

Lysander Ave, Cosford, Shifnal TF11 8UP

Project Name: RAF Museum Cosford

05/12/2023

Your PV system

Address of Installation

Lysander Ave, Cosford, Shifnal TF11 8UP



Project Overview

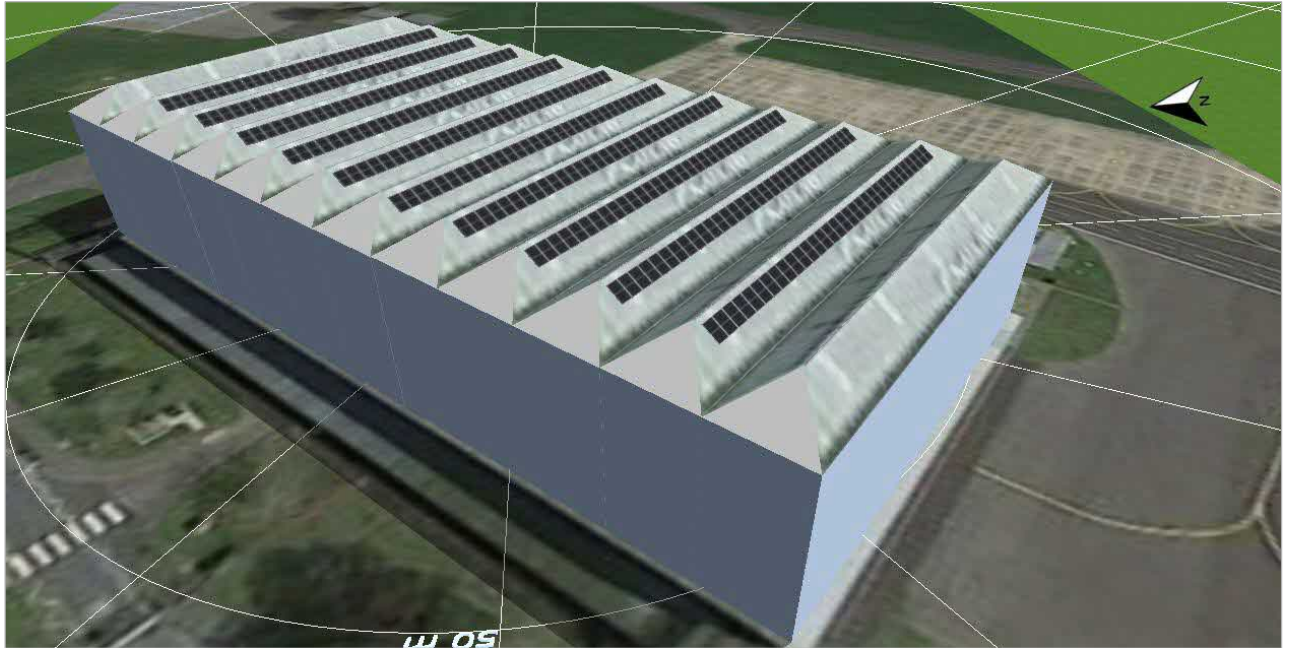


Figure: Overview Image, 3D Design

PV System

3D, Grid-connected PV System with Electrical Appliances

Climate Data	Midlands (SAP 2012), GBR (-)
Values source	SAP 2012
PV Generator Output	134.4 kWp
PV Generator Surface	624.9 m ²
Number of PV Modules	320
Number of Inverters	3

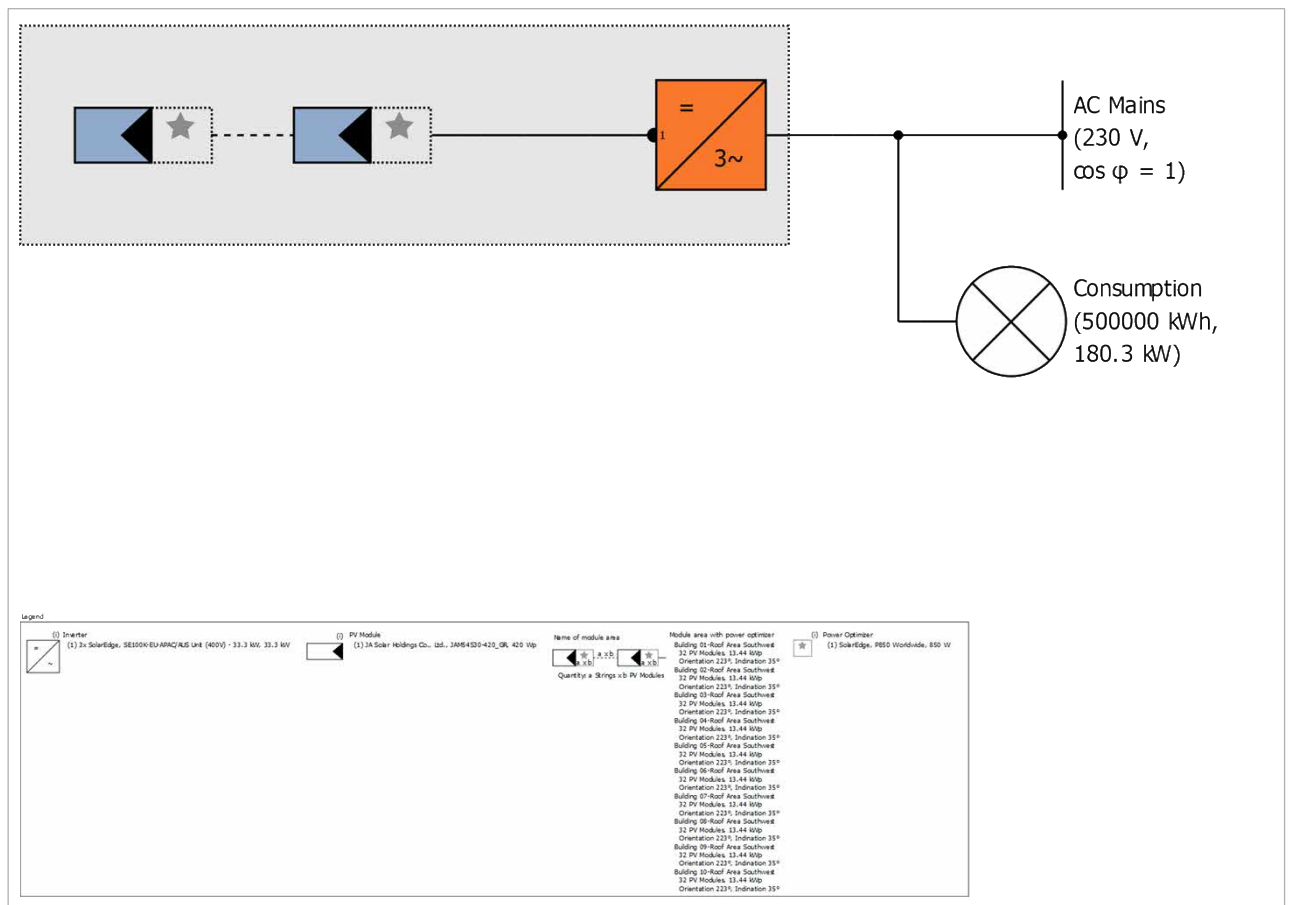


Figure: Schematic diagram

Production Forecast

Production Forecast

PV Generator Output	134.40 kWp
Spec. Annual Yield	969.68 kWh/kWp
Performance Ratio (PR)	93.25 %
Yield Reduction due to Shading	3.1 %
PV Generator Energy (AC grid)	130,404 kWh/Year
Own Consumption	124,678 kWh/Year
Clipping at Feed-in Point	0 kWh/Year
Grid Export	3,346 kWh/Year
Own Power Consumption	97.4 %
CO ₂ Emissions avoided	61,253 kg / year
Level of Self-sufficiency	24.9 %

Financial Analysis

Your Gain

Total investment costs	106,581.74 £
Internal Rate of Return (IRR)	49.75 %
Amortization Period	2.2 Years
Electricity Production Costs	0.0535 £/kWh
Energy Balance/Feed-in Concept	Surplus Feed-in

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 with Electrical Appliances
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Climate Data

Location	Midlands (SAP 2012), GBR (-)
Values source	SAP 2012
Resolution of the data	1 h
Simulation models used:	
- Diffuse Irradiation onto Horizontal Plane	Hofmann
- Irradiance onto tilted surface	Hay & Davies

Consumption

Total Consumption	500000 kWh
Department store 11000 m ² (with air conditioning)	500000 kWh
Load Peak	180.3 kW

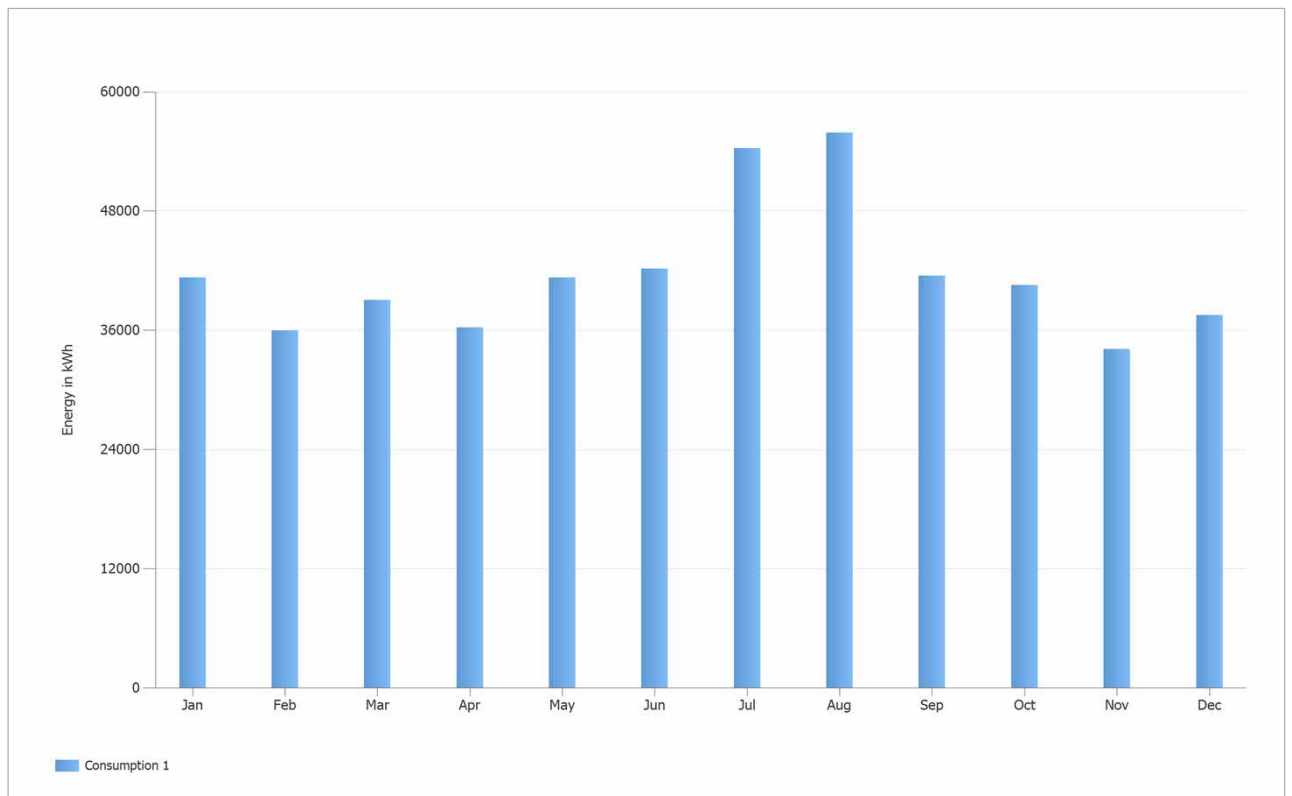


Figure: Consumption

Module Areas

1. Module Area - Building 01-Roof Area Southwest

PV Generator, 1. Module Area - Building 01-Roof Area Southwest

Name	Building 01-Roof Area Southwest
PV Modules	32 x JAM54S30-420_GR (v1)
Manufacturer	JA Solar Holdings Co., Ltd.
Inclination	35 °
Orientation	Southwest 223 °
Installation Type	Roof parallel
PV Generator Surface	62.5 m ²

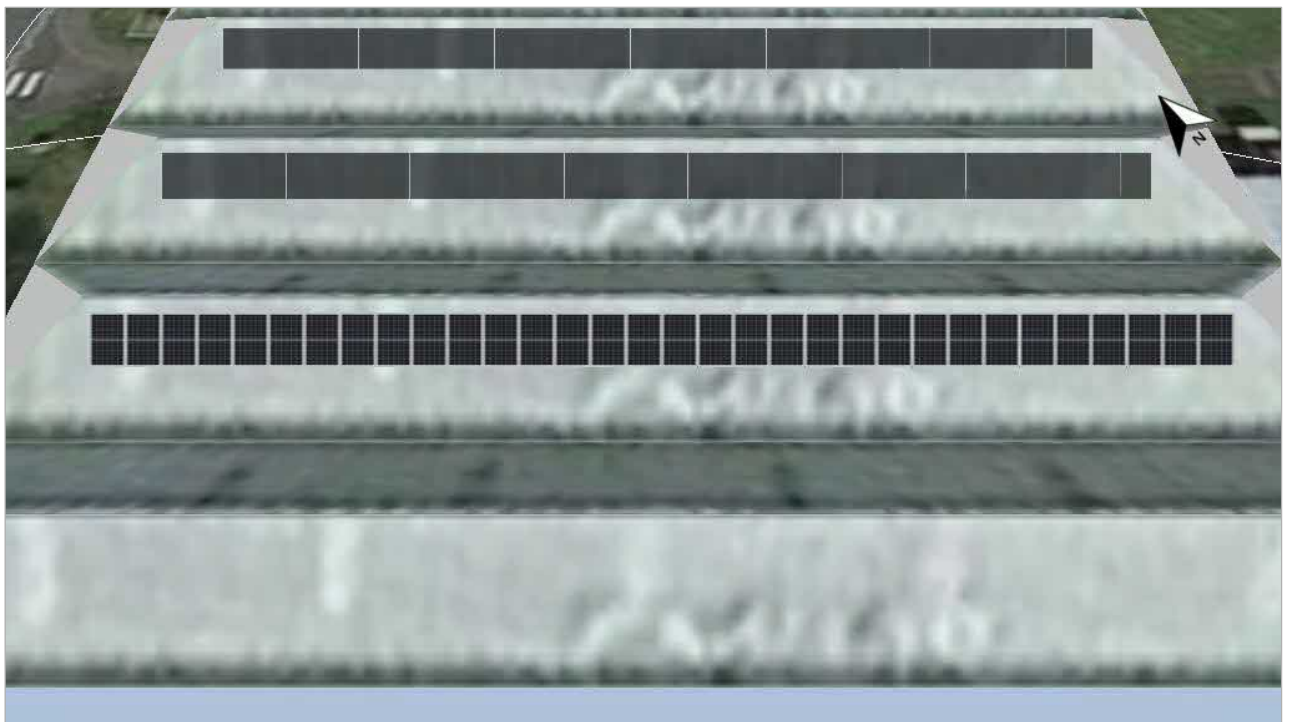


Figure: 1. Module Area - Building 01-Roof Area Southwest

2. Module Area - Building 02-Roof Area Southwest

PV Generator, 2. Module Area - Building 02-Roof Area Southwest

Name	Building 02-Roof Area Southwest
PV Modules	32 x JAM54S30-420_GR (v1)
Manufacturer	JA Solar Holdings Co., Ltd.
Inclination	35 °
Orientation	Southwest 223 °
Installation Type	Roof parallel
PV Generator Surface	62.5 m ²

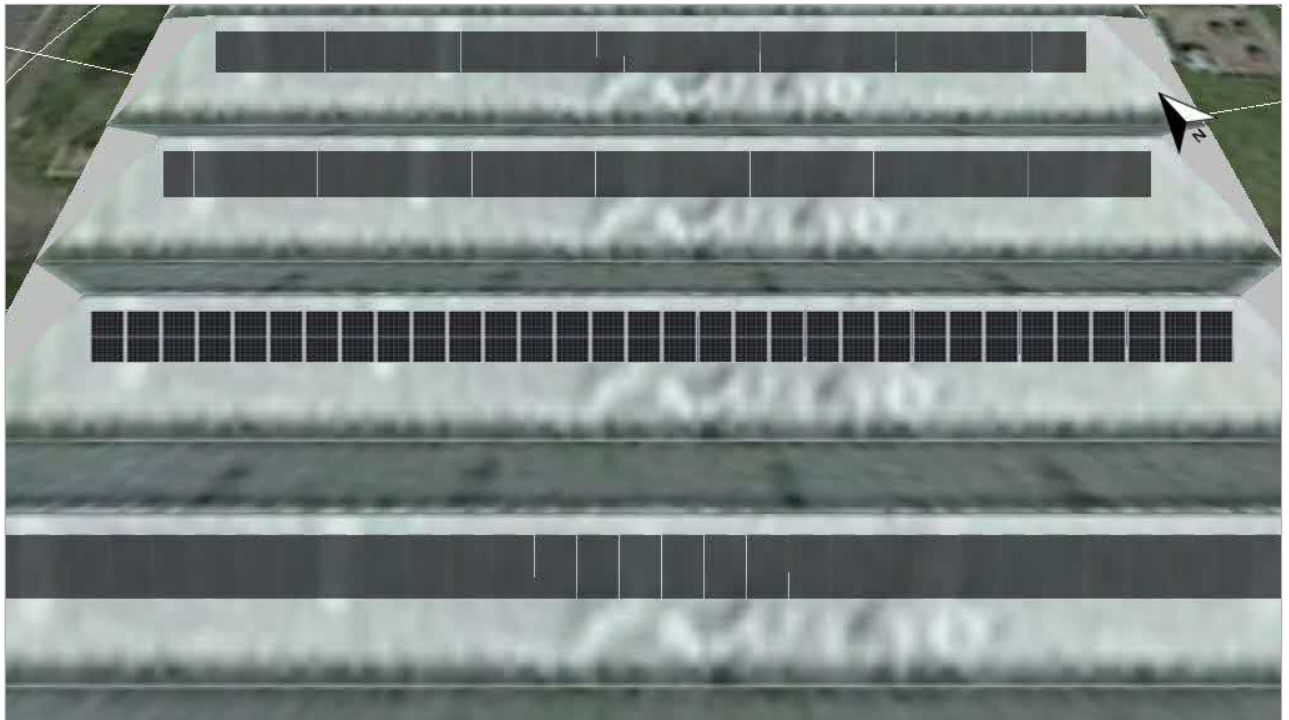


Figure: 2. Module Area - Building 02-Roof Area Southwest

3. Module Area - Building 03-Roof Area Southwest

PV Generator, 3. Module Area - Building 03-Roof Area Southwest

Name	Building 03-Roof Area Southwest
PV Modules	32 x JAM54S30-420_GR (v1)
Manufacturer	JA Solar Holdings Co., Ltd.
Inclination	35 °
Orientation	Southwest 223 °
Installation Type	Roof parallel
PV Generator Surface	62.5 m ²



Figure: 3. Module Area - Building 03-Roof Area Southwest

4. Module Area - Building 04-Roof Area Southwest

PV Generator, 4. Module Area - Building 04-Roof Area Southwest

Name	Building 04-Roof Area Southwest
PV Modules	32 x JAM54S30-420_GR (v1)
Manufacturer	JA Solar Holdings Co., Ltd.
Inclination	35 °
Orientation	Southwest 223 °
Installation Type	Roof parallel
PV Generator Surface	62.5 m ²



