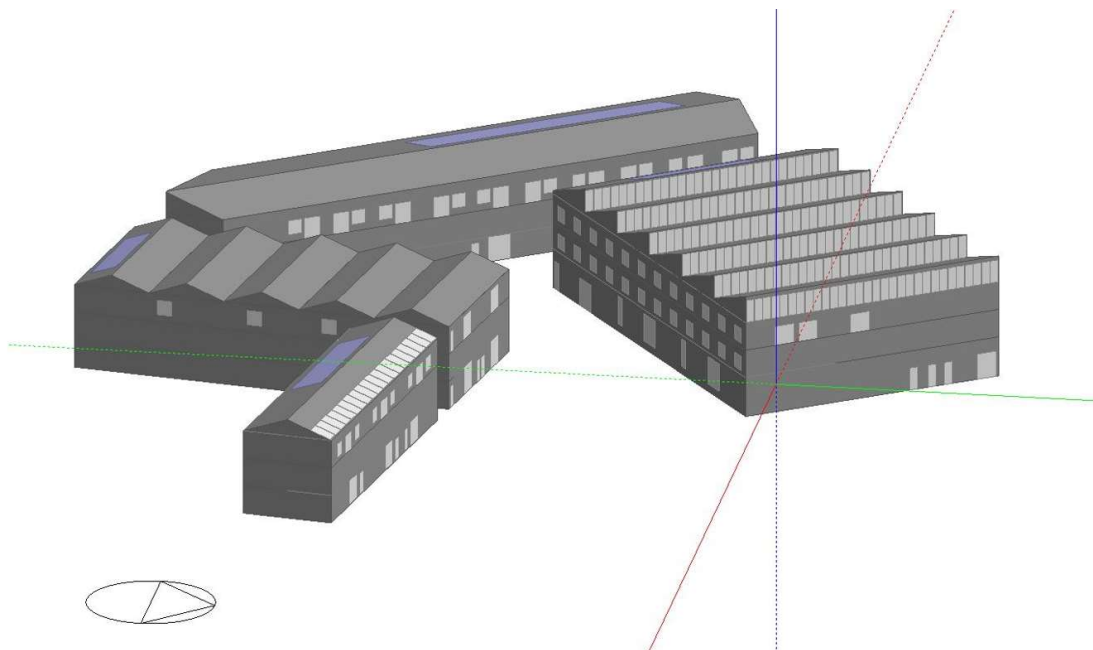




FLORENTIA VILLAGE
VALE ROAD
LONDON
N4 1TD

Pre-Construction Energy Strategy
[Planning Condition 13a]



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Client: Florentia Property Unit Trust
c/o General Projects
55 Blandford Street
London
W1U 7HW

Project: Florentia Village
Vale Road
London
N4 1TD

Project reference: 21066

Rev	Date	Author	Checked	Notes
00	06-07-2023	NB	DGW	First Issue
01	24-08-2023	NB	DGW	Condition 14 (DEN) elements removed and included in separate report.

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1 INTRODUCTION

This report relating to Florentia Village development (reference HGY/2022/0044) has been prepared to address condition 13(a) of the planning consent notice, as reproduced below:

Requirement	
<i>13(a) Prior to above ground construction, details of the Energy Strategy shall be submitted to and approved by the Local Planning Authority. This must include:</i>	
• <i>Confirmation of how this development will meet the zero-carbon policy requirement in line with the Energy Hierarchy;</i>	Refer to section 2.2
• <i>Confirmation of the necessary fabric efficiencies to achieve a minimum 21% reduction in SAP10 carbon factors, including details to reduce thermal bridging, with the aim of increasing the specified u-values;</i>	Refer to section 2.1
• <i>Details of the specification, efficiency, layout and capacity of temporary gas boiler plant and thermal store;</i>	Refer to appendix 4
• <i>Details of the solar PV, demonstrating the roof area has been maximised, with the following details: a roof plan; the number, angle, orientation, type, and efficiency level of the PVs; how overheating of the panels will be minimised; their peak output (kWp);</i>	Refer to appendix 3
• <i>A metering strategy.</i>	Refer to appendix 5
<i>The development shall be carried out strictly in accordance with the details so approved prior to first operation and shall be maintained and retained for the lifetime of the development. The solar PV array shall be installed with monitoring equipment prior to completion and shall be maintained at least annually thereafter.</i>	

2 PRE-CONSTRUCTION ENERGY CALCULATIONS

2.1 BE LEAN

No changes to the building fabric performance have been made further to the revisions submitted October 2022, and hence the 'Be Lean' calculations have not been amended.

A summary of the building u-values as provided by Turner Works (Project Architects) is included as appendix 1.

The resulting performance is summarised as:

BLOCK	AREA	SBEM 2013 BRUKL		For construction June 2023	
		TER	Total/annum	BER	Total/annum
	m2	kg CO2/m2	kg CO2	kg CO2/m2	kg CO2
A	989.2	13.5	13354	10.5	10387
B	2281.7	12.1	27609	9.9	22589
C	2698.6	11	29685	9.6	25907
D	4047.7	13.9	56263	10.2	41287
Total	10017.2	12.67	126910	10.00	100169
		Overall TER			
			REDUCTION	21.1%	

The full BRUKL outputs in support of the above are included as appendix 2.

2.2 BE CLEAN

Energy from the DEN is presumed to have a lower carbon factor than the gas boilers that will be utilised in the meantime, and as such once a connection has been made further carbon reductions will be realised.

However, as per the planning application energy statement, no carbon credits due to the potential future energy network connection have been included in the calculations presented here.

2.3 BE GREEN

A solar photovoltaic system specialist (Eden Energy) has been engaged by the developer and has worked closely with them to maximise and optimise the PV installation.

This has included the provision of PV cells on the existing Florentia Village buildings adjacent (though these have not been included in any of the following calculations).

The full technical proposal of the PV system is attached as appendix 3, and summarised as:

System size	271 kWp
Generated output	234,425 kWh/annum
	23.4 kWh/m ² . annum*
System area	1,287 m ²
Carbon reductions (Part L 2013):	121,667 kg/CO ₂ .annum

(* - value to be entered in columns T & AB of the GLA energy spreadsheet)

The resulting building emission rate for the whole development can then be calculated as:

$$100,169 - 121,667 = (\text{minus}) 21,498 \text{ kg CO}_2/\text{annum}$$

This equates to a building emission rate of:

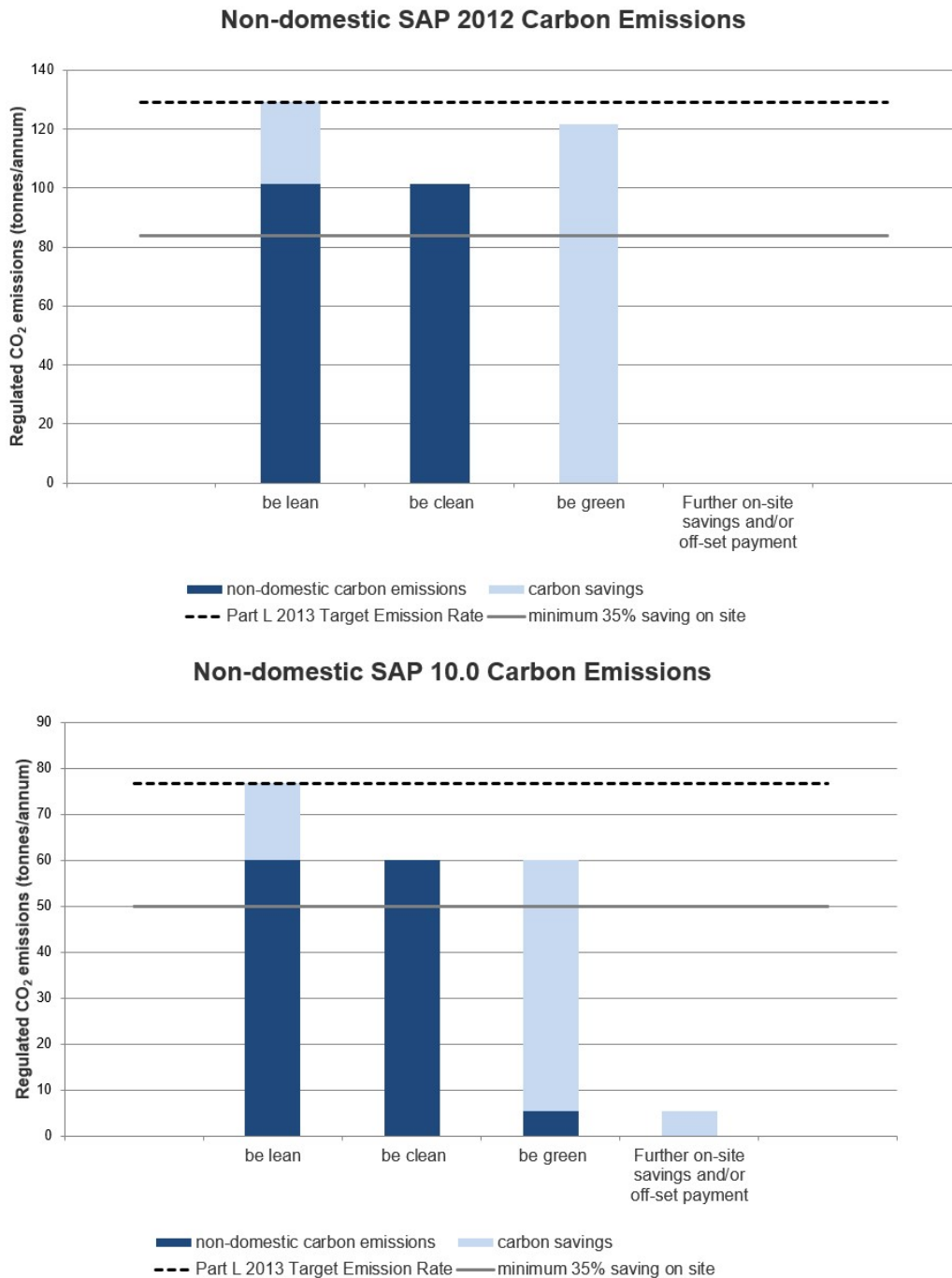
$$\text{BER} = \frac{-21,498 \text{ kg/CO}_2.\text{annum}}{10017.2 \text{ m}^2} = -2.15 \text{ kg.CO}_2/\text{m}^2.\text{annum}$$

Therefore carbon negative.

Note- Although the BRUKL calculations have been carried out block-by-block (to simplify the modelling & computation process) the effect of the PV system has been manually calculated with the output applied to the entire development to obtain an overall performance.

2.4 GLA CARBON REPORTING SPREADSHEET

In accordance with the Planning requirements, the values above have been entered into the GLA carbon reporting spreadsheet to obtain the SAP 10 carbon reduction results:



The completed spreadsheet file accompanies this report; screenshots are included as appendix 6.

APPENDIX 1 – BUILDING FABRIC PERFORMANCE TABLE

Turner.Works

Project: 21FLO - Florentia Clothing Village Extension
Date: 12.06.2023
Title: U-Value Summary

ELEMENT	LOCATION	DESCRIPTION/PRODUCT/SYSTEM	U-VALUE
External Wall Type 1 - Coated Steel Cladding	All other Walls	Layered Build Up System	0.21
External Wall Type 2 - Fibre Cement	Block D Vale Road Elevation	Layered Build Up System	0.2
Internal Blockwork Wall	All Blocks - GF	Internal Blockwork Wall	1.1
Internal Stud Wall	All Blocks	Internal Stud Wall	1.1
Ground Floor	All Blocks	Power Floated Reinforced Concrete Slab	0.18
First Floor	All Blocks	Composite In-Situ Slab	1
Roof	All Blocks	Layered Build Up System	0.18
Glazed Windows	All Blocks	Double Glazed windows with Aluminium Frame	1.6
Polycarbonate Windows	All Blocks - GF	Multilayered engineered polycarbonate system	1.6
Clerestory Rooflight	All Blocks	Double Glazed Curtain wall system	1.6
Polycarbonate rooflights	All Blocks	Polycarbonate rooflights	1.3
Personel Door	All Blocks	Personel Door	1.8
External Personel Door - Glazed	All Blocks	Double glazed door with aluminium frame	1.6
Vehicle Access Doors	All Blocks - GF	Sectional Overhead Door	1.24

APPENDIX 2- 'BE LEAN' BRUKL RESULTS

Project name

BLOCK A LEAN OPT 2

As designed

Date: Mon Sep 05 12:49:35 2022

Administrative information

Building Details

Address: Florentia Village, ,

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.6.b.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v6.1.8

BRUKL compliance check version: v5.6.b.0

Certifier details

Name: Tom Pope

Telephone number: 01489 883231

Address: 25 Barnes Wallis Road, Fareham, PO15 5TT

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	13.5
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	13.5
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	10.5
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	0.21	0.21	"Block 1 - A3 WC_W_8"
Floor	0.25	0.18	0.25	"Block 3 - A 6 WORKS_F_12"
Roof	0.25	0.18	0.18	"Block 3 - A 6 WORKS_R_13"
Windows***, roof windows, and rooflights	2.2	1.28	1.6	"Block 3 - A 6 WORKS_G_7"
Personnel doors	2.2	1.8	1.8	"Block 1 - A2 WORKS_D_7"
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"
U _a -Limit = Limiting area-weighted average U-values [W/(m ² K)] U _a -Calc = Calculated area-weighted average U-values [W/(m ² K)] U _i -Calc = Calculated maximum individual element U-values [W/(m ² K)]				
* 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	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- HVAC 1

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.98	-	-	-	-
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.					

1- DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	Hot water provided by HVAC system	-
Standard value	N/A	N/A

"No zones in project where local mechanical ventilation, exhaust, or terminal unit is applicable"

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name		Luminaire	Lamp	Display lamp	
	Standard value	60	60	22	
Block 1 - A3 WC		-	143	-	25
Block 1 - A2 WORKS		143	-	-	429
Block 1 - A1 WORKS		143	-	-	449
Block 1 - A3 WORKS		143	-	-	443
Block 1 - A2 WC		-	143	-	25
Block 1 - A1 WC		-	143	-	26
Block 2 - A2 works		143	-	-	217
Block 2 - A1 works		143	-	-	227
Block 2 - A3 works		143	-	-	223
Block 3 - A 6 WORKS		143	-	-	429
Block 3 - A 5 WORKS		143	-	-	414
Block 3 - A 4 WORKS		143	-	-	433

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Block 1 - A2 WORKS	N/A	N/A
Block 1 - A1 WORKS	N/A	N/A
Block 1 - A3 WORKS	N/A	N/A
Block 2 - A2 works	N/A	N/A
Block 2 - A1 works	N/A	N/A
Block 2 - A3 works	N/A	N/A
Block 3 - A 6 WORKS	YES (+104.1%)	NO
Block 3 - A 5 WORKS	YES (+104.6%)	NO
Block 3 - A 4 WORKS	YES (+104.1%)	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 [m ²]	989.2	989.2
External area [m ²]	1789.3	1789.3
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	3	7
Average conductance [W/K]	604.41	650.26
Average U-value [W/m ² K]	0.34	0.36
Alpha value* [%]	12.92	48.5

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

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	12.07	20.07
Cooling	0	0
Auxiliary	1.35	0.02
Lighting	13.53	17.3
Hot water	1.75	1.88
Equipment*	17.7	17.7
TOTAL **	28.7	39.27

* 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	0	0

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	109.23	94.16
Primary energy* [kWh/m ²]	61.39	78.62
Total emissions [kg/m ²]	10.5	13.5

* 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 SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Natural Gas									
Actual	39.8	69.4	12.1	0	1.3	0.92	0	0.98	0
Notional	62	32.1	20.1	0	0	0.82	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	0.21	"Block 1 - A3 WC_W_8"
Floor	0.2	0.18	"Block 1 - A3 WC_S_3"
Roof	0.15	0.18	"Block 3 - A 6 WORKS_R_13"
Windows, roof windows, and rooflights	1.5	1.22	"Block 3 - A 6 WORKS_G_11"
Personnel doors	1.5	1.8	"Block 1 - A2 WORKS_D_7"
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"
High usage entrance doors	1.5	-	"No external high usage entrance doors"
U _{i-Typ} = Typical individual element U-values [W/(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

Project name

BLOCK B LEAN OPT 2

As designed

Date: Mon Sep 05 12:50:42 2022

Administrative information

Building Details

Address: Florentia Village, ,

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.6.b.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v6.1.8

BRUKL compliance check version: v5.6.b.0

Certifier details

Name: Tom Pope

Telephone number: 01489 883231

Address: 25 Barnes Wallis Road, Fareham, PO15 5TT

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	12.1
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	12.1
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	9.9
Are emissions from the building less than or equal to the target?	BER ≤ TER
Are as built details the same as used in the BER calculations?	Separate submission

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

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

Building fabric

Element	U _a -Limit	U _a -Calc	U _i -Calc	Surface where the maximum value occurs*
Wall**	0.35	0.21	0.21	"Block 1 - B2 works 5_W_6"
Floor	0.25	0.18	0.18	"Block 1 - B1 wc 4_S_3"
Roof	0.25	0.25	0.25	"Block 3 - B6 WORKS_R_4"
Windows***, roof windows, and rooflights	2.2	1.6	1.6	"Block 1 - B5 Works_G_11"
Personnel doors	2.2	1.8	1.8	"Block 1 - B2 works 5_D_7"
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"
U _a -Limit = Limiting area-weighted average U-values [W/(m ² K)] U _a -Calc = Calculated area-weighted average U-values [W/(m ² K)] U _i -Calc = Calculated maximum individual element U-values [W/(m ² K)]				
* 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	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- HVAC 1

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.98	-	-	-	-
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.					

1- DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	Hot water provided by HVAC system	-
Standard value	N/A	N/A

"No zones in project where local mechanical ventilation, exhaust, or terminal unit is applicable"

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name		Luminaire	Lamp	Display lamp	
	Standard value	60	60	22	
Block 1 - B1 wc 4		-	143	-	24
Block 1 - B2 wc 5		-	143	-	24
Block 1 - B2 works 5		143	-	-	458
Block 1 - main circ		-	143	-	95
Block 1 - B1 works 4		143	-	-	448
Block 1 - B3 works 3		143	-	-	590
Block 1 - B3 wc 3		-	143	-	25
Block 1 - B4 Works 2		143	-	-	546
Block 1 - B4 wc 2		-	143	-	24
Block 1 - B5 wc 1		-	143	-	26
Block 1 - B5 Works		143	-	-	913
Block 2 - B1 WORKS		143	-	-	157
Block 2 - b2 WORKS		143	-	-	171
Block 2 - B3 WORKS		143	-	-	270
Block 2 - B4 WORKS		143	-	-	248
Block 2 - B5 WORKS		143	-	-	389
Block 3 - B6 WORKS		143	-	-	293
Block 3 - CIRC		-	143	-	92
Block 3 - B 7 WORKS		143	-	-	289
Block 3 - B9 WORKS		143	-	-	273
Block 3 - B 10 WORKS		143	-	-	273
Block 3 - B11 WORKS		143	-	-	297
Block 3 - B 12 WORKS		143	-	-	297
Block 3 - B13 WORKS		143	-	-	269

General lighting and display lighting		Luminous efficacy [lm/W]			
Zone name		Luminaire	Lamp	Display lamp	General lighting [W]
	Standard value	60	60	22	
Block 3 - B 14 WORKS		143	-	-	273
Block 3 - B 15 WORKS		143	-	-	614

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Block 1 - B2 works 5	N/A	N/A
Block 1 - B1 works 4	N/A	N/A
Block 1 - B3 works 3	N/A	N/A
Block 1 - B4 Works 2	N/A	N/A
Block 1 - B5 Works	NO (-87.9%)	NO
Block 2 - B1 WORKS	N/A	N/A
Block 2 - b2 WORKS	N/A	N/A
Block 2 - B3 WORKS	N/A	N/A
Block 2 - B4 WORKS	N/A	N/A
Block 2 - B5 WORKS	N/A	N/A
Block 3 - B6 WORKS	NO (-32.9%)	NO
Block 3 - B 7 WORKS	NO (-67.9%)	NO
Block 3 - B9 WORKS	NO (-61.6%)	NO
Block 3 - B 10 WORKS	NO (-79.9%)	NO
Block 3 - B11 WORKS	NO (-65%)	NO
Block 3 - B 12 WORKS	NO (-81.6%)	NO
Block 3 - B13 WORKS	NO (-60.9%)	NO
Block 3 - B 14 WORKS	NO (-79.9%)	NO
Block 3 - B 15 WORKS	NO (-83.5%)	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 [m ²]	2281.7	2281.7
External area [m ²]	3196.9	3196.9
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	3	7
Average conductance [W/K]	927.06	1220.3
Average U-value [W/m ² K]	0.29	0.38
Alpha value* [%]	10.65	33.84

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

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	9.78	15.17
Cooling	0	0
Auxiliary	1.35	0.07
Lighting	13.29	16.58
Hot water	1.67	1.79
Equipment*	17.13	17.13
TOTAL **	26.08	33.61

* 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	0	0

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	62.17	91.82
Primary energy* [kWh/m ²]	57.77	70.52
Total emissions [kg/m ²]	9.9	12.1

* 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 SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER	
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Natural Gas										
	Actual	32.3	29.9	9.8	0	1.3	0.92	0	0.98	0
	Notional	46.6	45.2	15.2	0	0.1	0.82	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	0.21	"Block 1 - B2 works 5_W_6"
Floor	0.2	0.18	"Block 1 - B1 wc 4_S_3"
Roof	0.15	0.25	"Block 3 - B6 WORKS_R_4"
Windows, roof windows, and rooflights	1.5	1.6	"Block 1 - B5 Works_G_11"
Personnel doors	1.5	1.8	"Block 1 - B2 works 5_D_7"
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"
High usage entrance doors	1.5	-	"No external high usage entrance doors"
U _{i-Typ} = Typical individual element U-values [W/(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

Project name

BLOCK C LEAN OPT 2

As designed

Date: Mon Sep 05 12:51:21 2022

Administrative information

Building Details

Address: FLORENTIA VILLAGE, LONDON,

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.6.b.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v6.1.8

BRUKL compliance check version: v5.6.b.0

Certifier details

Name: Tom Pope

Telephone number: 01489 883231

Address: 25 Barnes Wallis Road, Fareham, PO15 5TT

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	11
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	11
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	9.6
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	0.21	0.21	"Block 1 - PLANT 2_W_7"
Floor	0.25	0.18	0.18	"Block 1 - PLANT 2_S_3"
Roof	0.25	0.25	0.25	"Block 3 - works_R_4"
Windows***, roof windows, and rooflights	2.2	1.6	1.6	"Block 1 - C1 WORKS_G_8"
Personnel doors	2.2	1.8	1.8	"Block 1 - C1 WORKS_D_6"
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"
U _a -Limit = Limiting area-weighted average U-values [W/(m ² K)] U _a -Calc = Calculated area-weighted average U-values [W/(m ² K)] U _i -Calc = Calculated maximum individual element U-values [W/(m ² K)]				
* 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	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- HVAC 1

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.98	-	-	-	-
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.					

1- DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	Hot water provided by HVAC system	-
Standard value	N/A	N/A

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			
Block 3 - wc	-	-	-	1	-	-	-	-	-		0.81	0.5
Block 3 - kit	-	-	-	1	-	-	-	-	-		0.81	0.5
Block 3 - wash	-	-	-	1	-	-	-	-	-		0.81	0.5

General lighting and display lighting

Zone name	Luminous efficacy [lm/W]			General lighting [W]
	Luminaire	Lamp	Display lamp	
Standard value	60	60	22	
Block 1 - PLANT 2	143	-	-	84
Block 1 - C1 WORKS	143	-	-	464
Block 1 - PLANT	143	-	-	70
Block 1 - C2 WC	143	-	-	626
Block 1 - C1 WC	-	143	-	22
Block 1 - C2 WORKS	143	-	-	36
Block 1 - C3 WORKS	143	-	-	625
Block 1 - C3 WC	-	143	-	24

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
Block 1 - C4 WC	-	143	-	23
Block 1 - C4 WORKS	143	-	-	627
Block 1 - C5 WORKS	143	-	-	629
Block 1 - C5 WC	-	143	-	23
Block 1 - C6 WC	-	143	-	28
Block 1 - C6 WORKS	143	-	-	354
Block 2 - MEZZ	143	-	-	54
Block 2 - MEZZ	143	-	-	53
Block 2 - MEZZ	143	-	-	106
Block 2 - MEZZ	143	-	-	53
Block 2 - MEZZ	143	-	-	20
Block 3 - works	143	-	-	336
Block 3 - works	143	-	-	350
Block 3 - works	143	-	-	308
Block 3 - works	143	-	-	351
Block 3 - works	143	-	-	306
Block 3 - works	143	-	-	319
Block 3 - works	143	-	-	340
Block 3 - works	143	-	-	348
Block 3 - works	143	-	-	312
Block 3 - str	143	-	-	10
Block 3 - wc	-	143	-	108
Block 3 - kit	-	143	-	182
Block 3 - wash	-	143	-	43
Block 3 - lobby	-	143	-	18
Block 3 - works	143	-	-	336
Block 3 - str	143	-	-	8

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Block 1 - C1 WORKS	NO (-90.3%)	NO
Block 1 - C2 WC	N/A	N/A
Block 1 - C2 WORKS	N/A	N/A
Block 1 - C3 WORKS	N/A	N/A
Block 1 - C4 WORKS	N/A	N/A
Block 1 - C5 WORKS	N/A	N/A
Block 1 - C6 WORKS	N/A	N/A
Block 3 - works	NO (-86.7%)	NO
Block 3 - works	NO (-87.3%)	NO
Block 3 - works	NO (-85.3%)	NO
Block 3 - works	NO (-87.3%)	NO
Block 3 - works	NO (-85.2%)	NO
Block 3 - works	NO (-85.9%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Block 3 - works	NO (-86.9%)	NO
Block 3 - works	NO (-87.2%)	NO
Block 3 - works	NO (-85.5%)	NO
Block 3 - works	NO (-35.7%)	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 [m ²]	2698.6	2698.6
External area [m ²]	3884.6	3884.6
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	3	6
Average conductance [W/K]	1110.18	1464.61
Average U-value [W/m ² K]	0.29	0.38
Alpha value* [%]	11.13	33.51

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

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	10.72	16.13
Cooling	0	0
Auxiliary	1.45	0.34
Lighting	12.4	13.98
Hot water	1.34	1.43
Equipment*	19.71	19.71
TOTAL **	25.91	31.88

* 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	0	0

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	57.02	82.66
Primary energy* [kWh/m ²]	56.17	64.29
Total emissions [kg/m ²]	9.6	11

* 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] Natural Gas										
	Actual	35.4	21.6	10.7	0	1.4	0.92	0	0.98	0
	Notional	49.5	33.2	16.1	0	0.3	0.82	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	0.21	"Block 1 - PLANT 2_W_7"
Floor	0.2	0.18	"Block 1 - PLANT 2_S_3"
Roof	0.15	0.25	"Block 3 - works_R_4"
Windows, roof windows, and rooflights	1.5	1.6	"Block 1 - C1 WORKS_G_8"
Personnel doors	1.5	1.8	"Block 1 - C1 WORKS_D_6"
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"
High usage entrance doors	1.5	-	"No external high usage entrance doors"
U _{i-Typ} = Typical individual element U-values [W/(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

Project name

BLOCK D LEAN OPT 2

As designed

Date: Mon Sep 05 12:51:57 2022

Administrative information

Building Details

Address: Florentia Village, ,

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.6.b.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v6.1.8

BRUKL compliance check version: v5.6.b.0

Certifier details

Name: Tom Pope

Telephone number: 01489 883231

Address: 25 Barnes Wallis Road, Fareham, PO15 5TT

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	13.9
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	13.9
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	10.2
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	0.21	0.21	"1 GF - D5 Works 1_W_6"
Floor	0.25	0.18	0.18	"1 GF - D5 Works 1_S_3"
Roof	0.25	0.18	0.25	"Block 2 - CIRC_R_18"
Windows***, roof windows, and rooflights	2.2	1.6	1.6	"1 GF - D5 Works 1_G_7"
Personnel doors	2.2	1.8	1.8	"1 GF - D5 Works 1_D_8"
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"
U _a -Limit = Limiting area-weighted average U-values [W/(m ² K)] U _a -Calc = Calculated area-weighted average U-values [W/(m ² K)] U _i -Calc = Calculated maximum individual element U-values [W/(m ² K)]				
* 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	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- HVAC 1

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.98	-	-	-	-
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.					

1- DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	Hot water provided by HVAC system	-
Standard value	N/A	N/A

"No zones in project where local mechanical ventilation, exhaust, or terminal unit is applicable"

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name		Luminaire	Lamp	Display lamp	
	Standard value	60	60	22	
1 GF - D5 Works 1		143	-	-	452
1 GF - D5 Works		143	-	-	221
1 GF - Post Rm		143	-	-	66
1 GF - Guest WC		-	143	-	120
1 GF - D2 Wc		-	143	-	35
1 GF - D3 wc		-	143	-	36
1 GF - D7 Wc		-	143	-	39
1 GF - D7 Works		143	-	-	1128
1 GF - D8 Works		143	-	-	1178
1 GF - D2 Works		143	-	-	320
1 GF - D3 Works		143	-	-	342
1 GF - D6 wc		143	-	-	58
1 GF - D6 Works		143	-	-	1170
1 GF - D1 Wc		-	143	-	35
1 GF - D1 Works		143	-	-	336
1 GF - D4 Works		143	-	-	319
1 GF - D4 Wc		-	143	-	35
1 GF - D8 Wc		-	143	-	39
1 GF - Zone 2		143	-	-	19
Block 1 - D1 WORKS		143	-	-	154
Block 1 - D6 WORKS		143	-	-	539
Block 1 - D7 WORKS		143	-	-	519
Block 1 - D2 WORKS		143	-	-	142
Block 1 - D3 WORKS		143	-	-	152

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name		Luminaire	Lamp	Display lamp	
	Standard value	60	60	22	
Block 1 - D8 WORKS		143	-	-	548
Block 1 - D4 WORKS		143	-	-	140
Block 1 - D5 WORKS		143	-	-	285
Block 2 - D 13 WORKS		143	-	-	137
Block 2 - CIRC		-	143	-	276
Block 2 - D 21 WORKS		143	-	-	349
Block 2 - D 22 WORKS		143	-	-	411
Block 2 - WC		-	143	-	79
Block 2 - D 20 WORKS		143	-	-	364
Block 2 - D11 WORKS		143	-	-	490
Block 2 - D10 WORKS		143	-	-	419
Block 2 - D19 WORKS		143	-	-	405
Block 2 - D9 WORKS		143	-	-	448
Block 2 - D18 WORKS		143	-	-	356
Block 2 - D 15 WORKS		143	-	-	168
Block 2 - D 12 WORKS		143	-	-	346
Block 2 - KIT		-	143	-	180
Block 2 - D16 works		143	-	-	491
Block 2 - D 14 WORKS		143	-	-	192
Block 2 - D17 WORKS		143	-	-	373

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
1 GF - D5 Works 1	NO (-75.6%)	NO
1 GF - D5 Works	YES (+32.8%)	NO
1 GF - Post Rm	N/A	N/A
1 GF - D7 Works	NO (-92.8%)	NO
1 GF - D8 Works	NO (-93.1%)	NO
1 GF - D2 Works	NO (-86.2%)	NO
1 GF - D3 Works	NO (-87.4%)	NO
1 GF - D6 wc	N/A	N/A
1 GF - D6 Works	NO (-93.1%)	NO
1 GF - D1 Works	NO (-89.9%)	NO
1 GF - D4 Works	NO (-86.1%)	NO
Block 1 - D1 WORKS	N/A	N/A
Block 1 - D6 WORKS	N/A	N/A
Block 1 - D7 WORKS	N/A	N/A
Block 1 - D2 WORKS	N/A	N/A
Block 1 - D3 WORKS	N/A	N/A
Block 1 - D8 WORKS	N/A	N/A
Block 1 - D4 WORKS	N/A	N/A
Block 1 - D5 WORKS	N/A	N/A
Block 2 - D 13 WORKS	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Block 2 - D 21 WORKS	NO (-66.3%)	NO
Block 2 - D 22 WORKS	YES (+183.2%)	NO
Block 2 - D 20 WORKS	YES (+64.1%)	NO
Block 2 - D11 WORKS	YES (+168.2%)	NO
Block 2 - D10 WORKS	NO (-79.8%)	NO
Block 2 - D19 WORKS	YES (+185.8%)	NO
Block 2 - D9 WORKS	YES (+42.4%)	NO
Block 2 - D18 WORKS	NO (-66.9%)	NO
Block 2 - D 15 WORKS	N/A	N/A
Block 2 - D 12 WORKS	YES (+94.2%)	NO
Block 2 - D16 works	YES (+172.4%)	NO
Block 2 - D 14 WORKS	NO (-50.1%)	NO
Block 2 - D17 WORKS	YES (+55.3%)	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 [m ²]	4047.7	4047.7
External area [m ²]	5888	5888
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	3	5
Average conductance [W/K]	2184.75	1924.25
Average U-value [W/m ² K]	0.37	0.33
Alpha value* [%]	8.89	28.28

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

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	12.84	12.59
Cooling	0	0
Auxiliary	1.34	0.08
Lighting	12.66	21.26
Hot water	1.65	1.77
Equipment*	17.55	17.55
TOTAL **	28.49	35.7

* 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	0	0

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	106.17	89.96
Primary energy* [kWh/m ²]	59.6	81.41
Total emissions [kg/m ²]	10.2	13.9

* 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 SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Natural Gas									
Actual	42.4	63.8	12.8	0	1.3	0.92	0	0.98	0
Notional	38.5	51.5	12.6	0	0.1	0.82	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	0.21	"1 GF - D5 Works 1_W_6"
Floor	0.2	0.18	"1 GF - D5 Works 1_S_3"
Roof	0.15	0.18	"Block 2 - CIRC_R_18"
Windows, roof windows, and rooflights	1.5	1.6	"1 GF - D5 Works 1_G_7"
Personnel doors	1.5	1.8	"1 GF - D5 Works 1_D_8"
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"
High usage entrance doors	1.5	-	"No external high usage entrance doors"
U _{i-Typ} = Typical individual element U-values [W/(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 3 - SOLAR PHOTOVOLTAIC SYSTEM DETAILS

Eden Sustainable Ltd

28 Queen Street
London
EC4R 1BB

Contact person:

E-Mail: enquiries@edensustainable.co.uk

Project Name: Florentia - new buildings

09/06/2023

Your PV system from Eden Sustainable Ltd

Address of Installation

108 Vale Road
Haringay Warehouse District
London
N4 1TD



Project Overview



Figure: Overview Image, 3D Design

PV System

3D, Grid-connected PV System

Climate Data	Haringey, GBR (1996 - 2015)
Values source	Meteonorm 8.1(i)
PV Generator Output	271 kWp
PV Generator Surface	1,287.0 m ²
Number of PV Modules	542
Number of Inverters	9

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Production Forecast

The results have been calculated with a mathematical model calculation from Valentin Software GmbH (PV*SOL algorithms). The actual yields from the solar power system may differ as a result of weather variations, the efficiency of the modules and inverter, and other factors.

Set-up of the System

Overview

System Data

Type of System	3D, Grid-connected PV System
----------------	------------------------------

Climate Data

Location	Haringey, GBR (1996 - 2015)
Values source	Meteonorm 8.1(i)
Resolution of the data	1 h
Simulation models used:	
- Diffuse Irradiation onto Horizontal Plane	Hofmann
- Irradiance onto tilted surface	Hay & Davies

Module Areas

1. Module Area - Building 07-Roof Area Southwest

PV Generator, 1. Module Area - Building 07-Roof Area Southwest

Name	Building 07-Roof Area Southwest
PV Modules	162 x JAM66S30-500/MR (v3)
Manufacturer	JA Solar Holdings Co., Ltd.
Inclination	15 °
Orientation	Southwest 236 °
Installation Type	Roof parallel
PV Generator Surface	384.7 m ²

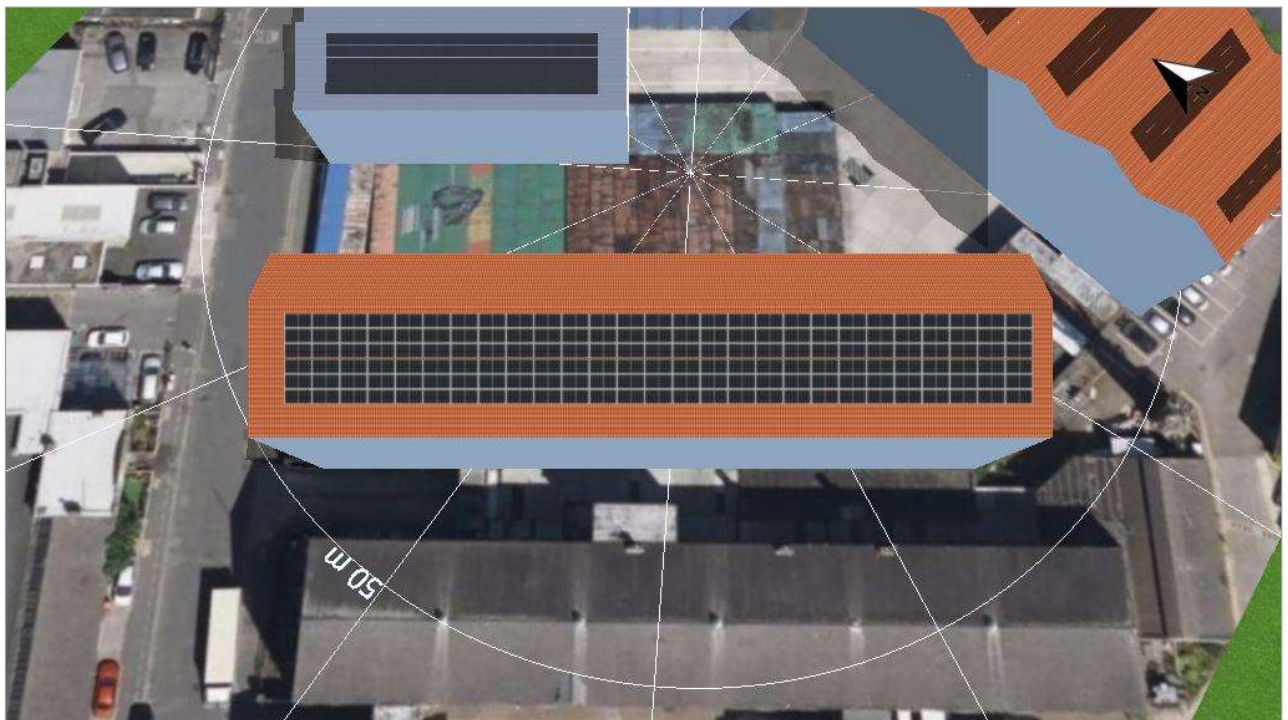


Figure: 1. Module Area - Building 07-Roof Area Southwest

2. Module Area - Building 01-Roof Area South

PV Generator, 2. Module Area - Building 01-Roof Area South

Name	Building 01-Roof Area South
PV Modules	42 x JAM66S30-500/MR (v3)
Manufacturer	JA Solar Holdings Co., Ltd.
Inclination	13 °
Orientation	South 191 °
Installation Type	Roof parallel
PV Generator Surface	99.7 m²

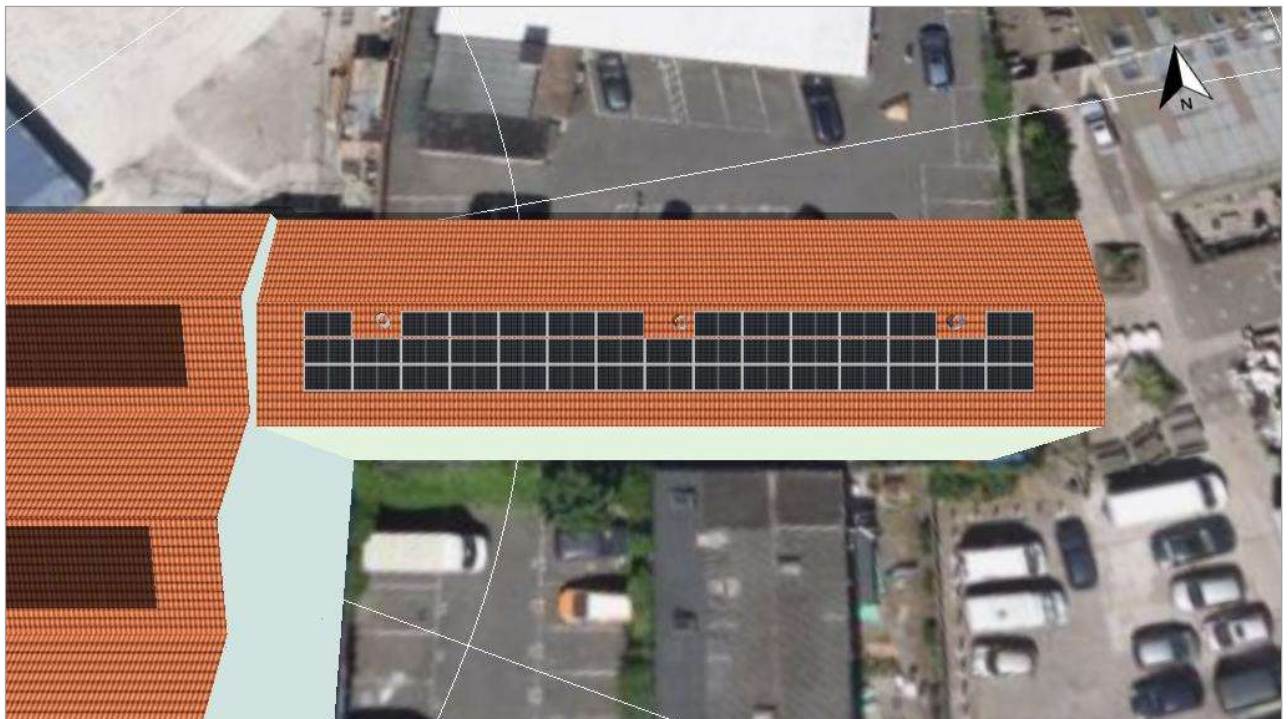


Figure: 2. Module Area - Building 01-Roof Area South

3. Module Area - Building 04-Roof Area South

PV Generator, 3. Module Area - Building 04-Roof Area South

Name	Building 04-Roof Area South
PV Modules	21 x JAM66S30-500/MR (v3)
Manufacturer	JA Solar Holdings Co., Ltd.
Inclination	23 °
Orientation	South 191 °
Installation Type	Roof parallel
PV Generator Surface	49.9 m²

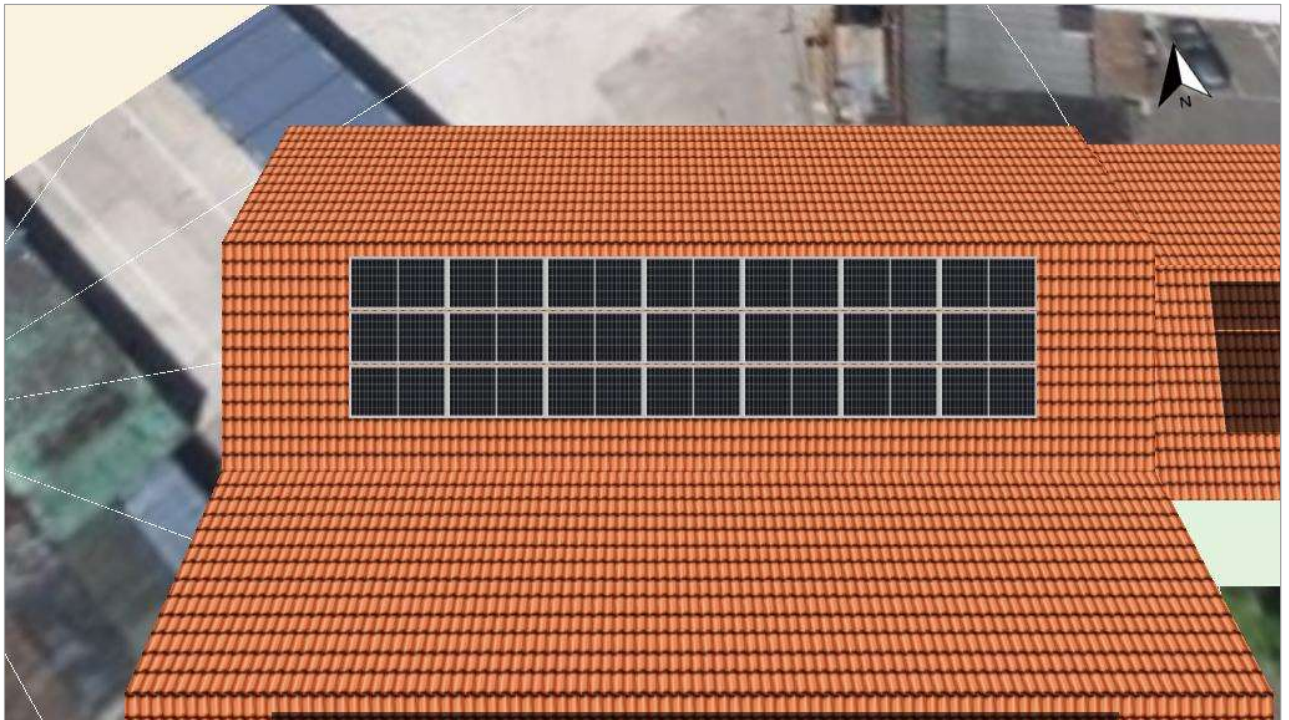


Figure: 3. Module Area - Building 04-Roof Area South

4. Module Area - Building 03-Roof Area South

PV Generator, 4. Module Area - Building 03-Roof Area South

Name	Building 03-Roof Area South
PV Modules	21 x JAM66S30-500/MR (v3)
Manufacturer	JA Solar Holdings Co., Ltd.
Inclination	23 °
Orientation	South 191 °
Installation Type	Roof parallel
PV Generator Surface	49.9 m²

