

BRUKL Output Document



Compliance with England Building Regulations Part L 2013

Project name

UoC Tech Park - Student Resi - SWH As designed

Date: Fri Nov 02 10:43:45 2018

Administrative information

Building Details

Address: Address 1, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.10

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.10

BRUKL compliance check version: v5.4.b.0

Owner Details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

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

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	39.6
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	39.6
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	35.7
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

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

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

Building fabric

Element	U _a -Limit	U _a -Calc	U _i -Calc	Surface where the maximum value occurs*
Wall**	0.35	0.15	0.15	SH000052:Surf[4]
Floor	0.25	0.15	0.15	SH000052:Surf[5]
Roof	0.25	0.15	0.15	00000061:Surf[9]
Windows***, roof windows, and rooflights	2.2	1.6	1.6	SH000052:Surf[2]
Personnel doors	2.2	1.6	1.6	SH00003D:Surf[1]
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

U_a-Limit = Limiting area-weighted average U-values [W/(m²K)]

U_a-Calc = Calculated area-weighted average U-values [W/(m²K)]

U_i-Calc = Calculated maximum individual element U-values [W/(m²K)]

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

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

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

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

Air Permeability	Worst acceptable standard	This building
m ³ /(h.m ²) at 50 Pa	10	3

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	0.9 to 0.95

1- System 1: Radiators

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.96	-	0.2	0	-
Standard value	0.91*	N/A	N/A	N/A	N/A

Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system

YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

"No HWS in project, or hot water is provided by HVAC system"

Local mechanical ventilation, exhaust, and terminal units

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

Zone name	SFP [W/(l/s)]										HR efficiency	
	ID of system type	A	B	C	D	E	F	G	H	I	Zone	Standard
Standard value		0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1		
00 - Accessible En suite		-	-	0.3	-	-	-	-	-	-	-	N/A
00 - Kitchen		-	-	0.6	-	-	-	-	-	0.6	-	N/A
00 - Kitchen		-	-	0.6	-	-	-	-	-	0.6	-	N/A
00 - Kitchen		-	-	0.6	-	-	-	-	-	0.6	-	N/A
00 - Kitchen		-	-	0.6	-	-	-	-	-	0.6	-	N/A
01 - Accessible En Suite		-	-	0.3	-	-	-	-	-	-	-	N/A
01 - Accessible En suite		-	-	0.3	-	-	-	-	-	-	-	N/A
01 - Kitchen		-	-	0.6	-	-	-	-	-	0.6	-	N/A
01 - Kitchen		-	-	0.6	-	-	-	-	-	0.6	-	N/A
01 - Kitchen		-	-	0.6	-	-	-	-	-	0.6	-	N/A
01 - Kitchen		-	-	0.6	-	-	-	-	-	0.6	-	N/A
02 - Accessible En Suite		-	-	0.3	-	-	-	-	-	-	-	N/A
02 - Accessible En suite		-	-	0.3	-	-	-	-	-	-	-	N/A
02 - Kitchen		-	-	0.6	-	-	-	-	-	0.6	-	N/A
02 - Kitchen		-	-	0.6	-	-	-	-	-	0.6	-	N/A
02 - Kitchen		-	-	0.6	-	-	-	-	-	0.6	-	N/A
02 - Kitchen		-	-	0.6	-	-	-	-	-	0.6	-	N/A
03 - Accessible En Suite		-	-	0.3	-	-	-	-	-	-	-	N/A

General lighting and display lighting		Luminous efficacy [lm/W]			
Zone name		Luminaire	Lamp	Display lamp	General lighting [W]
	Standard value	60	60	22	
00 - En Suite		-	84	-	22
00 - Kitchen		-	82	-	433
00 - Kitchen		-	82	-	391
00 - Kitchen		-	82	-	458
00 - Kitchen		-	79	-	301
00 - M&E Plant Room		138	-	-	197
00 - Stairs		-	100	-	75
00 - Stairs		-	100	-	75
00 - WC		-	104	-	27
00 - WC		-	104	-	31
01 - Accessible Bedroom		-	108	-	33
01 - Accessible Bedroom		-	108	-	34
01 - Accessible En Suite		-	84	-	33
01 - Accessible En suite		-	84	-	32
01 - Bedroom		-	108	-	21
01 - Bedroom		-	108	-	21
01 - Bedroom		-	108	-	21
01 - Bedroom		-	108	-	21
01 - Bedroom		-	108	-	21
01 - Bedroom		-	108	-	21
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01 - Bedroom		-	108	-	21
01 - Bedroom		-	108	-	21
01 - Bedroom		-	108	-</	