Figure: 4. Module Area - Building 04-Roof Area Southwest

5. Module Area - Building 05-Roof Area Southwest

PV Generator, 5. Module Area - Building 05-Roof Area Southwest

Name	Building 05-Roof Area Southwest
PV Modules	32 x JAM54S30-420_GR (v1)
Manufacturer	JA Solar Holdings Co., Ltd.
Inclination	35 °
Orientation	Southwest 223 °
Installation Type	Roof parallel
PV Generator Surface	62.5 m ²

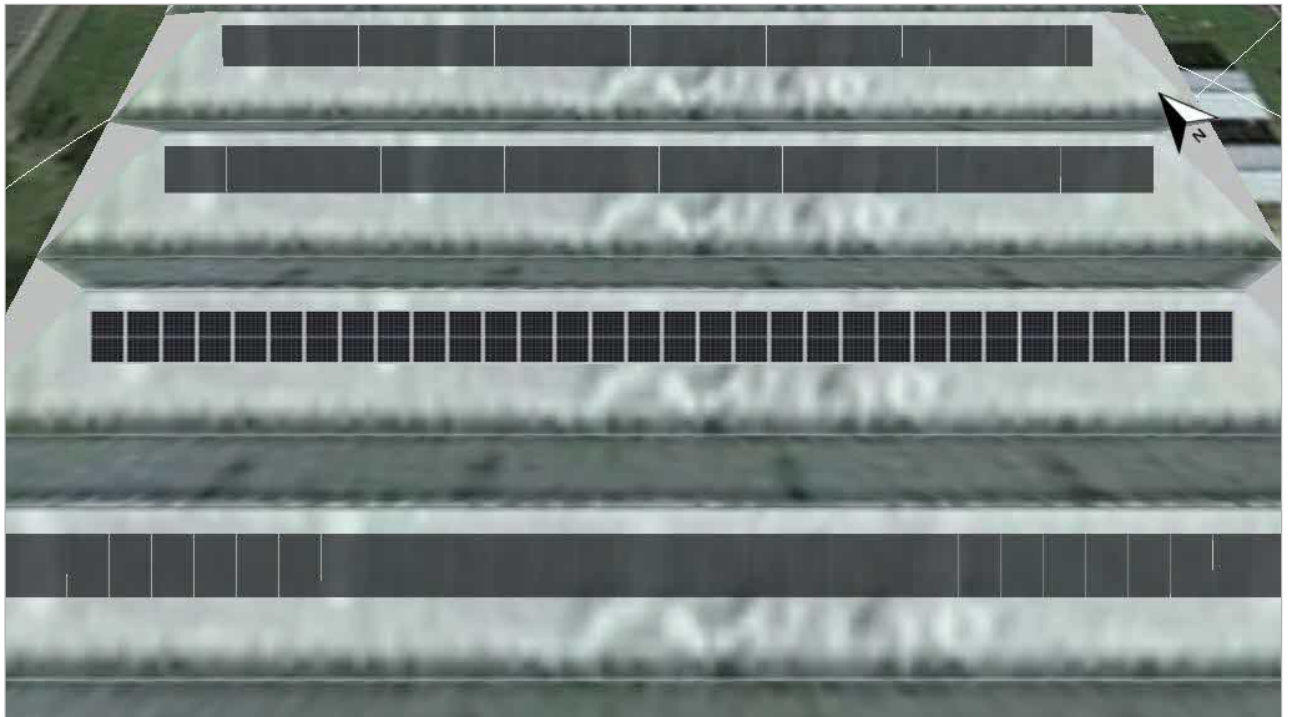


Figure: 5. Module Area - Building 05-Roof Area Southwest

6. Module Area - Building 06-Roof Area Southwest

PV Generator, 6. Module Area - Building 06-Roof Area Southwest

Name	Building 06-Roof Area Southwest
PV Modules	32 x JAM54S30-420_GR (v1)
Manufacturer	JA Solar Holdings Co., Ltd.
Inclination	35 °
Orientation	Southwest 223 °
Installation Type	Roof parallel
PV Generator Surface	62.5 m ²

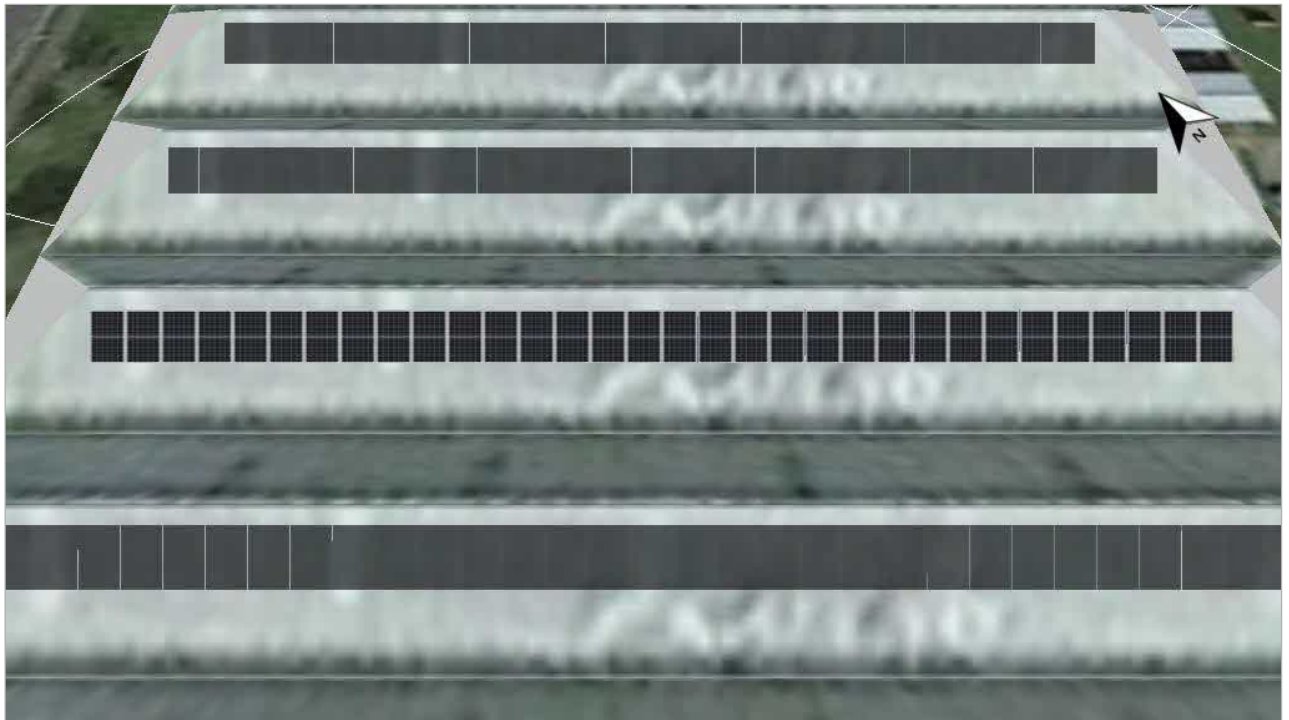


Figure: 6. Module Area - Building 06-Roof Area Southwest

7. Module Area - Building 07-Roof Area Southwest

PV Generator, 7. Module Area - Building 07-Roof Area Southwest

Name	Building 07-Roof Area Southwest
PV Modules	32 x JAM54S30-420_GR (v1)
Manufacturer	JA Solar Holdings Co., Ltd.
Inclination	35 °
Orientation	Southwest 223 °
Installation Type	Roof parallel
PV Generator Surface	62.5 m ²

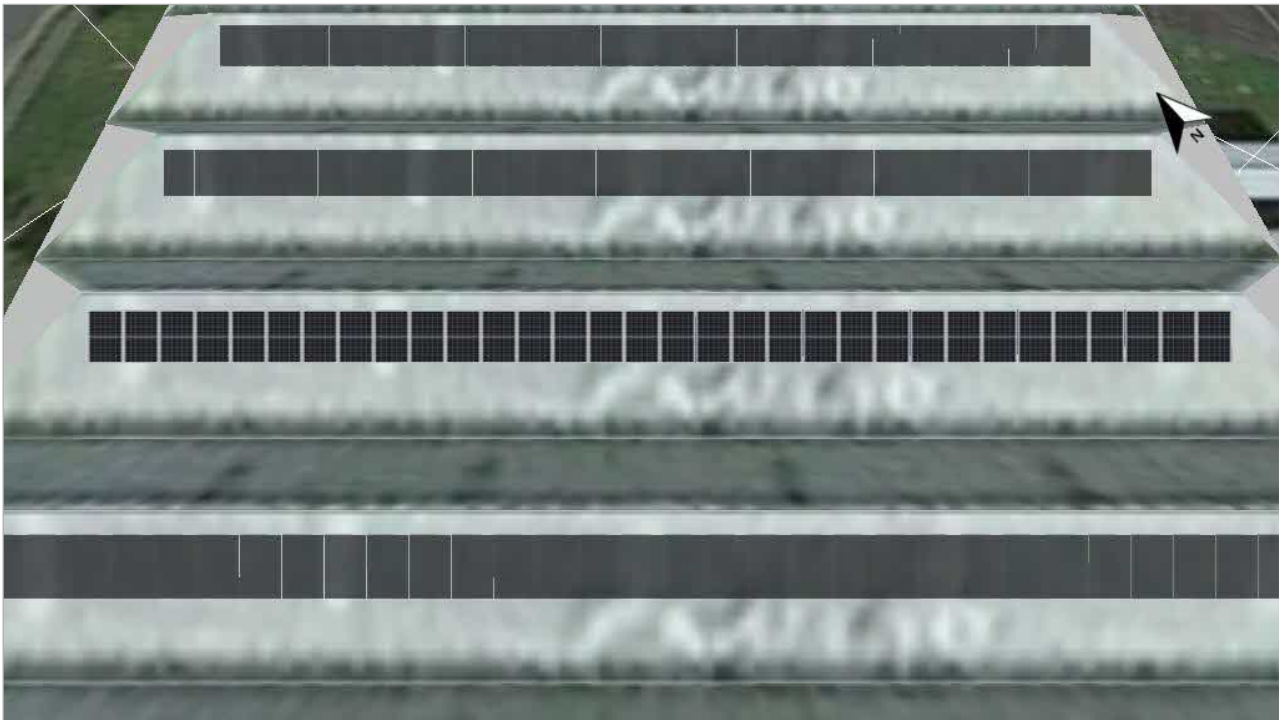


Figure: 7. Module Area - Building 07-Roof Area Southwest

8. Module Area - Building 08-Roof Area Southwest

PV Generator, 8. Module Area - Building 08-Roof Area Southwest

Name	Building 08-Roof Area Southwest
PV Modules	32 x JAM54S30-420_GR (v1)
Manufacturer	JA Solar Holdings Co., Ltd.
Inclination	35 °
Orientation	Southwest 223 °
Installation Type	Roof parallel
PV Generator Surface	62.5 m ²

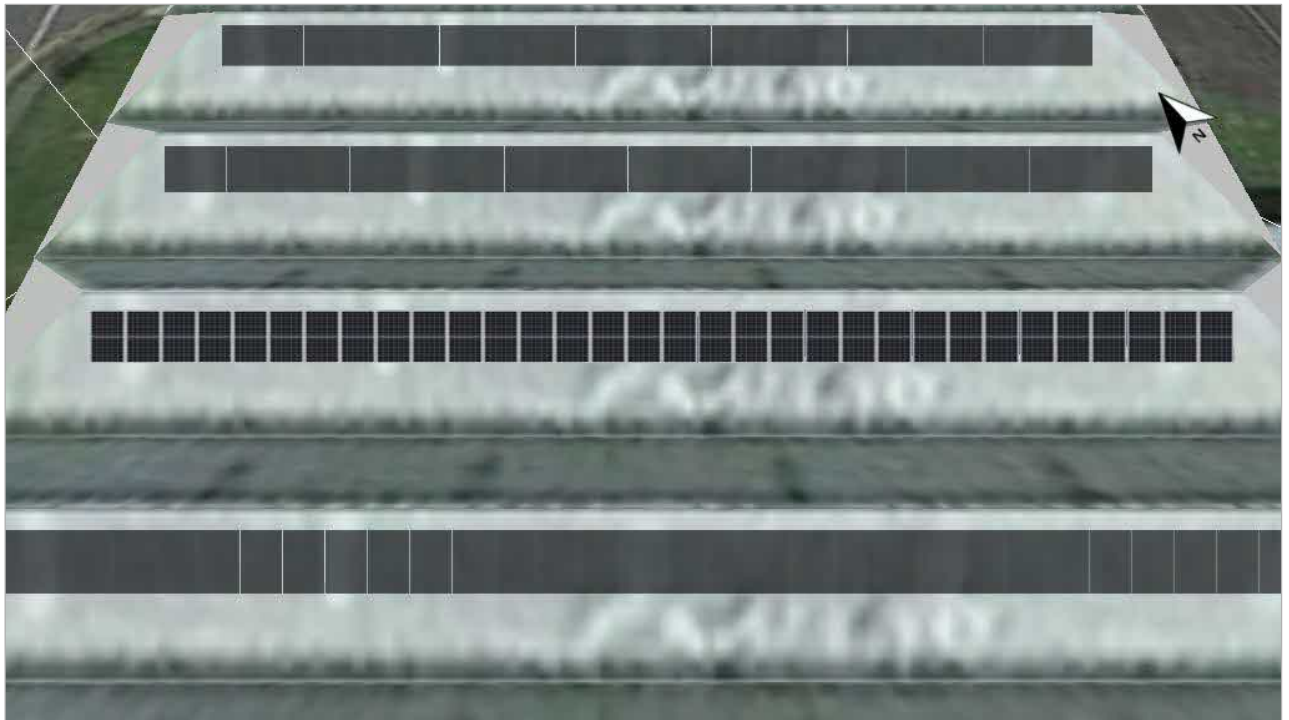


Figure: 8. Module Area - Building 08-Roof Area Southwest

9. Module Area - Building 09-Roof Area Southwest

PV Generator, 9. Module Area - Building 09-Roof Area Southwest

Name	Building 09-Roof Area Southwest
PV Modules	32 x JAM54S30-420_GR (v1)
Manufacturer	JA Solar Holdings Co., Ltd.
Inclination	35 °
Orientation	Southwest 223 °
Installation Type	Roof parallel
PV Generator Surface	62.5 m ²



Figure: 9. Module Area - Building 09-Roof Area Southwest

10. Module Area - Building 10-Roof Area Southwest

PV Generator, 10. Module Area - Building 10-Roof Area Southwest

Name	Building 10-Roof Area Southwest
PV Modules	32 x JAM54S30-420_GR (v1)
Manufacturer	JA Solar Holdings Co., Ltd.
Inclination	35 °
Orientation	Southwest 223 °
Installation Type	Roof parallel
PV Generator Surface	62.5 m ²

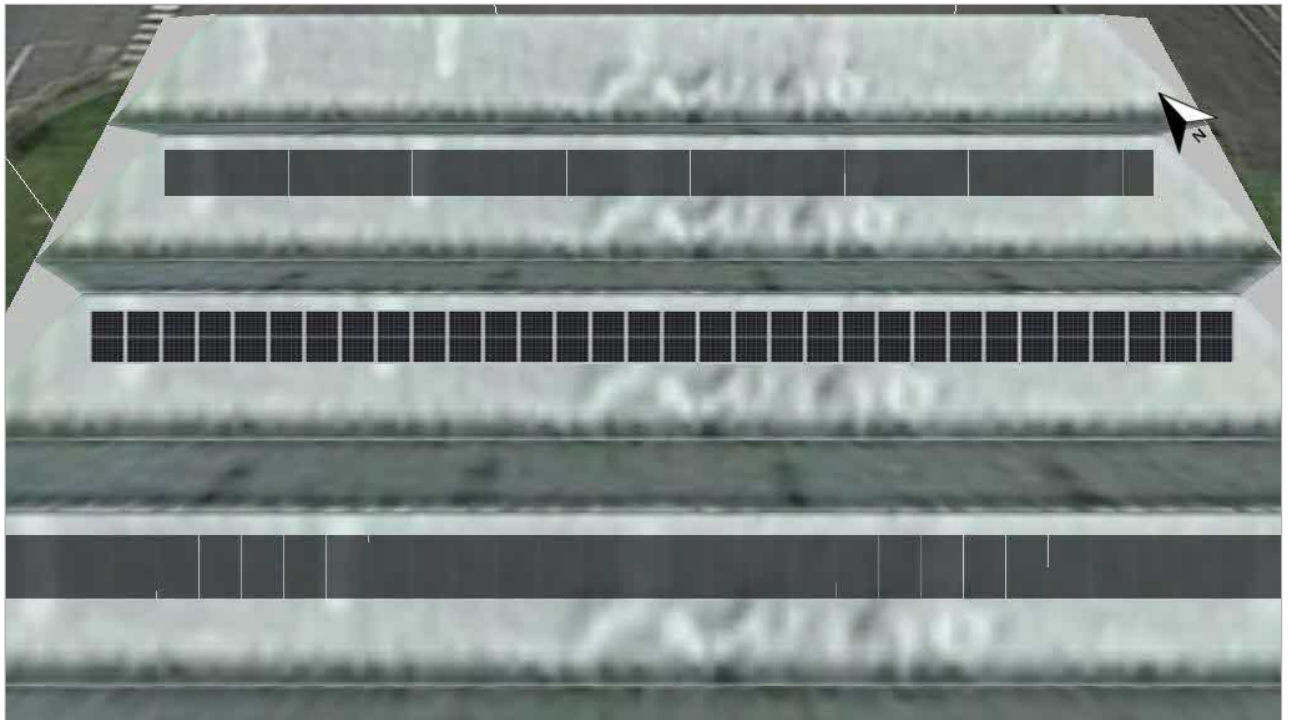


Figure: 10. Module Area - Building 10-Roof Area Southwest

Horizon Line, 3D Design

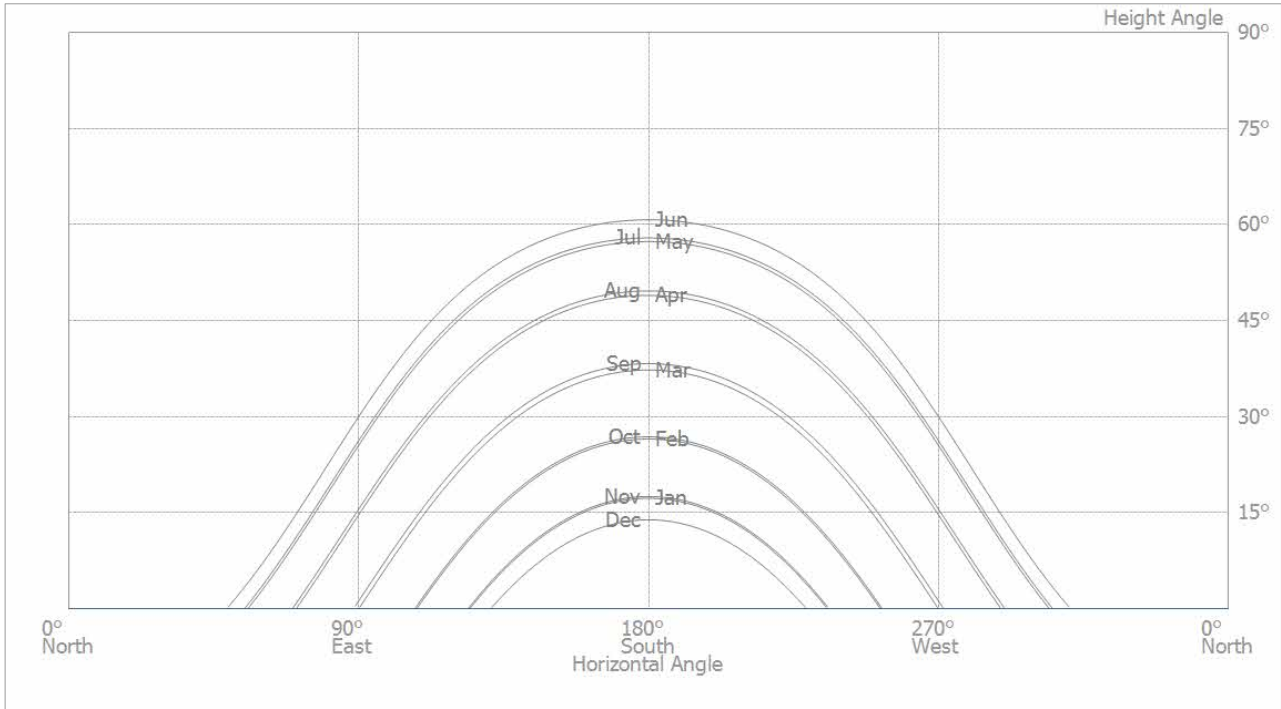


Figure: Horizon (3D Design)