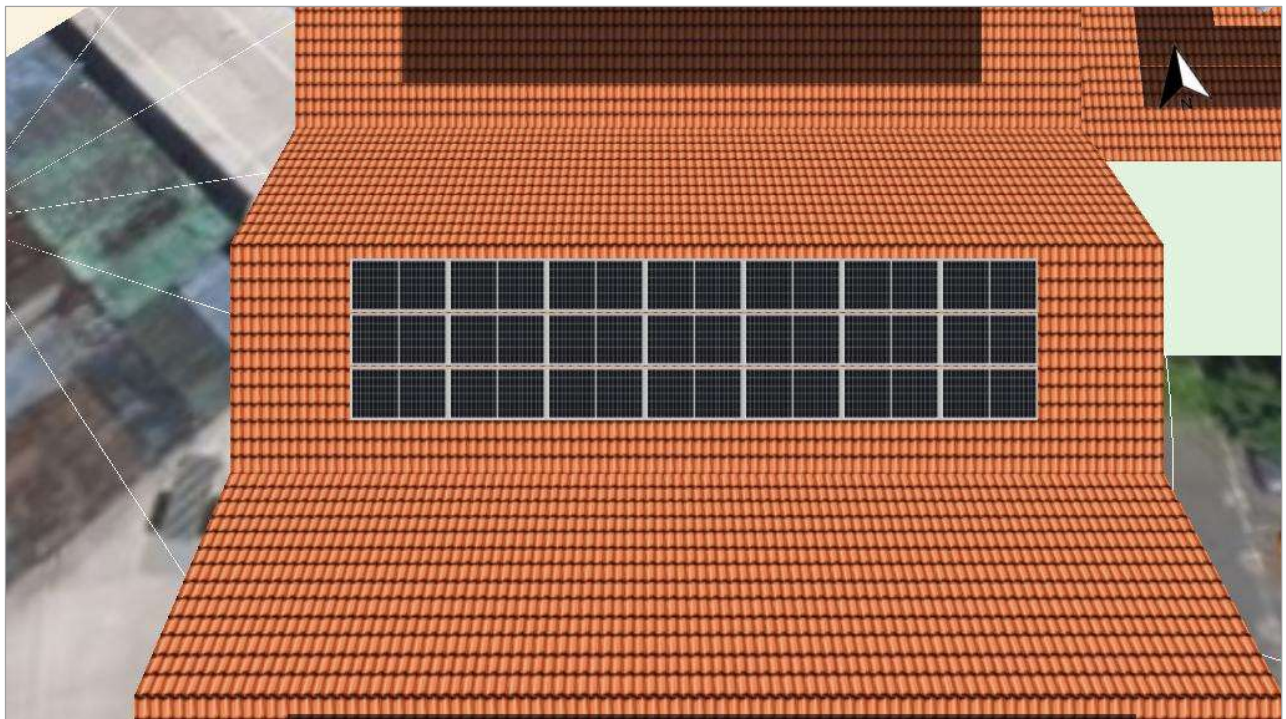


Figure: 4. Module Area - Building 03-Roof Area South

5. Module Area - Saw Tooth Roof 05-Roof Area Southwest

PV Generator, 5. Module Area - Saw Tooth Roof 05-Roof Area Southwest

Name	Saw Tooth Roof 05-Roof Area Southwest
PV Modules	36 x JAM66S30-500/MR (v3)
Manufacturer	JA Solar Holdings Co., Ltd.
Inclination	14 °
Orientation	Southwest 236 °
Installation Type	Roof parallel
PV Generator Surface	85.5 m²

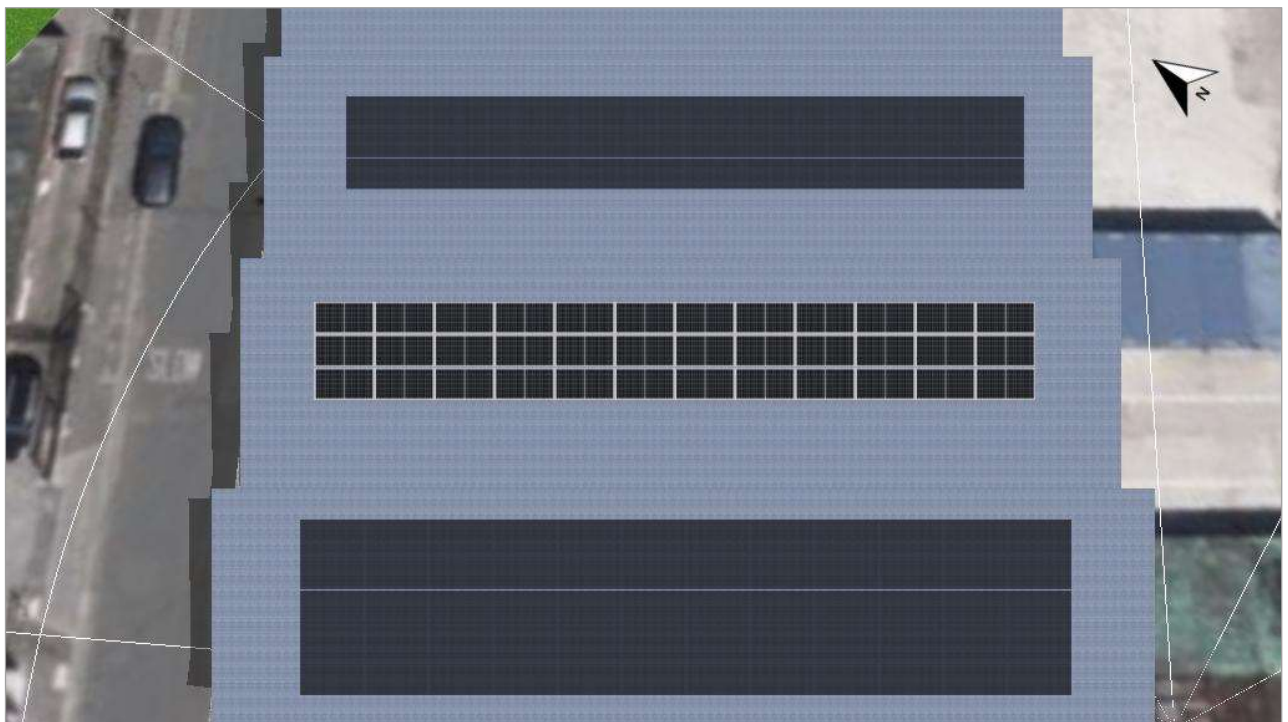


Figure: 5. Module Area - Saw Tooth Roof 05-Roof Area Southwest

6. Module Area - Saw Tooth Roof 06-Roof Area Southwest

PV Generator, 6. Module Area - Saw Tooth Roof 06-Roof Area Southwest

Name	Saw Tooth Roof 06-Roof Area Southwest
PV Modules	60 x JAM66S30-500/MR (v3)
Manufacturer	JA Solar Holdings Co., Ltd.
Inclination	14 °
Orientation	Southwest 236 °
Installation Type	Roof parallel
PV Generator Surface	142.5 m ²

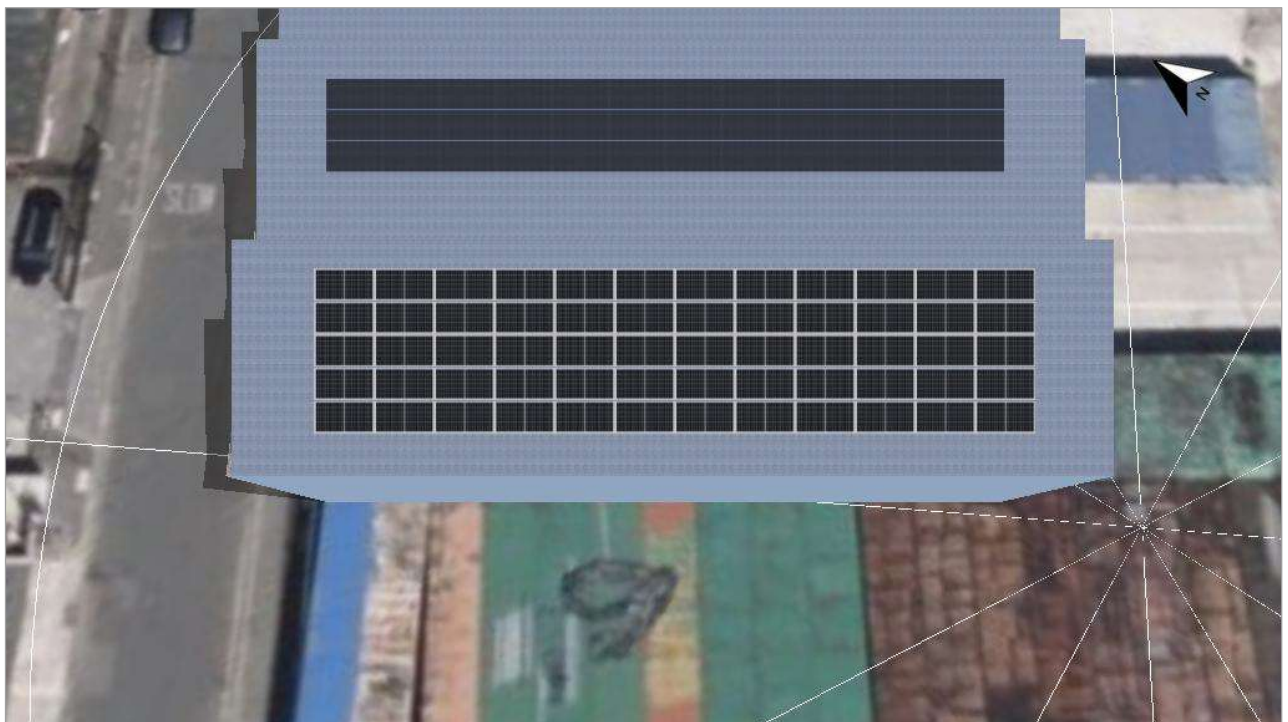


Figure: 6. Module Area - Saw Tooth Roof 06-Roof Area Southwest

7. Module Area - Saw Tooth Roof 03-Roof Area Southwest

PV Generator, 7. Module Area - Saw Tooth Roof 03-Roof Area Southwest

Name	Saw Tooth Roof 03-Roof Area Southwest
PV Modules	36 x JAM66S30-500/MR (v3)
Manufacturer	JA Solar Holdings Co., Ltd.
Inclination	14 °
Orientation	Southwest 236 °
Installation Type	Roof parallel
PV Generator Surface	85.5 m²

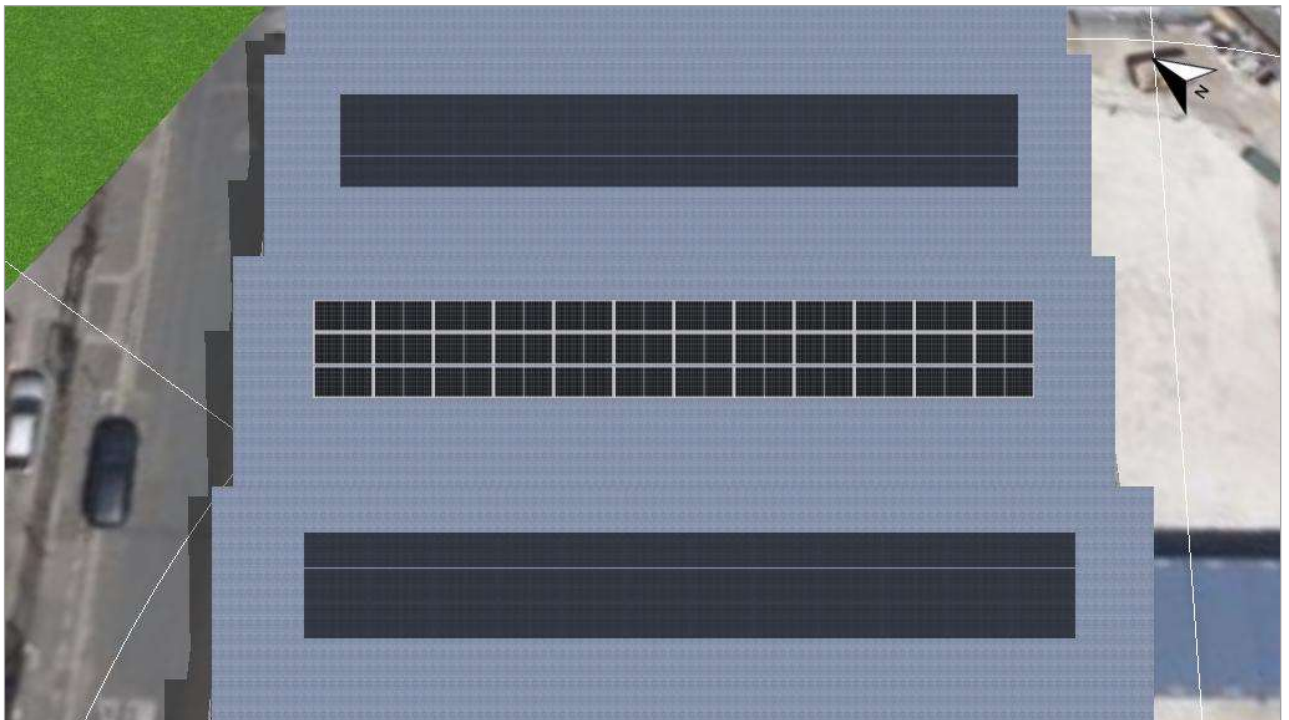


Figure: 7. Module Area - Saw Tooth Roof 03-Roof Area Southwest

8. Module Area - Saw Tooth Roof 04-Roof Area Southwest

PV Generator, 8. Module Area - Saw Tooth Roof 04-Roof Area Southwest

Name	Saw Tooth Roof 04-Roof Area Southwest
PV Modules	36 x JAM66S30-500/MR (v3)
Manufacturer	JA Solar Holdings Co., Ltd.
Inclination	14 °
Orientation	Southwest 236 °
Installation Type	Roof parallel
PV Generator Surface	85.5 m²

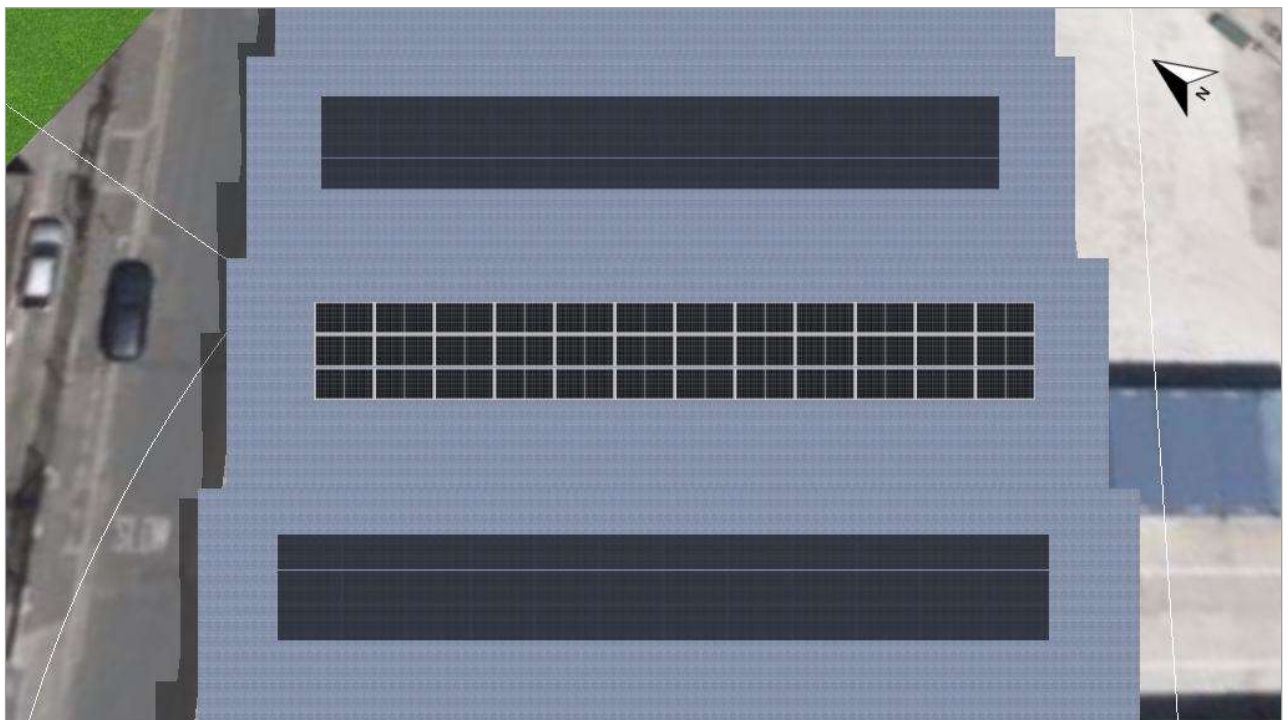


Figure: 8. Module Area - Saw Tooth Roof 04-Roof Area Southwest

9. Module Area - Saw Tooth Roof 01-Roof Area Southwest

PV Generator, 9. Module Area - Saw Tooth Roof 01-Roof Area Southwest

Name	Saw Tooth Roof 01-Roof Area Southwest
PV Modules	36 x JAM66S30-500/MR (v3)
Manufacturer	JA Solar Holdings Co., Ltd.
Inclination	14 °
Orientation	Southwest 236 °
Installation Type	Roof parallel
PV Generator Surface	85.5 m ²



Figure: 9. Module Area - Saw Tooth Roof 01-Roof Area Southwest

10. Module Area - Saw Tooth Roof 02-Roof Area Southwest

PV Generator, 10. Module Area - Saw Tooth Roof 02-Roof Area Southwest

Name	Saw Tooth Roof 02-Roof Area Southwest
PV Modules	36 x JAM66S30-500/MR (v3)
Manufacturer	JA Solar Holdings Co., Ltd.
Inclination	14 °
Orientation	Southwest 236 °
Installation Type	Roof parallel
PV Generator Surface	85.5 m²

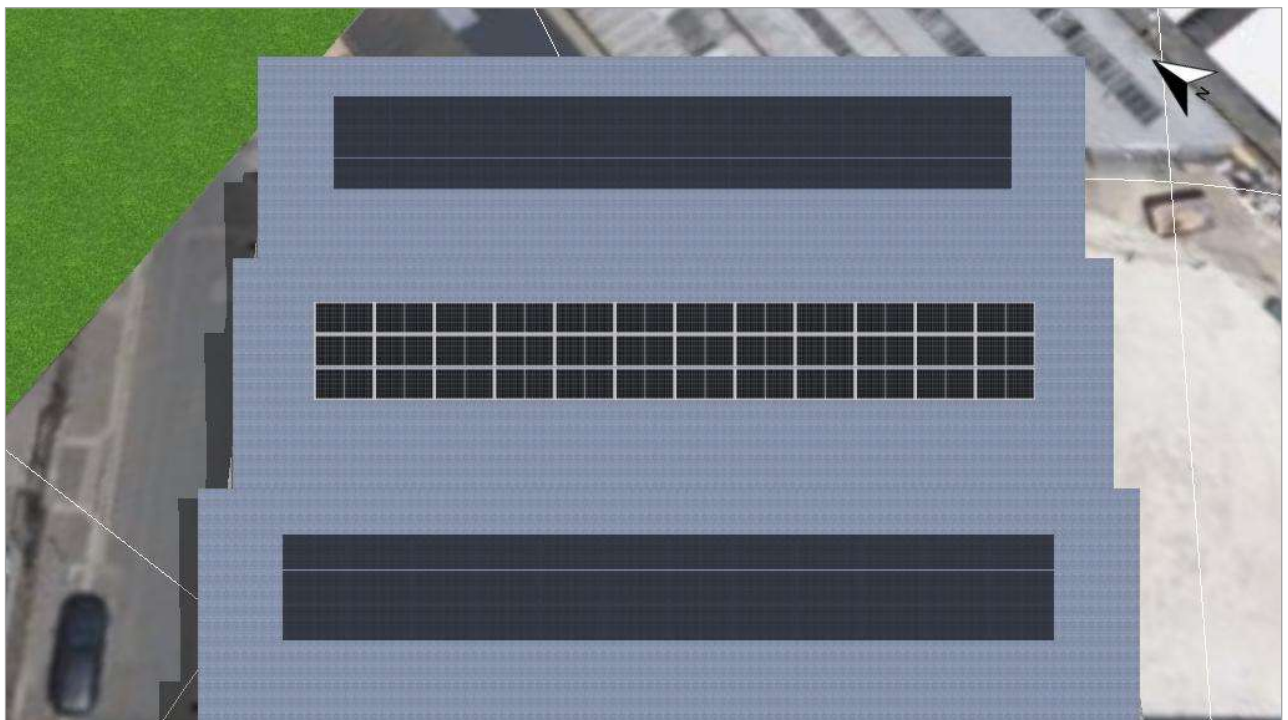


Figure: 10. Module Area - Saw Tooth Roof 02-Roof Area Southwest

11. Module Area - Building 02-Roof Area South

PV Generator, 11. Module Area - Building 02-Roof Area South

Name	Building 02-Roof Area South
PV Modules	21 x JAM66S30-500/MR (v3)
Manufacturer	JA Solar Holdings Co., Ltd.
Inclination	23 °
Orientation	South 191 °
Installation Type	Roof parallel
PV Generator Surface	49.9 m²

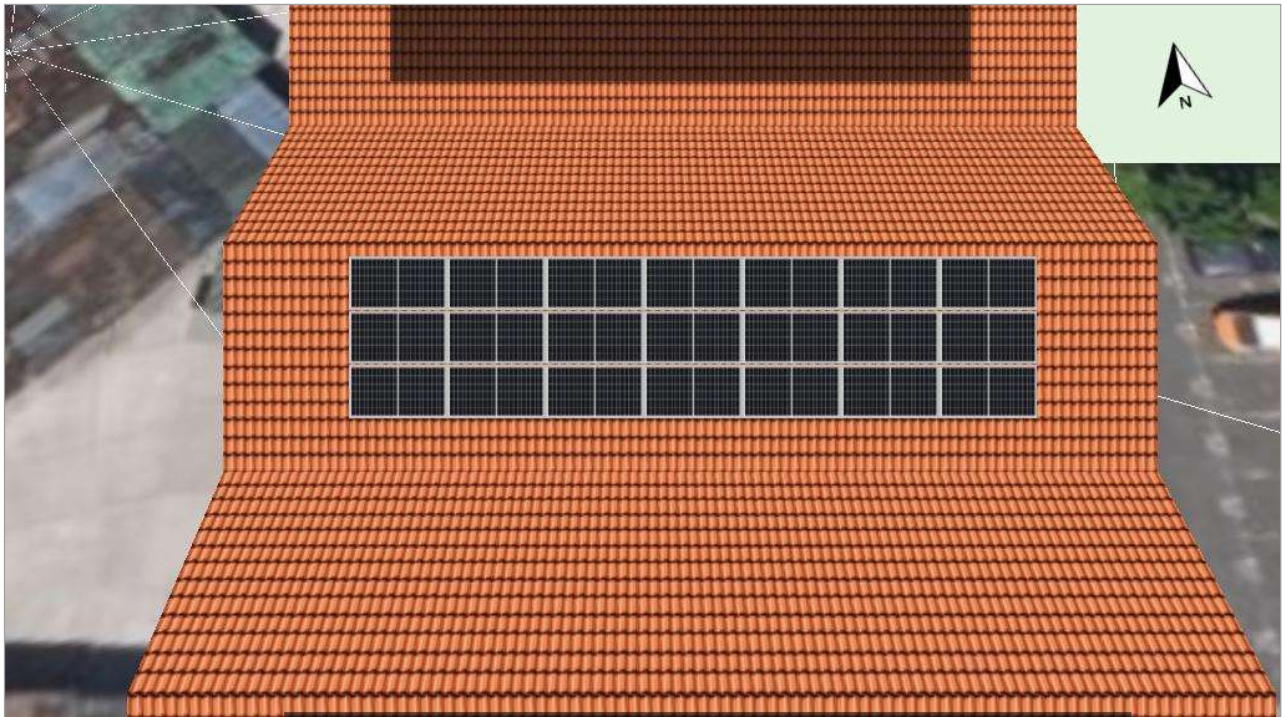


Figure: 11. Module Area - Building 02-Roof Area South

12. Module Area - Building 05-Roof Area South

PV Generator, 12. Module Area - Building 05-Roof Area South

Name	Building 05-Roof Area South
PV Modules	21 x JAM66S30-500/MR (v3)
Manufacturer	JA Solar Holdings Co., Ltd.
Inclination	23 °
Orientation	South 191 °
Installation Type	Roof parallel
PV Generator Surface	49.9 m²

