = \begin{bmatrix} 23.26 & 22.51 & 23.26 & 22.51 & (59) \\ P_{m} = \begin{bmatrix} 23.26 & 22.51 & 23.26 & 22.51 & (59) \\ P_{m} = \begin{bmatrix} 23.26 & 22.51 & 23.26 & 22.51 & (59) \\ P_{m} = \begin{bmatrix} 23.26 & 22.51 & 23.26 & 22.51 & (59) \\ P_{m} = \begin{bmatrix} 23.26 & 22.51 & 23.26 & 22.51 & (59) \\ P_{m} = \begin{bmatrix} 23.26 & 22.51 & 23.26 & 22.51 & (59) \\ P_{m} = \begin{bmatrix} 23.26 & 22.51 & 23.26 & 22.51 & (59) \\ P_{m} = \begin{bmatrix} 23.26 & 22.51 & 23.26 & 22.51 & (59) \\ P_{m} = \begin{bmatrix} 23.26 & 22.51 & 23.26 & 22.51 & (59) \\ P_{m} = \begin{bmatrix} 23.26 & 22.51 & 23.26 & 22.51 & (59) \\ P_{m} = \begin{bmatrix} 23.26 & 22.51 & 23.26 & 22.51 & (59) \\ P_{m} = \begin{bmatrix} 23.26 & 22.51 & 23.26 & 22.51 & (59) \\ P_{m} = \begin{bmatrix} 23.26 & 22.51 & 23.26 & 22.51 & (59) \\ P_{m} = \begin{bmatrix} 23.26 & 22.51 & 23.26 & 22.51 & (59) \\ P_{m} = \begin{bmatrix} 23.26 & 22.51 & 23.26 & 22.51 & 22.51 & (50.26 & 22.51 & 22.51 & 22.51 & 22.51 & (50.26 & 22.51 & 22.51 & 22.51 & 22.51 $														
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)	
Total h	eat requ	uired for	water h	eating ca	lculated	for ead	h month	(62)m =	0.85 × 1	(45)m +	(46)m +	(57)m +	(59)m + (61)n	1	
(62)m=	339.63	300.59	318.58	289.61	286.73	260.39	254.06	273.29	271.09	300.12	312.28	332.82	(00)/// · (01)//	(62)	
Solar DE	W input o	alculated	using App	endix G or	Annendix	H (negativ	ve quantity	() (enter '0	if no sola	r contribut	ion to wate	r heating)			
(add a	ditional	lines if	FGHRS	and/or \	MARS	applies	see An	nendix (	3)	0.275040545	1001.050.051900				
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)	
Output	from wa	ater hea	ter												
(64)m=	339.63	300.59	318.58	289.61	286.73	260 39	254.06	273.29	271.09	300.12	312.28	332.82			
an carrie		0.0000000			Readine .			Outr	ut from w	ater heater	(annual)		3539.18	(64)	
Heat a	nine free	n unter	hosting	LAA As Ass	onth 0 2	e : 10 96	× (4E)m	+ (61)	1.00.	(de)m	+ (67)m	+ (60)m	1		
riear g	470.76	163.10	160 76	462.26	462.47	142.54	~ (45)m	+ (01)1	146.4	457.69	160.0	+ (38)m	<b>.</b>	(85)	
(00)m-	1/0.76	152.10	103.70	152.20	155.17	142.04	142.31	140.7	140.1	157.62	159.0	100.48	2	(00)	
inclu	de (57)r	n in cald	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	ernal ga	ins (see	a Table 5	and 5a	):										
Metabo	lic gain	s (Table	5), Wat	ts											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
(66)m=	248.01	248.01	248.01	248.01	248.01	248.01	248.01	248.01	248.01	248.01	248.01	248.01		(66)	
Lightin	g gains	(calcula	ted in Ap	opendix	L, equat	ion L9 or	r L9a), a	lso see '	Table 5						
(67)m=	212.02	188.31	153.15	115.94	86.67	73,17	79.06	102.77	137.93	175.14	204.41	217.91		(67)	
Applia	nces gai	ns (calc	ulated in	Append	lix L, eq	uation L	13 or L1	3a), also	see Ta	ble 5					
(68)m=	1419.9	1434.64	1397.51	1318.46	1218.68	1124.9	1062.25	1047.52	1084.65	1163.69	1263.47	1357.25		(68)	
							1.								

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com

Page 5 of 22

(69)m=	63.93	63.93	63.93	63.93	63.93	63.93	63.93	63.93	63.93	63.93	63.93	63.93		(69)
Pumps	and fa	ans gains	(Table 5	5a)										
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses	se.g.e	vaporatio	n (negal	tive valu	es) (Tat	le 5)		en:	5.0 S	10 D.				
(71)m=	-165.34	-165.34	-165.34	-165.34	-165.34	-165.34	-165.34	-165.34	-165.34	-165.34	-165.34	-165.34		(71)
Water	heating	g gains (T	able 5)			с. 		2						
(72)m=	229.51	226.46	220.11	211.47	205.87	197.98	191.27	199.87	202.92	211.85	221.94	226.47		(72)
Total i	nterna	l gains =	é.			(66	i)m + (67)n	n + (68)m	+ (69)m + (	(70)m + (7	'1)m + (72)	m		
(73)m=	2011.0	4 1999.01	1920.36	1795.48	1660.82	1545.66	1482.19	1499.76	1575.11	1700.29	1839,43	1951.24		(73)
6. So	lar gair	195	a		947 					16 - S		46° - 51		
Solar g	ains are	calculated	using sola	r flux from	Table 6a	and asso	ciated equa	ations to c	onvert to th	e applicat	ole orientat	ion.		
Orienta	ation:	Access F Table 6d	actor	Area m <sup>2</sup>		Fle	ux ble 6a		g_ Table 6b	т	FF able 6c		Gains (W)	
Northes	et o ou	0.77		-		- <b>—</b>	44.00		0.00		0.7		04.50	175
Northe:	ast n ov	0.77	_ ^	2.4	(H	<u> </u>	11.28	lî⊨	0.63	╡ऀ╞	0.7	=	31.59	(75)
Northe	ast c.o.	0,77		1.0	20		11.28	îî⊨	0.63	╡┊╞	0.7	-	11,59	(75)
Northes	ast o o-	0.77		2.5	76	<u> </u>	11.20	î€⊨	0.63	╡┊╞	0.7		49.03	(75)
Northea	ist o ov	0.77	- 0		20	° 🛏	11,20	lî⊨	0.63	╡∁╞	0.7	-	12,14	(75)
Northea	ist o ov	0.77	- Û		24	<u> </u>	11.20	tî⊨	0.63	╡┊╞	0.7		13.21	(75)
Northea	ast o ov	0.77	<b>-</b>		2	<u>_</u>	11.20	lî⊨	0.63	╡┊╞	0.7	=	1.02	(75)
Northea	ast o ex	0.54		20	13		11.28	iî⊨	0.57	≓î,⊧	0.8	-	20.3	(75)
Northea	ast 0.9x	0.77		23	~	×	22.97	¦€⊨	0.63	╡╻╞	0.7	-	64 29	(75)
Northea	ast 0.9x	0.77	×	10	38	× –	22.97	i 🚬 🛏	0.63	╡╷╞	0.7		23.58	(75)
Northea	ast 0.9x	0.77	×	23	37	×	22.97	i 🚬 🛏	0.63	╡╷╞	0.7	=	99.81	(75)
Northea	ast 0.9x	0.77	×	1.7	76	×	22.97		0.63		0.7	-	24.71	(75)
Northea	ast 0.9x	0.77	×	3.8	33	×	22.97	i . ⊨	0.63		0.7	-	26.88	(75)
Northea	ast 0.9x	0.77	×	1.3	34	x	22.97	i × 🗖	0.63	<b>i</b> × F	0.7	=	28.22	(75)
Northea	ast 0.9x	0.77	×	0.	3	×	22.97	i x 🗖	0.63	<b>1</b> × [	0.7	-	2.11	(75)
Northea	ast 0.9x	0.54	×	2.0	03	x	22.97	×	0.57	<b>1</b> × [	0.8	=	41,33	(75)
Northea	ast o.9x	0.77	×	2.	8	x	41.38	i × 🗖	0.63	] × [	0.7	=	115.84	(75)
Northea	ast 0.9x	0.77	×	1.6	38	×	41.38	×	0.63	] × [	0.7	=	42.49	(75)
Northea	ast 0.9x	0.77	×	2.3	37	x	41.38	i × 🗖	0.63	×	0.7	=	179.82	(75)
Northea	ast 0.9x	0.77	×	1,7	76	x	41.38	×	0.63	×	0.7	=	44,51	(75)
Northea	ast 0.9x	0.77	×	3.8	33	×	41.38	X	0.63	×	0.7	=	48.43	(75)
Northea	ast 0.9x	0.77	×	1.3	34	x	41.38	X	0.63	] × [	0.7	=	50.84	(75)
Northea	ast 0.9x	0,77	x	0.	3	x	41.38	×	0.63	×	0.7	=	3.79	(75)
Northea	ast 0.9x	0.54	×	2.0	3	x	41.38	×	0.57	×	0.8	=	74,46	(75)
Northea	ast 0.9x	0.77	×	2.2	29	x	67.96	×	0.63	×	0.7	=	190.24	(75)
Northea	ast 0.9x	0.77	×	1.6	58	x	67.96	×	0.63	×	0.7	=	69.78	(75)
Northea	ast 0.9x	0.77	×	2.3	37	×	67.96	x	0.63	×	0.7	=	295.32	(75)
Northea	ast 0.9x	0.77	×	21,7	76	x	67.96	×	0.63	x	0.7		73.1	(75)