General lighting and display lighting		Luminous efficacy [lm/W]			
Zone name		Luminaire	Lamp	Display lamp	General lighting [W]
	Standard value	60	60	22	
01 - Circulation		-	104	-	47
01 - Circulation		-	104	-	30
01 - Cleaners Cupboard		-	104	-	26
01 - Cleaners Cupboard		-	104	-	25
01 - Comms		127	-	-	20
01 - Comms		127	-	-	20
01 - En suite		-	84	-	22
01 - En suite		-	84	-	23
01 - En suite		-	84	-	22
01 - En suite		-	84	-	22
01 - En suite		-	84	-	22
01 - En suite		-	84	-	22
01 - En suite		-	84	-	22
01 - En suite		-	84	-	22
01 - En suite		-	84	-	22
01 - En suite		-	84	-	22
01 - En Suite		-	84	-	22
01 - En suite		-	84	-	22
01 - En suite		-	84	-	22
01 - En Suite		-	84	-	23
01 - En Suite		-	84	-	22
01 - En suite		-	84	-	22
01 - En suite		-	84	-	22
01 - En Suite		-	84	-	22
01 - En suite		-	84	-	22
01 - En Suite		-	84	-	23
01 - En suite		-	84	-	23
01 - En suite		-	84	-	23
01 - En suite		-	84	-	22
01 - En Suite		-	84	-	22
01 - En Suite		-	84	-	22
01 - En suite		-	84	-	22
01 - En Suite		-	84	-	23
01 - Kitchen		-	82	-	433
01 - Kitchen		-	82	-	433
01 - Stairs		-	103	-	36
01 - Stairs		-	103	-	36
01 - Kitchen		-	82	-	468
01 - Kitchen		-	82	-	405
01 - Circulation		-	104	-	50
01 - Circulation		-	104	-	32

[illegible]

General lighting and display lighting		Luminous efficacy [lm/W]			
Zone name		Luminaire	Lamp	Display lamp	General lighting [W]
	Standard value	60	60	22	
02 - Comms		127	-	-	20
02 - Comms		127	-	-	20
02 - En suite		-	84	-	22
02 - En suite		-	84	-	23
02 - En suite		-	84	-	22
02 - En suite		-	84	-	22
02 - En suite		-	84	-	22
02 - En suite		-	84	-	22
02 - En suite		-	84	-	22
02 - En suite		-	84	-	22
02 - En suite		-	84	-	22
02 - En suite		-	84	-	22
02 - En suite		-	84	-	22
02 - En Suite		-	84	-	22
02 - En suite		-	84	-	22
02 - En suite		-	84	-	22
02 - En suite		-	84	-	22
02 - En Suite		-	84	-	23
02 - En Suite		-	84	-	22
02 - En suite		-	84	-	22
02 - En suite		-	84	-	22
02 - En Suite		-	84	-	22
02 - En suite		-	84	-	22
02 - En Suite		-	84	-	23
02 - En suite		-	84	-	23
02 - En suite		-	84	-	23
02 - En suite		-	84	-	22
02 - En Suite		-	84	-	22
02 - En Suite		-	84	-	22
02 - En suite		-	84	-	22
02 - En Suite		-	84	-	23
02 - Kitchen		-	82	-	433
02 - Kitchen		-	82	-	433
02 - Stairs		-	103	-	36
02 - Stairs		-	103	-	36
02 - Kitchen		-	82	-	468
02 - Kitchen		-	82	-	405
02 - Circulation		-	104	-	50
02 - Circulation		-	104	-	32
02 - Circulation		-	104	-	47
02 - En-suite		-	104	-	12
02 - Bedroom		-	108	-	21
02 - En Suite		-	84	-	22

[illegible]

