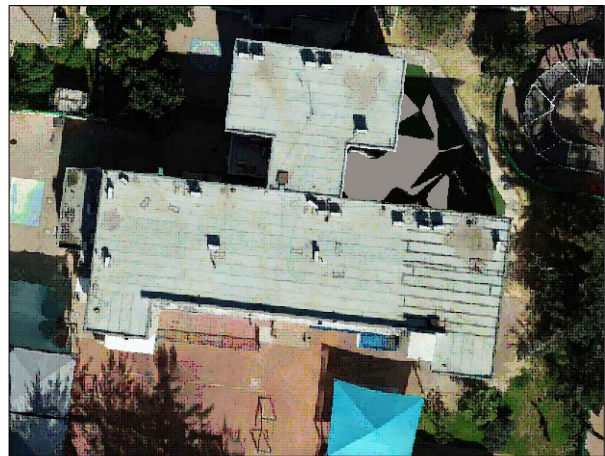


רמת גן- בית ספר הרא"ה

מערכת סולארית מתח נמוך – 62.59Kw

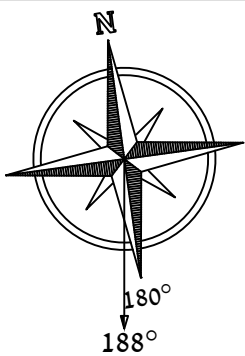


- Bet Sefer Haroe- G001 – הצבת פאנלים
- Bet Sefer Haroe- G002 – חיווט פאנלים
- Bet Sefer Haroe- E001 – חד קווי
- Bet Sefer Haroe- C001 – סימולציה PVSyst
- Bet Sefer Haroe- C003 – חישוב הפסדי הולכה DC
- Bet Sefer Haroe- C004 – חישוב הפסדי הולכה AC