Inverter configuration

Configuration 1

Module Areas	Building 01-Roof Area Southwest + Building 02-Roof Area Southwest + Building 03-Roof Area Southwest + Building 04-Roof Area Southwest + Building 05-Roof Area Southwest + Building 06-Roof Area Southwest + Building 07-Roof Area Southwest + Building 08-Roof Area Southwest + Building 09-Roof Area Southwest + Building 10-Roof Area Southwest
Inverter 1	
Model	SE100K-EU-APAC/AUS Unit (400V) - 33.3 kW (v1)
Manufacturer	SolarEdge
Quantity	1
Sizing Factor	161.4 %
Configuration	MPP 1: 1 x 16☆ [1 x 2] 1 x 16☆ [1 x 2] 1 x 16☆ [1 x 2] 1 x 16☆ [1 x 2]
Power Optimizer	64x SolarEdge, P850 Worldwide (v3)
Inverter 2	
Model	SE100K-EU-APAC/AUS Unit (400V) - 33.3 kW (v1)
Manufacturer	SolarEdge
Quantity	1
Sizing Factor	121.1 %
Configuration	MPP 1: 1 x 16☆ [1 x 2] 1 x 16☆ [1 x 2] 1 x 16☆ [1 x 2]
Power Optimizer	48x SolarEdge, P850 Worldwide (v3)
Inverter 3	
Model	SE100K-EU-APAC/AUS Unit (400V) - 33.3 kW (v1)
Manufacturer	SolarEdge
Quantity	1
Sizing Factor	121.1 %
Configuration	MPP 1: 1 x 16☆ [1 x 2] 1 x 16☆ [1 x 2] 1 x 16☆ [1 x 2]
Power Optimizer	48x SolarEdge, P850 Worldwide (v3)

AC Mains

AC Mains

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

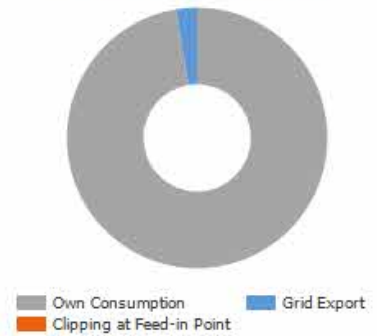
Simulation Results

Results Total System

PV System

PV Generator Output	134.40 kWp
Spec. Annual Yield	969.68 kWh/kWp
Performance Ratio (PR)	93.25 %
Yield Reduction due to Shading	3.1 %
PV Generator Energy (AC grid)	130,404 kWh/Year
Own Consumption	124,678 kWh/Year
Clipping at Feed-in Point	0 kWh/Year
Grid Export	3,346 kWh/Year
Own Power Consumption	97.4 %
CO ₂ Emissions avoided	61,253 kg / year

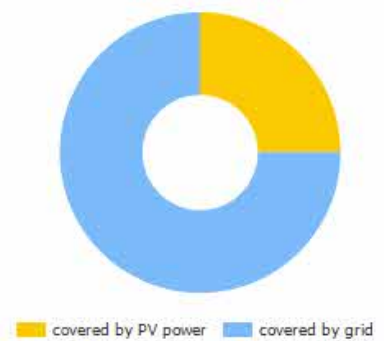
PV Generator Energy (AC grid)



Appliances

Appliances	500,000 kWh/Year
Standby Consumption (Inverter)	79 kWh/Year
Total Consumption	500,079 kWh/Year
covered by PV power	124,678 kWh/Year
covered by grid	375,401 kWh/Year
Solar Fraction	24.9 %

Total Consumption



Level of Self-sufficiency

Total Consumption	500,079 kWh/Year
covered by grid	375,401 kWh/Year
Level of Self-sufficiency	24.9 %

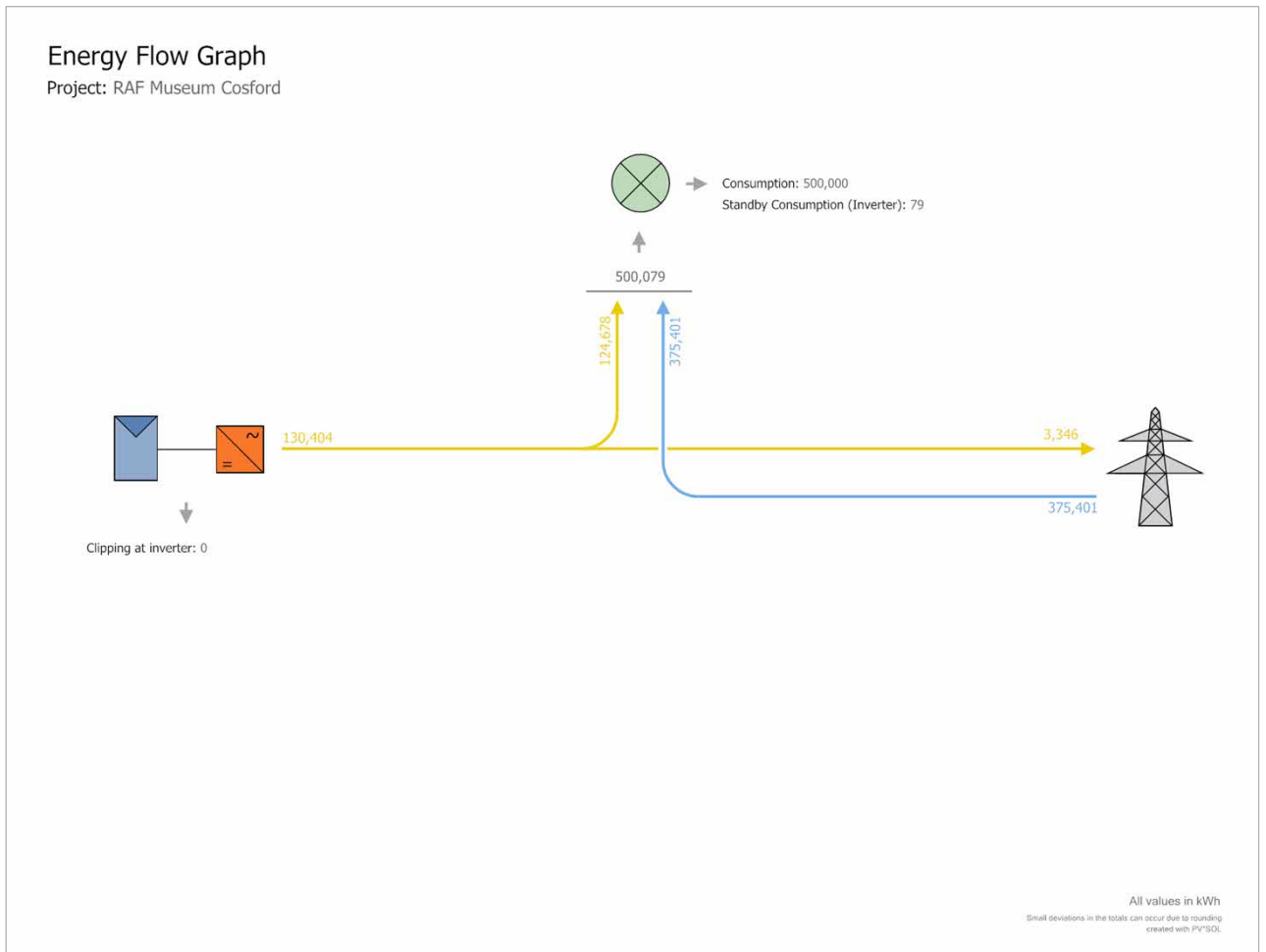


Figure: Energy flow

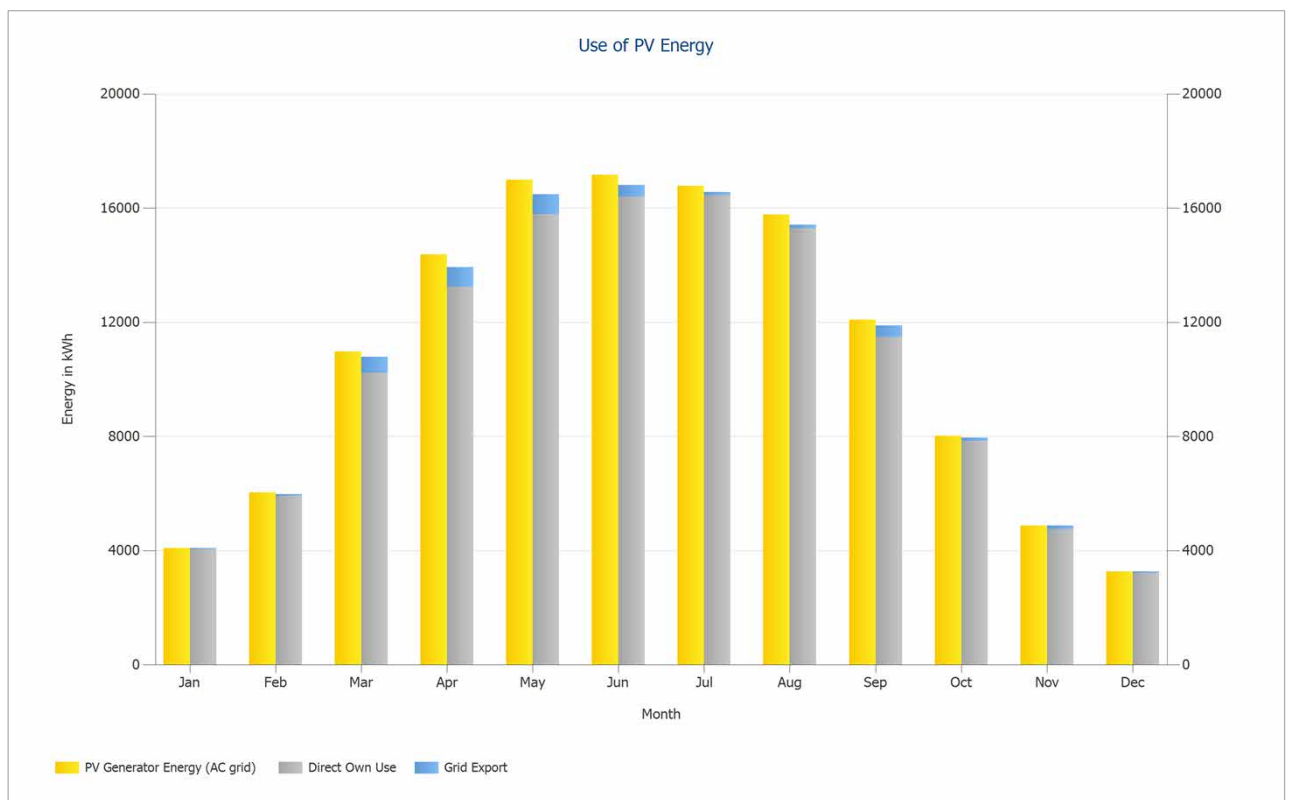


Figure: Use of PV Energy

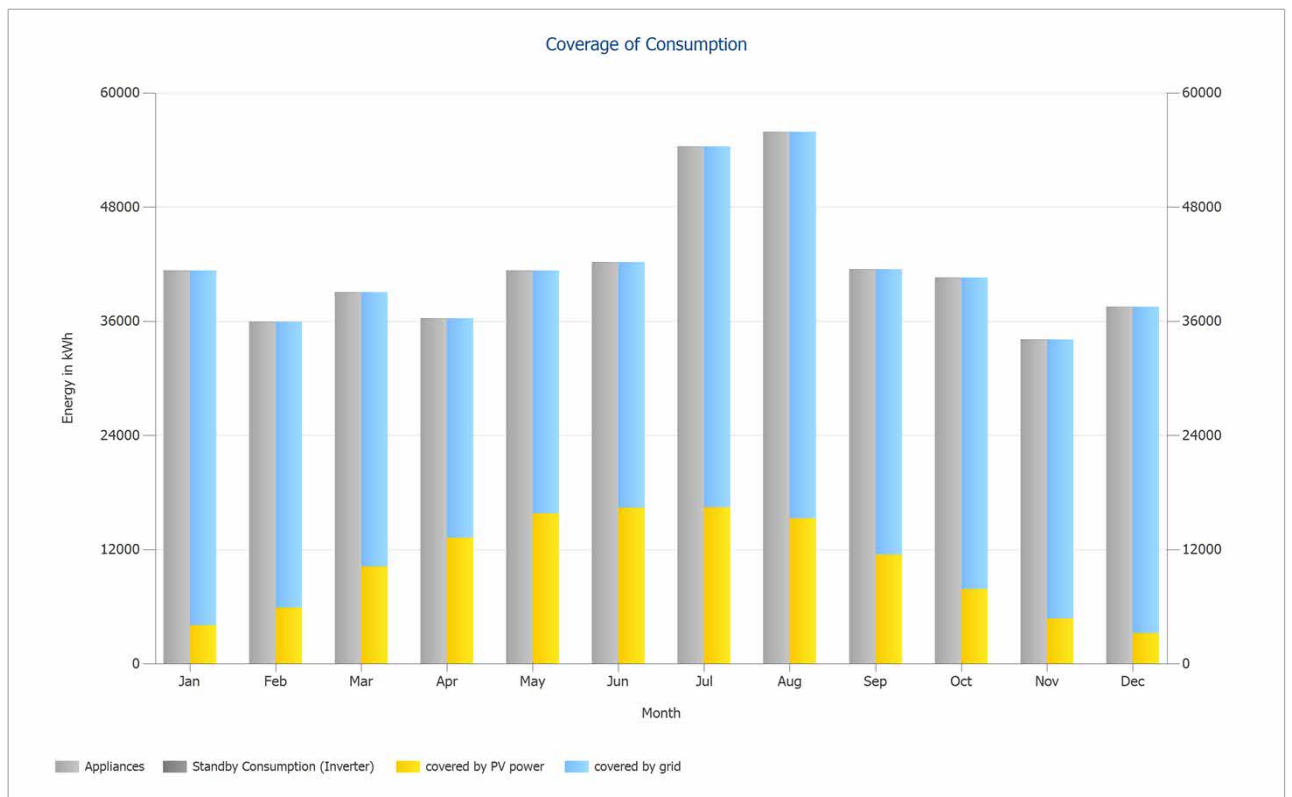


Figure: Coverage of Consumption

Financial Analysis

Overview

System Data

Grid Export in the first year (incl. module degradation)	3,346 kWh/Year
PV Generator Output	134.4 kWp
Start of Operation of the System	04/12/2023
Assessment Period	25 Years
Interest on Capital	1 %

Economic Parameters

Internal Rate of Return (IRR)	49.75 %
Accrued Cash Flow (Cash Balance)	1,882,587.00 £
Amortization Period	2.2 Years
Electricity Production Costs	0.0535 £/kWh

Payment Overview

Specific Investment Costs	793.02 £/kWp
Investment Costs	106,581.74 £
One-off Payments	0.00 £
Incoming Subsidies	0.00 £
Annual Costs	2,131.63 £/Year
Other Revenue or Savings	0.00 £/Year

Remuneration and Savings

Total Payment from Utility in First Year	334.57 £/Year
First year savings	49,468.11 £/Year

RAF estimate tariff (Energetica Industries GmbH)

Energy Price Tariff period 1	0.3982 £/kWh
Saving Tariff period 1	48,936.16 £/Year
Energy Price Tariff period 2	0.3094 £/kWh
Saving Tariff period 2	526.80 £/Year
Base Price	758 £/Month
Inflation Rate for Energy Price	5 %/Year

Remuneration of Electricity sold to Third Party

Price of Electricity sold to Third Party	0.10 £/kWh
Remuneration of Electricity sold to Third Party	334.57 £/Year