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com

Northeast 0.9x	0.77	x	3.83	×	67.96	] × [	0.63	×	0.7	=	79.54	(75)
Northeast 0.9x	0.77	×	1.34	×	67.96	] × [	0.63	] × [	0.7	ī - Ē	83.49	(75)
Northeast 0.9x	0.77	x	0.3	ī × ī	67.96	Ī×Ī	0.63	1 × [	0.7	=	6.23	(75)
Northeast 0.9x	0.54	x	2.03	×	67.96	] × [	0.57	×	0.8	=	122.29	(75)
Northeast 0.9x	0.77	×	2.29	×	91.35	] × [	0.63	×	0.7	-	255.72	(75)
Northeast 0.9x	0.77	×	1.68	] × [	91.35	] × [	0.63	] × [	0.7	=	93.8	(75)
Northeast 0.9x	0.77	×	2.37	×	91.35	] × [	0.63	] × [	0.7	=	396.97	(75)
Northeast 0.9x	0.77	×	1.76	×	91.35	] × [	0.63	) × [	0.7	=	98.27	(75)
Northeast 0.9x	0.77	×	3.83	] × [	91.35	] × [	0.63	×	0.7	=	106.92	(75)
Northeast 0.9x	0.77	×	1.34	×	91.35	] × [	0.63	) × [	0.7	=	112.22	(75)
Northeast 0.9x	0.77	×	0.3	×	91.35	] × [	0.63	×	0.7	=	8.37	(75)
Northeast 0.9x	0.54	×	2.03	] × [	91.35	] × [	0.57	× [	0.8	] = [	164.38	(75)
Northeast 0.9x	0.77	×	2.29	×	97.38	×	0.63	×	0.7	=	272.62	(75)
Northeast 0.9x	0.77	×	1.68	×	97.38	×	0.63	] × [	0.7	=	100	(75)
Northeast 0.9x	0.77	×	2.37	×	97.38	× [	0.63	) × [	0.7	=	423.22	(75)
Northeast 0.9x	0.77	×	1.76	×	97.38	] × [	0.63	× [	0.7	=	104.76	(75)
Northeast 0.9x	0.77	x	3.83	×	97.38	] × [	0.63	] × [	0.7	=	113.99	(75)
Northeast 0.9x	0.77	×	1.34	×	97.38	×	0.63	×	0.7		119.64	(75)
Northeast 0.9x	0.77	×	0,3	×	97.38	] × [	0.63	×	0.7	=	8.93	(75)
Northeast 0.9x	0.54	×	2.03	×	97.38	×	0.57	) × [	0.8	=	175.25	(75)
Northeast 0.9x	0.77	×	2.29	×	91.1	] × [	0.63	] × [	0.7	=	255.03	(75)
Northeast 0.9x	0.77	_ × [	1.68	] × [	91.1	] × [	0.63	] × [	0.7	=	93.55	(75)
Northeast 0.9x	0.77	×	2.37	x	91,1	×	0.63	×	0.7		395.91	(75)
Northeast 0.9x	0.77	×	1.76	] × [	91.1	] × [	0.63	× [	0.7	-	98	(75)
Northeast 0.9x	0.77	×	3.83	×	91.1	] × [	0.63	×	0.7	] = [	106.63	(75)
Northeast 0.9x	0.77	×	1.34	×	91.1	) × [	0.63	×	0.7	=	111.92	(75)
Northeast 0.9x	0.77	×	0.3	× [	91.1	] × [	0.63	] × [	0.7	] = [	8.35	(75)
Northeast 0.9x	0.54	_ × [	2.03	×	91.1	] × [	0.57	) × [	0.8	=	163.94	(75)
Northeast 0.9x	0.77	×	2.29	×	72.63	×	0.63	×	0.7	=	203.31	(75)
Northeast 0.9x	0.77	×	1.68	×	72.63	] × [	0.63	] × [	0.7	=	74.58	(75)
Northeast 0.9x	0.77	×	2.37	× [	72.63	) × [	0.63	] × [	0.7	] = [	315.62	(75)
Northeast 0.9x	0.77	×	1.76	×	72.63	) × [	0.63	×	0.7	=	78.13	(75)
Northeast 0.9x	0.77	×	3.83	×	72.63	] × [	0.63	) × [	0.7	=	85.01	(75)
Northeast 0.9x	0.77	×	1.34	×	72.63	×	0.63	×	0.7	-	89.23	(75)
Northeast 0.9x	0.77	×	0.3	×	72.63	×	0.63	x	0.7	=	6.66	(75)
Northeast 0.9x	0.54	×	2.03	×	72.63	×	0.57	] × [	0.8	] = [	130.69	(75)
Northeast 0.9x	0.77	×	2.29	×	50.42	× [	0.63	×	0.7	=	141.15	(75)
Northeast 0.9x	0.77	×	1.68	×	50.42	×	0.63	×	0.7	=	51.77	(75)
Northeast 0.9x	0.77	×	2.37	×	50.42	) × [	0.63	×	0.7	=	219.12	(75)
Northeast 0.9x	0.77	*	1.76	×	50.42	×	0.63	×	0.7	=	54.24	(75)
Northeast 0.9x	0.77	×	3.83	×	50.42	×	0.63	x	0.7	=	59.02	(75)

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com

Page 7 of 22

Northeast 0.9x	0.77	×	1.34	×	50.42	X	0.63	×	0.7	=	61.95	(75)
Northeast 0.9x	0.77	<b>]</b> × [	0.3	ī × Ē	50.42	ī × ī	0.63	ī × ī	0.7	1 = [	4.62	(75)
Northeast 0.9x	0.54	×	2.03	<b>-</b> × [	50.42	ī × Ē	0.57	ī × Ī	0.8	1 = [	90.73	(75)
Northeast 0.9x	0.77	×	2.29	×	28.07	×	0.63	] × [	0.7	=	78.57	(75)
Northeast 0.9x	0.77	×	1.68	×	28.07	] × [	0.63	] × [	0.7	] = [	28.82	(75)
Northeast 0.9x	0.77	×	2.37	×	28.07	] × [	0.63	] × [	0.7	] = [	121.97	(75)
Northeast 0.9x	0.77	×	1,76	x	28.07	×	0.63	×	0,7	=	30.19	(75)
Northeast 0.9x	0.77	×	3.83	×	28.07	] × [	0.63	) × [	0.7	] = C	32.85	(75)
Northeast 0.9x	0.77	×	1.34	×	28.07	×	0.63	×	0.7	-	34,48	(75)
Northeast 0.9x	0.77	x	0,3	×	28.07	) × [	0.63	×	0.7	=	2.57	(75)
Northeast 0.9x	0.54	×	2.03	× [	28.07	] × [	0.57	× [	0.8	=	50.51	(75)
Northeast 0.9x	0.77	×	2.29	×	14.2	] × [	0.63	×	0.7	=	39.74	(75)
Northeast 0.9x	0.77	×	1.68	×	14.2	] × [	0.63	×	0.7	=	14.58	(75)
Northeast 0.9x	0.77	×	2.37	×	14.2	] × [	0.63	] × [	0.7	=	61.7	(75)
Northeast 0.9x	0.77	×	1.76	×	14.2	) × [	0.63	×	0.7	] = [	15.27	(75)
Northeast 0.9x	0.77	x	3.83	×	14.2	] × [	0.63	X [	0.7	=	16.62	(75)
Northeast 0.9x	0.77	×	1.34	×	14,2	] × [	0.63	×	0.7	=	17,44	(75)
Northeast 0.9x	0.77	×	0.3	×	14.2	] × [	0.63	×	0.7	=	1.3	(75)
Northeast 0.9x	0.54	х	2.03	×	14.2	×	0.57	×	0.8	=	25.55	(75)
Northeast 0.9x	0.77	×	2.29	×	9.21	] × [	0.63	] × [	0.7	=	25.79	(75)
Northeast 0.9x	0.77	×	1.68	x	9.21	×	0.63	×	0.7	=	9,46	(75)
Northeast 0.9x	0.77	×	2.37	×	9.21	×	0.63	×	0.7	=	40.04	(75)
Northeast 0.9x	0.77	x	1.76	×	9.21	] × [	0.63	×	0.7	=	9.91	(75)
Northeast 0.9x	0.77	×	3.83	×	9.21	] × [	0.63	] × [	0.7	=	10.79	(75)
Northeast 0.9x	0.77	×	1.34	×	9.21	] * [	0.63	× [	0.7	=	11.32	(75)
Northeast 0.9x	0.77	×	0.3	×	9.21	] × [	0.63	] × [	0.7	=	0.84	(75)
Northeast 0.9x	0.54	×	2.03	×	9.21	] × [	0.57	×	0.8		16.58	(75)
Southeast 0.9x	0.77	×	0.95	×	36.79	] × [	0.63	×	0.7	=	10.68	(77)
Southeast 0.9x	0.77	×	2	×	36.79	] × [	0.63	) × [	0.7	=	22.49	(77)
Southeast 0.9x	0.77	×	0.95	×	62.67	] × [	0.63	×	0.7	=	18.2	(77)
Southeast 0.9x	0.77	×	2	×	62.67	×	0.63	× [	0.7	=	38.31	(77)
Southeast 0.9x	0.77	×	0.95	×	85.75	] × [	0.63	] × [	0.7	=	24.9	(77)
Southeast 0.9x	0.77	×	2	×	85.75	] × [	0.63	×	0.7	=	52.41	(77)
Southeast 0.9x	0.77	×	0.95	×	106.25	] × [	0.63	] × [	0.7	] = [	30.85	(77)
Southeast 0.9x	0.77	×	2	×	106.25	] × [	0.63	] × [	0.7	-	64.94	(77)
Southeast 0.9x	0.77	×	0.95	×	119.01	] × [	0.63	×	0.7	- [	34.55	(77)
Southeast 0.9x	0.77	×	2	×	119.01	] × [	0.63	×	0.7	] = [	72.74	(77)
Southeast 0.9x	0.77	] × [	0.95		118.15	Ī×Ī	0.63	×	0.7	=	34.3	(77)
Southeast 0.9x	0.77	×	2	×	118.15	] × [	0.63	×	0.7	] = [	72.22	(77)
Southeast 0.9x	0.77	×	0.95	- ×	113.91	] × [	0.63	×	0.7	] = [	33.07	(77)
Southeast 0.9x	0.77		2	<b>i</b> x F	113.91	ī , ī	0.63	ī x Ē	0.7	ī - Ē	69.62	177)