General lighting and display lighting		Luminous efficacy [lm/W]			
Zone name		Luminaire	Lamp	Display lamp	General lighting [W]
	Standard value	60	60	22	
03 - En suite		-	84	-	22
03 - En suite		-	84	-	22
03 - En suite		-	84	-	22
03 - En suite		-	84	-	22
03 - En suite		-	84	-	22
03 - En suite		-	84	-	22
03 - En suite		-	84	-	22
03 - En suite		-	84	-	22
03 - En Suite		-	84	-	22
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03 - En suite		-	84	-	22
03 - En suite		-	84	-	22
03 - En Suite		-	84	-	23
03 - En Suite		-	84	-	22
03 - En suite		-	84	-	22
03 - En suite		-	84	-	22
03 - En Suite		-	84	-	22
03 - En suite		-	84	-	22
03 - En suite		-	84	-	23
03 - En suite		-	84	-	23
03 - En suite		-	84	-	23
03 - En suite		-	84	-	22
03 - En Suite		-	84	-	22
03 - En Suite		-	84	-	22
03 - En suite		-	84	-	22
03 - En Suite		-	84	-	23
03 - Kitchen		-	82	-	433
03 - Kitchen		-	82	-	433
03 - Stairs		-	103	-	36
03 - Stairs		-	103	-	36
03 - Kitchen		-	82	-	468
03 - Kitchen		-	82	-	405
03 - Circulation		-	104	-	50
03 - Circulation		-	104	-	32
03 - Circulation		-	104	-	47
03 - En-suite		-	104	-	12
03 - Bedroom		-	108	-	21
03 - En Suite		-	84	-	22
03 - Bedroom		-	108	-	21
03 - Bedroom		-	104	-	27
04 - Accessible Bedroom		-	108	-	33
04 - Accessible Bedroom		-	108	-	34

[illegible]

General lighting and display lighting		Luminous efficacy [lm/W]			
Zone name		Luminaire	Lamp	Display lamp	General lighting [W]
	Standard value	60	60	22	
04 - En suite		-	84	-	22
04 - En suite		-	84	-	22
04 - En suite		-	84	-	22
04 - En suite		-	84	-	22
04 - En suite		-	84	-	22
04 - En suite		-	84	-	22
04 - En Suite		-	84	-	22
04 - En suite		-	84	-	22
04 - En suite		-	84	-	22
04 - En Suite		-	84	-	23
04 - En Suite		-	84	-	22
04 - En suite		-	84	-	22
04 - En suite		-	84	-	22
04 - En suite		-	84	-	22
04 - En Suite		-	84	-	22
04 - En suite		-	84	-	22
04 - En Suite		-	84	-	23
04 - En suite		-	84	-	23
04 - En suite		-	84	-	23
04 - En suite		-	84	-	22
04 - En Suite		-	84	-	22
04 - En Suite		-	84	-	22
04 - En suite		-	84	-	22
04 - En Suite		-	84	-	23
04 - Kitchen		-	82	-	433
04 - Kitchen		-	82	-	433
04 - Stairs		-	103	-	36
04 - Stairs		-	103	-	36
04 - Kitchen		-	82	-	468
04 - Kitchen		-	82	-	405
04 - Circulation		-	104	-	50
04 - Circulation		-	104	-	32
04 - Circulation		-	104	-	47
04 - En-suite		-	104	-	12
04 - Bedroom		-	108	-	21
04 - En Suite		-	84	-	22
04 - Bedroom		-	108	-	21
04 - Bedroom		-	104	-	27
05 - Cleaners Cupboard		-	104	-	26
05 - Comms		127	-	-	20
05 - Circulation		-	104	-	25
05 - Stairs		-	103	-	30
05 - Circulation		-	104	-	31
05 - Accessible Bedroom		-	108	-	33