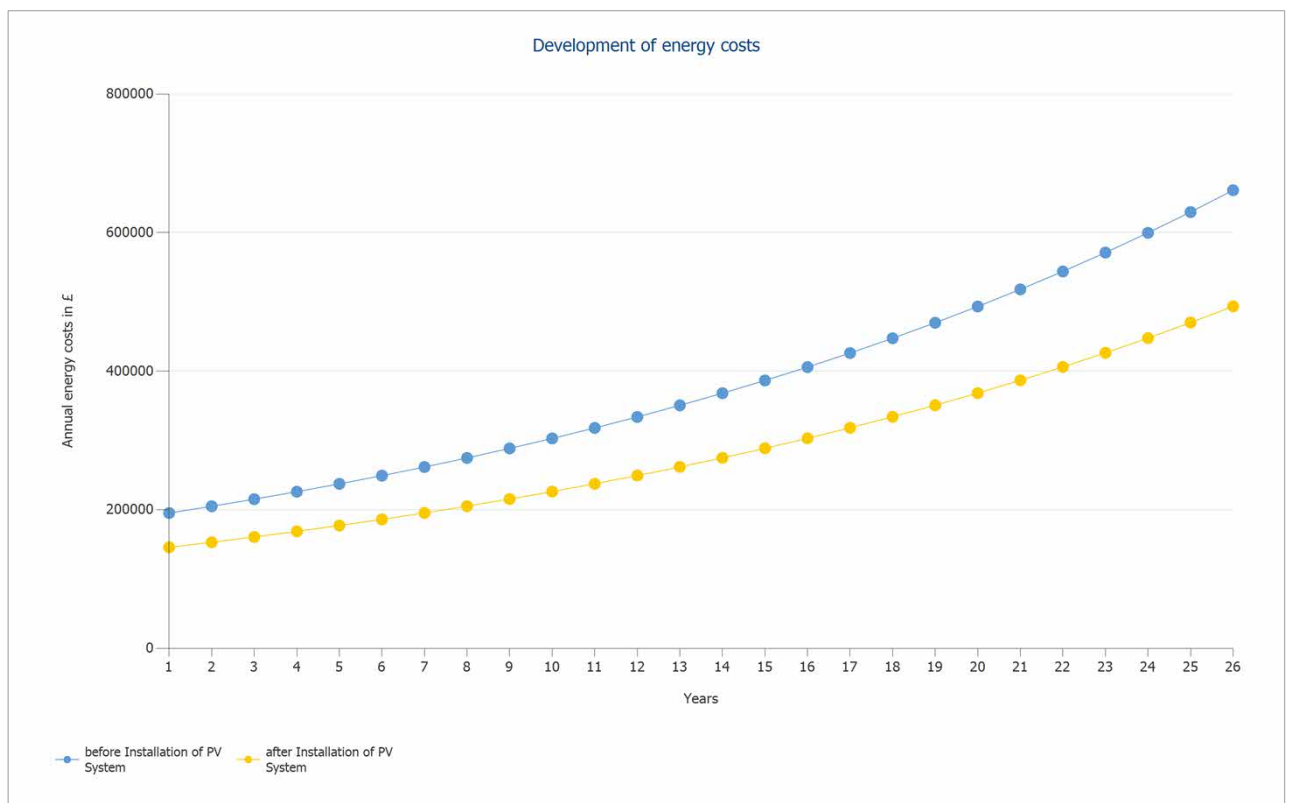
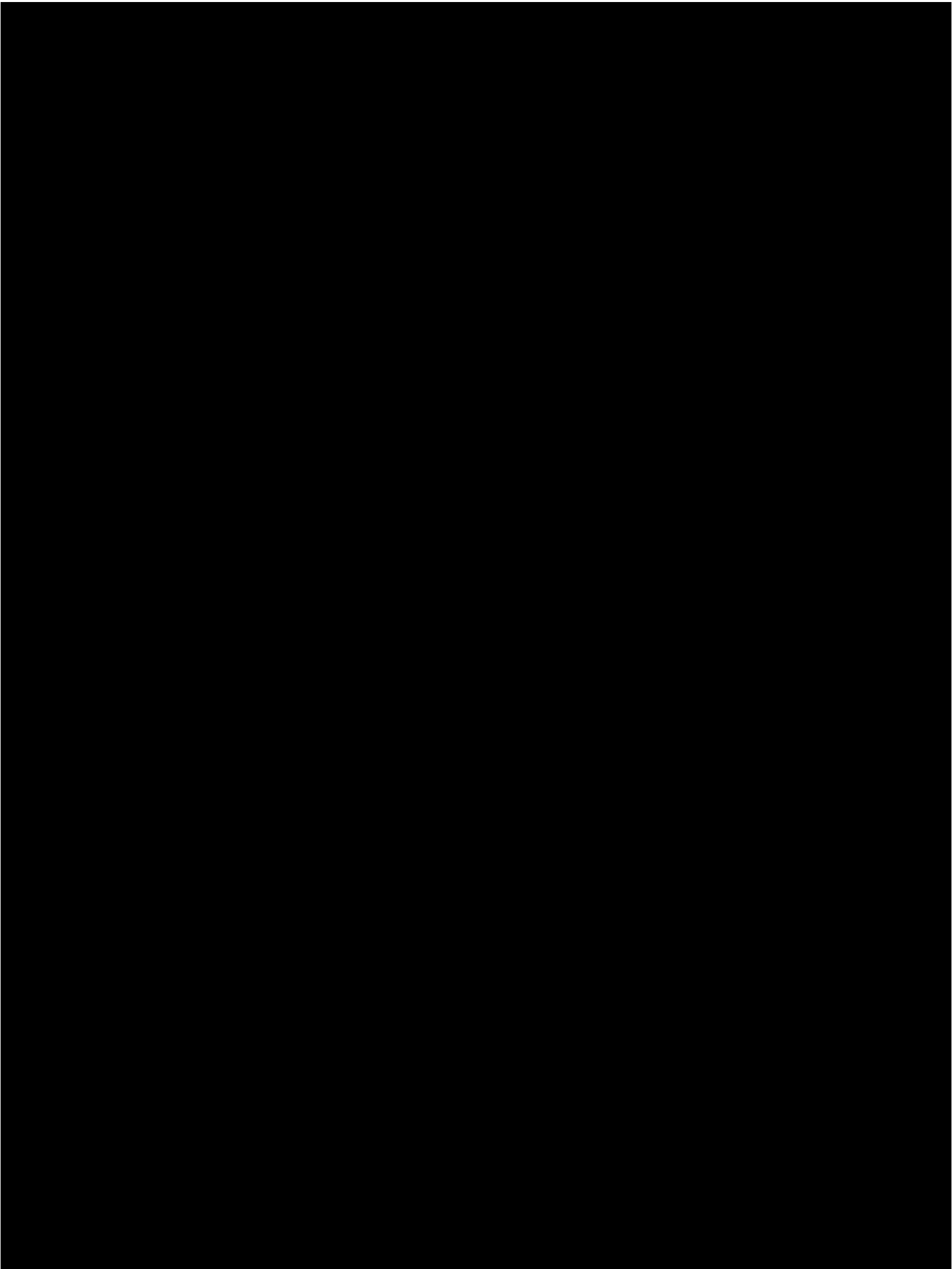


Figure: Development of energy costs



observation period. This is done in the first year.

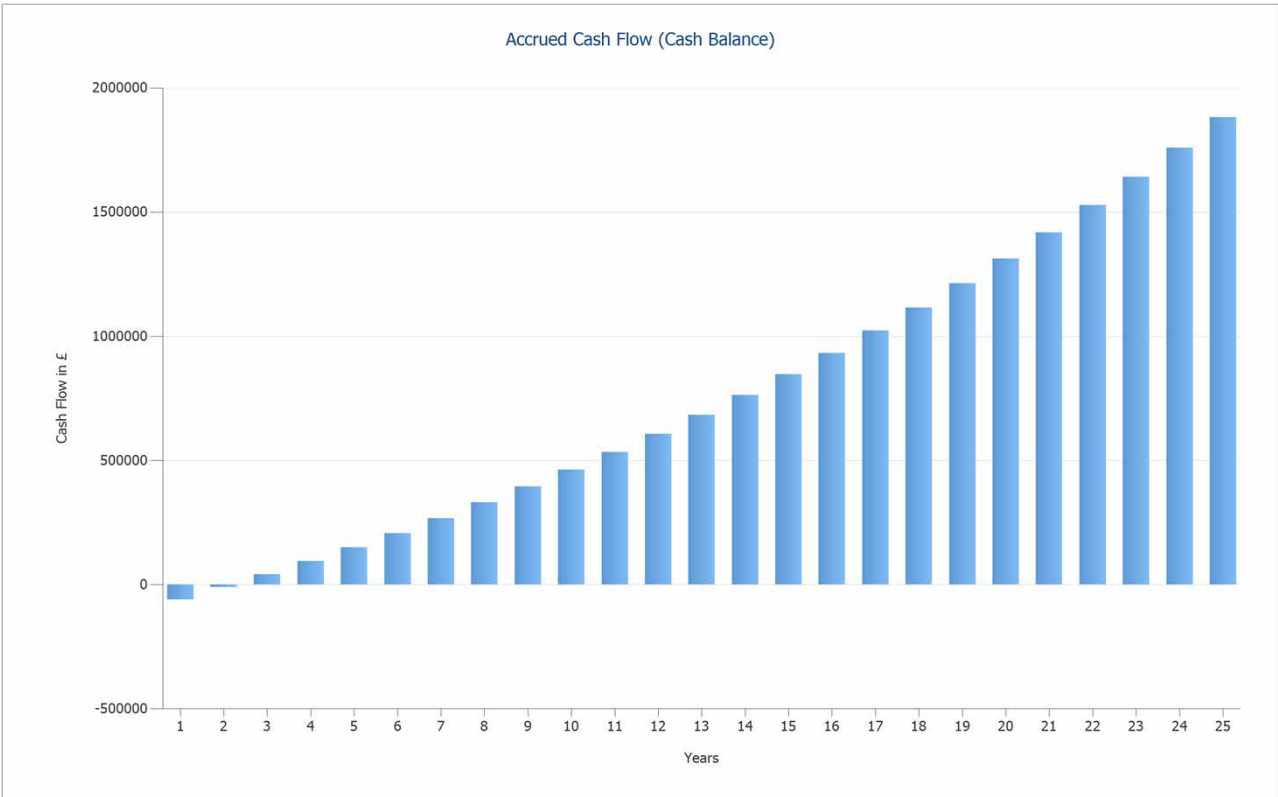
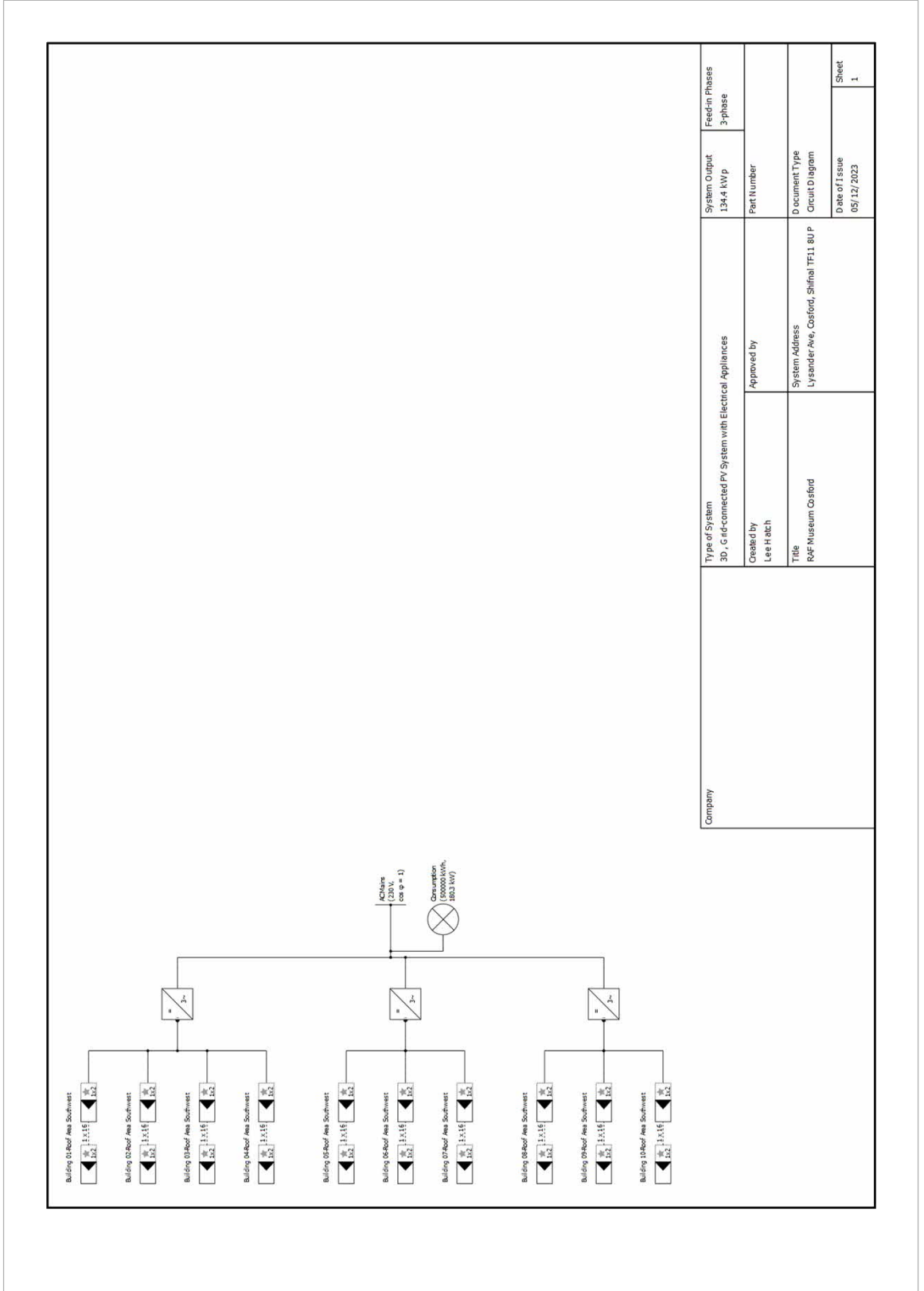


Figure: Accrued Cash Flow (Cash Balance)

Plans and parts list

Circuit Diagram



Company	Type of System	System Output	Feed-in Phases
	3D, Grid-connected PV System with Electrical Appliances	134.4 kWp	3-phase
	Created by	Part Number	
	Lee Hatch		
	Approved by	Document Type	
		Circuit Diagram	
	Title	Date of Issue	Sheet
	RAF Museum Cosford	05/12/2023	1