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com

				_								
Southeast 0.9x	0.77	×	0.95	×	104.39	×	0.63	×	0.7	=	30.31	(77)
Southeast 0.9x	0.77	×	2	×	104,39	×	0.63	×	0.7	=	63,81	(77)
Southeast 0.9x	0.77	×	0.95	×	92.85	] × [	0.63	] × [	0.7	=	26.96	(77)
Southeast 0.9x	0.77	x	2	x	92.85	×	0.63	×	0.7	=	56.75	(77)
Southeast 0.9x	0.77	×	0.95	×	69.27	×	0.63	×	0.7	=	20.11	(77)
Southeast 0.9x	0.77	×	2	x	69.27	×	0.63	x	0.7	=	42.34	(77)
Southeast 0.9x	0.77	×	0.95	×	44.07	× [	0.63	×	0.7	=	12.8	(77)
Southeast 0.9x	0.77	×	2	×	44.07	] × [	0.63	) × [	0.7	] = [	26.94	(77)
Southeast 0.9x	0.77	×	0.95	×	31.49	×	0.63	×	0.7	=	9.14	(77)
Southeast 0.9x	0.77	×	2	×	31.49	×	0.63	×	0.7		19.25	(77)
Southwest0.9x	0.77	×	7.38	×	36.79	] [	0.57	×	0.8	=	85.81	(79)
Southwest0.9x	0.77	× [	10.59	×	36.79	] [	0.57	) × [	0.8	=	123.13	(79)
Southwesto.9x	0.77	×	3.83	×	36.79		0.57	×	0.8	=	89.06	(79)
Southwest0.9x	0.77	×	2.25	×	36.79	] [	0.57	×	0.8	=	52.32	(79)
Southwest0.9x	0.77	×	23.96	×	36.79	] [	0.57	× [	0.8	] = [	278.59	(79)
Southwest0.9x	0.77	×	4.13	×	36.79	] [	0.57	×	0.8	=	96.04	(79)
Southwesto.9x	0.77	×	2.19	] × [	36.79	] [	0.57	×	0.8	=	50.93	(79)
Southwesto 9x	0.77	×	2.2	×	36.79	] [	0.57	×	0.8	=	25.58	(79)
Southwesto.9x	0.77	×	2.26	×	36.79	ון	0.63	×	0.7	=	127.06	(79)
Southwest0.9x	0.77	x	2.2	×	36.79		0.63	×	0.7	=	24.74	(79)
Southwest0.9x	0.77	×	2.19	<b>x</b>	36.79		0,63	X [	0.7	=	24.63	(79)
Southwesto.9x	0.77	x	2.93	×	36.79	] [	0.63	×	0.7	=	65.89	(79)
Southwest0.9x	0.77	×	1.49	×	36.79	וכ	0.63	×	0.7	] = [	16.75	(79)
Southwesto.9x	0.77	×	7,38	×	62.67		0.57	×	0.8	=	146.16	(79)
Southwesto.9x	0.77	×	10.59	×	62.67	] [	0.57	x	0.8	=	209.74	(79)
Southwest0.9x	0.77	×	3.83	×	62.67	] [	0.57	×	0.8	] = [	151.71	(79)
Southwest0.9x	0.77	_ × [	2.25	×	62.67	] [	0.57	×	0.8	=	89.12	(79)
Southwest0.9x	0.77	×	23.96	×	62.67	] [	0.57	×	0.8		474.54	(79)
Southwesto.9x	0.77	×	4.13	×	62.67	] [	0.57	_ × [	0.8	=	163.59	(79)
Southwest0.9x	0.77	×	2.19	×	62.67	] [	0.57	×	0.8	=	86.75	(79)
Southwest0.9x	0.77	×	2.2	×	62.67		0.57	] × [	0.8	=	43.57	(79)
Southwesto.9x	0.77	×	2.26	×	62.67	] [	0.63	×	0.7	-	216.44	(79)
Southwest0.9x	0.77	×	2.2	×	62.67	] [	0.63	×	0.7	=	42.14	(79)
Southwesto 9x	0.77	×	2.19	×	62.67	] [	0.63	×	0.7	=	41.95	(79)
Southwesto.9x	0.77	×	2.93	×	62.67	] [	0.63	×	0.7	=	112.24	(79)
Southwesto.9x	0.77	×	1.49	×	62.67	] [	0.63	×	0.7	=	28.54	(79)
Southwesto.9x	0.77	ं	7.38	×	85.75		0.57	×	0.8	=	199.99	(79)
Southwesto.9x	0.77	×	10.59	×	85.75	ונ	0.57	×	0.8	=	286.97	(79)
Southwesto.9x	0.77	×	3.83	×	85.75		0.57	×	0.8	=	207.57	(79)
Southwesto.9x	0.77	×	2.25	×	85.75	] [	0.57	×	0.8	=	121.94	(79)
Southwest0.9x	0.77	×	23.96	×	85.75		0.57	×	0.8	=	649.28	(79)

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com

Page 9 of 22

Southwesto.9x	0.77	×	4.13	×	85.75		0.57	×	0.8		223.83	(79)
Southwest0.9x	0.77	*	2.19	×	85.75	E	0.57	×	0.8	=	118.69	(79)
Southwesto.9x	0.77	×	2.2	×	85.75		0.57	) × [	0.8	] = [	59.62	(79)
Southwesto.9x	0.77	×	2.26	×	85.75	E	0.63	x	0.7		296.14	(79)
Southwest <sub>0.9x</sub>	0.77	×	2.2	×	85.75		0.63	×	0.7	=	57.66	(79)
Southwest0.9x	0.77	×	2.19	x	85.75	E	0.63	) × [	0.7	=	57,39	(79)
Southwesto.9x	0.77	×	2.93	×	85.75		0.63	) × [	0.7		153.57	(79)
Southwesto.9x	0.77	×	1.49	×	85.75	E	0.63	×	0.7	=	39.05	(79)
Southwesto 9x	0.77	×	7.38	×	106.25		0.57	×	0.8	=	247.79	(79)
Southwesto.9x	0.77	×	10.59	×	106.25	E	0.57	_ × [	0.8	=	355.57	(79)
Southwesto.9x	0.77	×	3.83	× [	106.25		0.57	×	0.8	=	257.19	(79)
Southwesto.9x	0.77	×	2.25	×	106.25		0.57	.×:[	0.8		151.09	(79)
Southwesto 9x	0.77	×	23.96	×	106.25		0.57	) × [	0.8	=	804.49	(79)
Southwesto.9x	0.77	×	4.13	×	106.25		0.57	] × [	0.8	=	277.34	(79)
Southwesto.9x	0.77	×	2.19	×	106.25	E	0.57	) × [	0.8	.=	147.06	(79)
Southwesto.9x	0.77	×	2.2	×	106.25	E	0.57	×	0.8	=	73.87	(79)
Southwest0.9x	0.77	×	2.26	×	106.25		0.63	) × [	0.7	=	366.93	(79)
Southwesto.9x	0.77	×	2.2	×	106.25	E	0.63	×	0.7	=	71.44	(79)
Southwesto 9x	0.77	×	2.19	×	106.25	E	0.63	×	0.7	=	71.11	(79)
Southwesto.9x	0.77	×	2.93	×	106.25	E	0.63	] × [	0.7	=	190.29	(79)
Southwesto.9x	0.77	×	1.49	×	106.25		0.63	] × [	0.7	=	48.38	(79)
Southwesto 9x	0.77	×	7.38	×	119.01	E	0.57	x	0.8	=	277.55	(79)
Southwesto 9x	0.77	×	10.59	×	119.01	E	0.57	×	0.8	=	398.27	(79)
Southwesto.9x	0.77	×	3.83	×	119.01	E	0.57	] × [	0.8	=	288.08	(79)
Southwesto.9x	0.77	×	2,25	×	119.01		0.57	x	0.8	=	169.24	(79)
Southwesto 9x	0.77	×	23.96	×	119.01		0.57	) × [	0.8	=	901.1	(79)
Southwest0.9x	0.77	×	4.13	×	119.01	Ľ	0.57	× [	0.8	=	310.64	(79)
Southwest0.9x	0.77	×	2.19	×	119.01		0.57	×	0.8	=	164.72	(79)
Southwest0.9x	0.77	×	2.2	×	119.01		0.57	×	0.8	=	82.74	(79)
Southwesto.9x	0.77	×	2.26	×	119.01	L	0.63	× [	0.7	=	410.99	(79)
Southwest0.9x	0.77	×	2.2	×	119.01		0.63	×	0.7	=	80.02	(79)
Southwest0.9x	0.77	×	2.19	×	119.01		0.63	×	0.7	=	79.65	(79)
Southwest0.9x	0.77	×	2.93	×	119.01		0.63	x	0.7	-	213.14	(79)
Southwesto.9x	0.77	×	1.49	×	119.01		0.63	×	0.7	=	54.19	(79)
Southwest0.9x	0.77	×	7.38	×	118.15		0.57	×	0.8	=	275.54	(79)
Southwesto_9x	0.77	×	10.59	×	118.15		0.57	] × [	0.8	=	395.39	(79)
Southwesto.9x	0,77	×	3,83	×	118.15	L	0.57	×	0.8	=	286	(79)
Southwest0.9x	0.77	×	2.25	×	118.15		0.57	×	0.8	=	168.01	(79)
Southwest0.9x	0.77	×	23.96	×	118.15		0.57	×	0.8	=	894.58	(79)
Southwesto.9x	0.77	×	4.13	×	118.15		0.57	×	0,8	=	308.4	(79)
Southwesto.9x	0.77	×	2.19	×	118.15	E	0.57	×	0.8		163.53	(79)