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
01 - Bedroom	NO (-82.9%)	NO
01 - Bedroom	NO (-79.3%)	NO
01 - Bedroom	NO (-83.2%)	NO
01 - Bedroom	NO (-82.4%)	NO
01 - Bedroom	NO (-82.2%)	NO
01 - Bedroom	NO (-84.1%)	NO
01 - Bedroom	NO (-75.4%)	NO
01 - Bedroom	NO (-76.2%)	NO
01 - Bedroom	NO (-75.9%)	NO
01 - Bedroom	NO (-82.7%)	NO
01 - Bedroom	NO (-75.5%)	NO
01 - Bedroom	NO (-82.2%)	NO
01 - Bedroom	NO (-87.8%)	NO
01 - Bedroom	NO (-77.9%)	NO
01 - Bedroom	NO (-84.4%)	NO
01 - Bedroom	NO (-83.1%)	NO
02 - Accessible Bedroom	NO (-80.8%)	NO
02 - Accessible Bedroom	NO (-81.7%)	NO
02 - Bedroom	NO (-77.3%)	NO
02 - Bedroom	NO (-78.4%)	NO
02 - Bedroom	NO (-78.6%)	NO
02 - Bedroom	NO (-82.4%)	NO
02 - Bedroom	NO (-81.6%)	NO
02 - Bedroom	NO (-75.7%)	NO
02 - Bedroom	NO (-76.1%)	NO
02 - Bedroom	NO (-86.4%)	NO
02 - Bedroom	NO (-74.9%)	NO
02 - Bedroom	NO (-80.6%)	NO
02 - Bedroom	NO (-78.4%)	NO
02 - Bedroom	NO (-75.9%)	NO
02 - Bedroom	NO (-75.9%)	NO
02 - Bedroom	NO (-84.8%)	NO
02 - Bedroom	NO (-82.8%)	NO
02 - Bedroom	NO (-78.8%)	NO
02 - Bedroom	NO (-82.9%)	NO
02 - Bedroom	NO (-82.4%)	NO
02 - Bedroom	NO (-82.2%)	NO
02 - Bedroom	NO (-84.1%)	NO
02 - Bedroom	NO (-75.4%)	NO
02 - Bedroom	NO (-76.2%)	NO
02 - Bedroom	NO (-75.9%)	NO
02 - Bedroom	NO (-82.7%)	NO
02 - Bedroom	NO (-75.5%)	NO
02 - Bedroom	NO (-82.2%)	NO
02 - Bedroom	NO (-87.8%)	NO
02 - Bedroom	NO (-77.9%)	NO
02 - Bedroom	NO (-84.4%)	NO
02 - Bedroom	NO (-83.1%)	NO
03 - Accessible Bedroom	NO (-80.8%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
03 - Accessible Bedroom	NO (-81.2%)	NO
03 - Bedroom	NO (-77.1%)	NO
03 - Bedroom	NO (-78.4%)	NO
03 - Bedroom	NO (-78.5%)	NO
03 - Bedroom	NO (-82.4%)	NO
03 - Bedroom	NO (-81.6%)	NO
03 - Bedroom	NO (-75.7%)	NO
03 - Bedroom	NO (-75.9%)	NO
03 - Bedroom	NO (-86.4%)	NO
03 - Bedroom	NO (-74.7%)	NO
03 - Bedroom	NO (-80.1%)	NO
03 - Bedroom	NO (-77.9%)	NO
03 - Bedroom	NO (-75.9%)	NO
03 - Bedroom	NO (-75.9%)	NO