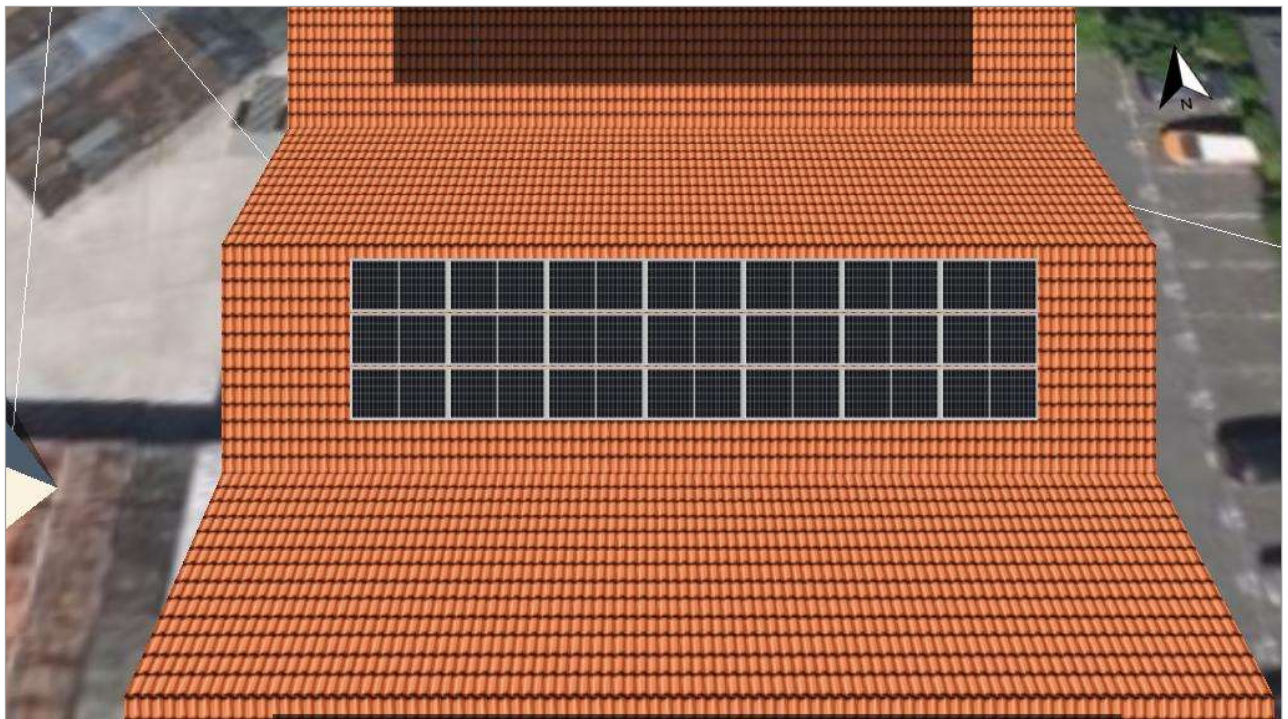


Figure: 12. Module Area - Building 05-Roof Area South

13. Module Area - Building 06-Roof Area South

PV Generator, 13. Module Area - Building 06-Roof Area South

Name	Building 06-Roof Area South
PV Modules	14 x JAM66S30-500/MR (v3)
Manufacturer	JA Solar Holdings Co., Ltd.
Inclination	23 °
Orientation	South 191 °
Installation Type	Roof parallel
PV Generator Surface	33.2 m²

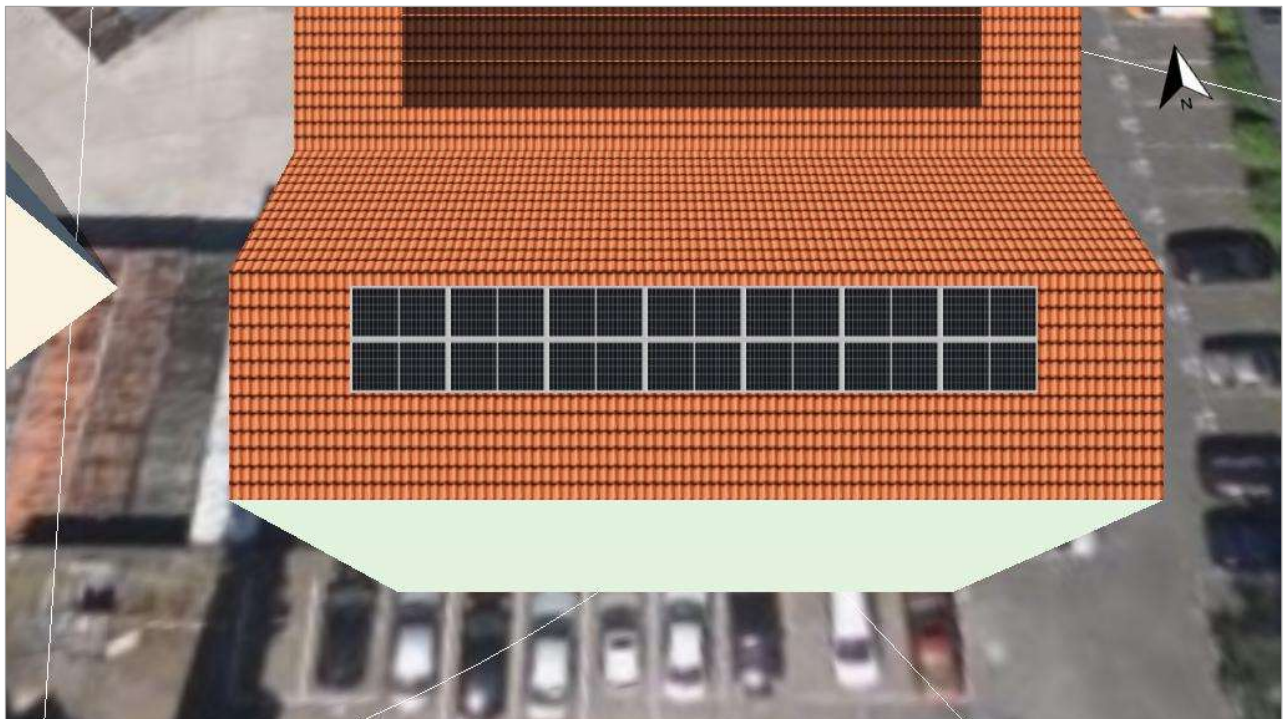


Figure: 13. Module Area - Building 06-Roof Area South

Horizon Line, 3D Design

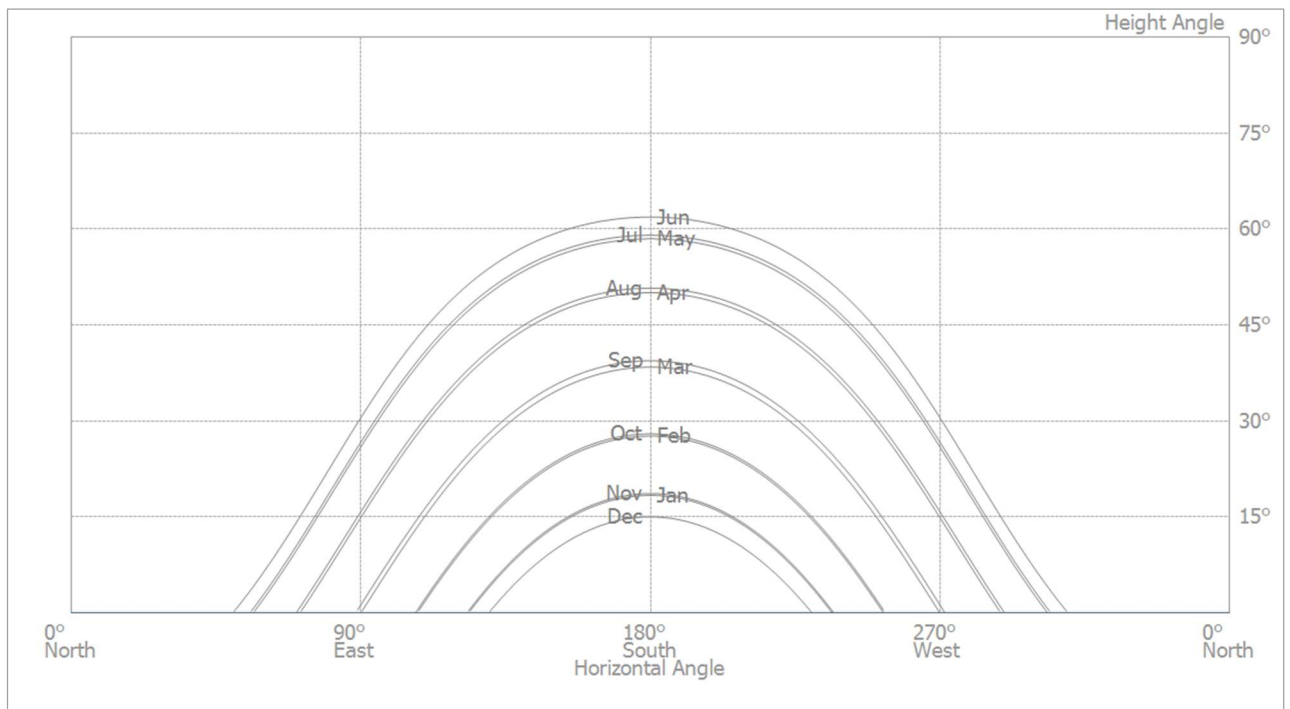


Figure: Horizon (3D Design)

Inverter configuration

Configuration 1

Module Area	Building 07-Roof Area Southwest
Inverter 1	
Model	Solis-80K-5G-PRO (v1)
Manufacturer	Ginlong (Solis)
Quantity	1
Sizing Factor	101.3 %
Configuration	MPP 1: 2 x 15
	MPP 2: 2 x 15
	MPP 3: 2 x 15
	MPP 4: 2 x 15
	MPP 5: 1 x 16
	MPP 6: 2 x 13

Configuration 2

Module Area	Building 01-Roof Area South
Inverter 1	
Model	Solis-20K (v2)
Manufacturer	Ginlong (Solis)
Quantity	1
Sizing Factor	105 %
Configuration	MPP 1: 1 x 10
	MPP 2: 1 x 11
	MPP 3: 1 x 10
	MPP 4: 1 x 11

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Configuration 3

Module Areas	Building 04-Roof Area South + Building 03-Roof Area South
Inverter 1	
Model	Solis-20K (v2)
Manufacturer	Ginlong (Solis)
Quantity	1
Sizing Factor	105 %
Configuration	MPP 1: 1 x 10
	MPP 2: 1 x 11
	MPP 3: 1 x 10
	MPP 4: 1 x 11

Configuration 4

Module Areas	Saw Tooth Roof 05-Roof Area Southwest + Saw Tooth Roof 06-Roof Area Southwest
Inverter 1	
Model	Solis-40K-5G (v1)
Manufacturer	Ginlong (Solis)
Quantity	1
Sizing Factor	120 %
Configuration	MPP 1: 2 x 12
	MPP 2: 1 x 12
	MPP 3: 2 x 15
	MPP 4: 2 x 15

Configuration 5

Module Areas	Saw Tooth Roof 03-Roof Area Southwest + Saw Tooth Roof 04-Roof Area Southwest
Inverter 1	
Model	Solis-30K-5G (v1)
Manufacturer	Ginlong (Solis)
Quantity	1
Sizing Factor	120 %
Configuration	MPP 1: 2 x 12
	MPP 2: 1 x 12
	MPP 3: 2 x 18

Configuration 6

Module Areas	Saw Tooth Roof 01-Roof Area Southwest + Saw Tooth Roof 02-Roof Area Southwest
Inverter 1	
Model	Solis-30K-5G (v1)
Manufacturer	Ginlong (Solis)
Quantity	1
Sizing Factor	120 %
Configuration	MPP 1: 2 x 12
	MPP 2: 1 x 12
	MPP 3: 2 x 18

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Configuration 7

Module Area	Building 02-Roof Area South
Inverter 1	
Model	S5-GR3P10K (v2)
Manufacturer	Ginlong (Solis)
Quantity	1
Sizing Factor	105 %
Configuration	MPP 1: 1 x 10
	MPP 2: 1 x 11

Configuration 8

Module Area	Building 05-Roof Area South
Inverter 1	
Model	S5-GR3P10K (v2)
Manufacturer	Ginlong (Solis)
Quantity	1
Sizing Factor	105 %
Configuration	MPP 1: 1 x 10
	MPP 2: 1 x 11

Configuration 9

Module Area	Building 06-Roof Area South
Inverter 1	
Model	Solis-1P7K-5G (v2)
Manufacturer	Ginlong (Solis)
Quantity	1
Sizing Factor	100 %
Configuration	MPP 1: 1 x 7
	MPP 2: 1 x 7

AC Mains

AC Mains

Number of Phases	3
Mains voltage between phase and neutral	230 V
Displacement Power Factor (cos phi)	+/- 1

Simulation Results

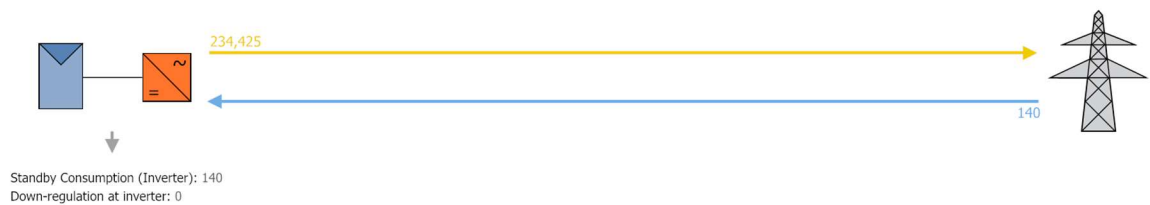
Results Total System

PV System

PV Generator Output	271.00 kWp
Spec. Annual Yield	864.52 kWh/kWp
Performance Ratio (PR)	83.53 %
Yield Reduction due to Shading	2.6 %
Grid Export	234,425 kWh/Year
Grid Export in the first year (incl. module degradation)	234,425 kWh/Year
Standby Consumption (Inverter)	140 kWh/Year
CO ₂ Emissions avoided	54,588 kg / year

Energy Flow Graph

Project: Florentia - new buildings



All values in kWh
Small deviations in the totals can occur due to rounding
created with PV*SOL