Figure: Circuit Diagram

Overview plan

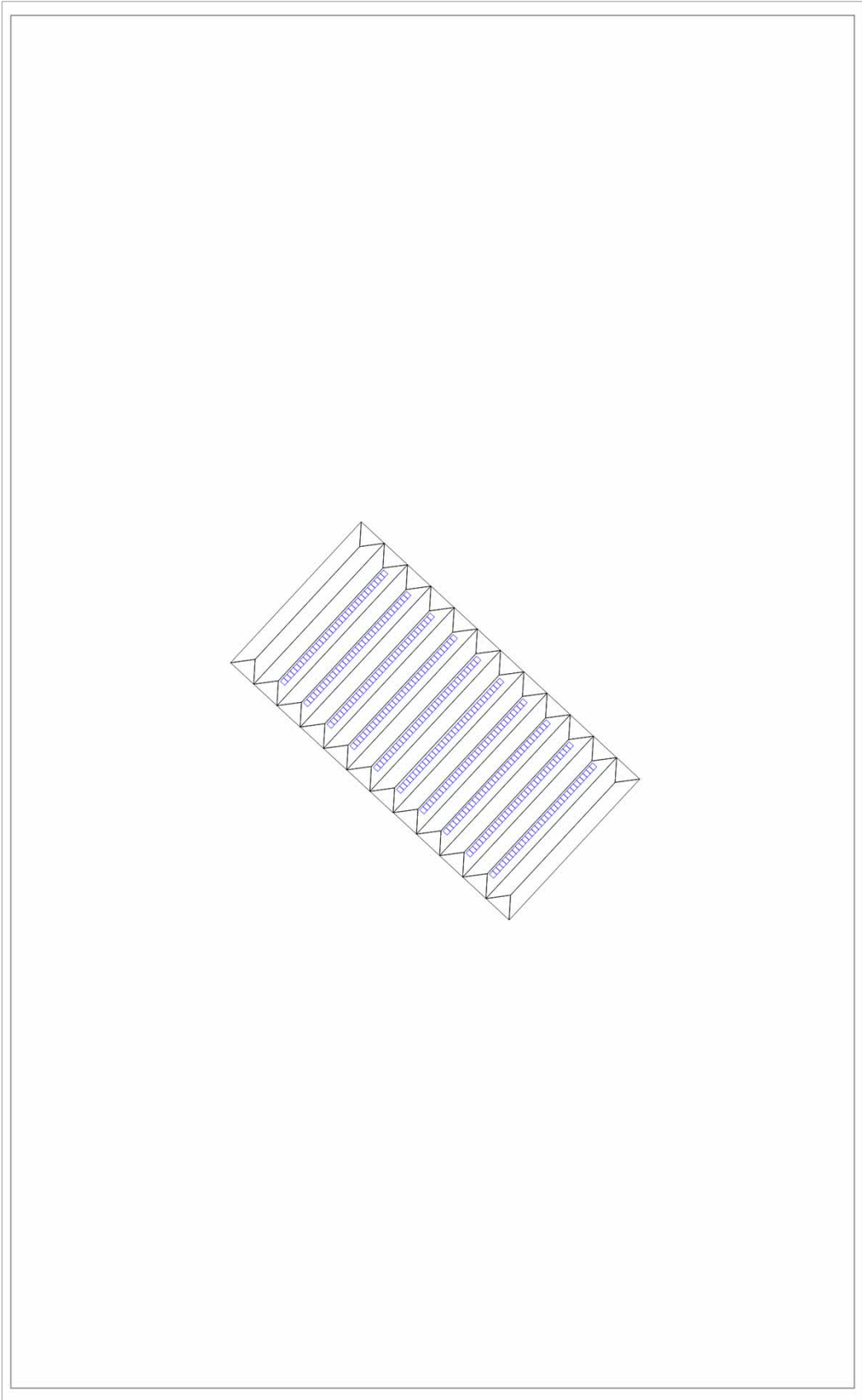


Figure: Overview plan

Dimensioning Plan

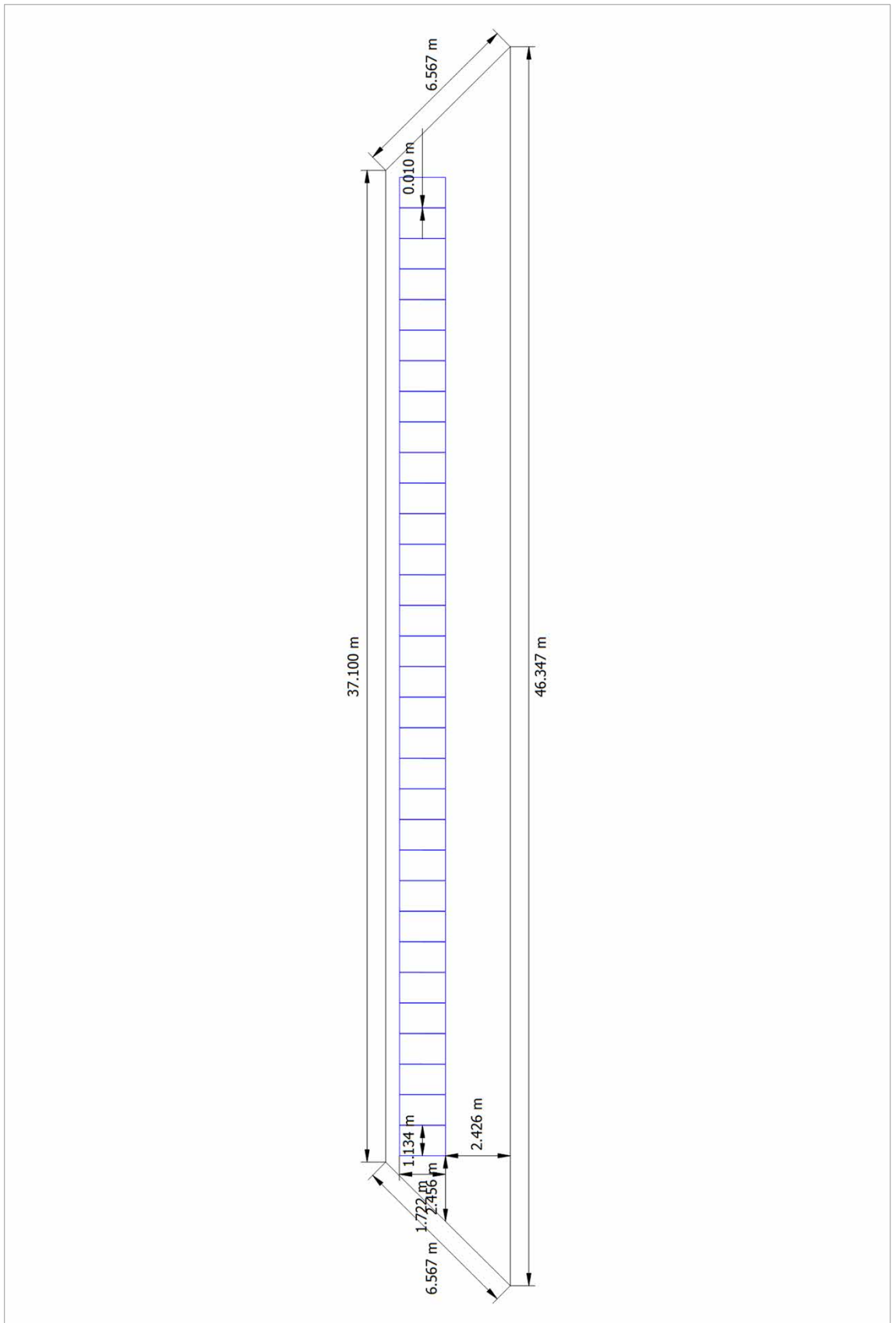


Figure: Building 01 - Roof Area Southwest

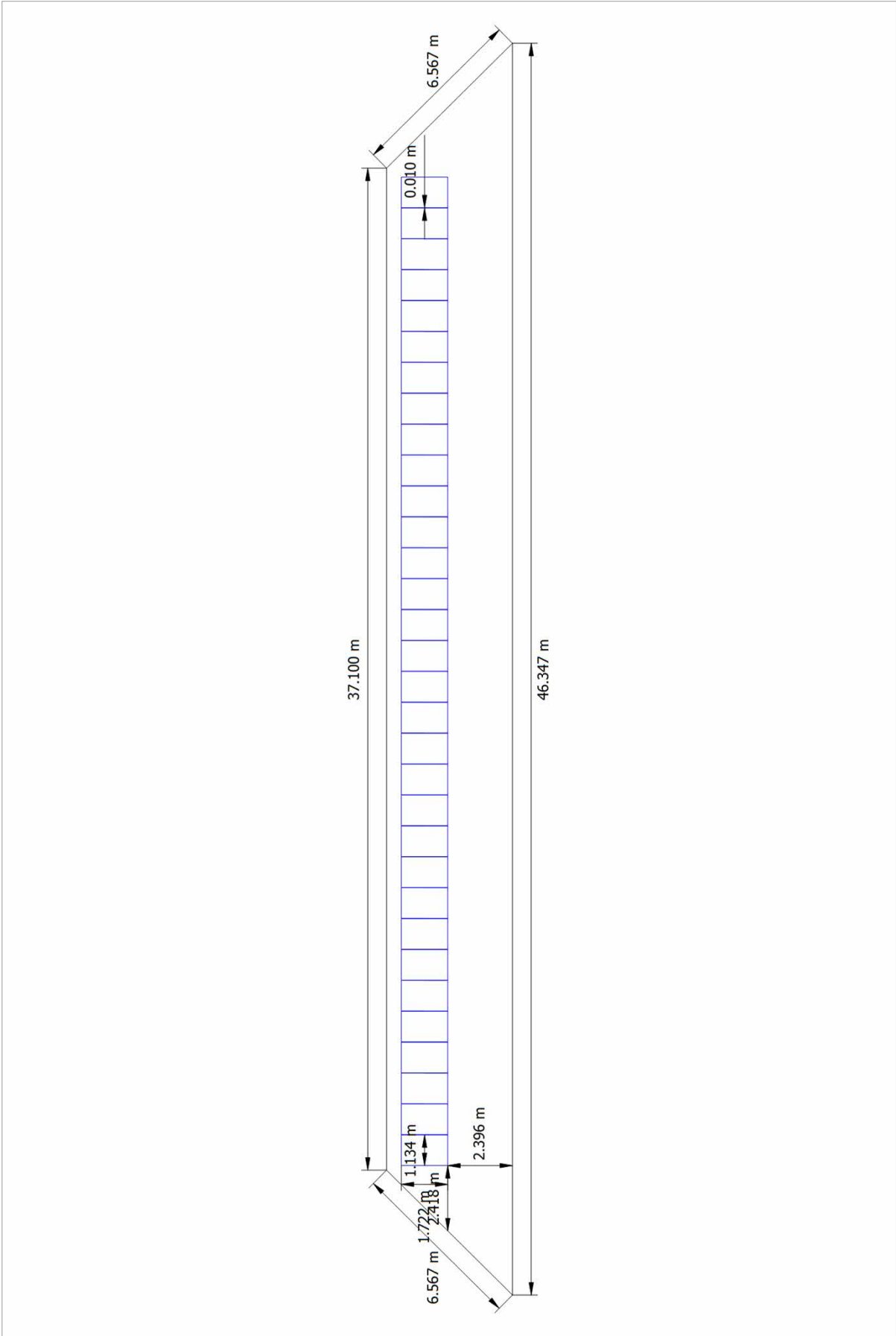


Figure: Building 03 - Roof Area Southwest

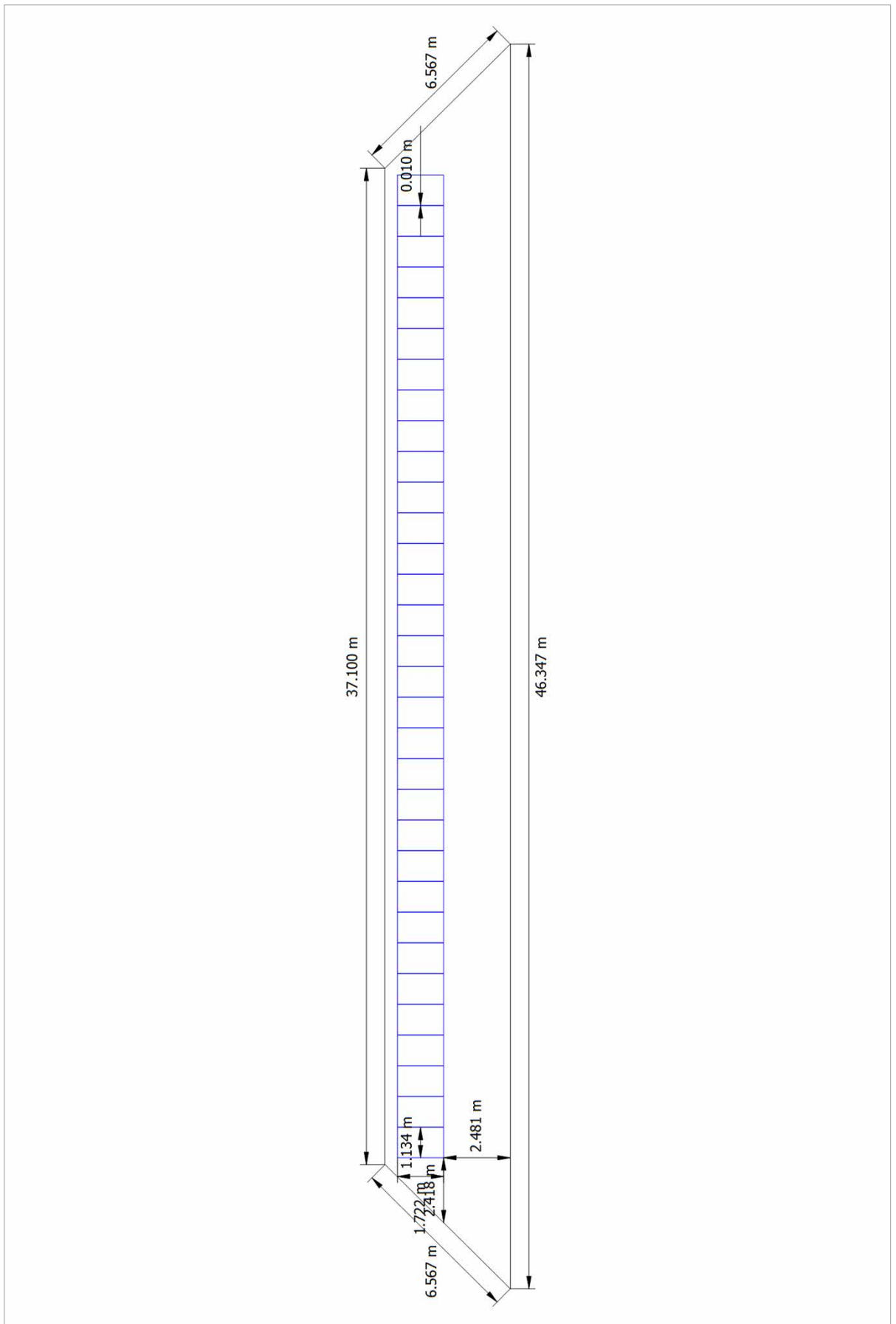


Figure: Building 02 - Roof Area Southwest

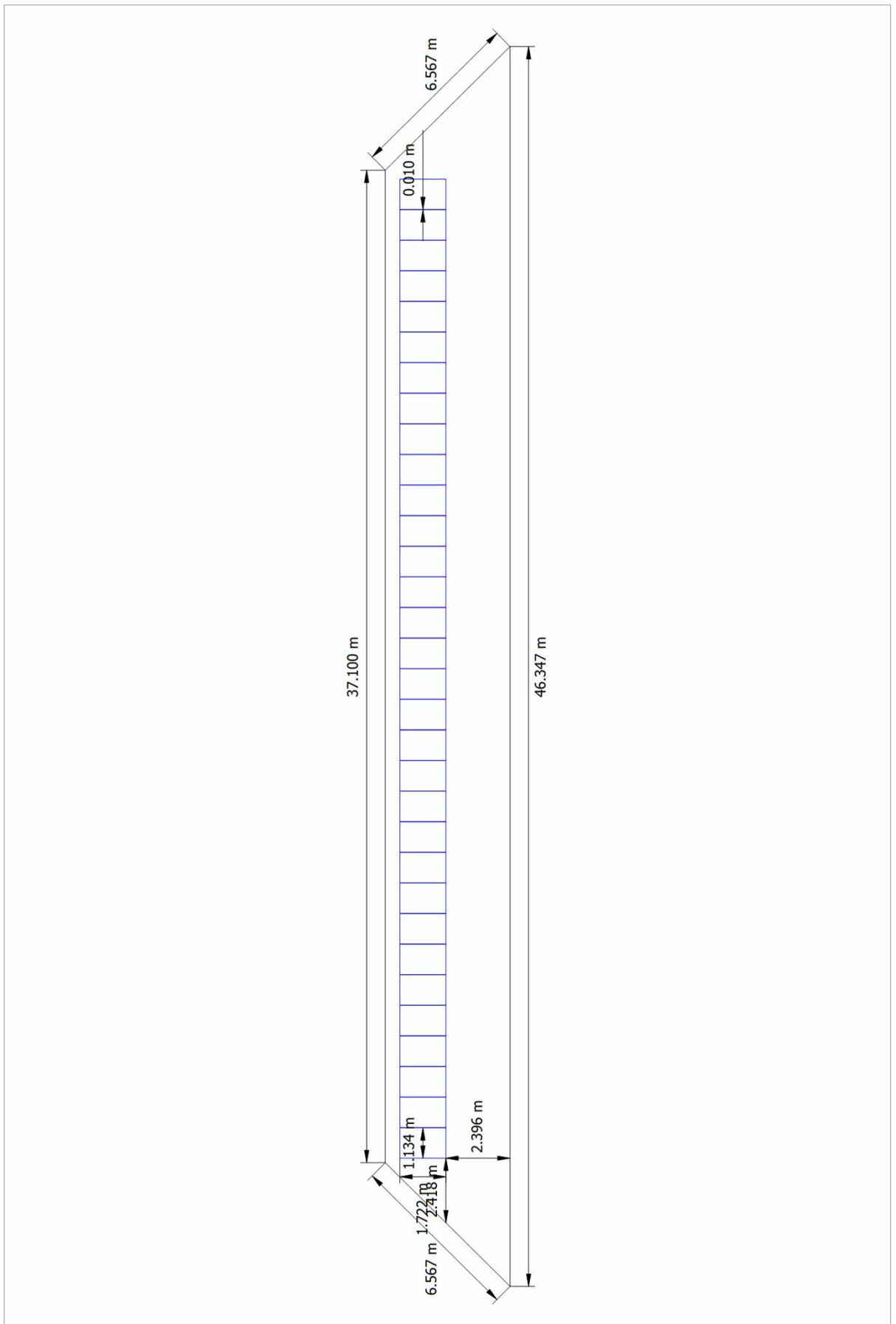


Figure: Building 04 - Roof Area Southwest

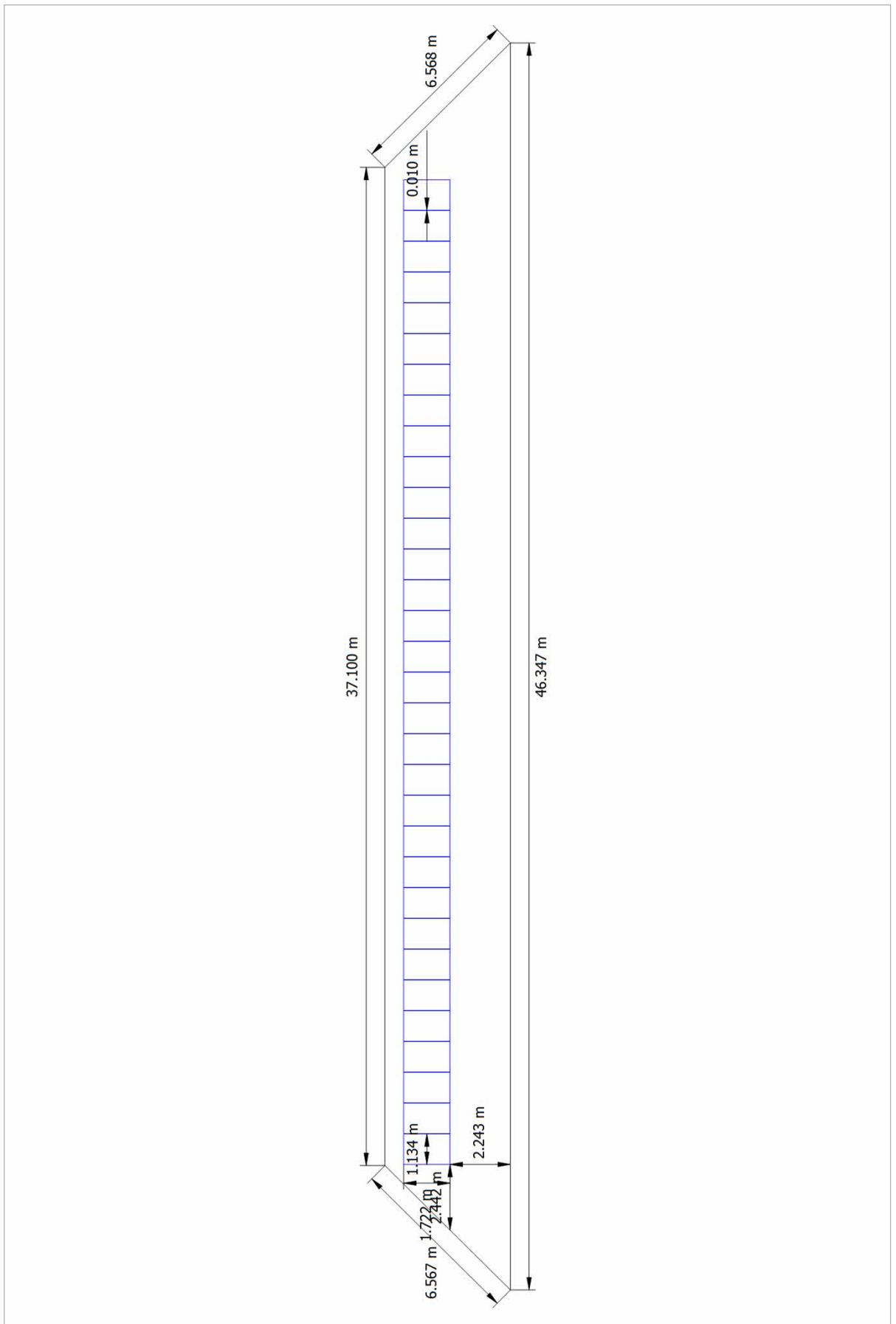


Figure: Building 06 - Roof Area Southwest

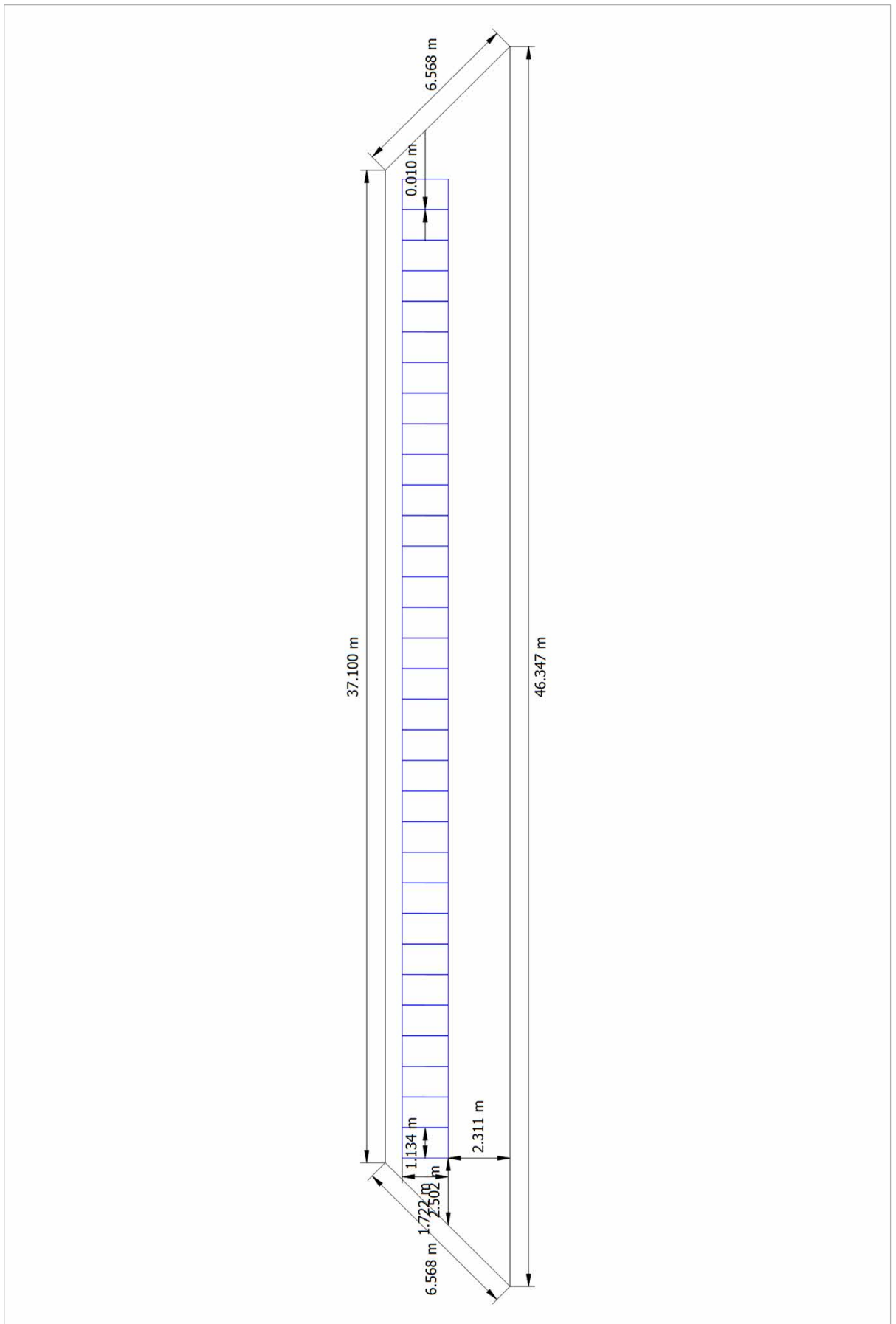