03 - Bedroom	NO (-84.4%)	NO
03 - Bedroom	NO (-82.7%)	NO
03 - Bedroom	NO (-78.3%)	NO
03 - Bedroom	NO (-82.5%)	NO
03 - Bedroom	NO (-82.4%)	NO
03 - Bedroom	NO (-82.2%)	NO
03 - Bedroom	NO (-84.1%)	NO
03 - Bedroom	NO (-75.4%)	NO
03 - Bedroom	NO (-76.2%)	NO
03 - Bedroom	NO (-75.9%)	NO
03 - Bedroom	NO (-82.7%)	NO
03 - Bedroom	NO (-75.5%)	NO
03 - Bedroom	NO (-82.2%)	NO
03 - Bedroom	NO (-87.8%)	NO
03 - Bedroom	NO (-77.9%)	NO
03 - Bedroom	NO (-84.4%)	NO
03 - Bedroom	NO (-83.1%)	NO
04 - Accessible Bedroom	NO (-80.7%)	NO
04 - Accessible Bedroom	NO (-80.7%)	NO
04 - Bedroom	NO (-77%)	NO
04 - Bedroom	NO (-78.3%)	NO
04 - Bedroom	NO (-77.8%)	NO
04 - Bedroom	NO (-82.4%)	NO
04 - Bedroom	NO (-81.6%)	NO
04 - Bedroom	NO (-75.7%)	NO
04 - Bedroom	NO (-75.3%)	NO
04 - Bedroom	NO (-86.4%)	NO
04 - Bedroom	NO (-74.6%)	NO
04 - Bedroom	NO (-79%)	NO
04 - Bedroom	NO (-77.3%)	NO
04 - Bedroom	NO (-75.9%)	NO
04 - Bedroom	NO (-75.9%)	NO
04 - Bedroom	NO (-84%)	NO
04 - Bedroom	NO (-82.7%)	NO
04 - Bedroom	NO (-77.6%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
04 - Bedroom	NO (-81.6%)	NO
04 - Bedroom	NO (-82.4%)	NO
04 - Bedroom	NO (-82.2%)	NO
04 - Bedroom	NO (-84.1%)	NO
04 - Bedroom	NO (-75.4%)	NO
04 - Bedroom	NO (-76.2%)	NO
04 - Bedroom	NO (-75.9%)	NO
04 - Bedroom	NO (-82.7%)	NO
04 - Bedroom	NO (-75.5%)	NO
04 - Bedroom	NO (-82.2%)	NO
04 - Bedroom	NO (-87.8%)	NO
04 - Bedroom	NO (-77.9%)	NO
04 - Bedroom	NO (-84.4%)	NO
04 - Bedroom	NO (-83.1%)	NO
05 - Accessible Bedroom	NO (-80.6%)	NO
05 - Accessible Bedroom	NO (-77.7%)	NO
05 - Bedroom	NO (-76.7%)	NO
05 - Bedroom	NO (-77.2%)	NO
05 - Bedroom	NO (-75.7%)	NO
05 - Bedroom	NO (-86.4%)	NO
05 - Bedroom	NO (-77.6%)	NO
05 - Bedroom	NO (-76.4%)	NO
05 - Bedroom	NO (-75.9%)	NO
05 - Bedroom	NO (-75.9%)	NO
05 - Bedroom	NO (-75.4%)	NO
05 - Bedroom	NO (-76.2%)	NO
05 - Bedroom	NO (-75.9%)	NO
05 - Bedroom	NO (-82.7%)	NO
05 - Bedroom	NO (-75.5%)	NO
05 - Bedroom	NO (-77.9%)	NO