Figure: Energy flow

Plans and parts list

Circuit Diagram

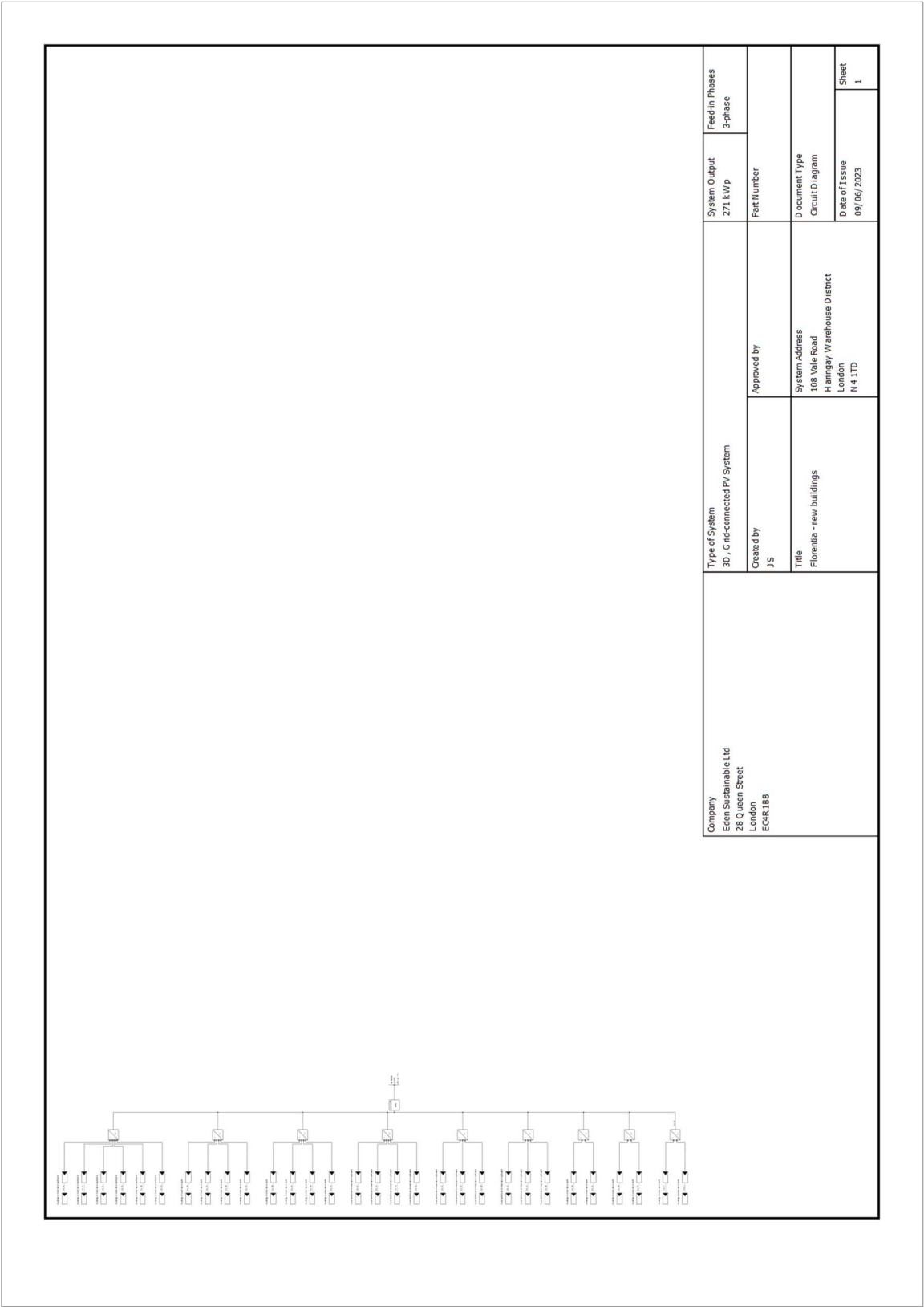


Figure: Circuit Diagram

Overview plan

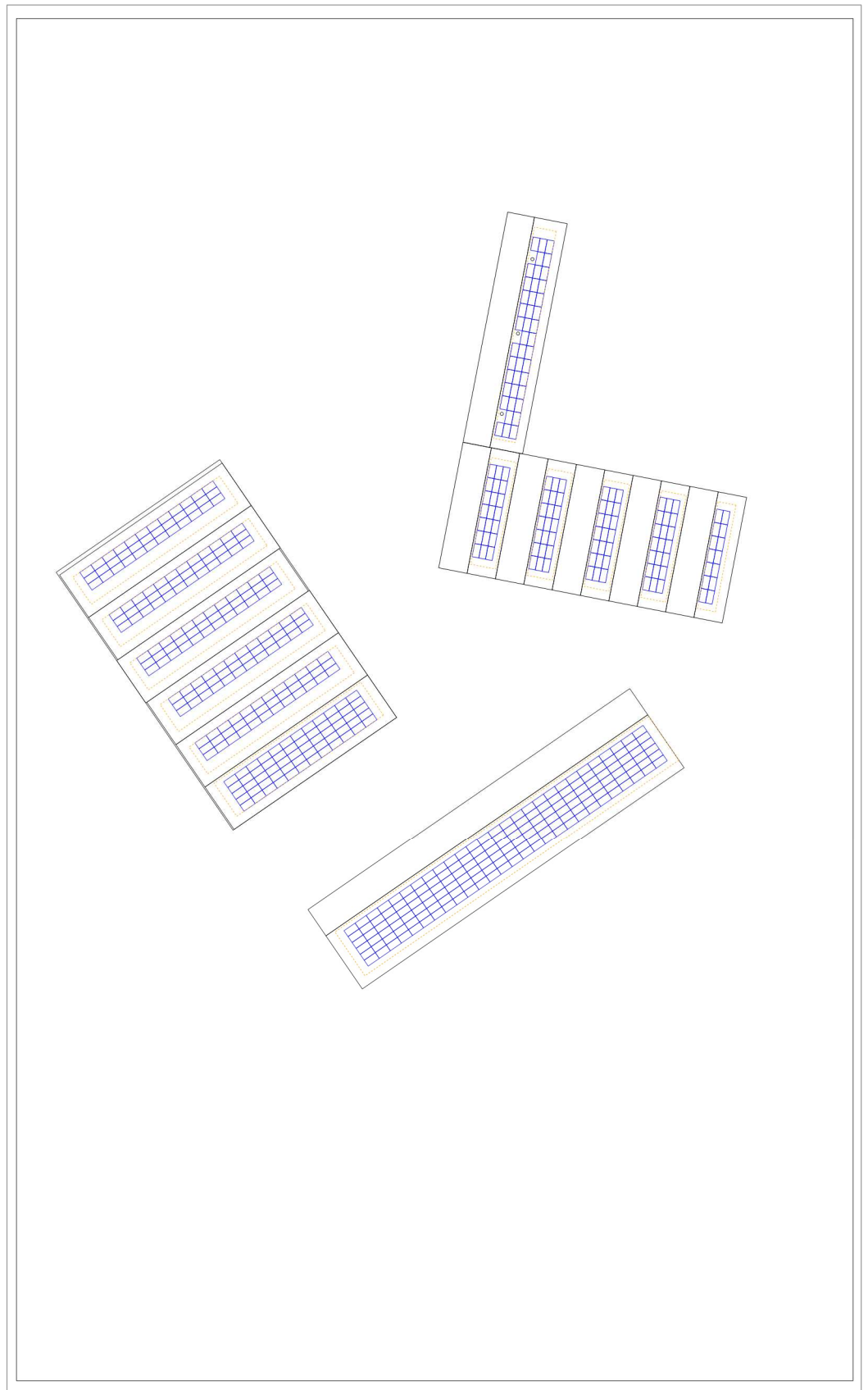


Figure: Overview plan

Dimensioning Plan

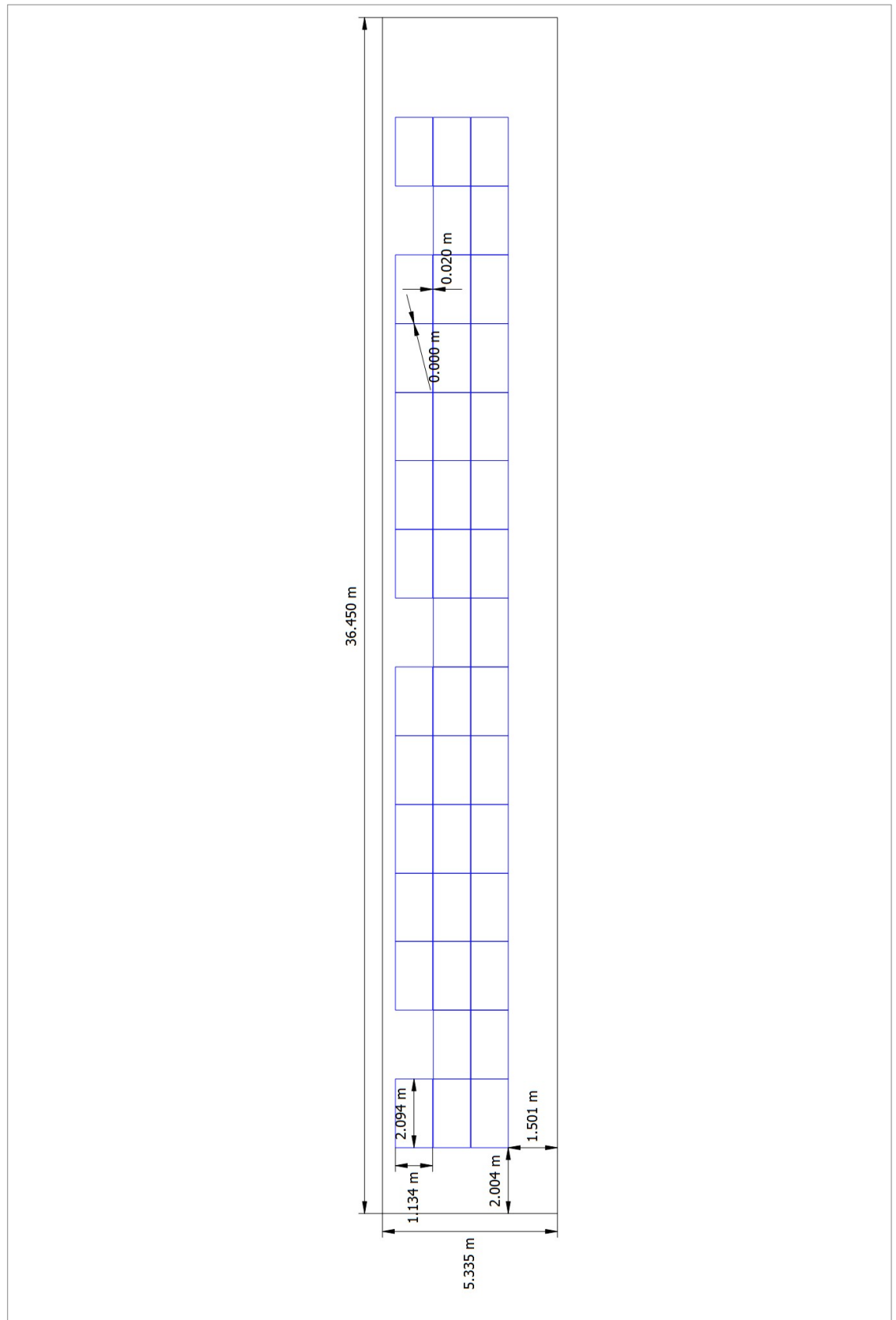


Figure: Building 01 - Roof Area South

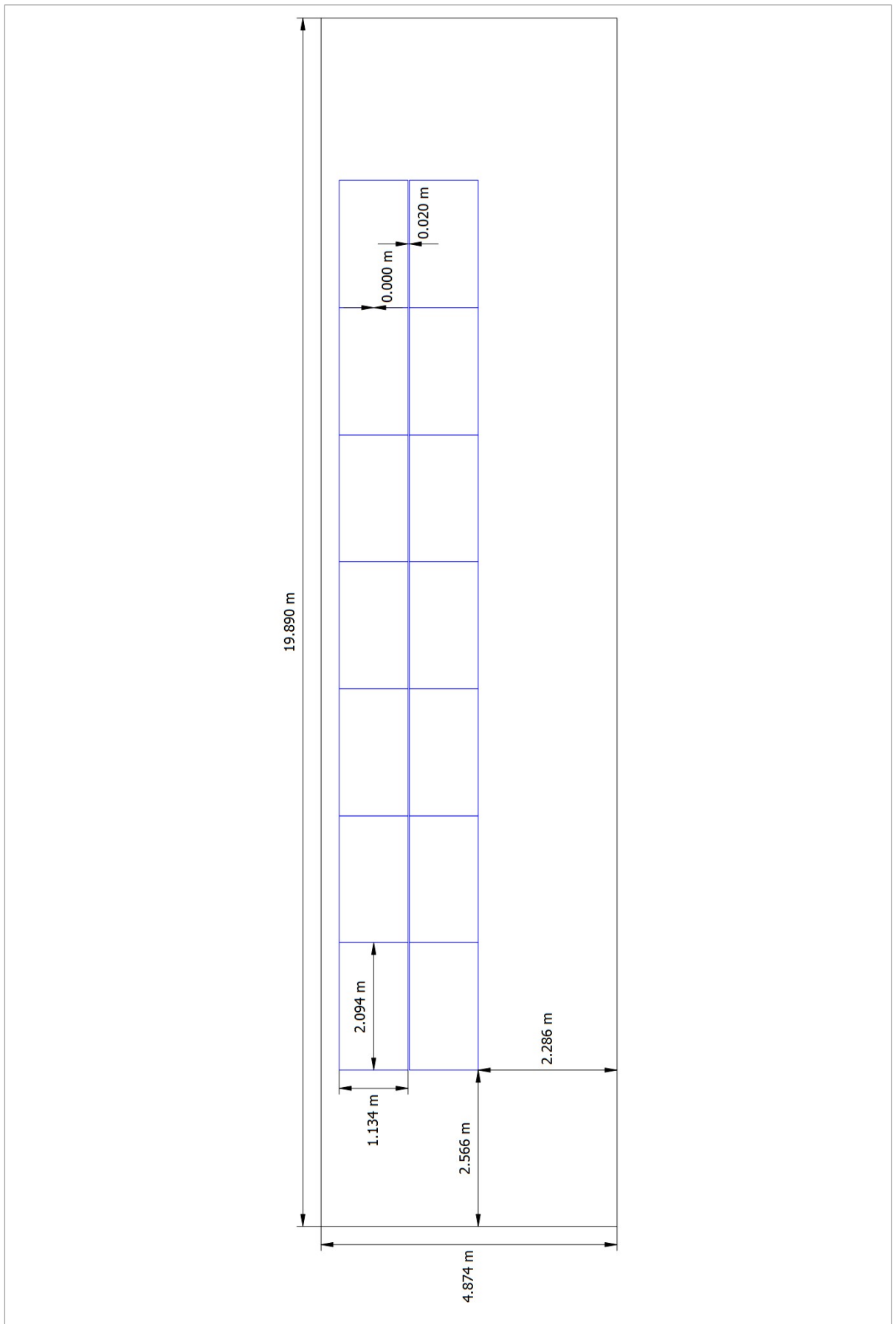


Figure: Building 06 - Roof Area South

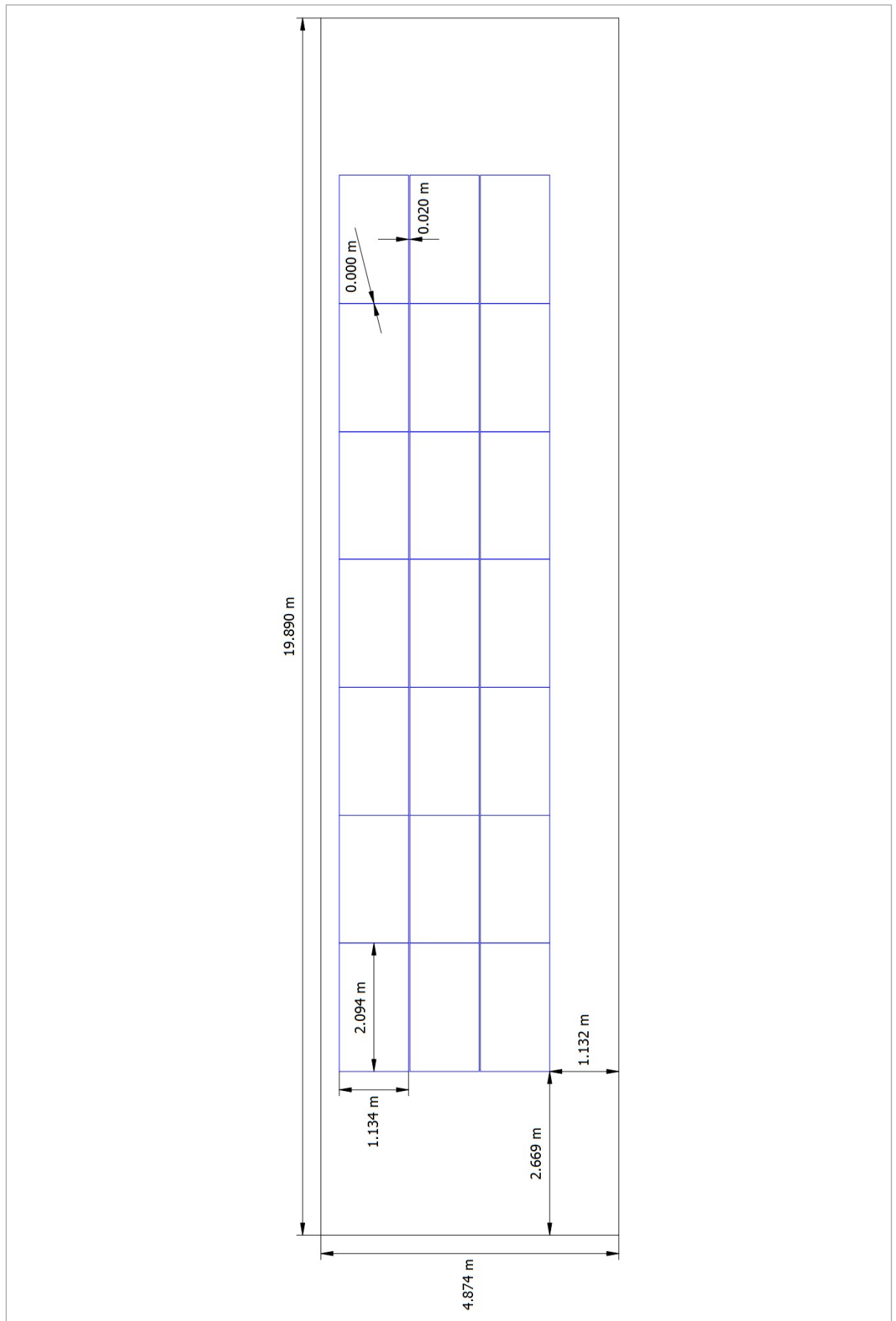


Figure: Building 02 - Roof Area South

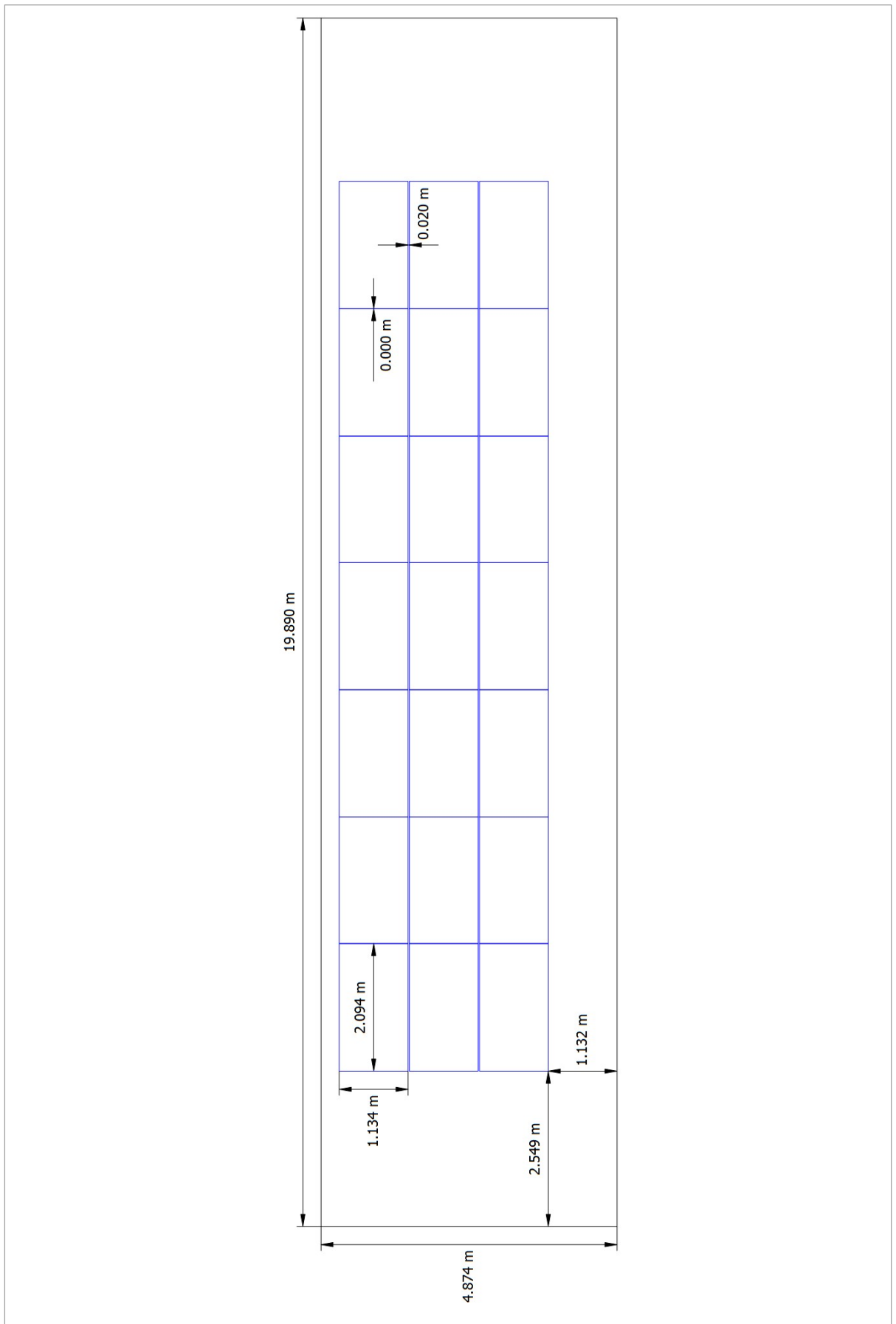


Figure: Building 03 - Roof Area South

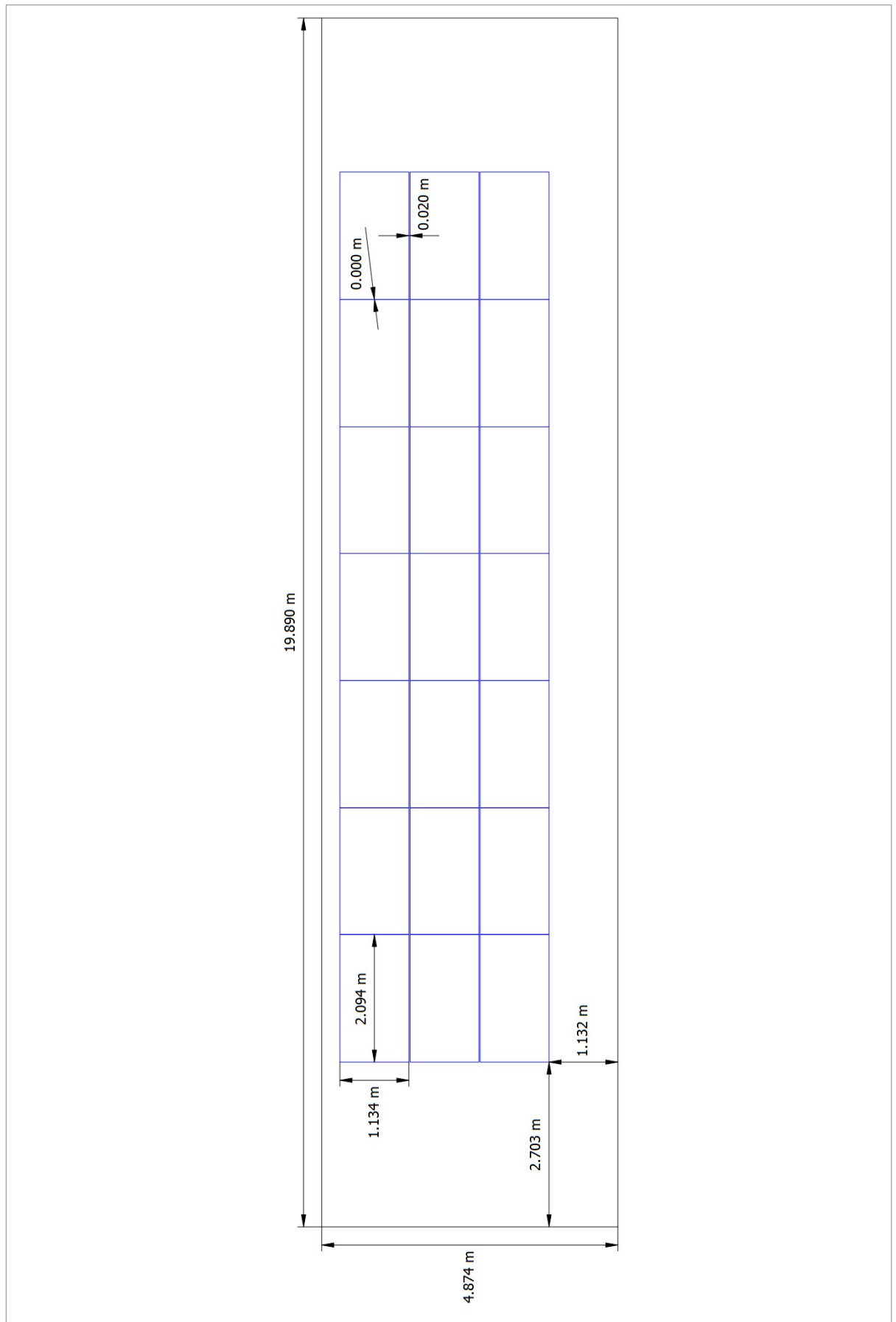


Figure: Building 04 - Roof Area South

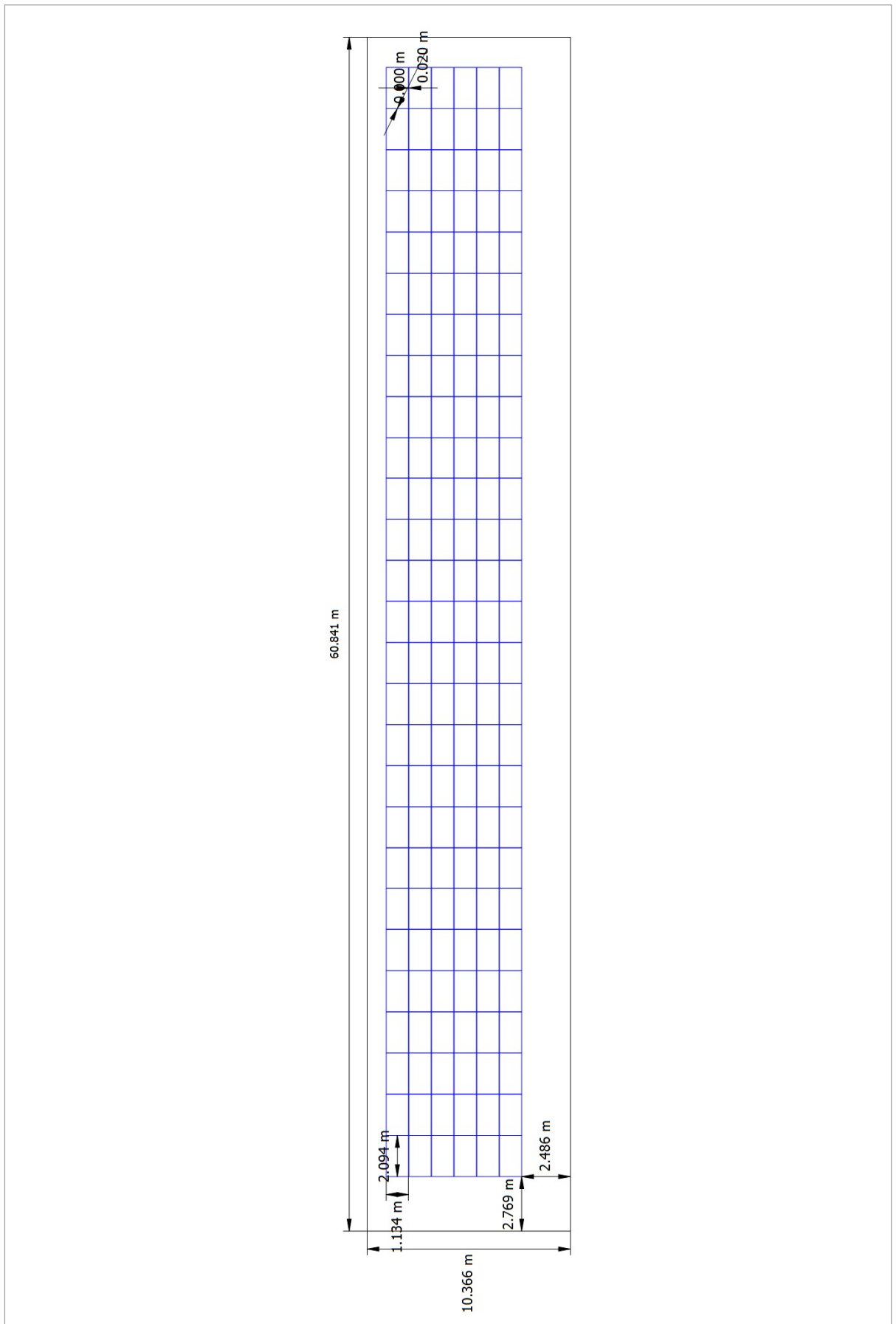


Figure: Building 07 - Roof Area Southwest

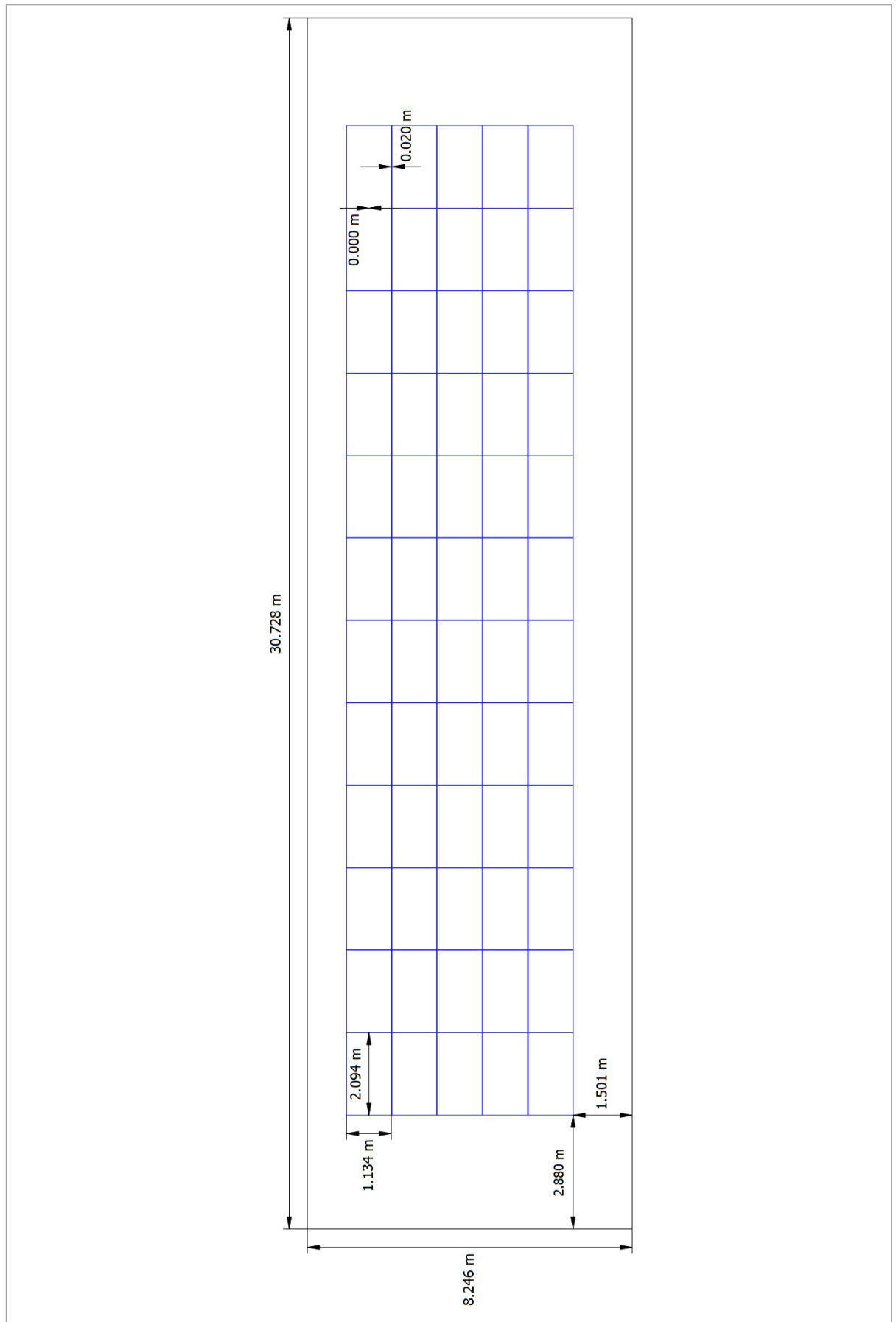


Figure: Saw Tooth Roof 06 - Roof Area Southwest

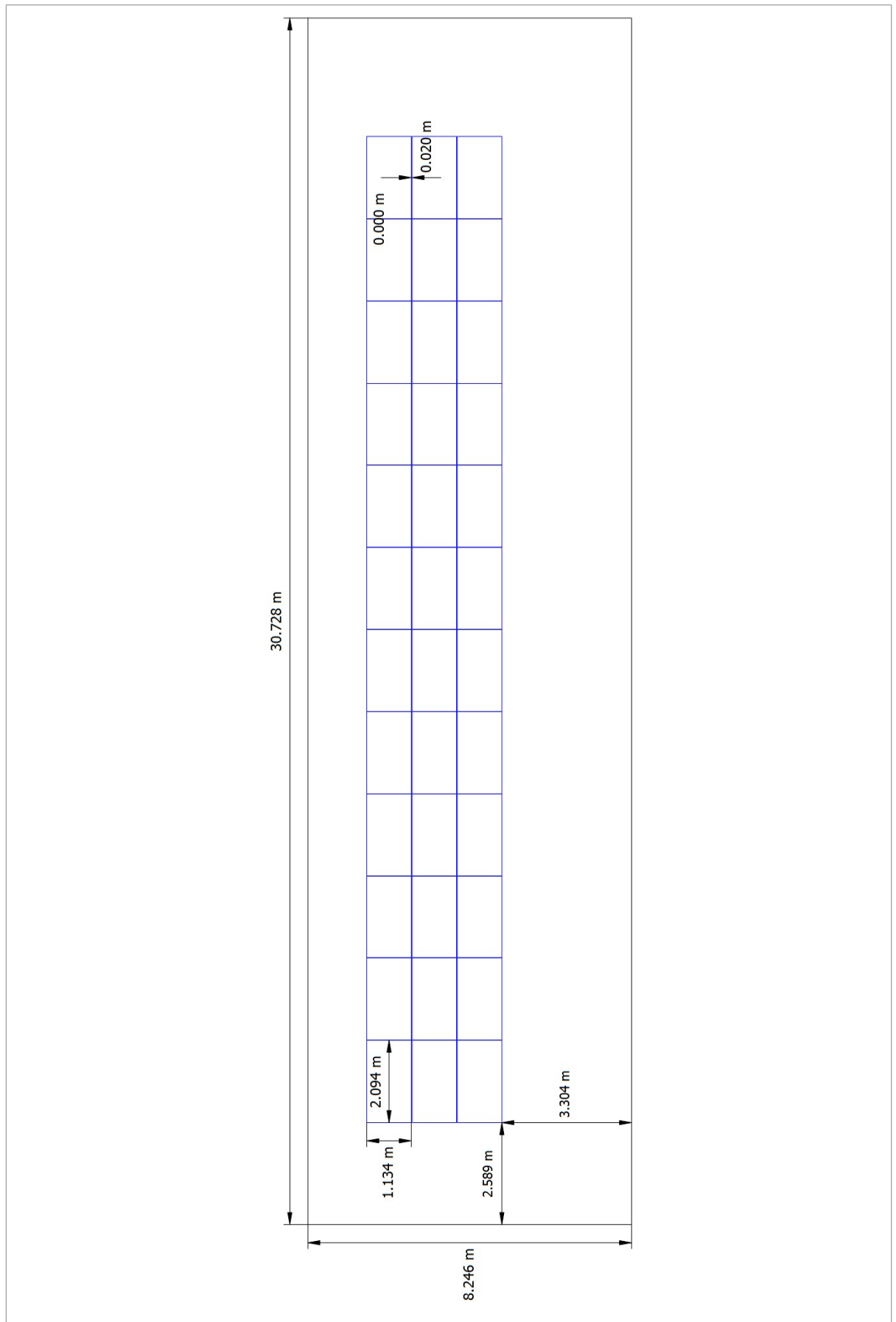


Figure: Saw Tooth Roof 05 - Roof Area Southwest

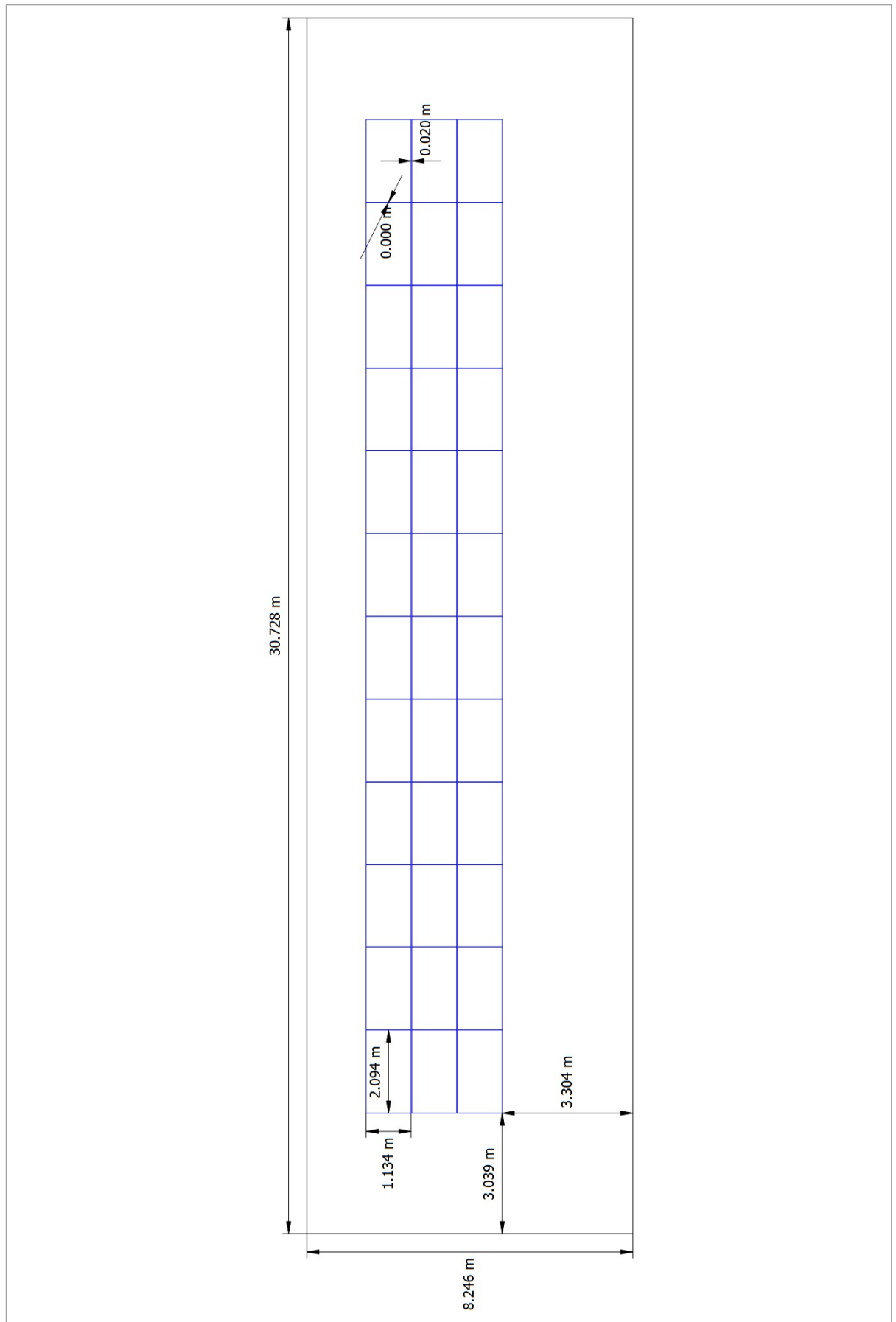


Figure: Saw Tooth Roof 04 - Roof Area Southwest

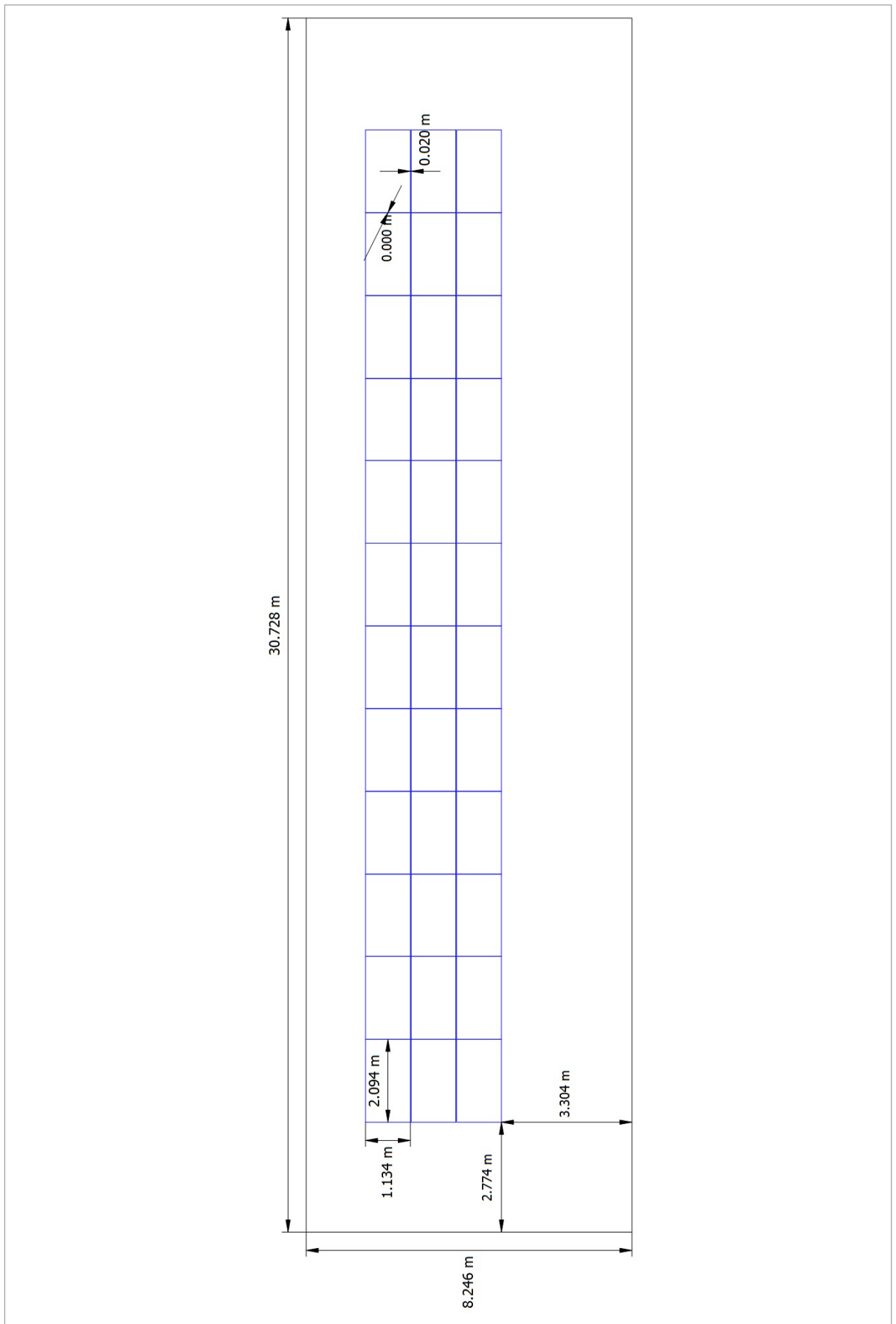


Figure: Saw Tooth Roof 03 - Roof Area Southwest

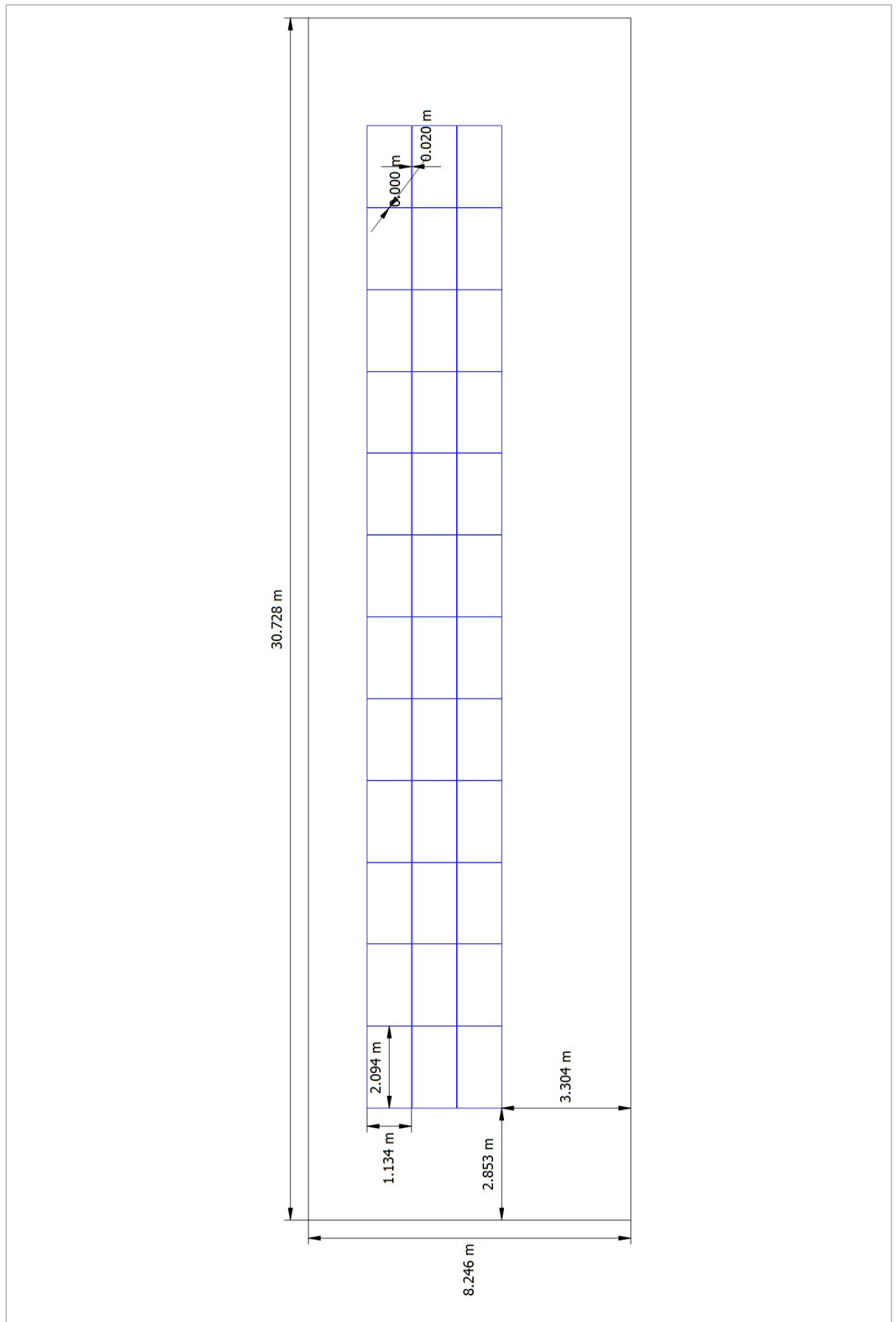


Figure: Saw Tooth Roof 02 - Roof Area Southwest

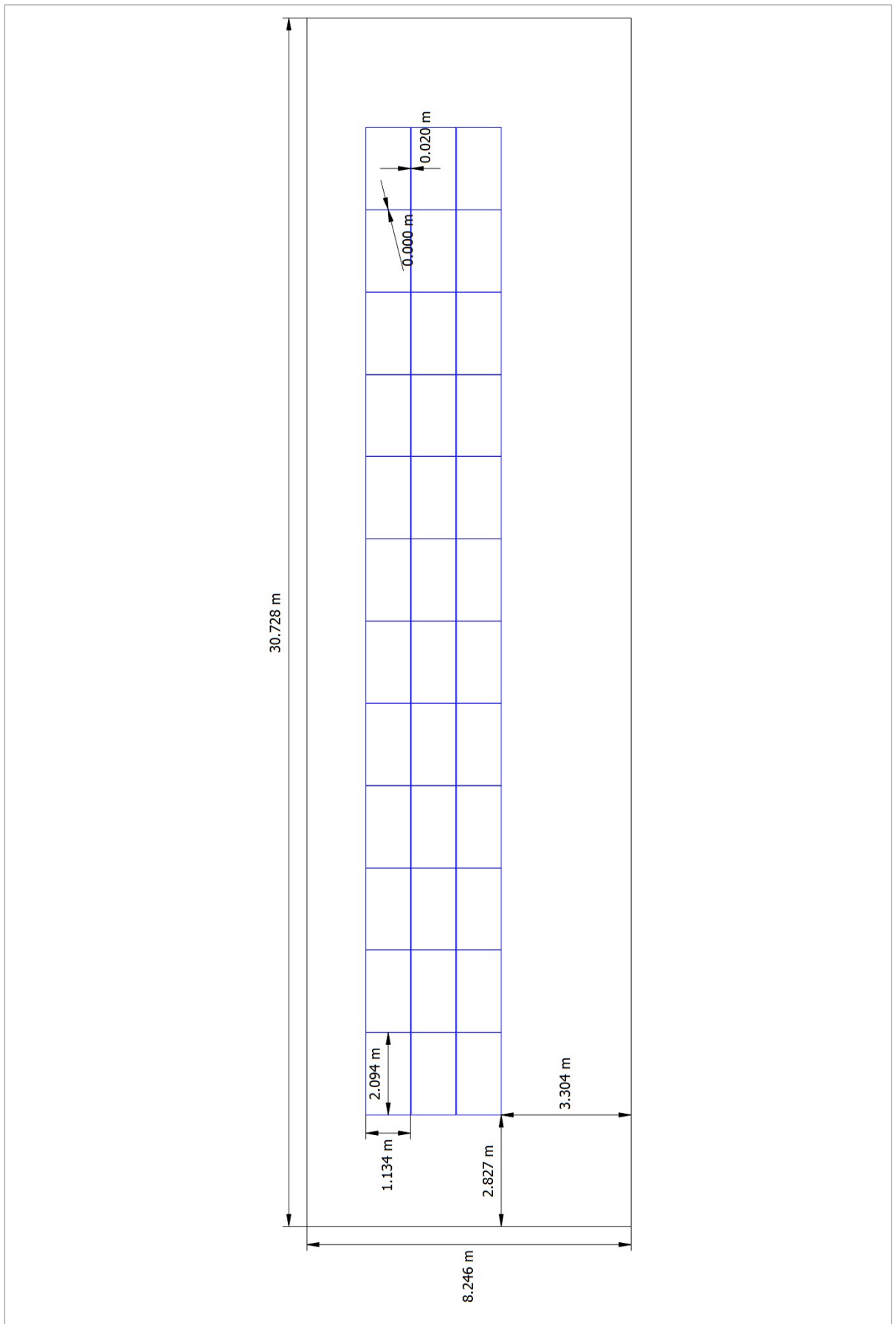


Figure: Saw Tooth Roof 01 - Roof Area Southwest

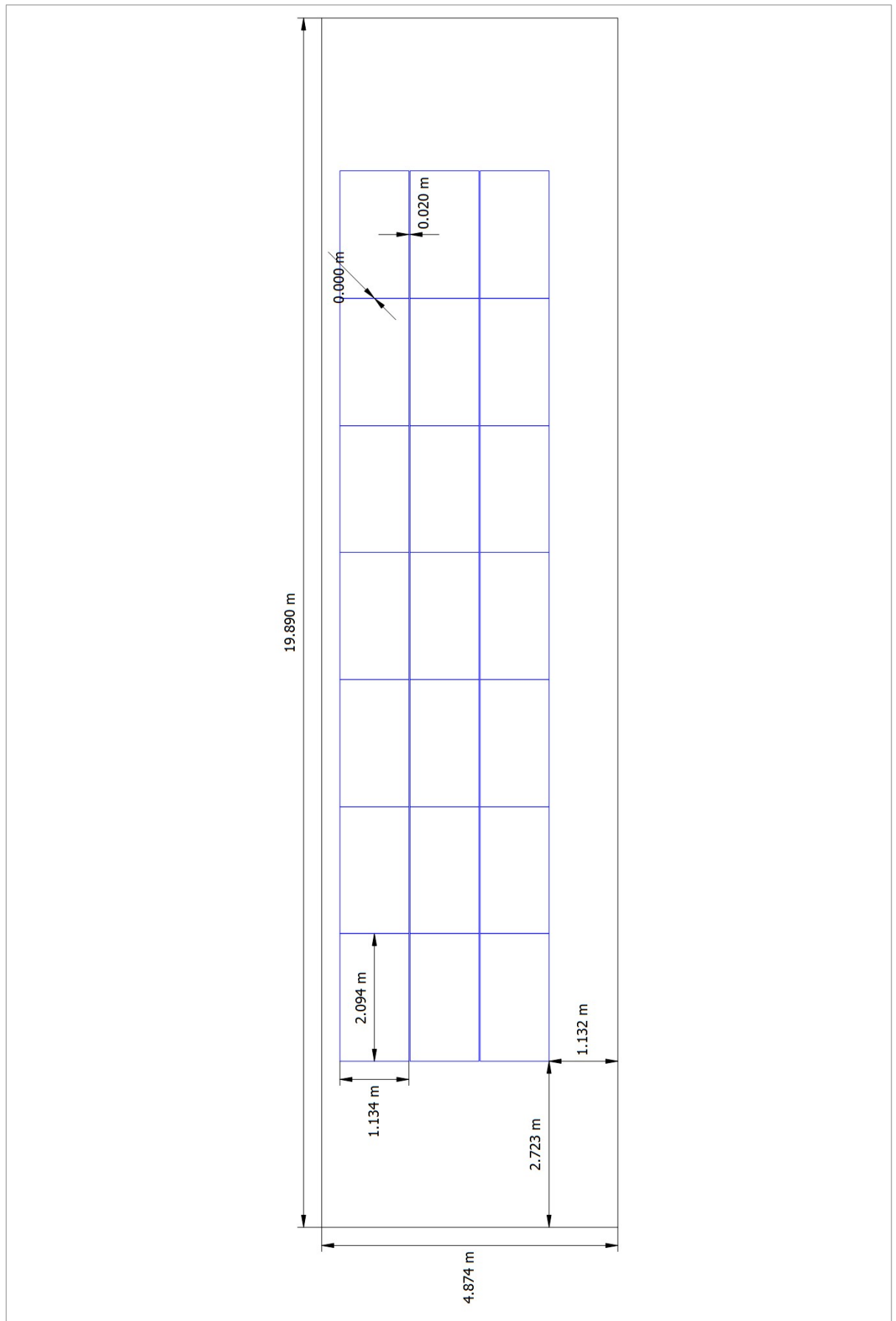


Figure: Building 05 - Roof Area South

String Plan

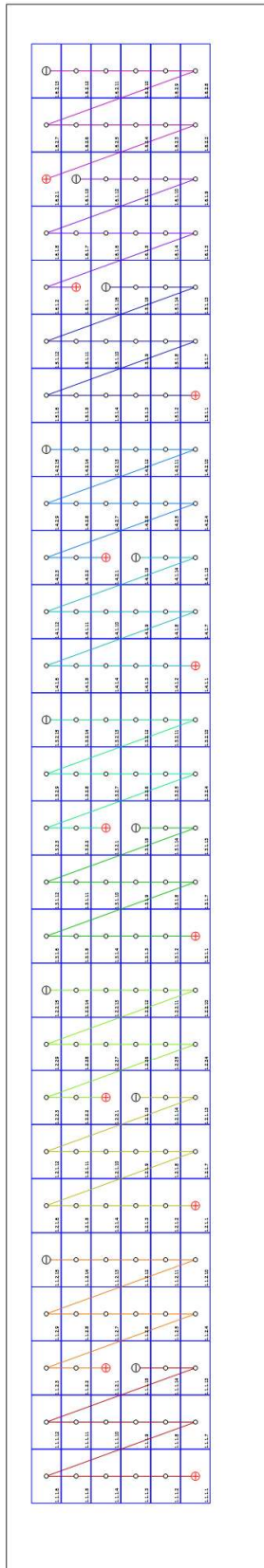


Figure: Building 07 - Roof Area Southwest

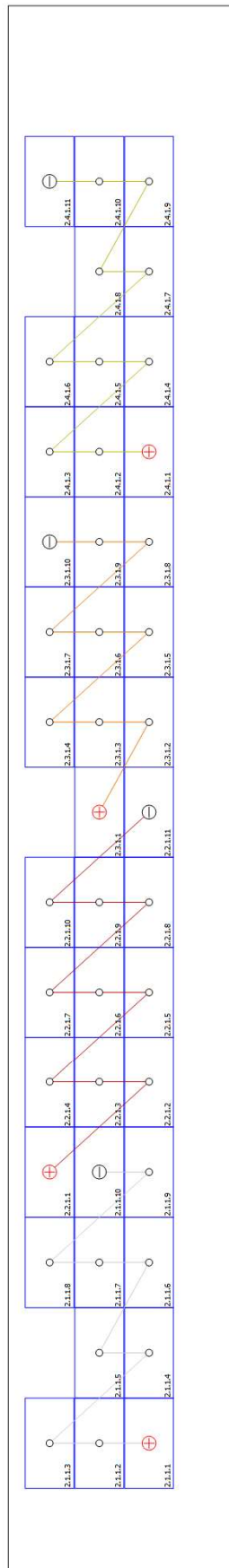


Figure: Building 01 - Roof Area South

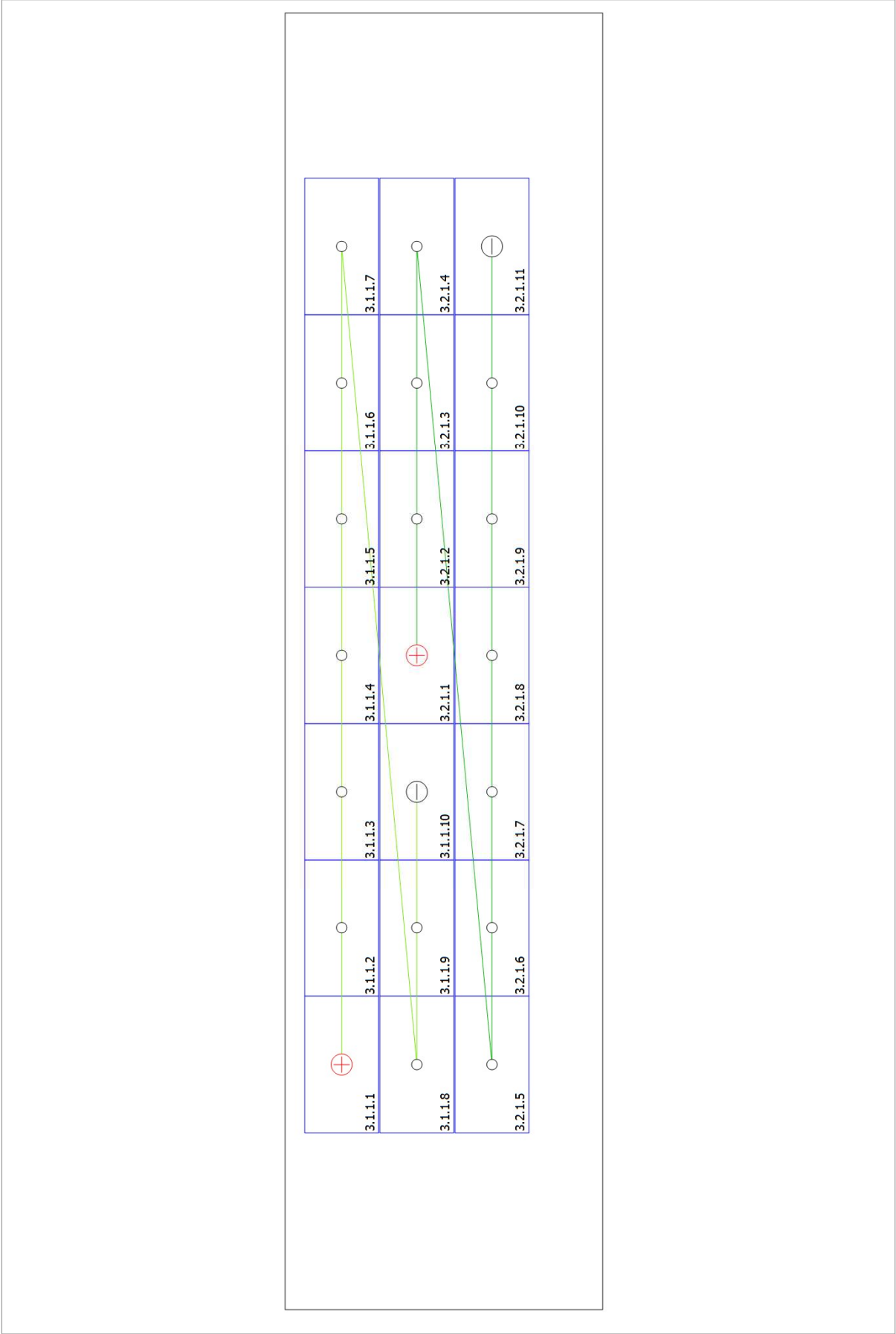


Figure: Building 04 - Roof Area South

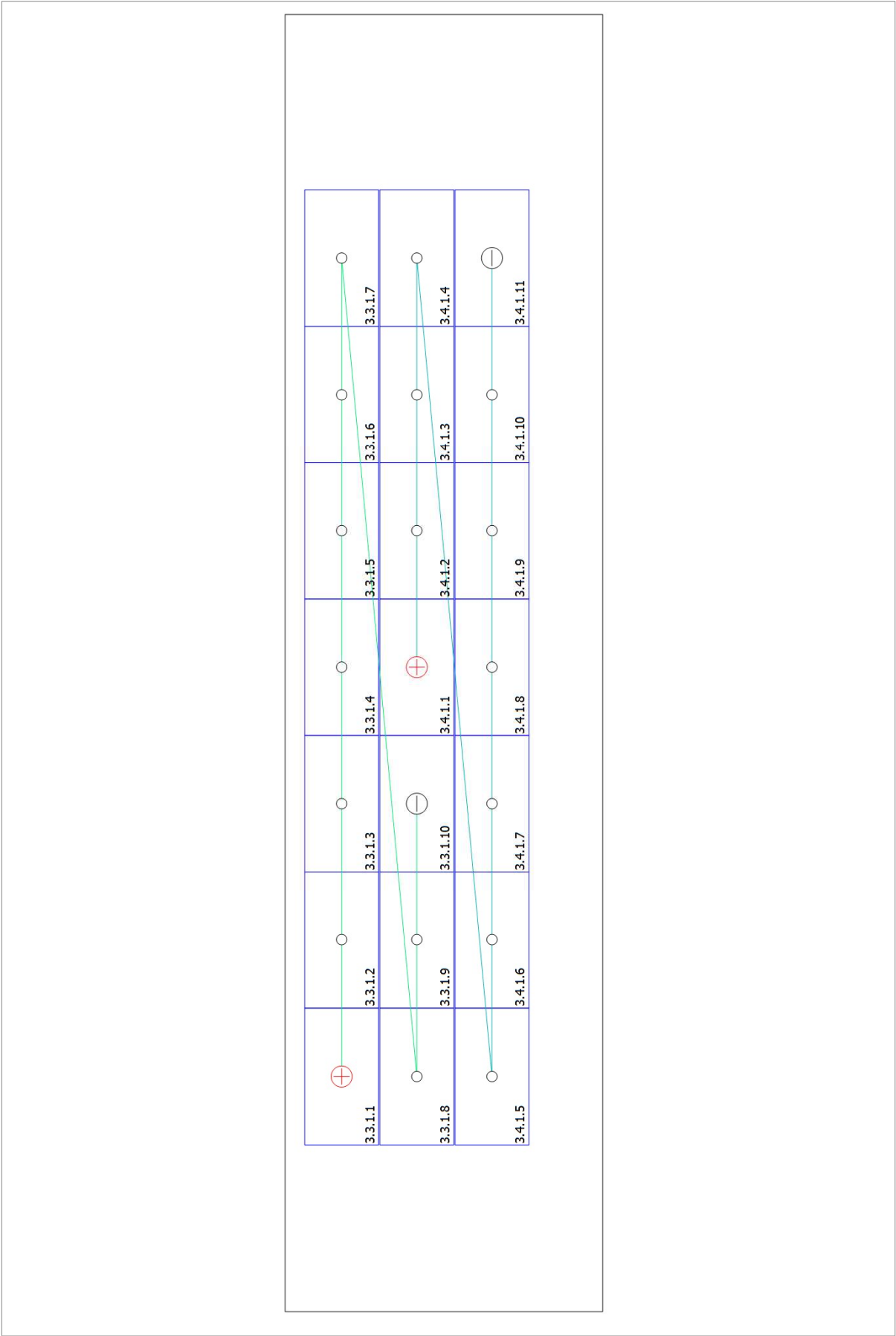


Figure: Building 03 - Roof Area South

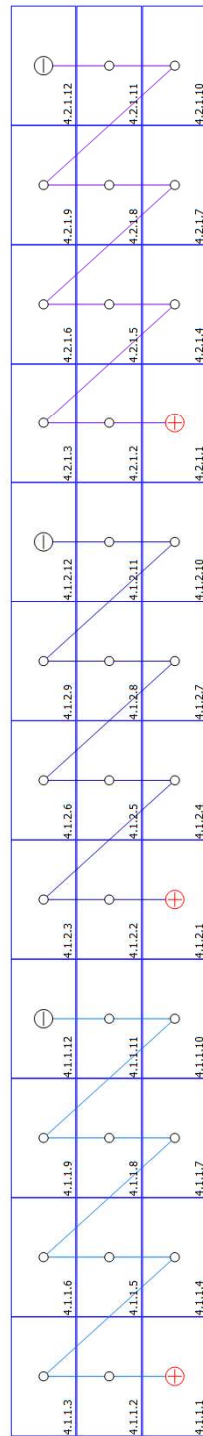