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com

Page 10 of 22

Southwesto.9x	0.77	x	2.2	×	118.15	] [	0.57	×	0.8	=	82.14	(79)
Southwesto.9x	0.77	x	2.26	Ī×Ī	118.15	i i	0.63	ī × Ī	0.7	ī - Ē	408.02	(79)
Southwest0.9x	0.77	×	2.2	] × [	118.15	ii	0.63	×	0.7	] = [	79.44	(79)
Southwesto.9x	0.77	×	2.19	×	118.15	Ì	0.63	×	0.7	=	79.08	(79)
Southwesto.9x	0.77	x	2,93	] × [	118.15	İ	0.63	] × [	0.7	] = [	211.59	(79)
Southwesto.9x	0.77	×	1.49	] × [	118.15	ĺĺ	0.63	×	0.7	] = [	53.8	(79)
Southwest0.9x	0.77	×	7.38	×	113.91	İ	0.57	×	0.8	=	265.65	(79)
Southwesto 9x	0.77	×	10.59	] × [	113,91	1 [	0.57	×	0.8	=	381.2	(79)
Southwest0.9x	0.77	×	3.83	] × [	113.91	1 [	0.57	×	0.8	=	275.73	(79)
Southwesto.9x	0.77	×	2.25	] × [	113.91	Ì	0.57	×	0.8	] = [	161.98	(79)
Southwesto.9x	0.77	×	23.96	×	113.91	] [	0.57	×	0.8	=	862.47	(79)
Southwest0.9x	0.77	×	4.13	] × [	113.91	1 [	0.57	×	0.8	] = [	297.33	(79)
Southwesto.9x	0.77	×	2.19	] × [	113.91	] [	0.57	x	0.8	] - [	157,66	(79)
Southwesto.9x	0.77	x	2.2	×	113.91	1 [	0.57	×	0.8	=	79.19	(79)
Southwesto.9x	0.77	×	2.26	] × [	113.91	i i	0.63	×	0.7	=	393.38	(79)
Southwest0.9x	0.77	×	2.2	×	113.91	Ì	0.63	×	0.7	] = [	76.59	(79)
Southwesto.9x	0.77	x	2.19	×	113.91	İ	0.63	] × [	0.7	=	76.24	(79)
Southwest0.9x	0.77	×	2.93	×	113.91	] [	0.63	×	0.7	=	204	(79)
Southwesto.9x	0.77	x	1.49	×	113.91	1 [	0.63	×	0.7	=	51.87	(79)
Southwesto.9x	0.77	×	7.38	<b>x</b>	104.39	] [	0.57	] × [	0.8	=	243.45	(79)
Southwesto, 9x	0,77	×	10,59	×	104.39	1 [	0.57	×	0.8	=	349.35	(79)
Southwesto.9x	0.77	×	3.83	] × [	104.39	Ì	0.57	×	0.8	=	252.69	(79)
Southwest0.9x	0.77	x	2.25	] × [	104.39	1 [	0.57	x	0.8	] = [	148.45	(79)
Southwest0,9x	0.77	×	23.96	×	104.39	I	0.57	×	8.0	] = [	790.4	(79)
Southwesto.9x	0.77	x	4.13	<b>x</b>	104.39	] [	0.57	×	0.8	=	272.48	(79)
Southwesto 9x	0.77	x	2.19	] × [	104.39	I I	0.57	x	0.8	=	144.49	(79)
Southwesto.9x	0.77	x	2.2	×	104.39	] [	0.57	×	0.8	=	72.57	(79)
Southwesto.9x	0.77	×	2.26	×	104.39	1 [	0.63	×	0.7	=	360.5	(79)
Southwesto.9x	0.77	×	2.2	] × [	104.39	Ì	0.63	×	0.7	. = [	70.19	(79)
Southwesto.9x	0.77	x	2.19	×	104.39	] [	0.63	×	0.7	=	69.87	(79)
Southwest0.9x	0.77	×	2.93	×	104.39	] [	0.63	] × [	0.7	=	186.95	(79)
Southwest0.9x	0.77	×	1.49	×	104.39	] [	0.63	×	0.7	=	47.54	(79)
Southwesto 9x	0.77	×	7.38	×	92.85	] [	0.57	×	0.8		216.54	(79)
Southwesto.9x	0.77	×	10.59	×	92.85	1 [	0.57	×	0.8	•	310.73	(79)
Southwest0.9x	0.77	×	3.83	×	92.85	] [	0.57	×	0.8	=	224.76	(79)
Southwesto.sx	0.77	×	2.25	] × [	92.85	1 [	0.57	×	0.8	=	132.04	(79)
Southwesto.9x	0.77	×	23.96	×	92.85	İ	0.57	×	0.8	] = [	703.03	(79)
Southwesto.9x	0.77	×	4.13	×	92.85	i I	0.57	×	0.8	] = [	242.36	(79)
Southwest0.9x	0.77	×	2.19	] × [	92.85	i i	0.57	×	0.8	=	128.52	(79)
Southwesto.9x	0.77	×	2.2	×	92.85	i I	0.57	×	8.0	=	64,55	(79)
Southwesto.9x	0.77	×	2.26	×	92.85	i I	0.63	×	0.7	=	320.66	(79)

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com

Page 11 of 22

Southwesto.9x	0.77	x	2.2	×	92.85		0.63	×	0.7	=	62.43	(79)
Southwest0.9x	0.77	×	2.19	×	92.85	Ē	0.63	×	0.7	=	62.15	(79)
Southwesto.9x	0.77	×	2.93	] × [	92.85	Ē	0.63	×	0.7	=	166.29	(79)
Southwest0.9x	0.77	×	1,49	×	92.85	E	0.63	×	0.7	=	42.28	(79)
Southwesto 9x	0.77	] * [	7.38	×	69.27	Ē	0.57	×	0.8	] = [	161.54	(79)
Southwesto.9x	0.77	×	10.59	×	69.27		0.57	×	0.8	=	231.81	(79)
Southwesto 9x	0.77	×	3.83	×	69.27	E	0.57	×	0.8	=	167.67	(79)
Southwesto.9x	0.77	×	2.25	X [	69.27		0.57	x	0.8	=	98.5	(79)
Southwesto.9x	0.77	×	23.96	×	69.27		0,57	×	0.8		524.46	(79)
Southwesto.9x	0.77	×	4.13	×	69.27		0.57	x	0,8	=	180.8	(79)
Southwesto 9x	0.77	×	2.19	_ × [	69.27		0.57	×	0.8	=	95.87	(79)
Southwest0.9x	0.77	×	2.2	×	69.27		0.57	×	0.8	] = [	48.16	(79)
Southwest0.9x	0.77	×	2.26	×	69.27		0.63	×	0.7	=	239.21	(79)
Southwesto.9x	0,77	×	2.2	×	69.27		0.63	×	0.7	=	46,57	(79)
Southwesto.9x	0.77	×	2.19	×	69.27		0.63	×	0.7		46.36	(79)
Southwesto.9x	0.77	×	2.93	×	69.27		0.63	×	0.7	=	124.05	(79)
Southwesto.9x	0.77	×	1.49	×	69.27		0.63	×	0.7	=	31,54	(79)
Southwesto.9x	0.77	×	7.38	] × [	44.07		0.57	×	0.8	] = [	102.78	(79)
Southwest0.9x	0.77	×.	10.59	] × [	44.07		0.57	x	0.8	] = [	147.48	(79)
Southwesto.9x	0.77	×	3.83	×	44.07		0.57	×	0.8	=	106.68	(79)
Southwesto,9x	0.77	×	2.25	× [	44.07		0.57	×	0.8	] = [	62.67	(79)
Southwesto.9x	0.77	×	23.96	×	44.07		0.57	×	0.8	=	333.68	(79)
Southwesto.9x	0.77	ं×	4.13	×	44.07		0.57	x	0.8	=	115.03	(79)
Southwest <sub>0.9x</sub>	0.77	] × [	2.19	] × [	44.07		0.57	×	0.8	] = [	61	(79)
Southwesto.9x	0.77	×	2.2	×	44.07		0.57	×	0.8	=	30.64	(79)
Southwesto 9x	0.77	×	2.26	×	44.07		0.63	×	0.7	=	152.19	(79)
Southwesto 9x	0.77	×	2.2	×	44.07		0.63	×	0.7	=	29.63	(79)
Southwest0.9x	0.77	.*	2.19	×	44.07		0.63	×	0.7	=	29.5	(79)
Southwesto.9x	0.77	×	2.93	×	44.07		0.63	×	0.7	=	78.93	(79)
Southwesto.9x	0.77	×	1.49	×	44.07		0.63	×	0.7	=	20.07	(79)
Southwest0.9x	0.77	×	7,38	×	31.49		0.57	×	0.8	=	73.43	(79)
Southwesto.9x	0.77	×	10.59	×	31.49		0.57	×	0.8	=	105.37	(79)
Southwest0.9x	0.77	×	3.83	×	31.49		0.57	×	0.8	] = [	76.22	(79)
Southwesto, 9x	0.77	×	2.25	×	31.49		0.57	×	0.8	=	44.78	(79)
Southwest0.9x	0.77	×	23.96	×	31.49		0.57	×	0.8	=	238.41	(79)
Southwest <sub>0.9x</sub>	0.77	×	4.13	×	31.49		0.57	×	0.8	=	82.19	(79)
Southwesto.9x	0.77	×	2.19	×	31.49	E	0.57	×	0.8	=	43.58	(79)
Southwest0.9x	0.77	×	2.2	x	31.49		0.57	×	0.8	=	21.89	(79)
Southwesto, 9x	0,77	×	2.26	×	31.49		0.63	×	0.7	=	108.74	(79)
Southwest0.9x	0.77	×	2.2	×	31.49		0.63	×	0.7	=	21.17	(79)
Southwest0.9x	0.77	×	2.19	×	31.49		0.63	x	0.7	=	21.07	(79)