Figure: Building 05 - Roof Area Southwest

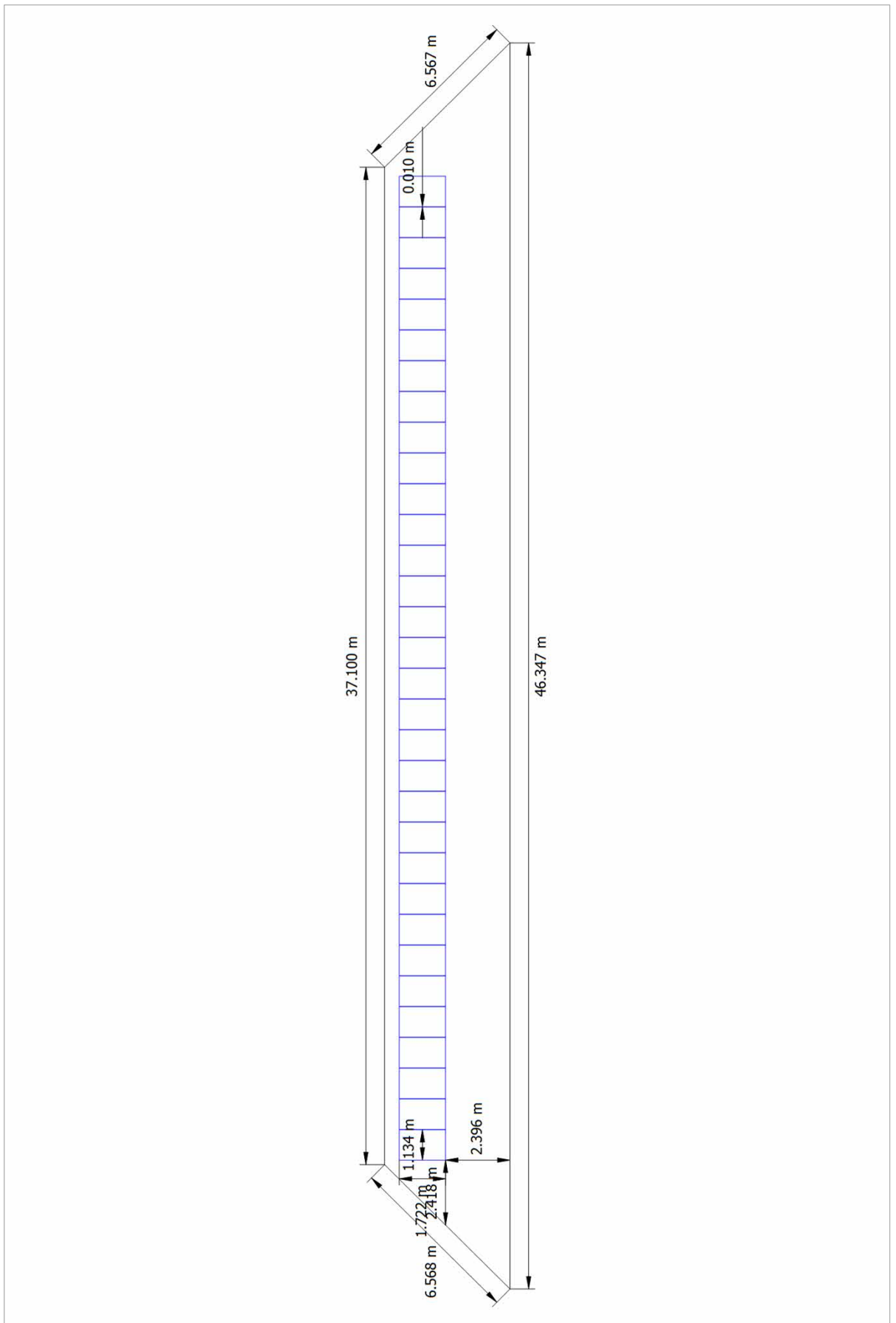


Figure: Building 07 - Roof Area Southwest

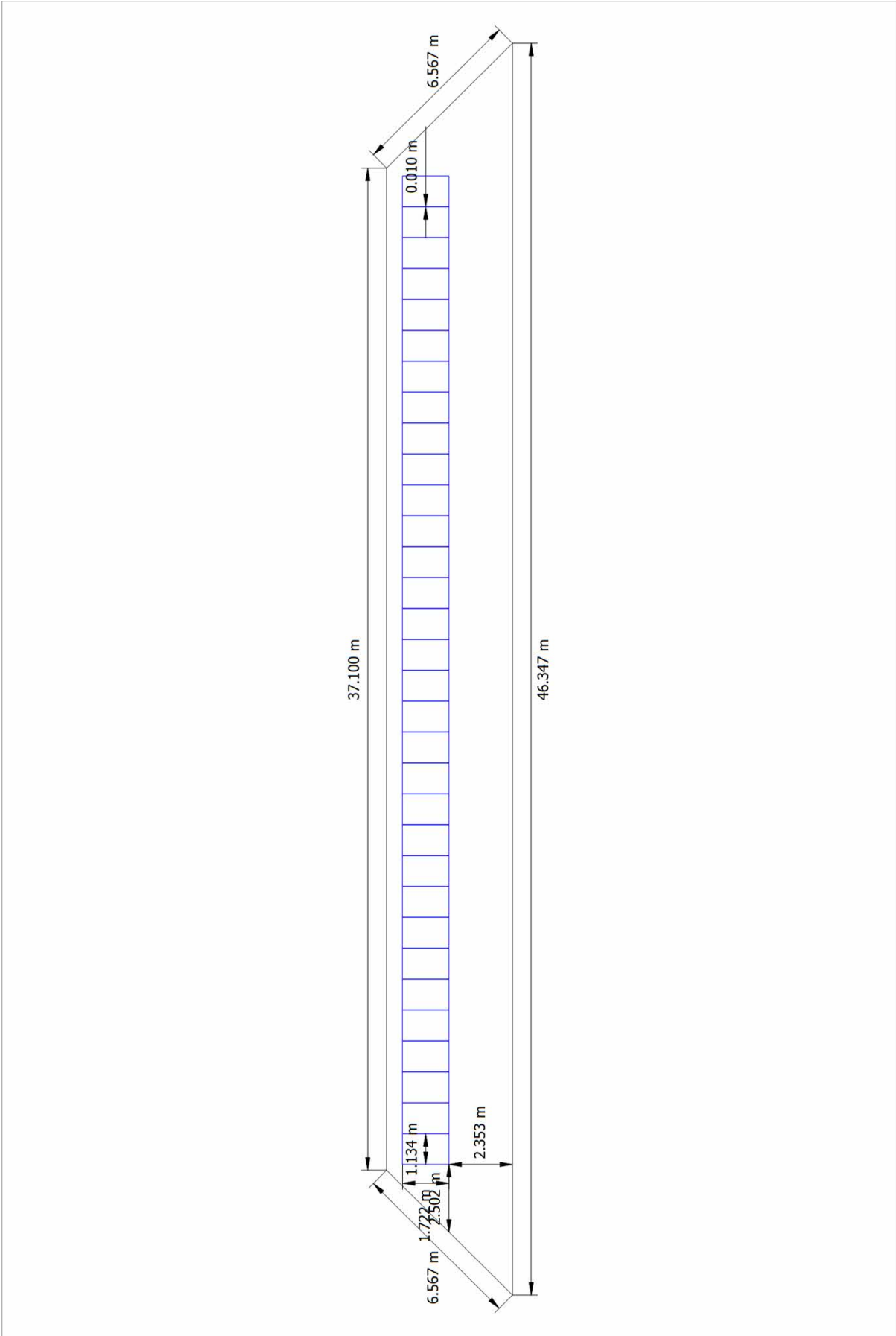


Figure: Building 08 - Roof Area Southwest

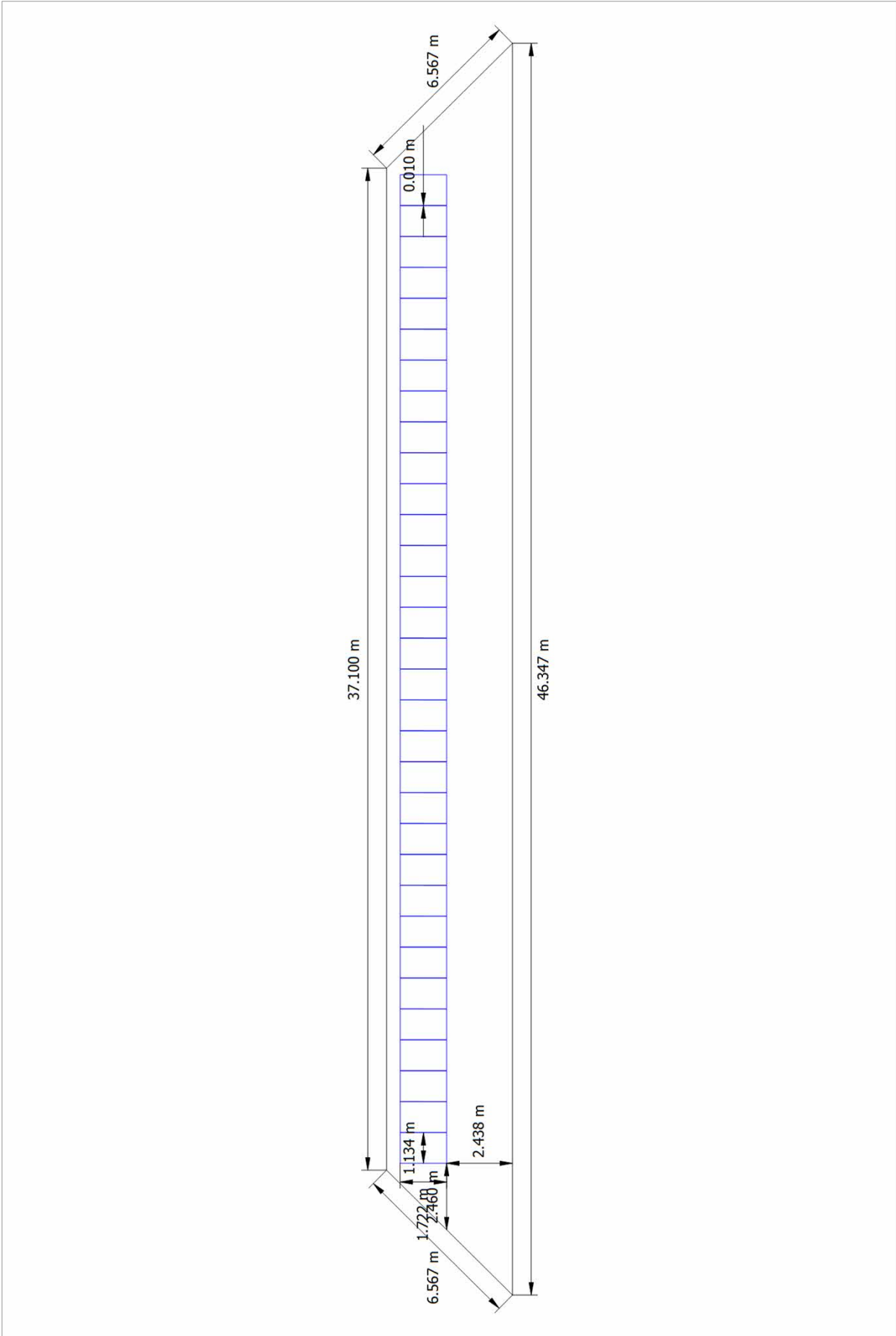


Figure: Building 10 - Roof Area Southwest

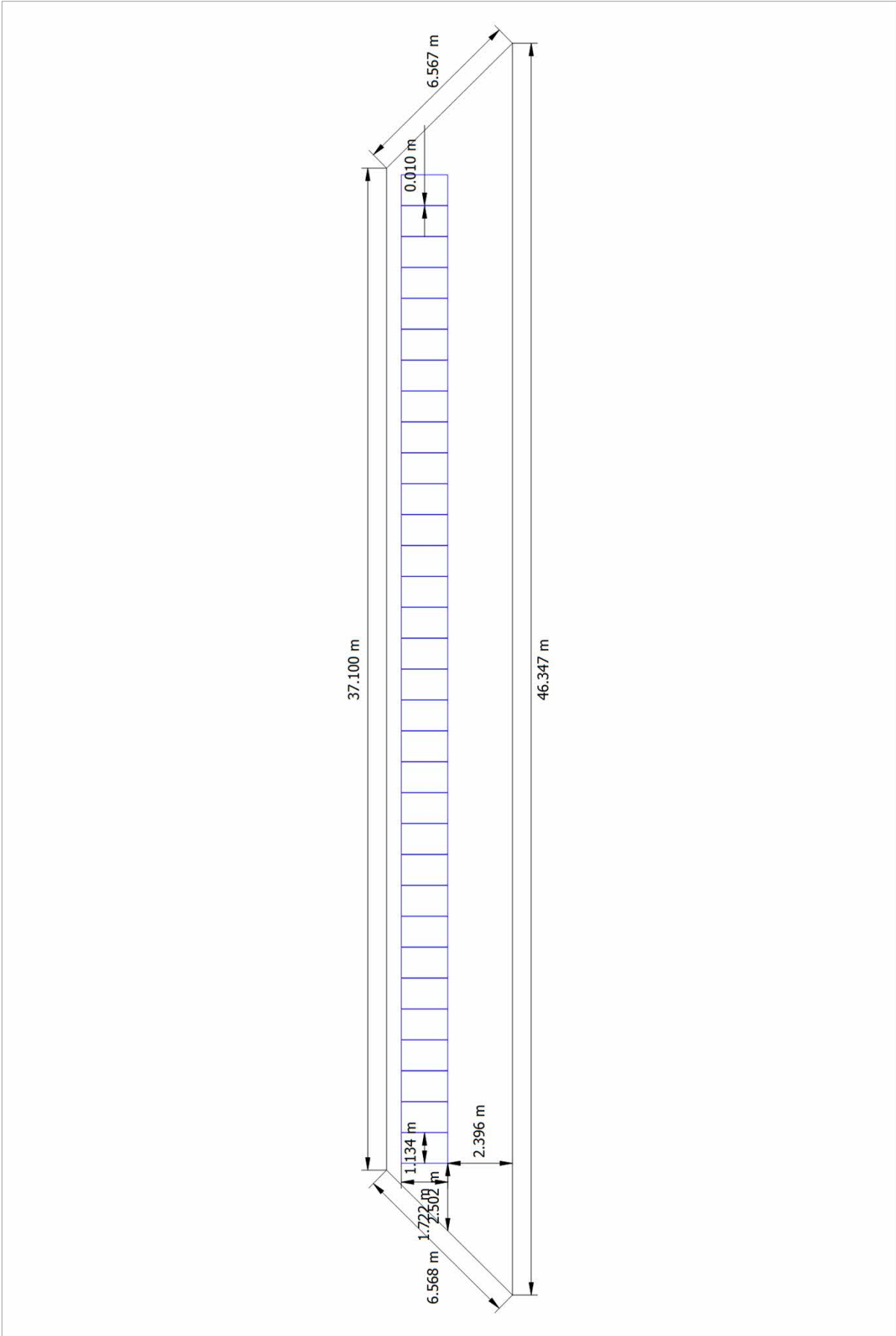


Figure: Building 09 - Roof Area Southwest

String Plan

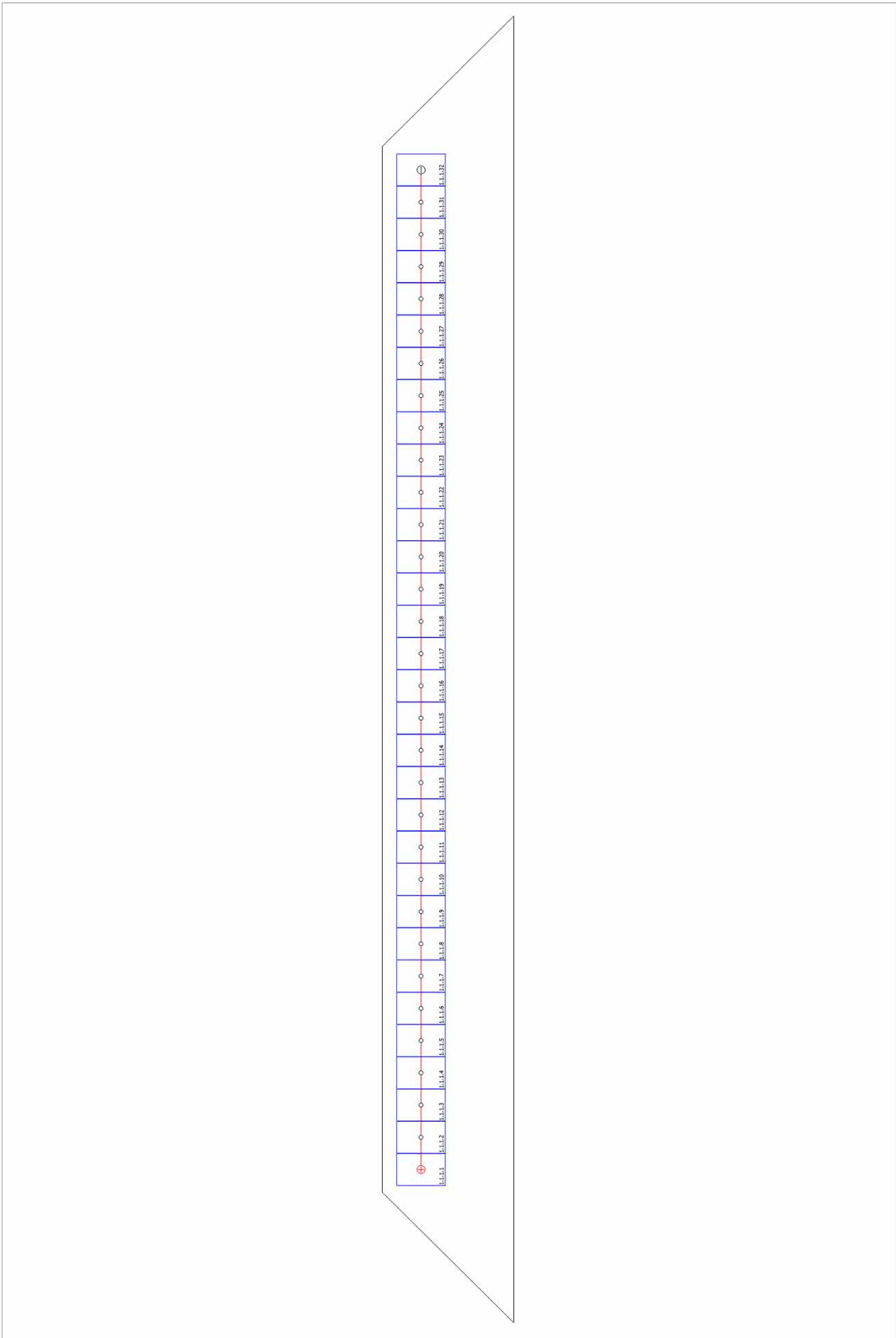


Figure: Building 01 - Roof Area Southwest

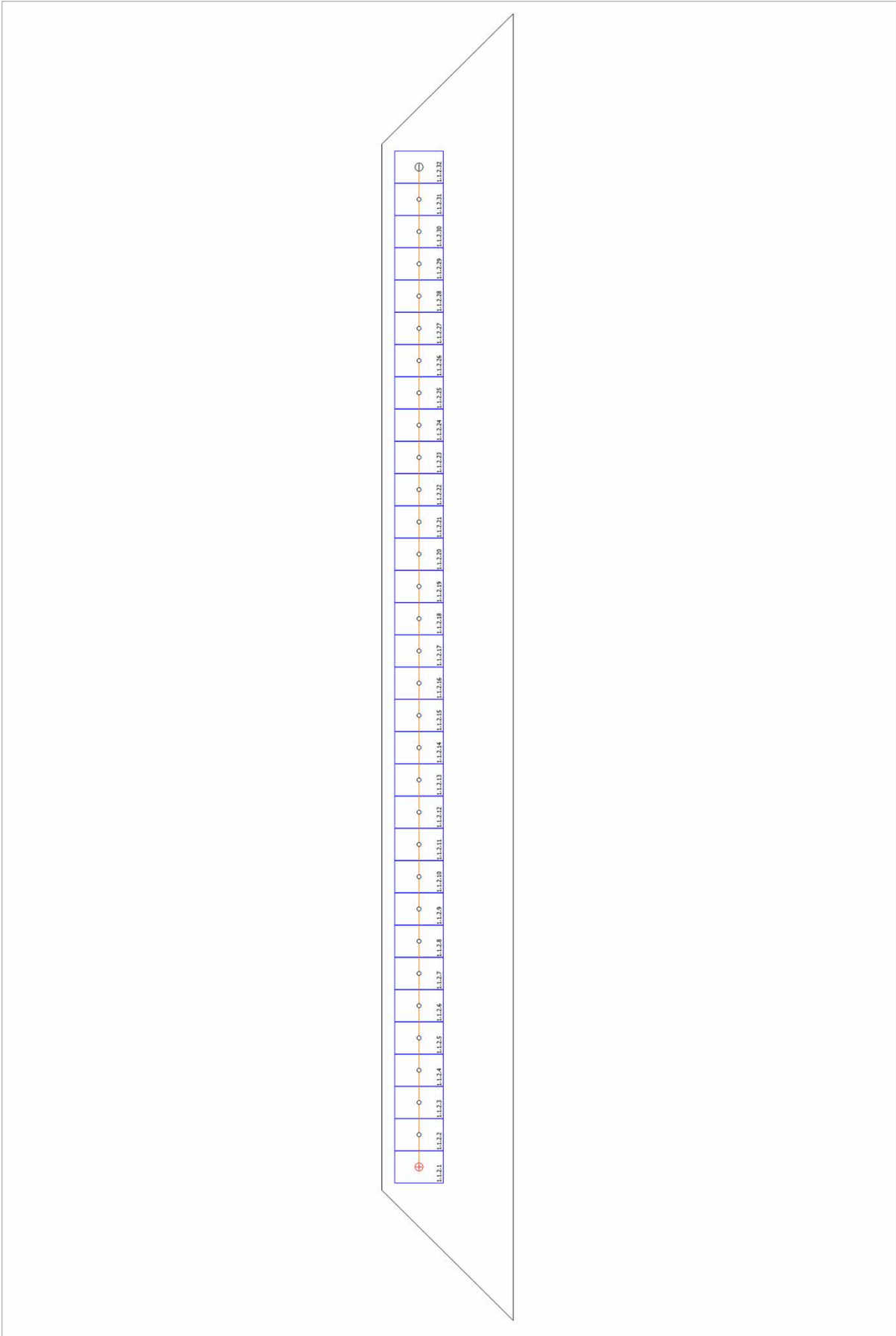


Figure: Building 02 - Roof Area Southwest