Figure: Saw Tooth Roof 05 - Roof Area Southwest

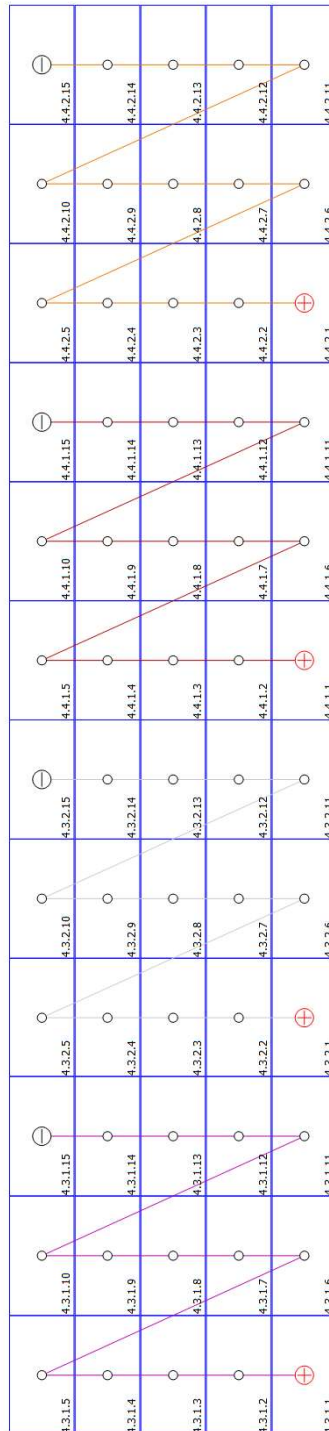


Figure: Saw Tooth Roof 06 - Roof Area Southwest

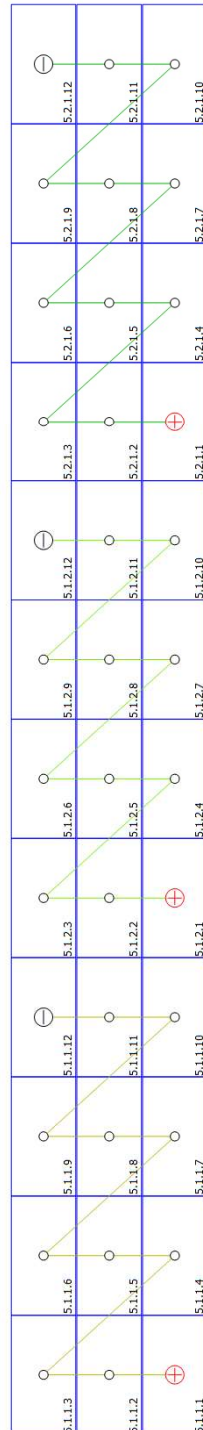


Figure: Saw Tooth Roof 03 - Roof Area Southwest

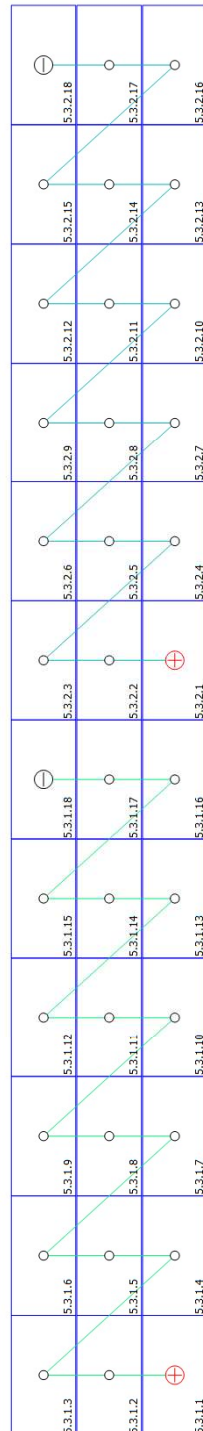


Figure: Saw Tooth Roof 04 - Roof Area Southwest

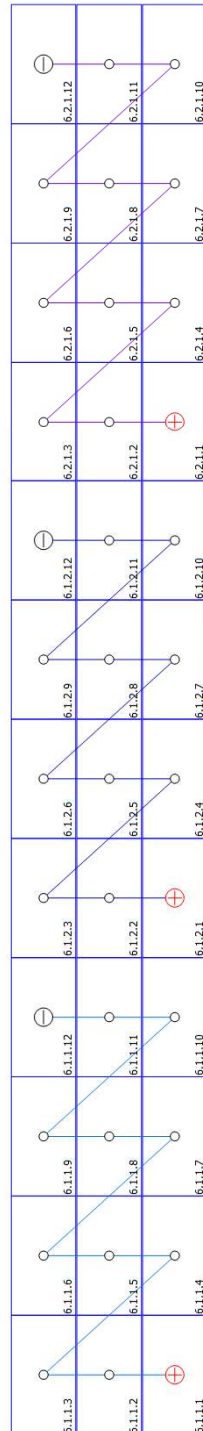


Figure: Saw Tooth Roof 01 - Roof Area Southwest

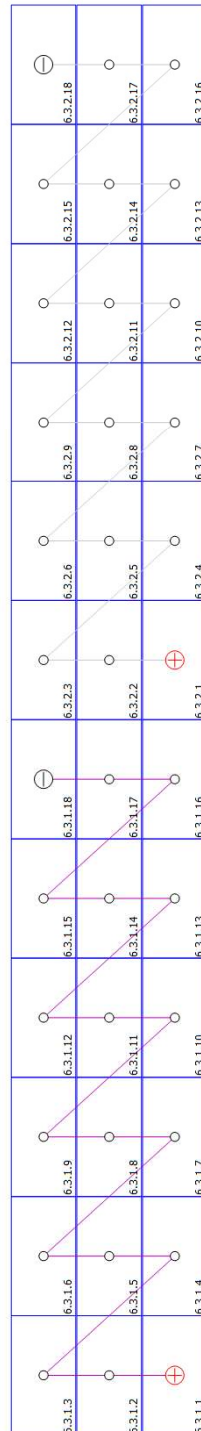


Figure: Saw Tooth Roof 02 - Roof Area Southwest

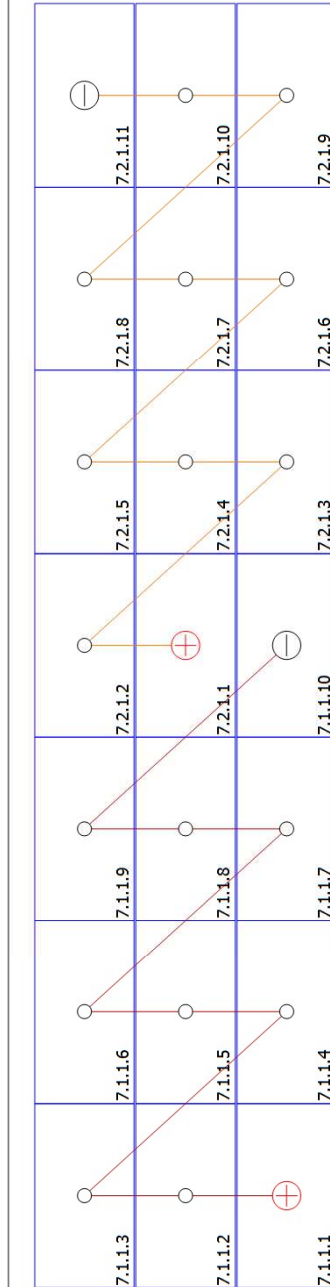


Figure: Building 02 - Roof Area South

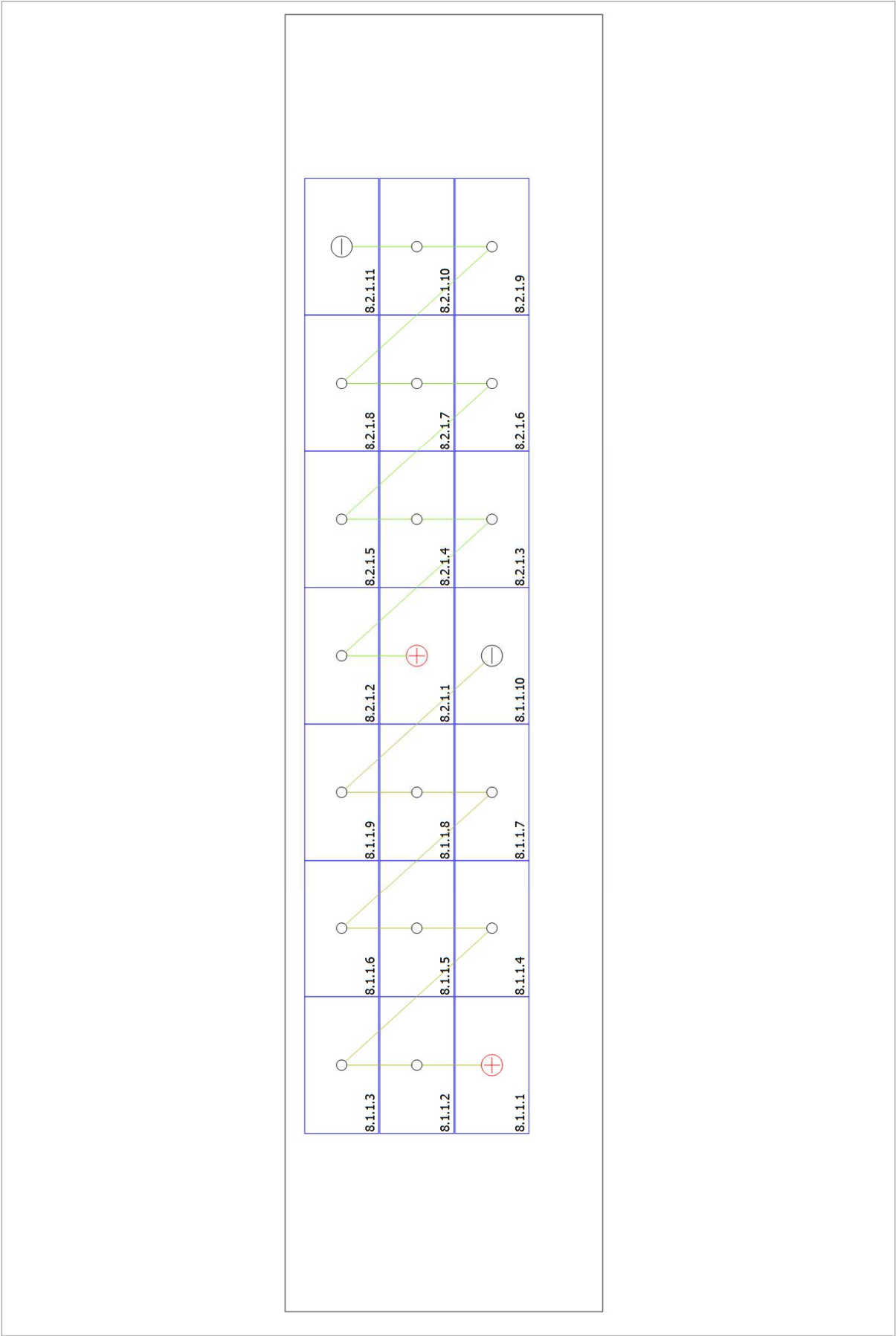


Figure: Building 05 - Roof Area South

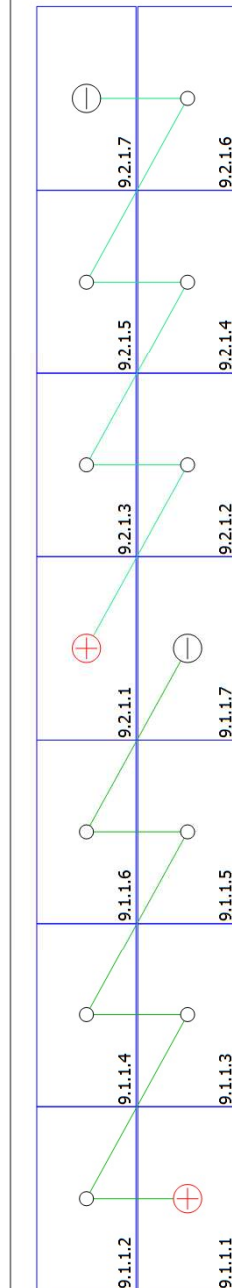


Figure: Building 06 - Roof Area South

Parts list

Parts list

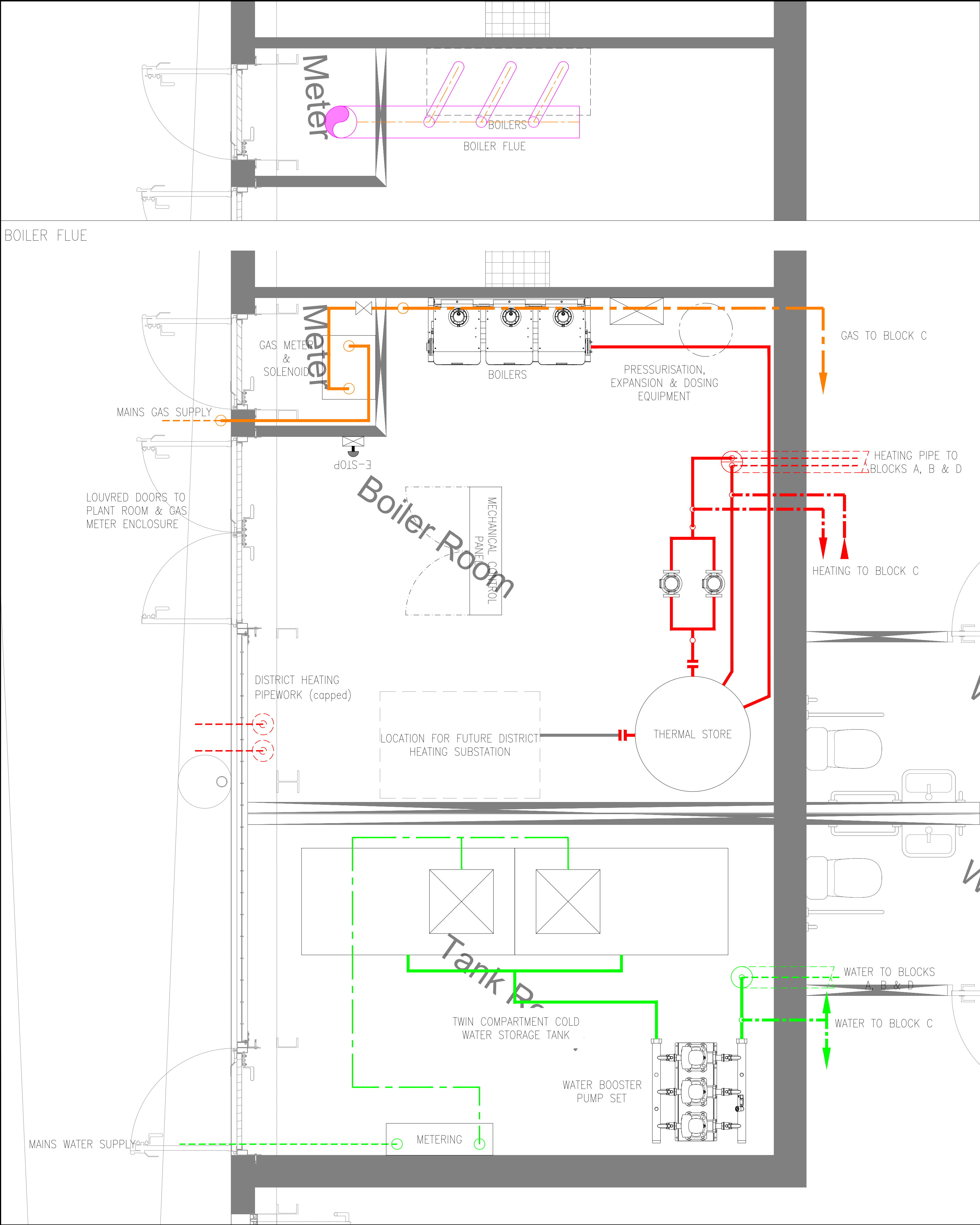
#	Type	Item number	Manufacturer	Name	Quantity	Unit
1	PV Module		JA Solar Holdings Co., Ltd.	JAM66S30-500/MR	542	Piece
2	Inverter		Ginlong (Solis)	Solis-80K-5G-PRO	1	Piece
3	Inverter		Ginlong (Solis)	Solis-20K	2	Piece
4	Inverter		Ginlong (Solis)	Solis-40K-5G	1	Piece
5	Inverter		Ginlong (Solis)	Solis-30K-5G	2	Piece
6	Inverter		Ginlong (Solis)	S5-GR3P10K	2	Piece
7	Inverter		Ginlong (Solis)	Solis-1P7K-5G	1	Piece
8	Components			Feed-in Meter	1	Piece

Screenshots, 3D Design Environment

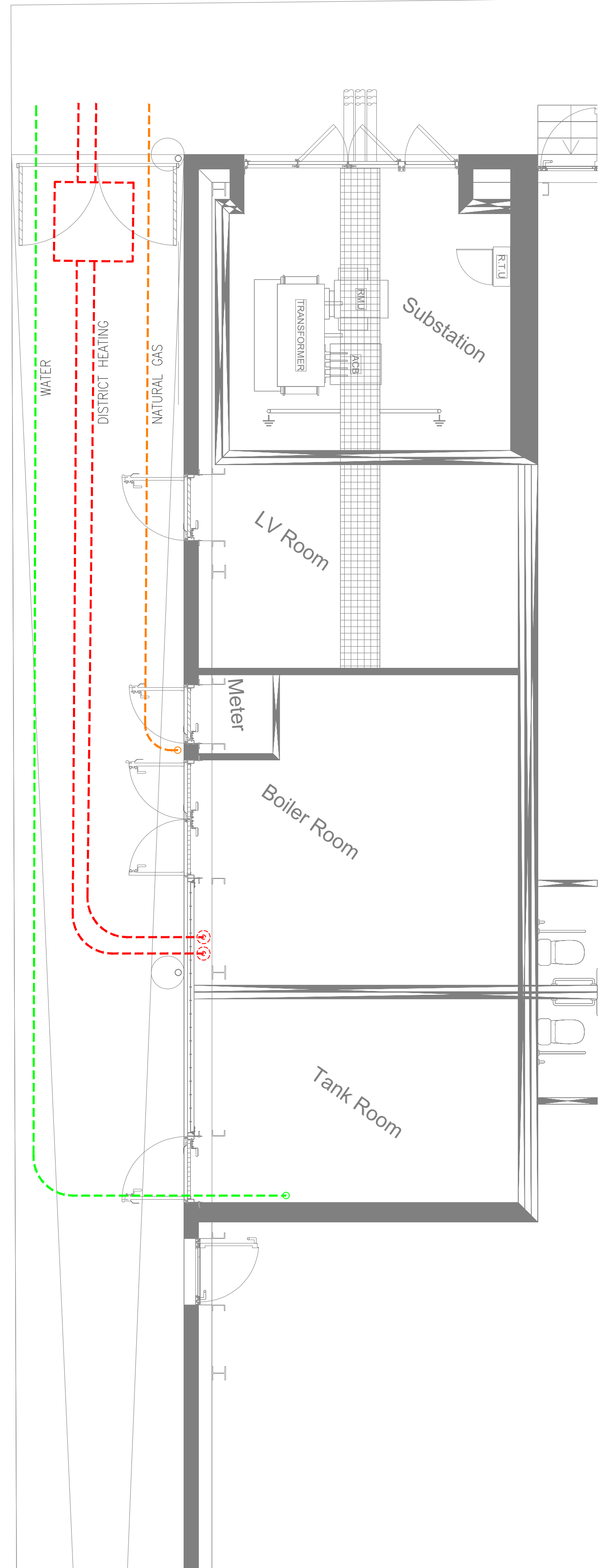


Figure: Screenshot02

APPENDIX 4 – PLANT ROOM DRAWING



LOCATION PLAN (1/50)



This drawing was produced using CAD and on no account should be amended by hand.
This drawing should not be scaled from.
All dimensions shown are for reference and should be checked on site prior to commencement of work.

NOTES