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

Separate submission

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

Separate submission

EPBD (Recast): Consideration of alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	5189.5	5189.5
External area [m²]	5091.7	5091.7
Weather	SOU	SOU
Infiltration [m³/hm²@ 50Pa]	3	3
Average conductance [W/K]	1704.11	2883.05
Average U-value [W/m²K]	0.33	0.57
Alpha value* [%]	10.14	10

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

Building Use

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

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	34.26	44.59
Cooling	0	0
Auxiliary	2.74	2.45
Lighting	9.5	12.39
Hot water	102.08	103.96
Equipment*	37.55	37.55
TOTAL **	148.57	163.39

* Energy used by equipment does not count towards the total for consumption or calculating emissions.

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

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	8.73	0

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	111.14	138.38
Primary energy* [kWh/m²]	203.53	225.65
Total emissions [kg/m²]	35.7	39.6

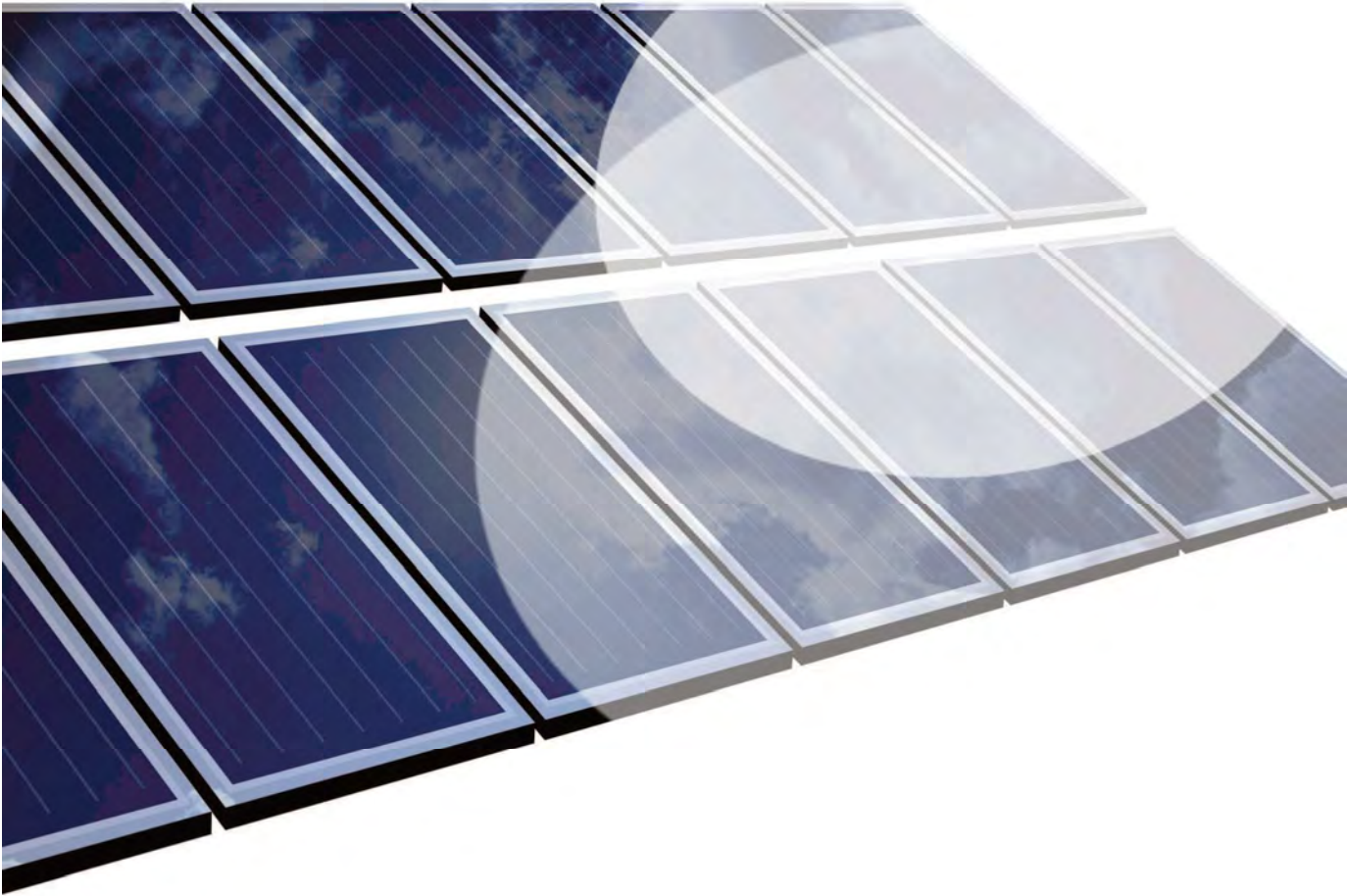
* Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

HVAC Systems Performance										
System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER	
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	148	0	45.6	0	2.1	0.9	0	0.96	0
	Notional	0	0	0	0	0	0	0	---	---
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	184.3	0	59.4	0	2.1	0.86	0	---	---