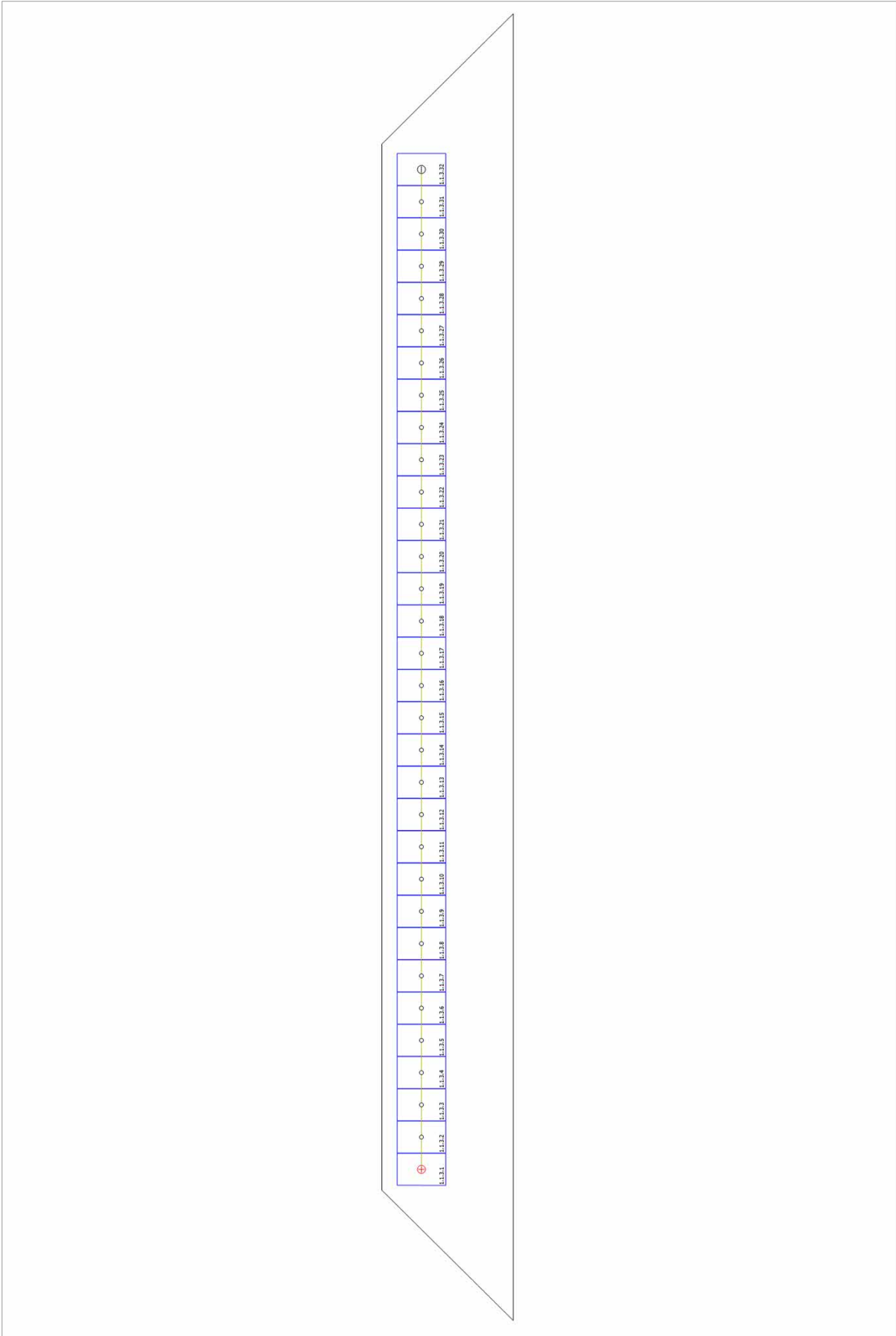


Figure: Building 03 - Roof Area Southwest

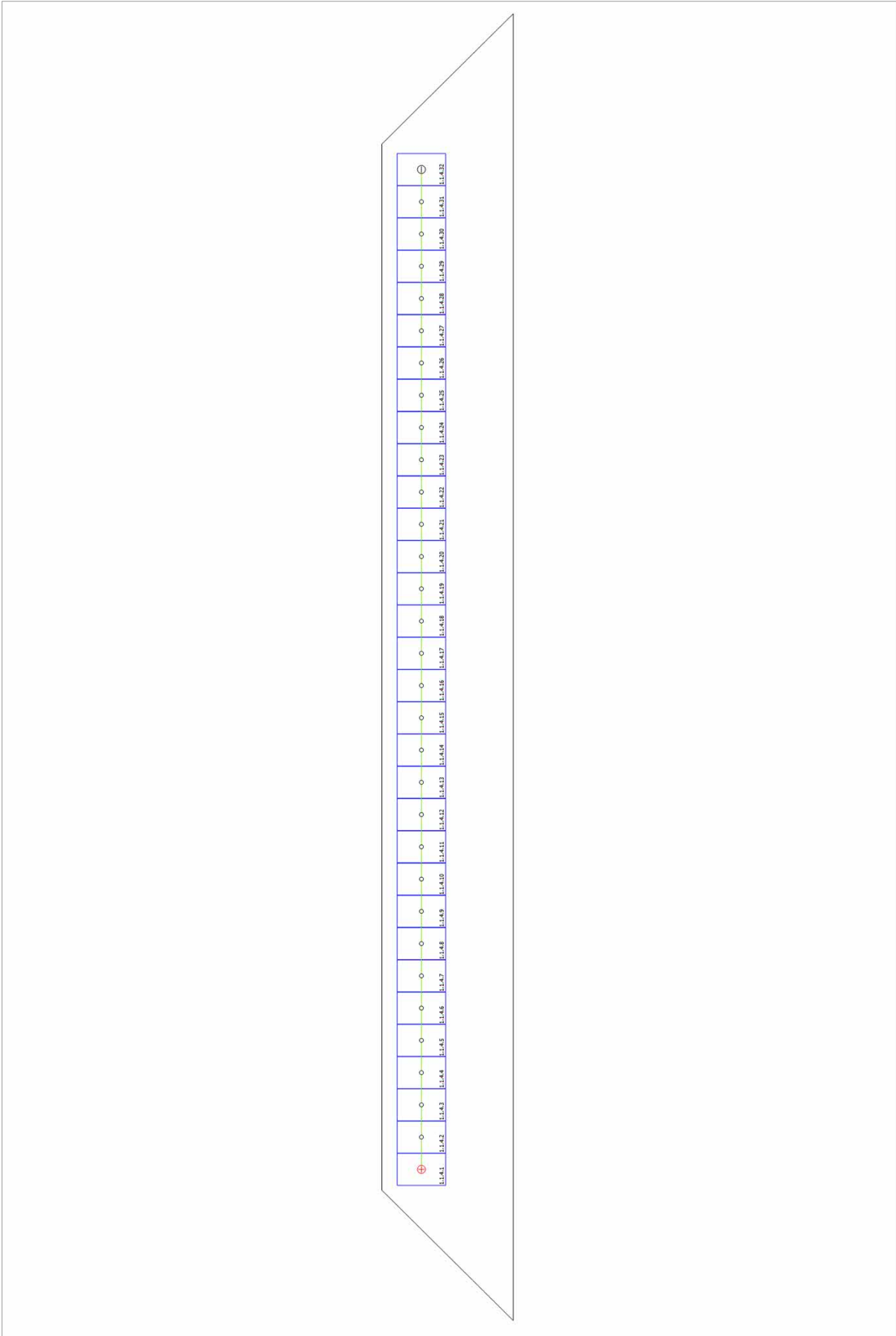


Figure: Building 04 - Roof Area Southwest

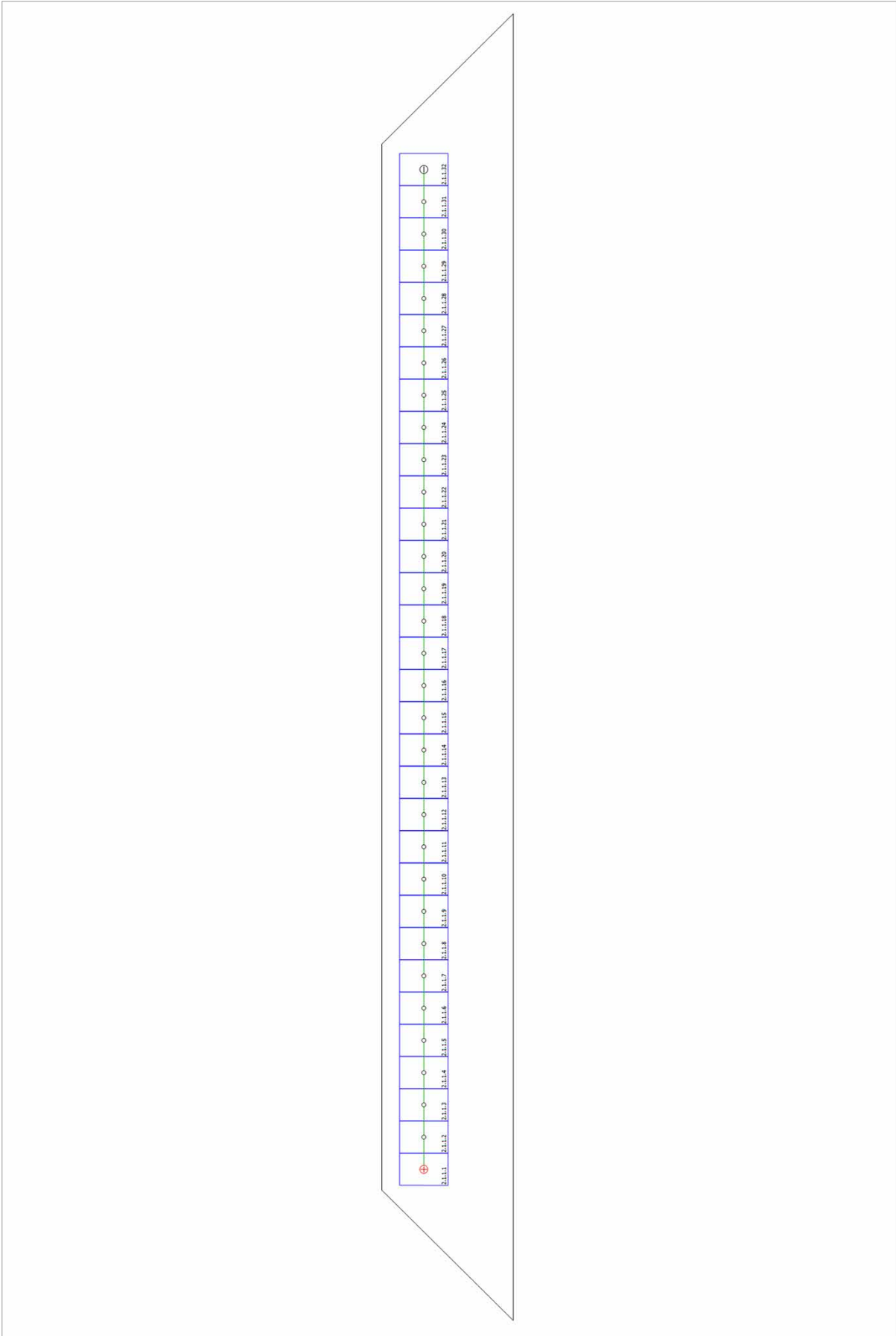


Figure: Building 05 - Roof Area Southwest

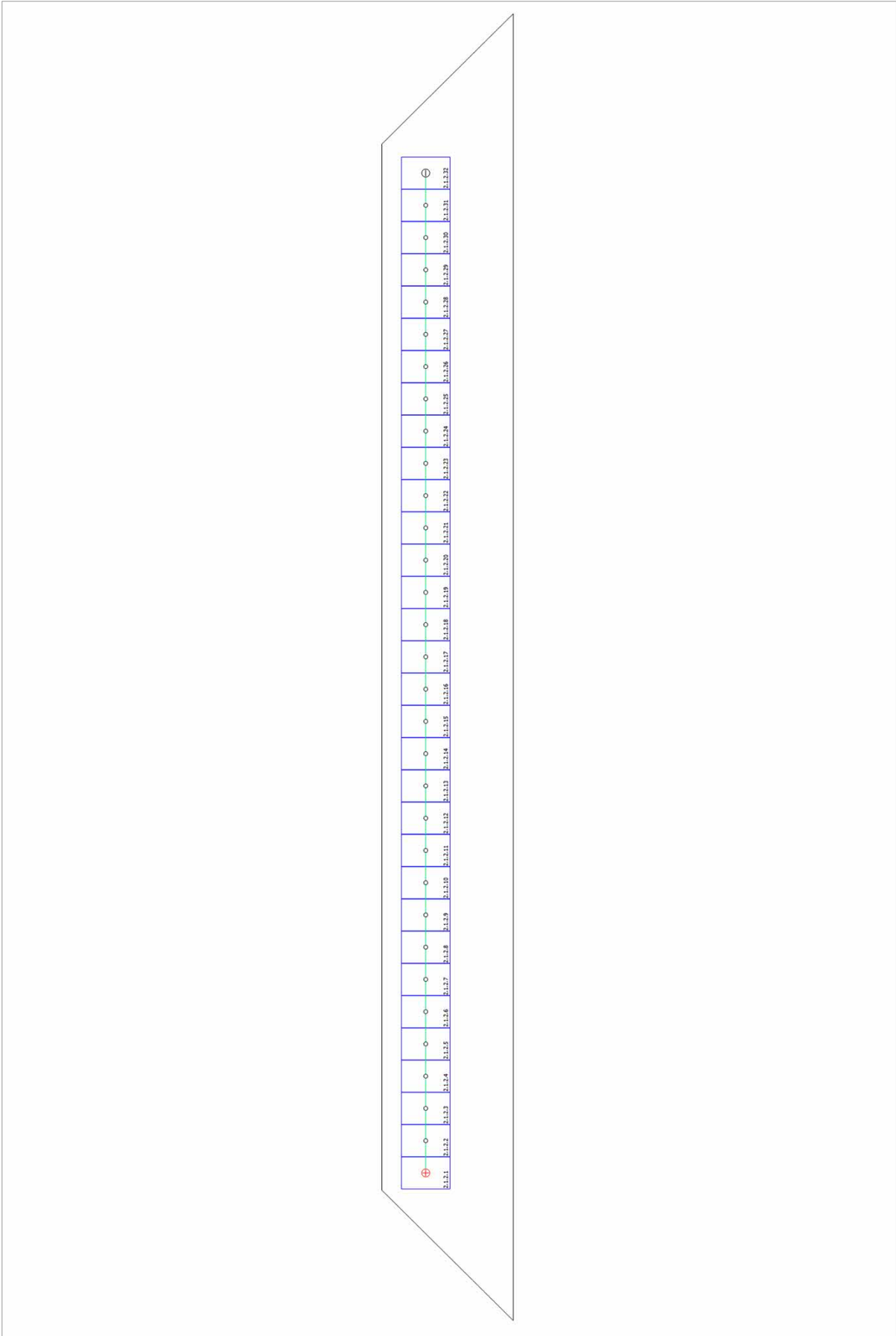


Figure: Building 06 - Roof Area Southwest

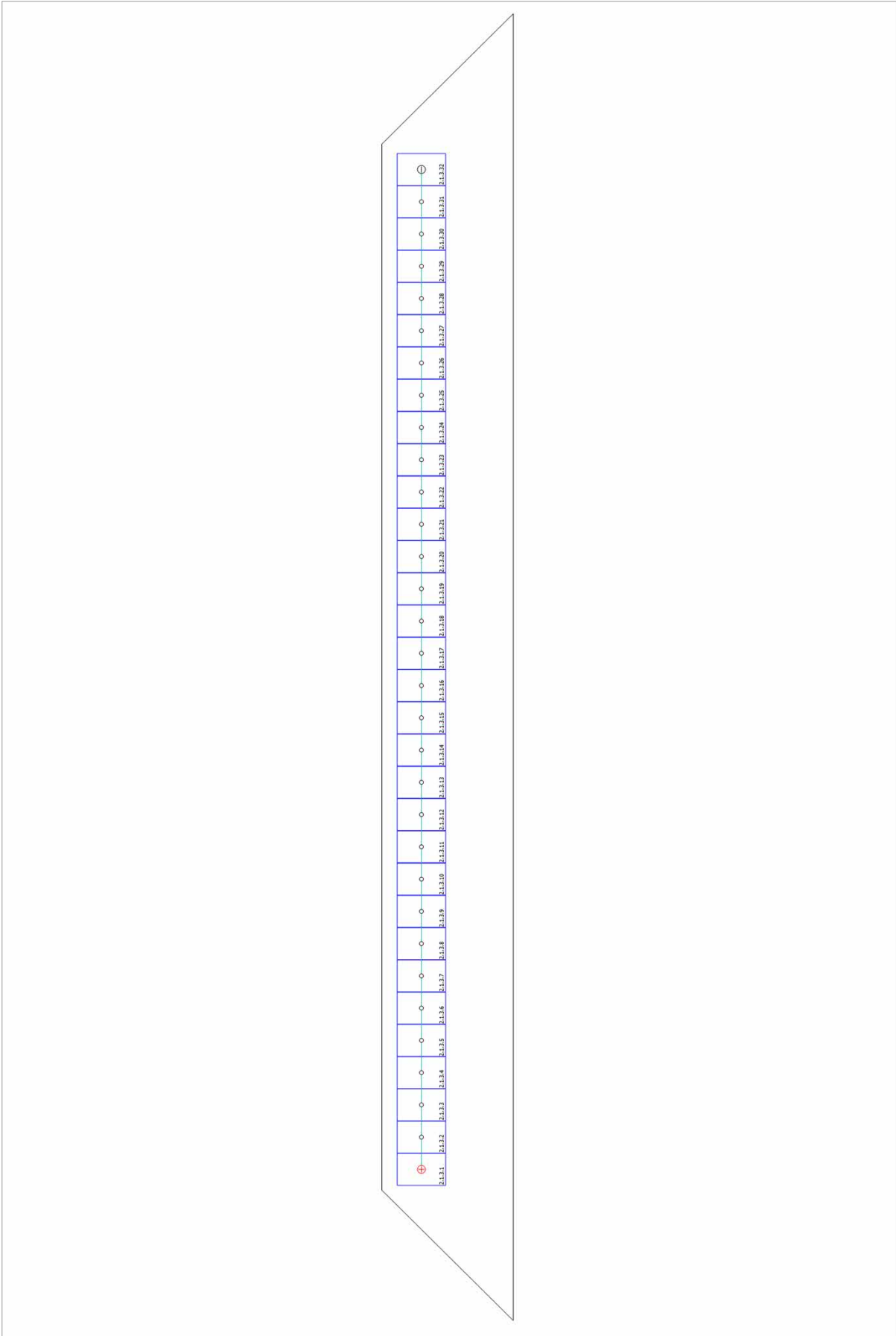


Figure: Building 07 - Roof Area Southwest

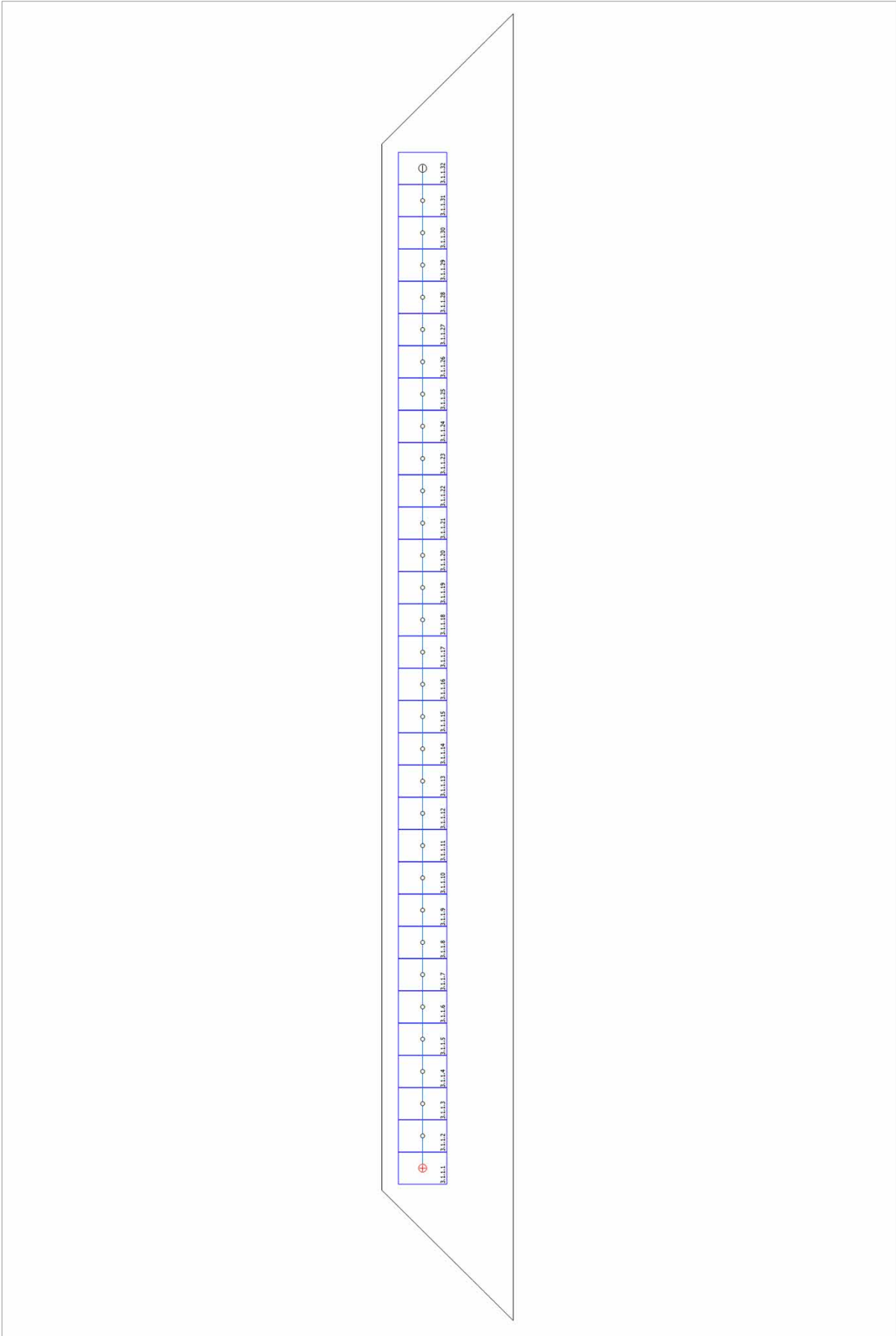


Figure: Building 08 - Roof Area Southwest

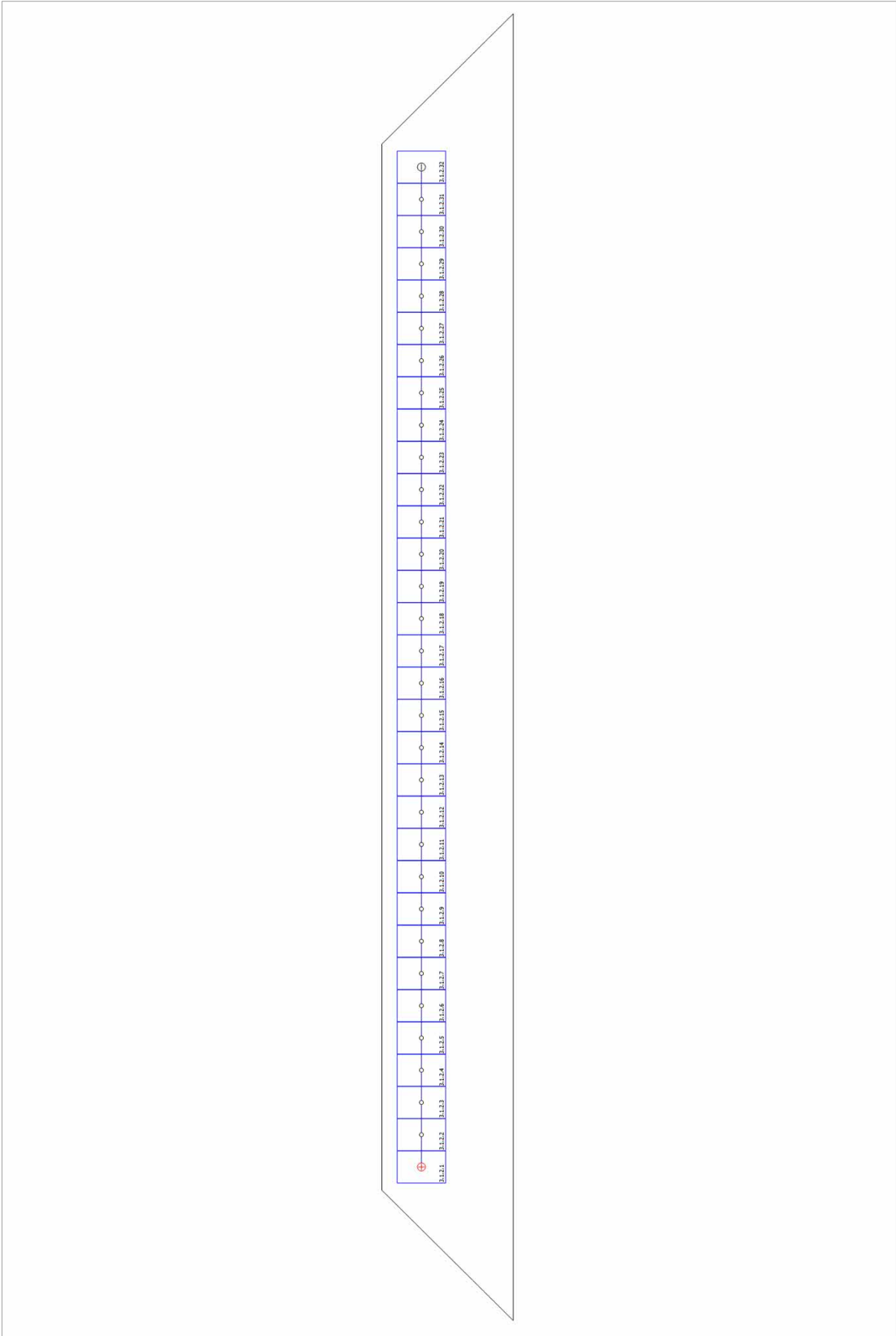


Figure: Building 09 - Roof Area Southwest