DRAWING IS DETAILED TO BSRIA STAGE 4A FOR ADOPTION BY CONTRACTOR UNDER A DESIGN & BUILD CONTRACT

C2	16-01-23	REVISED TO SUIT NEW LAYOUT	NB	DG	DGW
C1	13/10/22	CONTRACT ISSUE- STAGE 4A	NB	DG	DGW
REV	DATE		DRAWN	CHKD	APPRD



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PROJECT
FLORENTIA VILLAGE
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LONDON N4 1TD

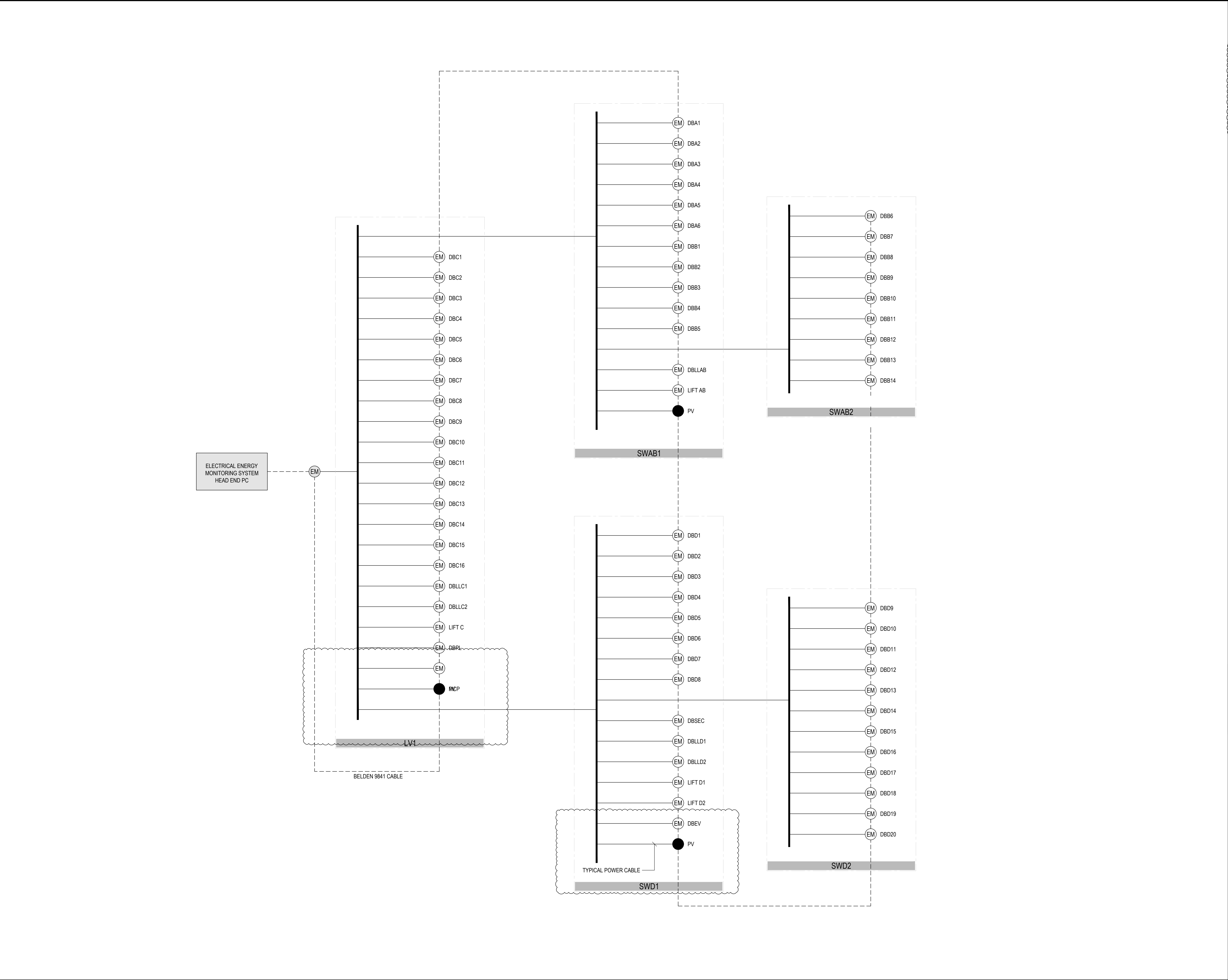
Drawing Title
**PLANT ROOM GENERAL
ARRANGEMENT**

Drawn NB	Date 01-22	Checked By DGW	Approved By DGW
Status CONTRACT ISSUE	Scale 1/20 @ A1	Drawing Number 21066-L-50-01	Revision C2

APPENDIX 5 – METERING STRATEGY

Refer to attached schematic drawings showing provisional metering positions (these are subject to detailed technical design and the input of specialist subcontractors during RIBA stages 4b/c & 5)

- Electricity- schematic drawing 21066-S-60-04
- Heat & water (typical) – schematic drawings 21066-S-50-02



This drawing was produced using CAD and on no account should be amended by hand.
This drawing should not be scaled from.
All dimensions shown are for reference and should be checked on site prior to commencement of work.

NOTES

- This drawing to be read in conjunction with all electrical drawings for this contract.
 - All services work to be carried out in accordance with relevant Engineering Specification for this contract.
 - Refer to drawing No 21066-L-60-00 for symbol/legend information.
 - Refer to drawing No 21066-L-60-01 for meter locations and type detail (single or three phase).
- DRAWING IS DETAILED TO BSRIA STAGE 4A FOR ADOPTION BY CONTRACTOR UNDER A DESIGN & BUILD CONTRACT

LEGEND

- EM ELECTRICITY UTILITY METER
- EM ONE WAY ELECTRICITY MID CHECK METER
- BI DIRECTIONAL ELECTRICITY CHECK METER

C2	13.10.2022	AS CLOUDED	RS	NB	DGW