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com

Page 12 of 22

Southwest0.9x	0.77	×	2.93	×	31.49	] [	0.63	X	0.7	=	56.39	(79)
Southwesto 9x	0.77	×	1.49	×	31.49	ĪĒ	0.63	×	0.7	] - [	14.34	(79)
Northwest 0.9x	0.77	×	0.46	] × [	11,28	] × [	0.57	×	0.8	=	4.92	(81)
Northwest 0.9x	0.77	x	0.57	×	11.28	] × [	0.57	x	0.8	=	4.06	(81)
Northwest 0.9x	0.77	- × [	6.67	×	11.28	] × [	0.57	×	0.8	] = [	23.78	(81)
Northwest 0.9x	0.77	x	2.07	×	11.28	] × [	0.63	] × [	0.7	=	14.28	(81)
Northwest 0.9x	0.77	×	2.07	×	11.28	] × [	0.57	×	0.8	=	7.38	(81)
Northwest 0.9x	0.77	×	2.22	×	11,28	] × [	0.57	× [	0.8	=	7.92	(81)
Northwest 0.9x	0.77	×	1.82	×	11.28	] × [	0.63	×	0.7	=	6.28	(81)
Northwest 0.9x	0.77	x	1.82	] × [	11.28	] × [	0.57	] × [	0.8	=	6.49	(81)
Northwest 0.9x	0.77	×	2.2	] × [	11.28	] × [	0.63	) × [	0.7		7.59	(81)
Northwest 0.9x	0.77	×	3.08	] × [	11.28	] × [	0.57	×	0.8	=	10.98	(81)
Northwest 0.9x	0.77	×	13.1	×	11.28	] × [	0.57	] × [	0.8	=	46.71	(81)
Northwest 0.9x	0.77	x	3.96	×	11.28	] × [	0.57	] × [	0.8	=	14.12	(81)
Northwest 0.9x	0.77	×	1.38	×	11.28	] × [	0.57	×	0.8	=	4.92	(81)
Northwest 0.9x	0.77	×	0.46	×	22.97	] × [	0.57	×	0.8	=	10.02	(81)
Northwest 0.9x	0.77	×	0.57	] × [	22.97	] × [	0.57	×	0.8	- [	8.27	(81)
Northwest 0.9x	0.77	×	6.67	×	22.97	] × [	0.57	) × [	0.8	=	48.41	(81)
Northwest 0.9x	0.77	×	2.07	×	22.97	] × [	0.63	×	0.7	=	29.06	(81)
Northwest 0.9x	0.77	x	2.07	×	22.97	] × [	0.57	<b>x</b>	0.8	=	15.02	(81)
Northwest 0.9x	0.77	×	2.22	×	22,97	×	0.57	×	0.8	=	16,11	(81)
Northwest 0.9x	0.77	×	1.82	×	22.97	] × [	0.63	) × [	0.7	=	12.77	(81)
Northwest 0.9x	0.77	x	1.82	×	22.97	] × [	0.57	x	0.8	=	13.21	(81)
Northwest 0.9x	0.77	×	2.2	×	22.97	] * [	0.63	×	0.7	] = [	15.44	(81)
Northwest 0.9x	0.77	×	3.08	×	22.97	×	0.57	×	0.8	=	22.35	(81)
Northwest 0.9x	0.77	×	13.1	×	22.97	×	0.57	× [	0.8	=	95.08	(81)
Northwest 0.9x	0.77	×	3.96	×	22.97	] × [	0.57	<b>×</b>	0.8	=	28.74	(81)
Northwest 0.9x	0.77	× .	1.38	×	22.97	× [	0.57	×	0.8	=	10.02	(81)
Northwest 0.9x	0.77	×	0.46	) × [	41.38	] × [	0.57	×	0.8	= [	18.04	(81)
Northwest 0.9x	0.77	×	0.57	×	41.38	×	0.57	×	0.8	=	14.91	(81)
Northwest 0.9x	0.77	×	6.67	×	41.38	] × [	0.57	×	0.8	=	87.22	(81)
Northwest 0.9x	0.77	×	2.07	×	41.38	×	0.63	] × [	0.7	=	52.35	(81)
Northwest 0.9x	0.77	×	2.07	×	41.38	×	0.57	×	0.8	=	27.07	(81)
Northwest 0.9x	0.77	×	2.22	×	41.38	] × [	0.57	× [	0.8	=	29.03	(81)
Northwest 0.9x	0.77	×	1.82	×	41.38	×	0.63	×	0.7	=	23.02	(81)
Northwest 0.9x	0.77	×	1.82	×	41.38	] × [	0.57	×	0.8	=	23.8	(81)
Northwest 0.9x	0.77	×	2.2	×	41.38	×	0.63	×	0.7	=	27.82	(81)
Northwest 0.9x	0.77	×	3.08	×	41.38	×	0.57	x	0.8	=	40.27	(81)
Northwest 0.9x	0.77	×	13.1	×	41.38	×	0.57	×	0.8		171.3	(81)
Northwest 0.9x	0.77	×	3.96	×	41.38	×	0.57	×	0.8	=	51,78	(81)
Northwest 0.9x	0.77	×	1.38	×	41.38	×	0.57	×	0.8	=	18.04	(81)

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com

Page 13 of 22

Northwest 0.9x	0.77	×	0.46	×	67.96		0.57	×	0.8	=	29.63	(81)
Northwest 0.9x	0.77	×	0.57	×	67.96	ī × Ē	0.57	Ī×Ī	0.8	ī - Ē	24.48	(81)
Northwest 0.9x	0.77	×	6.67	Ī×Ī	67.96	ī×ī	0.57	ī × ī	0.8		143.24	(81)
Northwest 0.9x	0.77	x	2.07	×	67.96	] × [	0.63	x	0.7	] = [	85.98	(81)
Northwest 0.9x	0.77	×	2.07	×	67.96	] × [	0.57	×	0.8	] = [	44.45	(81)
Northwest 0.9x	0.77	x	2.22	×	67.96	] × [	0.57	] × [	0.8	=	47.67	(81)
Northwest 0.9x	0.77	ं×े	1.82	×	67.96	×	0.63	×	0.7	=	37.8	(81)
Northwest 0.9x	0.77	×	1.82	×	67.96	] × [	0.57	×	0.8	=	39.08	(81)
Northwest 0.9x	0.77	×	2.2	× [	67.96	] × [	0.63	×	0.7	=	45.69	(81)
Northwest 0.9x	0.77	x	3.08	) × [	67.96	] × [	0.57	] × [	0.8	=	66.14	(81)
Northwest 0.9x	0.77	×	13.1	×	67.96	] * [	0.57	×	0.8		281.32	(81)
Northwest 0.9x	0.77	x	3.96	×	67.96	] × [	0.57	×	0.8	=	85.04	(81)
Northwest 0.9x	0.77	×	1.38	×	67.96	) × [	0.57	) × [	0.8	=	29.63	(81)
Northwest 0.9x	0.77	x	0.46	×	91.35	] × [	0.57	] × [	0.8	=	39.84	(81)
Northwest 0.9x	0.77	×	0.57	×	91.35	] × [	0.57	) × [	0.8	=	32,91	(81)
Northwest 0.9x	0.77	×	6.67	×	91.35	] × [	0.57	×	0.8	=	192.54	(81)
Northwest 0.9x	0,77	×	2.07	×	91.35	] * [	0.63	×	0.7		115.57	(81)
Northwest 0.9x	0.77	x	2.07	×	91.35	] × [	0.57	×	0.8	=	59.75	(81)
Northwest 0.9x	0.77	×	2.22	×	91.35	] * [	0.57	×	0.8	=	64.08	(81)
Northwest 0.9x	0.77	x	1.82	×	91.35	] × [	0.63	×	0.7	=	50.81	(81)
Northwest 0.9x	0.77	×	1.82	×	91.35	×	0.57	×	0.8	=	52.54	(81)
Northwest 0.9x	0.77	×	2.2	] × [	91.35	] × [	0.63	] × [	0.7	=	61.42	(81)
Northwest 0.9x	0.77	x	3.08	×	91.35	] × [	0.57	×	0.8	=	88.91	(81)
Northwest 0.9x	0.77	×	13.1	] × [	91.35	] * [	0.57	×	0.8	=	378.15	(81)
Northwest 0.9x	0.77	×	3.96	×	91.35	×	0.57	x	0.8	=	114.31	(81)
Northwest 0.9x	0.77	×	1.38	×	91.35	) × [	0.57	) × [	0.8	=	39.84	(81)
Northwest 0.9x	0.77	×	0.46	× [	97.38	] × [	0.57	×	0.8	=	42.47	(81)
Northwest 0.9x	0.77	×	0.57	×	97.38	] * [	0.57	× [	0.8	=	35.08	(81)
Northwest 0.9x	0.77	x	6.67	) × [	97.38	] × [	0.57	× [	0.8	] = [	205.26	(81)
Northwest 0.9x	0.77	×	2.07	×	97.38	×	0.63	×	0.7	=	123.21	(81)
Northwest 0.9x	0.77	×	2.07	×	97.38	] × [	0.57	×	0.8	=	63.7	(81)
Northwest 0.9x	0.77	×	2.22	×	97.38	×	0.57	] × [	0.8	=	68.32	(81)
Northwest 0.9x	0.77	×	1.82	×	97.38	×	0.63	×	0.7	=	54.17	(81)
Northwest 0.9x	0.77	×	1.82	×	97.38	] * [	0.57	×	0.8	=	56.01	(81)
Northwest 0.9x	0.77	×	2.2	×	97.38	] × [	0.63	×	0.7	=	65.48	(81)
Northwest 0.9x	0.77	×	3.08	×	97,38	×	0.57	×	0.8	=	94.78	(81)
Northwest 0.9x	0.77	×	13.1	×	97.38	] × [	0.57	×	0.8	=	403.14	(81)
Northwest 0.9x	0.77	×	3.96	×	97.38	] × [	0.57	×	0.8	=	121.87	(81)
Northwest 0.9x	0.77	×	1.38	×	97.38	×	0.57	×	0.8		42.47	(81)
Northwest 0.9x	0.77	×	0.46	×	91.1	) × [	0.57	×	0.8	=	39.73	(81)
Northwest 0.9x	0.77	×	0.57	×	91.1	×	0.57	×	8.0	=	32.82	(81)
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1												