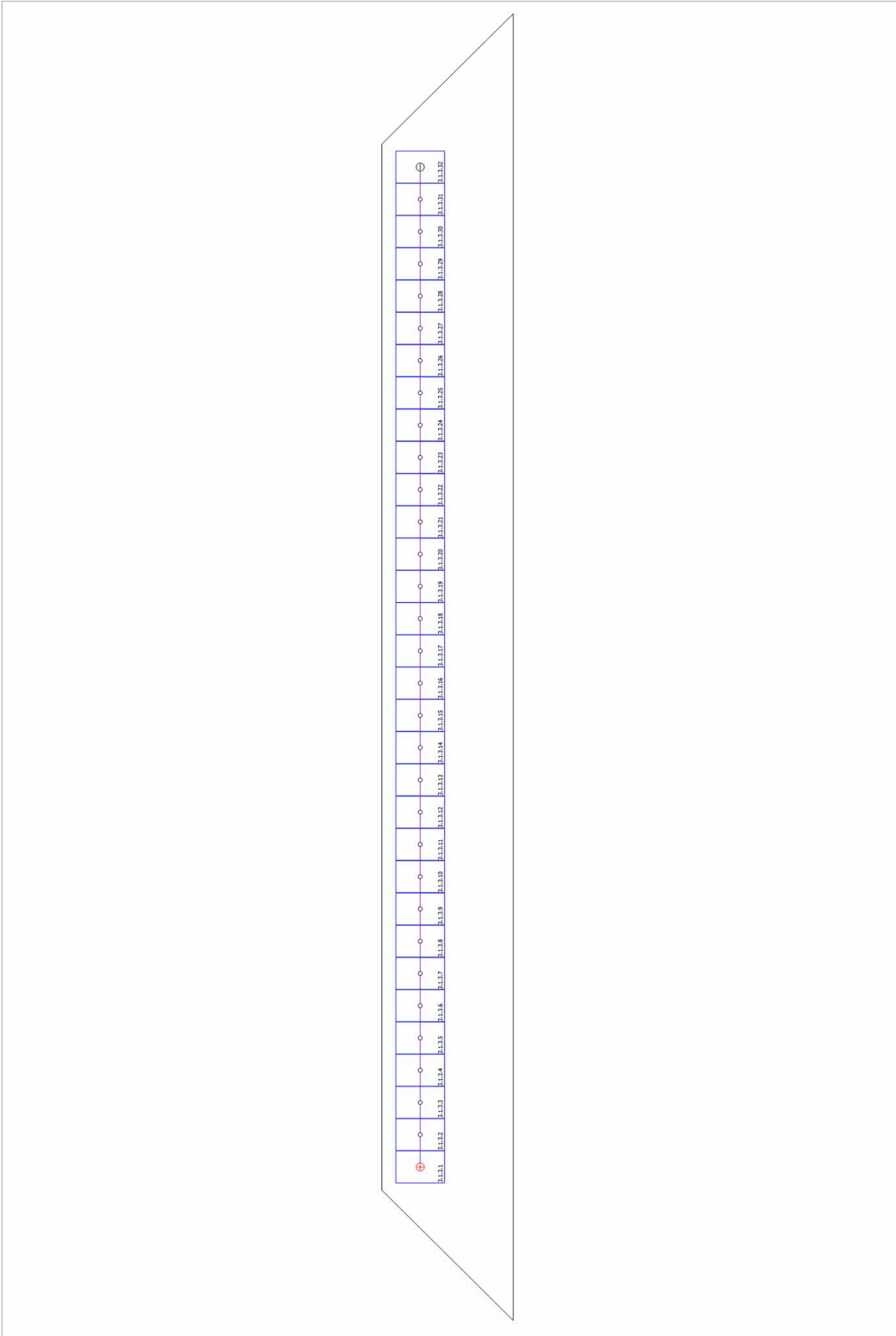


Figure: Building 10 - Roof Area Southwest

Parts list

Parts list

#	Type	Item number	Manufacturer	Name	Quantity	Unit
1	PV Module		JA Solar Holdings Co., Ltd.	JAM54S30-420_GR	320	Piece
2	Inverter		SolarEdge	SE100K-EU-APAC/AUS Unit (400V) - 33.3 kW	3	Piece
3	Power Optimizer		SolarEdge	P850 Worldwide	160	Piece

Screenshots, 3D Design Environment



Figure: Screenshot02



Figure: Screenshot03

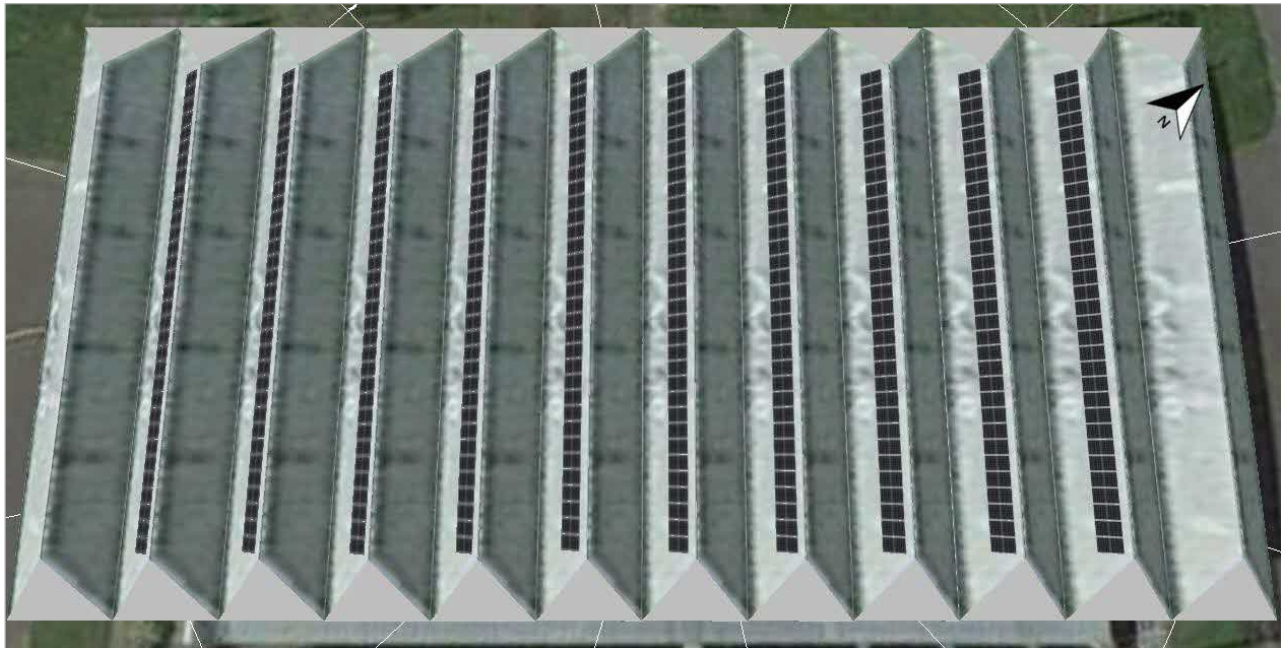


Figure: Screenshot04

Configuration

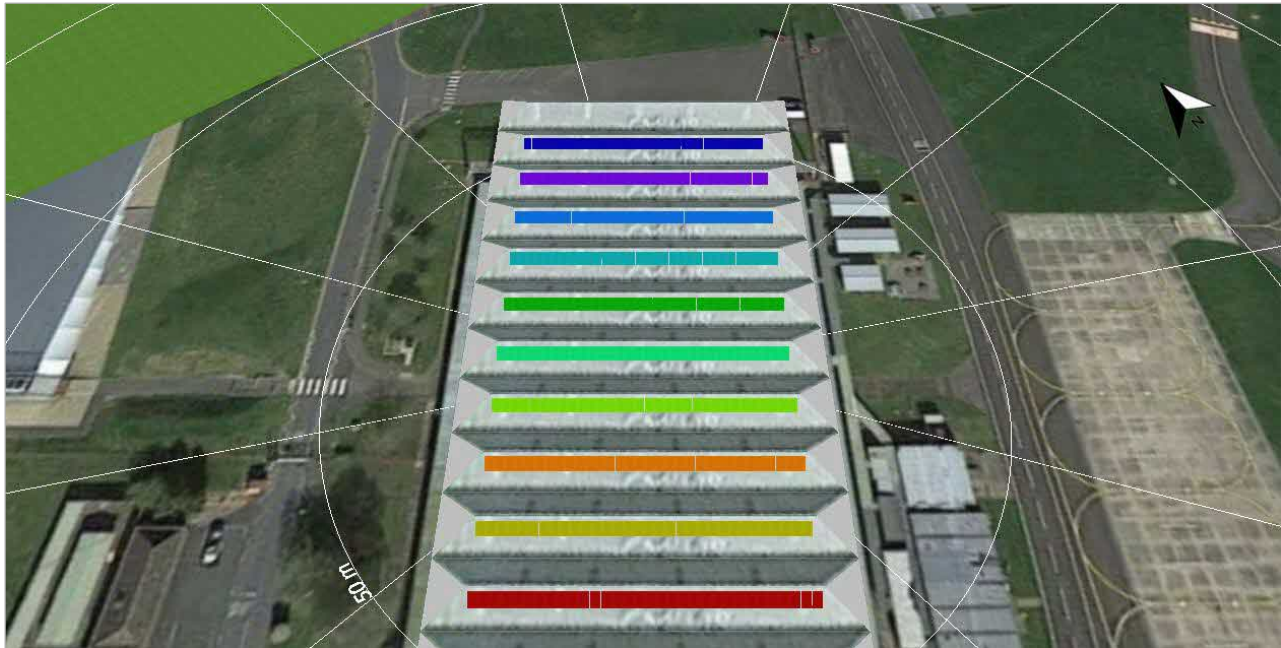


Figure: Screenshot01