C1	30.09.22	STAGE 4a CONTRACT ISSUE	RS	NB	DGW
REV	DATE		DRAWN	CHKD	APPRD



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Drawing Title
METERING SCHEMATIC

Drawn MW	Date 01-22	Checked By DGW	Approved By DGW
Status CONTRACT ISSUE	Scale NTS @ A1		
Drawing Number 21066-S-60-04	Revision C2		

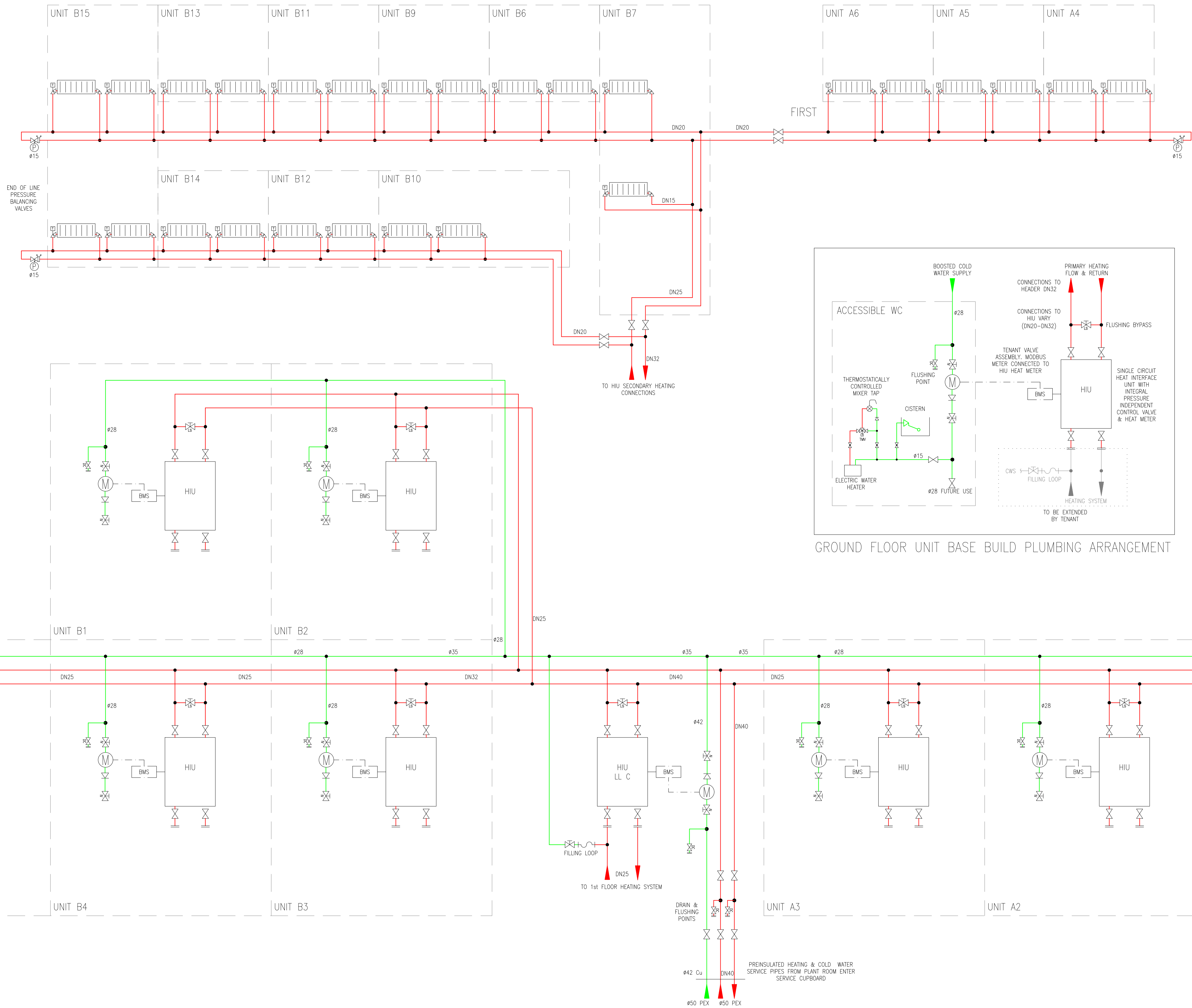
This drawing was produced using CAD and on no account should be amended by hand.
This drawing should not be scaled from.
All dimensions shown are for reference and should be checked on site prior to commencement of work.

GENERAL NOTES

1. THIS DRAWING IS DETAILED TO BSRIA STAGE 4A FOR ADOPTION BY CONTRACTOR UNDER A DESIGN & BUILD CONTRACT
2. NOT ALL COMPONENTS AND ELEMENTS REQUIRED ARE SHOWN. MANUFACTURER'S PARTICULAR INSTALLATION DETAILS SHOULD BE USED AND FOLLOWED
3. REFER TO WRITTEN SPECIFICATION FOR DETAILED REQUIREMENTS.

KEY

- ⊗ SERVICE VALVE
- ⊗ THERMOSTATIC SHOWER MIXER
- ⊗ PRESSURE REDUCING VALVE
- ⊗ DOUBLE CHECK VALVE
- ⊗ NON RETURN/CHECK VALVE
- ⊗ ISOLATION VALVE
- ⊗ SOLENOID OPERATED VALVE
- ⊗ THERMOSTATIC RADIATOR VALVE
- ⊗ PRESSURE RELIEF VALVE
- ◇ AUTOMATIC AIR VENT
- ⊗ STRAINER
- ⊗ PUMP
- ⊗ EXPANSION VESSEL
- ⊗ DRAIN COCK
- ⊗ THERMOSTATIC MIXER c/w NRV & STRAINERS
- ⊗ SELF REGULATING TEMPERATURE CONTROL VALVE
- ⊗ METER
- ⊗ CONTROL SENSOR (temp, pressure, etc)
- ⊗ CISTERN WITH FILLER MECHANISM
- ⊗ FLEXIBLE CONNECTOR
- ⊗ SERVICE VALVE



C1	10-2022	CONTRACT ISSUE	NB	DW	DGW
REV	DATE		DRAWN	CHKD	APPRD

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Drawing Title
**BLOCKS A & B PIPED
SERVICES SCHEMATIC**

Drawn NB	Date 01-22	Checked By DGW	Approved By DGW
Status CONTRACT ISSUE	Scale nts @ A1		
Drawing Number 21066-S-50-02	Revision C1		