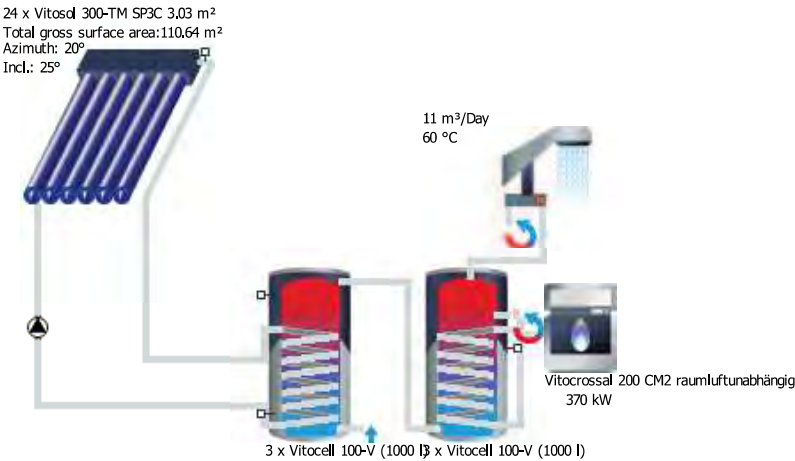
Key to terms	
Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building,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

Key Features		
The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.		
Building fabric		
Element	U _{i-Typ}	U _{i-Min} Surface where the minimum value occurs*
Wall	0.23	0.15 SH000052:Surf[4]
Floor	0.2	0.15 SH000052:Surf[5]
Roof	0.15	0.15 00000061:Surf[9]
Windows, roof windows, and rooflights	1.5	1.6 SH000052:Surf[0]
Personnel doors	1.5	1.6 SH00003D:Surf[1]
Vehicle access & similar large doors	1.5	- No Vehicle access doors in building
High usage entrance doors	1.5	- No High usage entrance doors in building
U _{i-Typ} = Typical individual element U-values [W/(m²K)]		U _{i-Min} = Minimum individual element U-values [W/(m²K)]
* There might be more than one surface where the minimum U-value occurs.		
Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3

Appendix C – Results of Solar Calculation.



Variant 1



Results of annual simulation

Installed collector power:		77.45 kW
Installed solar surface area (gross):		110.64 m²
Irradiation on collector surface (active):	136,203.87 kWh	1,231.05 kWh/m²
Energy delivered by collectors:	57,280.42 kWh	517.72 kWh/m²
Energy delivered by collector loop:	56,510.61 kWh	510.76 kWh/m²
DHW heating energy supply:		224,109.04 kWh
Solar energy contribution to DHW:		56,459.67 kWh
Energy from auxiliary heating:		178,454.0 kWh
Natural gas (H) savings:		5,465.5 m³
CO2 emissions avoided:		11,557.60 kg
DHW solar fraction:		24.0 %
Relative savings of supplementary energy (DIN EN 12977):		24.3 %
System efficiency:		41.5 %

Variant 1

Site Data

Climate data

Location:	THORNEY ISLAND(AUT)
Climate data record:	THORNEY ISLAND(AUT)
Total annual global irradiation:	1100.959 kWh/m²
Latitude:	50.81 °
Longitude:	0.91 °

Domestic hot water

Average daily consumption:	11 m³
Desired temperature:	60 °C
Consumption profile:	Student housing without cafeteria
Cold water temperature:	February: 10 °C August: 13 °C
Circulation:	yes

Variant 1

System

Collector loop

Manufacturer:	Viessmann Werke GmbH & Co
Type:	Vitosol 300-TM SP3C 3.03 m²
Number:	24.00
Total gross surface area:	110.64 m²
Total active solar surface area:	110.64 m²
Inclination (Tilt Angle):	25 °
Orientation:	200 °
Azimuth:	20 °

DHW standby tank

Manufacturer:	Viessmann
Type:	3 x Vitocell 100-V (1000 l)
Volume:	3 x 1 m³

Solar preheating tank

Manufacturer:	Viessmann
Type:	3 x Vitocell 100-V (1000 l)
Volume:	3 x 1 m³

Auxiliary heating

Manufacturer:	Viessmann Werke GmbH & Co
Type:	Vitocrossal 200 CM2 raumluftunabhängig
Nominal output:	370 kW