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com

Page 14 of 22

Northwest 0.9x	0.77	x	6.67	] × [	91.1	] × [	0.57	×	0.8	=	192.02	(81)
Northwest 0.9x	0.77	×	2.07	Ī×Ī	91.1	ī×Ē	0.63	Ī×Ē	0.7	ī - Ē	115.26	(81)
Northwest 0.9x	0.77	×	2.07	Ī×Ī	91.1	Ī×Ē	0.57	Ī×Ē	0.8	] = [	59.59	(81)
Northwest 0.9x	0.77	×	2.22	×	91.1	] × [	0.57	×	0.8	=	63.91	(81)
Northwest 0.9x	0.77	x	1.82	] × [	91.1	] × [	0.63	×	0.7		50.67	(81)
Northwest 0.9x	0.77	×	1.82	×	91.1	] × [	0.57		0.8	=	52.4	(81)
Northwest 0.9x	0.77	× [	2.2	] × [	91.1	] × [	0.63	×	0.7	] = [	61,25	(81)
Northwest 0.9x	0.77	x	3.08	×	91.1	×	0.57	×	0.8	=	88.67	(81)
Northwest 0.9x	0.77	×	13.1	×	91.1	×	0.57	×	0.8	=	377.13	(81)
Northwest 0.9x	0.77	_ × [	3.96	×	91.1	] × [	0.57	×	0.8	=	114	(81)
Northwest 0.9x	0,77	×	1.38	×	91.1	×	0.57	×	0.8	=	39.73	(81)
Northwest 0.9x	0.77	×	0.46	×	72.63	×	0.57	×	0.8	-	31.67	(81)
Northwest 0.9x	0.77	×	0.57	) × [	72.63	×	0.57	×	0.8	=	26.16	(81)
Northwest 0.9x	0.77	×	6.67	×	72.63	×	0.57	×	0.8	=	153.08	(81)
Northwest 0.9x	0.77	×	2.07	×	72.63	] × [	0.63	] × [	0.7	- [	91.89	(81)
Northwest 0.9x	0.77	×	2.07	<b>×</b>	72.63	×	0.57	] × [	0.8	-	47.51	(81)
Northwest 0.9x	0.77	×	2.22	×	72.63	×	0.57	×	0.8	=	50.95	(81)
Northwest 0.9x	0.77	×	1.82	] × [	72.63	] × [	0.63	×	0.7	=	40.4	(81)
Northwest 0.9x	0.77	×	1.82	×	72.63		0.57	] × [	0.8	=	41.77	(81)
Northwest 0.9x	0.77	×	2.2	×	72.63	] × [	0.63	] x [	0.7	] = [	48.83	(81)
Northwest 0.9x	0.77	×	3.08	×	72.63	×	0.57	×	0.8	=	70.69	(81)
Northwest 0.9x	0.77	×	13.1	×	72.63	Ī×Ī	0.57	٦× [	0.8	<b>-</b> -	300.65	(81)
Northwest 0.9x	0.77	x	3.96	×	72.63	] × [	0.57	x	0.8		90.88	(81)
Northwest 0.9x	0.77	×	1.38	×	72.63	] × [	0.57	×	0.8	=	31.67	(81)
Northwest 0.9x	0.77	×	0.46	×	50.42	] × [	0.57	×	0.8	=	21.99	(81)
Northwest 0.9x	0.77	×	0.57	×	50.42	×	0.57	×	0.8	=	18.16	(81)
Northwest 0.9x	0.77	×	6.67	×	50.42	] × [	0.57	×	0.8	] = [	106.28	(81)
Northwest 0.9x	0.77	×	2.07	×	50.42	×	0.63	×	0.7	=	63.79	(81)
Northwest 0.9x	0.77	×	2.07	×	50.42	] × [	0.57	×	0.8	=	32.98	(81)
Northwest 0.9x	0.77	×	2.22	×	50.42	] × [	0.57	×	0.8	-	35.37	(81)
Northwest 0,9x	0.77	×	1.82	× [	50.42	] × [	0.63	×	0.7	=	28.04	(81)
Northwest 0.9x	0.77	x	1.82	] × [	50.42	] × [	0.57	×	0.8	=	29	(81)
Northwest 0.9x	0.77	х	2.2	×	50.42	×	0.63	×	0.7	=	33.9	(81)
Northwest 0.9x	0.77	×	3.08	] × [	50.42	] × [	0.57	×	0.8	=	49.07	(81)
Northwest 0.9x	0.77	( <b>x</b> )	13.1	×	50.42	×	0.57	×	0.8	=	208.73	(81)
Northwest 0.9x	0.77	×	3.96	×	50.42	] × [	0.57	×	0.8	=	63.1	(81)
Northwest 0.9x	0.77	×	1.38	] × [	50.42	×	0.57	×	0.8	=	21.99	(81)
Northwest 0.9x	0.77	×	0.46	×	28.07	×	0.57	× [	0.8	=	12.24	(81)
Northwest 0.9x	0,77	×	0.57	×	28.07	×	0.57	×	0.8	=	10,11	(81)
Northwest 0.9x	0.77	×	6.67	×	28.07	×	0.57	×	0.8	=	59.16	(81)
Northwest 0.9x	0.77	×	2.07	×	28.07	×	0.63	×	0.7	=	35.51	(81)

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com

Page 15 of 22

Northwest 0.9x	0.77	×	2.07	×	28.07	] × [	0.57	×	0.8	=	18.36	(81)
Northwest 0.9x	0.77	×	2.22	×	28.07	Ī×Ī	0.57	×	0.8	ī - Ē	19,69	(81)
Northwest 0.9x	0.77	×	1.82	] × [	28.07	Ī×Ī	0.63	× [	0.7	=	15.61	(81)
Northwest 0.9x	0.77	×	1.82	×	28.07	] × [	0.57	x	0.8	] = [	16.14	(81)
Northwest 0.9x	0.77	] * [	2.2	×	28.07	] × [	0.63	×	0.7	] = [	18.87	(81)
Northwest 0.9x	0.77	x	3.08	×	28.07	] × [	0.57	×	0.8	=	27.32	(81)
Northwest 0.9x	0.77	×	13.1	] × [	28.07	] × [	0.57	×	0.8	=	116.19	(81)
Northwest 0.9x	0.77	×	3.96	×	28.07	] × [	0.57	×	0.8	=	35.12	(81)
Northwest 0.9x	0.77	×	1.38	×	28.07	] × [	0.57	×	0.8	=	12.24	(81)
Northwest 0.9x	0.77	] × [	0.46	] × [	14.2	] × [	0.57	] × [	0.8	] = [	6.19	(81)
Northwest 0.9x	0.77	×	0.57	× [	14.2	] × [	0.57	×	0.8	] = [	5.11	(81)
Northwest 0.9x	0.77	×	6.67	] × [	14.2	] × [	0.57	× [	0.8	=	29.92	(81)
Northwest 0.9x	0.77	x	2.07	×	14.2	] × [	0.63	) × [	0.7	=	17.96	(81)
Northwest 0.9x	0.77	x	2.07	×	14.2	×	0.57	<b>×</b>	0.8	=	9.29	(81)
Northwest 0.9x	0.77	×	2.22	×	14.2	] × [	0.57	×	0.8	=	9.96	(81)
Northwest 0.9x	0.77	×	1.82	×	14.2	] × [	0.63	×	0.7	=	7.9	(81)
Northwest 0.9x	0.77	×	1.82	×	14.2	] × [	0.57	×	0.8	] = [	8.17	(81)
Northwest 0.9x	0.77	×	2.2	] × [	14.2	] × [	0.63	×	0.7	] = [	9.55	(81)
Northwest 0.9x	0.77	×	3.08	×	14.2	] × [	0.57	×	0.8	=	13.82	(81)
Northwest 0.9x	0.77	×	13.1	×	14.2	] × [	0.57	×	0.8	=	58.77	(81)
Northwest 0.9x	0.77	×	3.96	<b>×</b>	14.2	×	0.57	×	0.8	=	17,77	(81)
Northwest 0.9x	0.77	×	1.38	×	14.2	] × [	0.57	] × [	0.8	=	6.19	(81)
Northwest 0.9x	0.77	×	0.46	×	9.21	] × [	0.57	] × [	0.8	=	4.02	(81)
Northwest 0.9x	0.77	×	0.57	×	9.21	] × [	0.57	×	0.8	] = [	3.32	(81)
Northwest 0.9x	0.77	×	6.67	) × [	9.21	×	0.57	×	0.8	] = [	19.42	(81)
Northwest 0.9x	0.77	×	2.07	×	9.21	] × [	0.63	×	0.7	=	11.66	(81)
Northwest 0.9x	0.77	×	2.07	] × [	9.21	] × [	0.57	×	0.8	=	6.03	(81)
Northwest 0.9x	0.77	×	2.22	×	9.21	] × [	0.57	×	0.8	=	6.46	(81)
Northwest 0.9x	0.77	×	1.82	×	9.21	] × [	0.63	× [	0.7	] = [	5.13	(81)
Northwest 0.9x	0.77	×	1.82	×	9.21	× [	0.57	×	0.8	=	5.3	(81)
Northwest 0.9x	0.77	×	2.2	×	9.21	] × [	0.63	×	0.7	] = [	6.2	(81)
Northwest 0.9x	0.77	] × [	3.08	×	9.21	] × [	0.57	) × [	0.8	=	8.97	(81)
Northwest 0.9x	0.77	×	13.1	×	9.21	×	0.57	×	0.8	=	38.14	(81)
Northwest 0.9x	0.77	×	3.96	×	9.21	] × [	0.57	×	0.8	=	11.53	(81)
Northwest 0.9x	0,77	×	1.38	×	9.21	] × [	0.57	×	0.8	=	4.02	(81)
Rooflights 0.9x	1	×	4.47	) × [	26	× [	0.63	×	0.7	=	46.15	(82)
Rooflights 0.9x	1	×	2.04	×	26	] × [	0.63	×	0.7	=	21.08	(82)
Rooflights 0.9x	1	×	5.52	×	26	] × [	0.63	×	0.7	=	170.89	(82)
Rooflights 0.9x	1	×	9.27	×	26	×	0.63	×	0.7		95.7	(82)
Rooflights 0.9x	1	×	7.7	×	26	) × [	0.63	×	0.7	=	79.42	(82)
Rooflights 0.9x	1	×	4.47	×	54	×	0.63	×	0.7	=	95.85	(82)
						and the second second						

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com

Page 16 of 22

Rooflights 0.9x	1	x	2.04	×	54		0.63	×	0.7	=	43.79	(82)
Rooflights 0.9x	1	ī × Ē	5.52	Ī×Ī	54	ī × ī	0.63	ī × ī	0.7	ī - Ē	354.92	(82)
Rooflights 0.9x	1	×	9.27	<b>1</b> × [	54	ī × ī	0.63	×	0.7	] = [	198.76	(82)
Rooflights 0.9x	<u>ा</u>	×	7.7	×	54	] × [	0.63	×	0.7	=	164.95	(82)
Rooflights 0.9x	1	×	4.47	Ī×Ī	96	Ī×Ī	0.63	×	0.7	<b>1</b> - C	170.39	(82)
Rooflights 0.9x	1	×	2.04	×	96	] × [	0.63	×	0.7	=	77.84	(82)
Rooflights 0.9x	1	×	5.52	×	96	] × [	0.63	×	0.7	=	630.98	(82)
Rooflights 0.9x	1	×	9.27	×	96	] × [	0.63	×	0.7	] = [	353.35	(82)
Rooflights 0.9x	1	×	7.7	×	96	] × [	0.63	×	0.7	-	293.24	(82)
Rooflights 0.9x	1	×	4.47	×	150	] × [	0.63	×	0.7	-	266.24	(82)
Rooflights 0.9x	1	×	2.04	×	150	] × [	0.63	×	0.7		121.63	(82)
Rooflights 0.9x	1	×	5.52	×	150	] × [	0.63	×	0.7	-	985.9	(82)
Rooflights 0.9x	1	×	9.27	×	150	] × [	0.63	×	0.7	=	552.1	(82)
Rooflights 0.9x	1	×	7.7	×	150	] × [	0.63	×	0.7	] = [	458.18	(82)
Rooflights 0.9x	1	×	4.47	×	192	Ī×Ī	0.63	×	0.7	=	340.79	(82)
Rooflights 0.9x	1	×	2.04	×	192	] × [	0.63	×	0.7		155.69	(82)
Rooflights 0.9x	1	1 × [	5.52	Ī×Ī	192	ī×ī	0.63	i × i	0.7	-	1261.95	(82)
Rooflights 0.9x	1	×	9.27	×	192	] × [	0.63	×	0.7	=	706.69	(82)
Rooflights 0.9x	1	X	7.7	Ī×Ī	192	1 × [	0.63	ī × [	0.7	=	586.47	(82)
Rooflights 0.9x	1	×	4.47	<b>]</b> × [	200	Ī×Ī	0.63	] × [	0.7	] = [	354.99	(82)
Rooflights 0.9x	1	×	2.04	×	200	Ī×Ī	0,63	×	0.7	-	162.17	(82)
Rooflights 0.9x	1	x	5.52	×	200	] × [	0.63	×	0.7	=	1314.53	(82)
Rooflights 0.9x	1	×	9.27	×	200	] × [	0.63	×	0.7	=	736.14	(82)
Rooflights 0.9x	1	×	7.7	×	200	] × [	0.63	×	0.7	=	610.91	(82)
Rooflights 0.9x	1	×	4.47	<b>×</b>	189	] × [	0.63	×	0.7	=	335.46	(82)
Rooflights 0.9x	1	×	2,04	×	189	] × [	0.63	×	0.7	=	153.25	(82)
Rooflights 0.9x	1	×	5.52	×	189	] × [	0.63	x	0.7	=	1242.23	(82)
Rooflights 0.9x	1	×	9.27	×	189	] × [	0.63	×	0.7	-	695.65	(82)
Rooflights 0.9x	1	×	7.7	] × [	189	] × [	0.63	×	0.7		577.31	(82)
Rooflights 0.9x	1	×	4.47	×	157	] × [	0.63	×	0.7	=	278.67	(82)
Rooflights 0.9x	1	×	2.04	×	157	] × [	0.63	×	0.7		127.31	(82)
Rooflights 0.9x	1	×	5.52	] × [	157	] × [	0.63	×	0.7		1031.91	(82)
Rooflights 0.9x	1	×	9.27	×	157	] × [	0.63	×	0.7	=	577.87	(82)
Rooflights 0.9x	1	×	7.7	×	157	] × [	0.63	_ × [	0.7	=	479.56	(82)
Rooflights 0.9x	1	×	4.47	] × [	115	] × [	0.63	×	0.7	=	204.12	(82)
Rooflights 0.9x	1	्र	2.04	×	115	] × [	0.63	×	0.7	=	93.25	(82)
Rooflights 0.9x	1	×	5.52	×	115	×	0.63	×	0.7	] = [	755.86	(82)
Rooflights 0.9x	1	×	9.27	×	115	×	0.63	×	0.7	=	423.28	(82)
Rooflights 0.9x	1	×	7.7	×	115	×	0.63	x	0.7	=	351.27	(82)
Rooflights 0.9x	1	×	4.47	×	66	) × [	0.63	×	0.7	=	117.15	(82)
Rooflights 0.9x	1	×	2.04	×	66	] * [	0.63	×	0.7	=	53.52	(82)

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com

Page 17 of 22

Roofligh	nts 0.9x	1	×	5.	52	x	66	1×Г	0.63	×	0.7	=	433.8	(82)
Roofligh	hts 0.9x	1	×	9.3	27	×	66	i × 🗖	0.63	<b>1</b> × [	0.7	=	242.93	(82)
Rooflig	hts 0.9x	1	×	7	7	×	66	i . E	0.63	٦×٢	0.7	=	201.6	(82)
Roofligh	nts 0.9x	1	×	4.	47	×	33	i × 🗖	0.63	<b>1</b> × [	0.7	=	58.57	(82)
Roofligh	hts 0.9x	1	×	2.0	04	×	33	i × 🗖	0.63	<b>1</b> × [	0.7	=	26,76	(82)
Roofligh	hts 0.9x	1	×	5.	52	×	33	i × 🗖	0.63	Ξ×Γ	0.7	-	216.9	(82)
Roofligh	hts 0.9x	1	×	9.	27	x	33	i × 🗖	0.63	ī × ī	0,7	=	121.46	(82)
Rooflig	hts 0.9x	1	×	7	7	×	33	i × 🗖	0.63	<b>1</b> × [	0.7	=	100.8	(82)
Roofligh	hts 0.9x	1	×	4.	47	×	21	×	0.63	×	0.7	-	37.27	(82)
Roofligh	hts 0.9x	1	×	2.0	D4	×	21	I × [	0.63	×	0.7	=	17.03	(82)
Roofligh	hts 0.9x	1	×	5.	52	×	21	1 * 🗆	0.63		0.7	=	138.03	(82)
Roofligh	nts 0.9x	1	×	9.3	27	x	21	1 × 🗆	0.63	×	0.7	=	77.29	(82)
Roofligh	nts 0.9x	1	×	7	7	×	21	i × 🗖	0.63	ī×Γ	0.7	=	64.15	(82)
				-						_				
Solar g	ains in	watts, ca	alculated	for eac	h month			(83)m = 5	Sum(74)m	(82)m				
(83) <b>m</b> =	1819.11	3356.68	5219.66	7422.57	9116.52	9385.16	8910.42	7607,74	5982.83	3884.53	2227.29	1524.69		(83)
Total g	iains – i	nternal a	and sola	(84)m	= (73)m	+ (83)m	, watts	1852) 2017					7 8	
(84)m=	3830.15	5355.69	7140.02	9218.06	10777.34	10930.81	10392.61	9107.5	7557.94	5584.82	4066.72	3475.92		(84)
7. Me	an inter	nal temp	erature	(heating	season	ύ.								
Temp	erature	during h	neating p	eriods i	n the livi	ng area	from Ta	ble 9, Th	n1 (°C)			I	21	(85)
Utilisa	ation fac	tor for a	ains for	living an	ea, h1,m	(see Ta	able 9a)	ener der						- Contraction
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	ř.	
(86)m=	1	1	0.99	0.98	0.94	0.86	0.75	0.81	0.95	0.99	1	1		(86)
Mean	interna	Itemner	ature in	living ar	ea T1 /f	ollow ste	ans 3 to	7 in Tabl	e 9c)				÷	
(87)m=	18.82	19	19.32	19.8	20.24	20.62	20.78	20.74	20.42	19.85	19.28	18.84		(87)
Toma	a veture	duning b	anting p	orlada li	a reat of	abuse II in a	from T.	able 0.7	100					
(88 mm	10.00	during r	10 11	10.17	10.18	19 74	19.74	10 25	19.21	10.18	10.15	10.13	f.	(88)
(oo)m-	10,00	10.1	19.11	15.17	10.10	10.24	10.24	10.20	10.21	15.10	10.10	15.15	ł.	(20)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (s	ee Table	e 9a)					6	
(89)m=	1	1	0.99	0.97	0.9	0.75	0.53	0.62	0.9	0.99	1	3		(69)
Mean	interna	I temper	ature in	the rest	of dwell	ing T2 (f	follow st	eps 3 to	7 in Tab	le 9c)			c.	
(90)m=	16.28	16.55	17.03	17.76	18.39	18.91	19.07	19.05	18.67	17.84	17	16.34		(90)
										fLA = Livir	ng area + (-	4) =	0.03	(91)
Mean	interna	l temper	ature (fo	or the wh	nole dwe	lling) = 1	LA × T1	+ (1 – fl	LA) × T2					
(92)m=	16.37	16.63	17.1	17.83	18.45	18.96	19.12	19.11	18.72	17.9	17.07	16.42	Ĵ.	(92)
Apply	adjustr	nent to t	he mear	interna	l temper	ature fro	om Table	e 4e, wh	ere appr	opriate	· · · ·		5	
(93)m=	16.37	16.63	17.1	17.83	18.45	18.96	19.12	19.11	18.72	17.9	17.07	16.42		(93)
8. Sp	ace hea	ting req	uirement										2	
Set T	i to the	mean int	ernal ter	nperatu	re obtair	ned at st	ep 11 of	Table 9	b, so tha	at Ti,m=(	76)m an	d re-calc	ulate	
the ut	lisation	factor fe	or gains	using Ta	able 9a		1				1.000		Ê.	
10233	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	0.00	0.00	0.72	0.50		0.07	0.00			ē.	(04)
(94)m=		0.99	0.98	0.96	88.0	0.73	0.52	0.6	0.87	0.98	1	1		(34)
Usefu	ans,	nmGm	, W = (9	4)m x (8	4)m	7097.05	5357.00	Learne and	eren o	E 400.07	1054 77	9474 07	é.	(05)
(80 m=	3822.85	5327.92	7035.09	8810.84	9498.28	/837.05	5357.88	0404.92	0092.3	5469.37	4051.77	34/1.2/		(90)