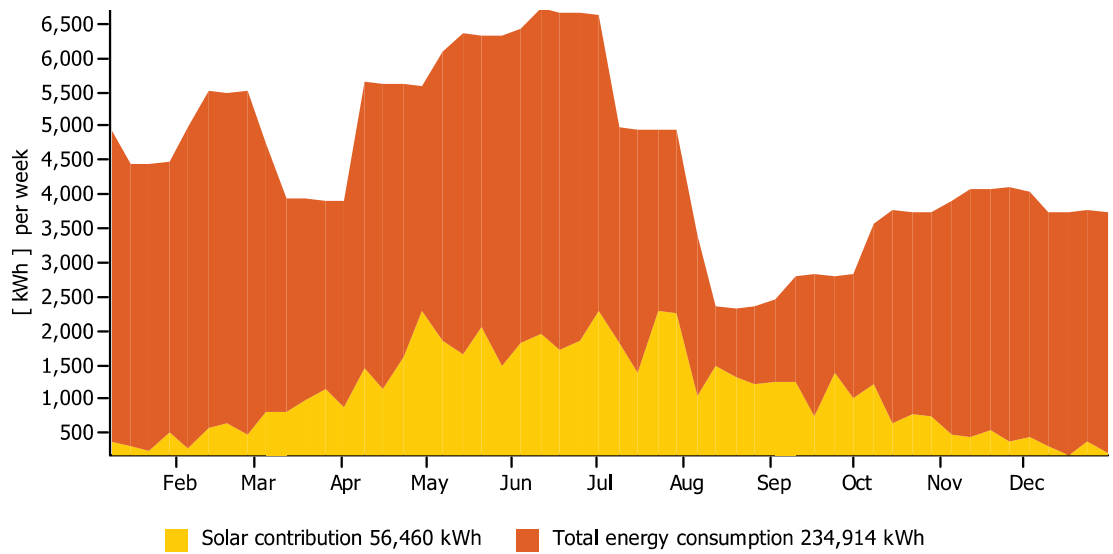
Legend

With test report
Solar Keymark

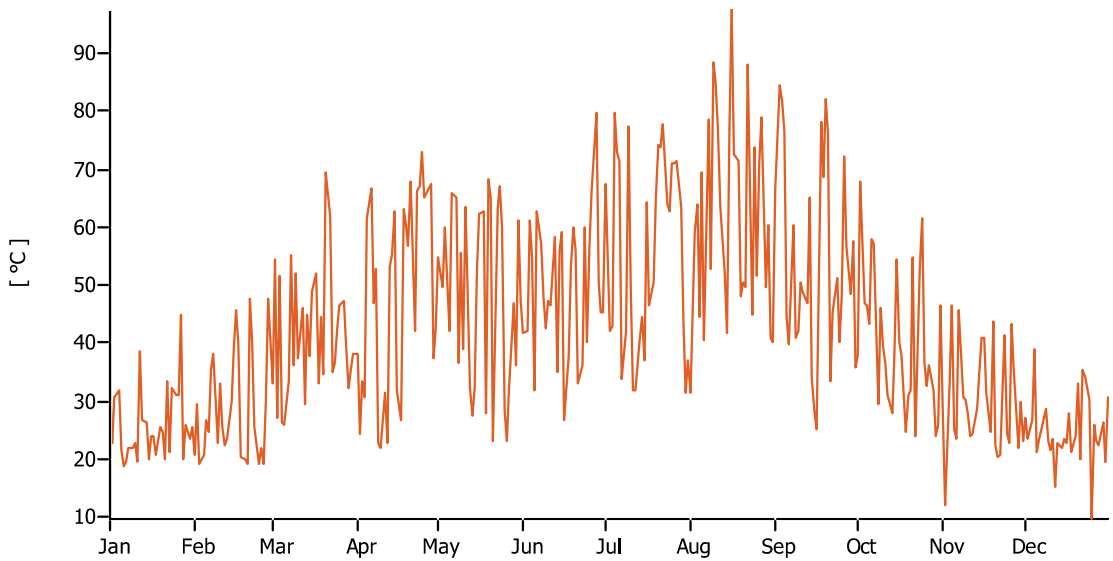


Variant 1

Solar energy consumption as percentage of total consumption



Daily maximum collector temperature



These calculations were carried out by Vitodesk 100 SolCalc Thermie 1.0 (R5) - the simulation program for solar thermal heating systems. The results are determined by a mathematical model calculation with variable time steps of up to 6 minutes. Actual yields can deviate from these values due to fluctuations in climate, consumption and other factors. The system schematic diagram above does not represent and cannot replace a full technical drawing of the solar system.



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