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com

Page 18 of 22

Month	ly avera	age exte	ernal tem	perature	from T	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	oss rate	for me	an interr	al temp	erature,	Lm , W	=[(39)m	x [(93)m	- (96)m	1				
(97)m=	30820.64	29727.08	26669.26	21588.43	16190.22	10041.38	5806.47	6178.62	10814.06	17514.96	5 24309.79	30255.35		(97)
Space	heatin	g requir	ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(97	)m – (95	5)m]x (4	11)m			
=m(89)	20086.35	16396.24	14607.82	9199.86	4978.8	0	0	0	0	8961.91	14585.78	19927.36		
								Tota	l per year	(kWh/yea	ir) = Sum(9	8)	108744.13	(98)
Space	heatin	a reauir	ement in	kWh/m <sup>3</sup>	/vear							ř	101.59	(99)
		1100000	Waterstein	12										
Oc. op		oning rei	Juirentei	11. A	Cos To									
Calcu	lated to	Ech	July and	August.	See 1a	ble 10b	hat	Aug	Con	Oat	Nov	Dee		
Heatl	Jan Jan	reu Im (ca	Interview	ueing 2	5°C inte	rnal tem	Dersture	and ext	arnal ter	neratu	re from T	able 10)		
(100)m=	ossiale			using 2	0	21628.3	17026 53	17338 46	o	nperatu				(100)
Litilies	tion fac	tor for l	one hm	v	U	21020.0	11020.00	11 300.40			v	, v		(100)
(101)m-	aoniac			0	0	0.51	0.60	0.62	0	0	0			(101)
11000	l laca h	ml m ()	Vetto) =	(100)m	(101)	0.51	0.58	0.55	0		0	U		(101)
Useru	noss, n		vatts) -	(100)m 3		11086 13	10004 24	0167.76	0		1 0			(102)
Calma	(and an		laudated	farant		11080.13	10094.24	Table	10)		U			(ior)
Gains	(solar g	jains ca	Culated	for appli	cable w	later re	41407 72		10)	0				(103)
Change	U Constitution			v mouth	whole	11887.80	11407.72	8804.5		04	021m (	1001-1-1	(11)	(100)
set (1)	04)m to	zero if	(104)m <	3 × (98	)m	uwening,	continu	ous ( KV	(n) = 0.0	24 X [[1	03)m - (	102/11 ] X	(41)m	
(104)m=	0	0	0	0	0	656.53	977.23	0	0	0	0	0		
hiometts J	6 (1997) 6 (1997)	2	2 1020		1.12		1.50.000		Tota	= Sum	(104)	=	1633.76	(104)
Cooled fraction $f C = cooled area + (4) =$									4) =	0.65	(105)			
Intermi	ttency fa	actor (T	able 10b	)								Ļ	2.0010041	_
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		
	12 		·	•	011 	•		<u>а</u> .	Tota	l = Sum	(104)	=	0	(106)
Space	cooling	require	ment for	month =	(104)m	× (105)	× (106)	m			3 34			-
(107)m=	0	0	0	0	0	107.34	159.77	0	0	0	0	0		
					47.	~ ~ ~		Sec.	Tota	I = Sum	(107)	=	267.1	(107)
Space	cooling	require	ment in I	(Wh/m²/	vear				(107	) + (4) =	1	Ē	0.25	(108)
Qa Eni	BERLY FRE	ireme	nts – Ind	widual h	eating s	vetems	including	micro-C	HP			-		-
Cnace	a beatir	un enne	110 110	Print G BI TI	canny s	gacansi	incratainig	i milero i e	nana)					
Fractio	on of sp	ace he:	at from s	econdar	v/supple	ementary	/ system					Г	0	(201)
Exaction of energy hast from main sustam/s) $(200) = 1 - (201) =$											(202)			
- interest	on or sp	acene	at nom n	iani syst	em(s)			(2004) - (7	12017			Ļ	<u>.</u>	(202)
Fraction	on of to	tal heat	ng from	main sy	stem 1			(204) = (2	02) × [1 -	(203)]=		Ļ	1	(204)
Efficie	ency of r	nain sp	ace heat	ing syste	em 1							L	319.7	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heatin	g systen	n, %						0	(208)
Coolin	ng Syste	m Ener	gy Effici	ency Ra	tio							Ĩ	8.1	(209)
	Jan	Feb	Mar	Anr	May	Jun	, hul	Aug	Sen	Oct	Nov	Dec	Mahar	ar
Space	heatin	a requir	ement (	alculate	d above	J		Aug	Och	001	1404	Dec	Reverye	
opace	20086 35	16396 24	14607 82	9199.86	4978.8	0	0	0	0	8961 91	14585 78	19927 38		
			1.1.0.01.1.00		101010					0000000	1.1000.10			

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com

Page 19 of 22

(211)m = {[(98)m x (20	14)] } x 1	00 + (20	06)			201					<u>_</u> n	(211)
6282.88 5128.63	4569.23	2877.66	1557.34	0	0	0	0	2803.23	4562.33	6233.14	[	19
						Tota	al (kWh/ye	ar) =Sum()	211),	7	34014.43	(211)
Space heating fuel (s	econdar	y), kWh/	/month									
$= \{[(98)m \times (201)]\} \times 1$	00 + (20	8)	0	0	0	0	0	0	0	0	1	
(Liohu)			, e	<del></del> .		Tota	al (kWh/ye	ar) =Sum()	215)	=	0	(215)
Water heating												
Output from water hea	ter (calc	ulated a	bove)								<u>.</u>	
339.63 300.59	318.58	289.61	286.73	260.39	254.06	273.29	271.09	300.12	312.28	332.82		-
Efficiency of water hea	iter									0.000000	224.4	(216)
(217)m= 224.4 224.4	224.4	224.4	224.4	224.4	224.4	224.4	224.4	224.4	224.4	224.4	1	(217)
Fuel for water heating, (219)m = (64)m x 100	kWh/mo + (217)	m										
(219)m= 151.35 133.95	141.97	129.06	127.77	116.04	113.22	121.79	120.81	133.74	139.16	148.32	1	
						Tota	al = Sum(2	19a) <sub>1.0</sub> =			1577.18	(219)
Space cooling fuel, k	Wh/mor	nth.										
(221)m = (107)m + (209)	9)	0	0	12.25	10.72	0	0	0	0	0	1	
(22 ()))- 0 0	U			10.20	10.72	Tota	al = Sum(2	21), =	v	v	32.98	(221)
Annual totale								F	Whivea		kWb/year	
Space heating fuel use	ed, main	system	1					n	viryea		34014.43	1
Water heating fuel use	d										1577.18	Ħ
Space cooling fuel use	d										32.98	4
Electricity for summer f	anc and	oloctric	keen he									
cleancy or pumps, a	ans anu	electric	keep-no				20				1	1000
mechanical ventilation	n - balan	icea, exi	tract or p	ositive i	nput from	n outsia	e			6787.31	ļ	(230a)
central heating pump										30		(230c)
Total electricity for the	above, k	(Wh/yea	ar -			sum	of (230a)	(230g) =			6817.31	(231)
Electricity for lighting											1497.73	(232)
Electricity generated b	y PVs										-4819.18	(233)
10a. Fuel costs - indiv	viduai he	ating sy	stems:									
				E	al			Eucl P	rice		Fuel Cost	
				kV	Vh/year			(Table	12)		£/year	
Space heating - main s	system 1	ł		(21	1) x			13.	19	x 0.01 =	4486.5	(240)
Space heating - main s	system 2	2		(21	3) x					x 0.01 =	0	(241)
Space heating - secon	darv			(21	5) x			43	10	x 0.01 =	0	(242)
Water heating cost (of	her fuel			(21	9)			13.		x 0.01 =	000.00	
Chase applies	na nuel)			(22	1)			13.	19	x 0.01 =	208.03	
Space cooling		576		122				13.	19		4.35	(248)
Pumps, fans and elect	ric keep-	not		(23	ŋ			13.	19	x 0.01 =	899.2	(249)
(if off-peak tariff, list ea	ch of (2	30a) to (	(230g) se	eparatel	y as app	licable a	ind apply	y fuel pri	ce acco	rding to	Table 12a	-
chargy for lighting				100	-/			13.	19		197.55	(200)

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com

Page 20 of 22

Additional standing charges (Table 12)			Ű	(251)
	one of (233) to (235) x)	13.19 × 0.0	01 = -635.65	(252)
Appendix Q items: repeat lines (253) and (254) as	s needed			
Total energy cost (245)(24	7) * (250)(254) =		5159.99	(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] =		1.94	(257)
SAP rating (Section 12)			72.9	(258)
12a. CO2 emissions – Individual heating system	s including micro-CHF			
	Energy kWh/year	Emission factor kg CO2/kWh	Emission kg CO2/ye	s ar
Space heating (main system 1)	(211) x	0.519 =	17653.49	(261)
Space heating (secondary)	(215) x	0.519 =	0	(263)
Water heating	(219) x	0.519 =	818.55	(264)
Space and water heating	(261) + (262) + (263) + (	(264) =	18472.04	(265)
Space cooling	(221) x	0.519 =	17,11	(266)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	3538.18	(267)
Electricity for lighting	(232) x	0.519 =	777.32	(268)
Energy saving/generation technologies Item 1		0.519 =	-2501.16	(269)
Total CO2, kg/year		sum of (265)(271) =	20303.51	(272)
CO2 emissions per m <sup>2</sup>		(272) + (4) =	18.97	(273)
El rating (section 14)			76	(274)
13a. Primary Energy				
	Energy kWh/year	Primary factor	P. Energy kWh/year	
Space heating (main system 1)	(211) ×	3.07 =	104424.3	(261)
Space heating (secondary)	(215) x	3.07 =	0	(263)
Energy for water heating	(219) x	3.07 =	4841.93	(264)
Space and water heating	(261) + (262) + (263) + (	(264) =	109266.23	(265)
Space cooling	(221) x	3.07	101.24	(266)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07 =	20929.13	(267)
Electricity for lighting	(232) x	0 =	4598.03	(268)
Energy saving/generation technologies Item 1		3.07 =	-14794.89	(269)
'Total Primary Energy		sum of (265)(271) =	120099.74	(272)

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com

Page 21 of 22

Primary energy kWh/m²/year

(272) + (4) =

112.2 (273)

I

Stroma FSAP 2012 Version: 1.0.5.12 (SAP 9.92) - http://www.stroma.com

APPENDIX (iii)

PEA – PREDICTED ENERGY ASSESSMENT (PRE-EPC)

#### Predicted Energy Assessment



7 Greenaway Gardens LONDON NW3 7DJ Dwelling type: Date of assessment: Produced by: Total floor area: Detached House 16 December 2020 Ondrej Gajdos 1070.4 m<sup>2</sup>

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

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO2) emissions.



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

APPENDIX (iv)

ENERGY RSU -



**RENEWABLES & SUSTAINABILITY UNIT** 

#### ENERGY RSU is an integrated energy sustainability unit able to provide the following:

- SAP Calculations & Certificates L1A&B New/Existing Buildings (NHER certified)
- SBEM Calculations & Certificates L2A&B New/Existing Buildings (BRE certified)
- EPC & DEC Certificates New Build (CIBSE certified)
- Rd SAP Survey EPC Certificates Existing Buildings (NHER certified)
- Commercial EPC Survey certificates Existing Buildings (BRE certified) Level 3, 4 & 5
- Energy Statements & Renewable Reports for Planning
- LEED/ BREEAM assessments (USGBC/BRE certified)
- Low/Zero Carbon (LZC) and Sustainability Appraisals/designs (CIBSE Low Carbon Consultant)
- Renewable Energy Appraisals and Designs
- Carbon Rating assessments
- 2D/3D CFD and Dynamic Thermal Simulations
- EPBD Air Conditioning Inspections (Article 20) and EPBD Asset Ratings & Certificates
- Energy Usage (Running Costs)
- Utility/ Bill Analysis and Recommendations
- Advice on Green and Environmental Issues Relating to M&E Building Services
- Code for Sustainable Homes New Build and Domestic Refurbishment (BRE certified)
- Solar Shading/Sun Studies



 ME7 Ltd, Jorand House, Bebington Close, Billericay, Essex, CM12 0DT

 Tel: +44(0)1277 353225
 MB: +44(0)7412 601472

 Web: www.me7.ltd
 Email: jb@me7.ltd

M&E Consultants

Energy Consultants