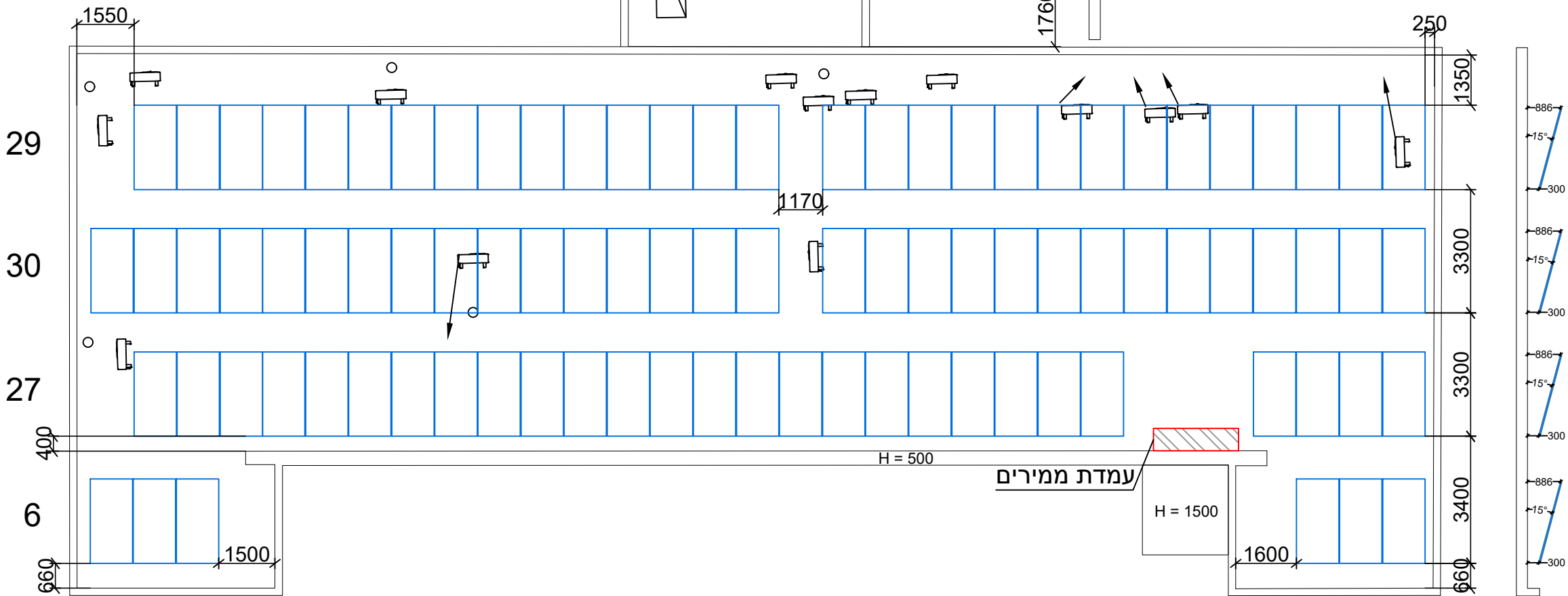
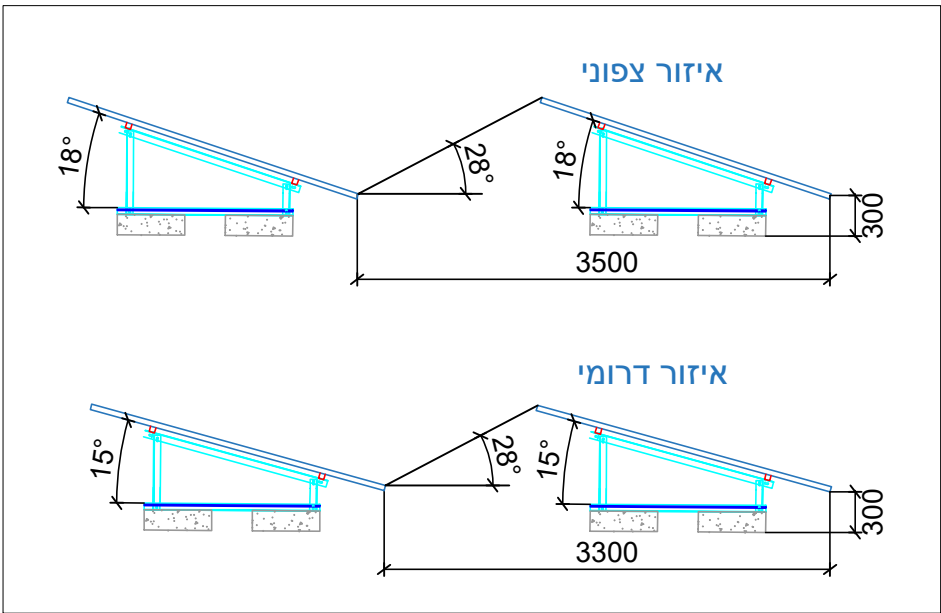
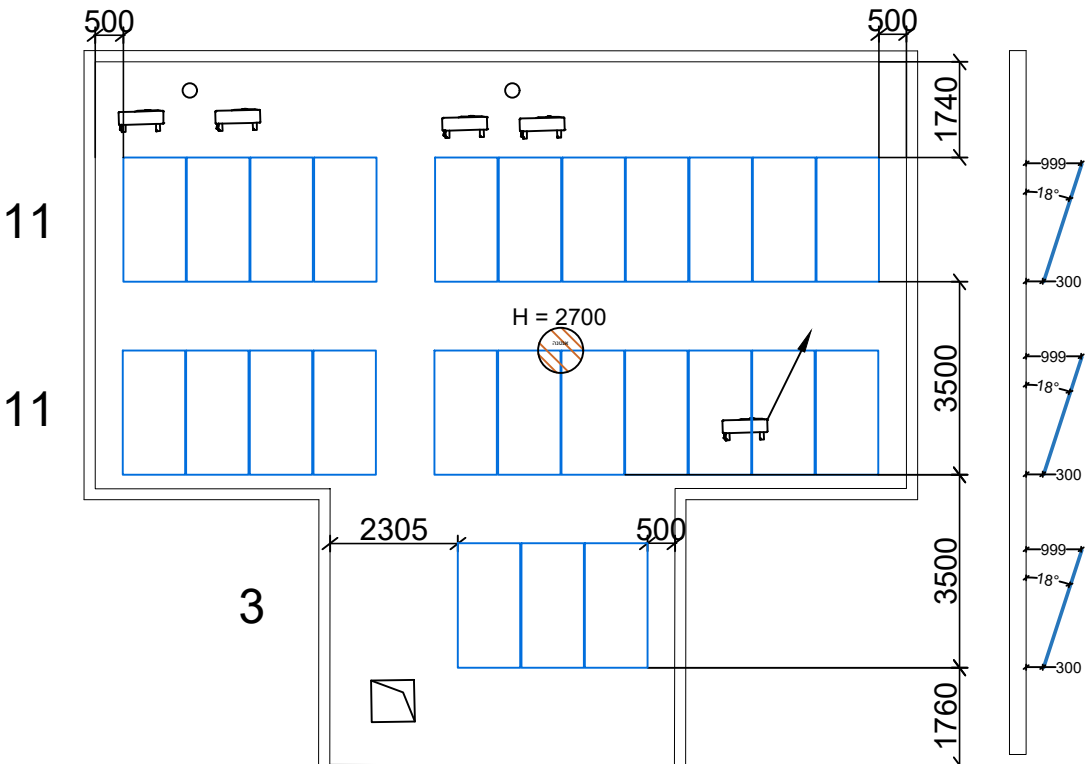


Beit Sefer Noam Haroe Design Layout

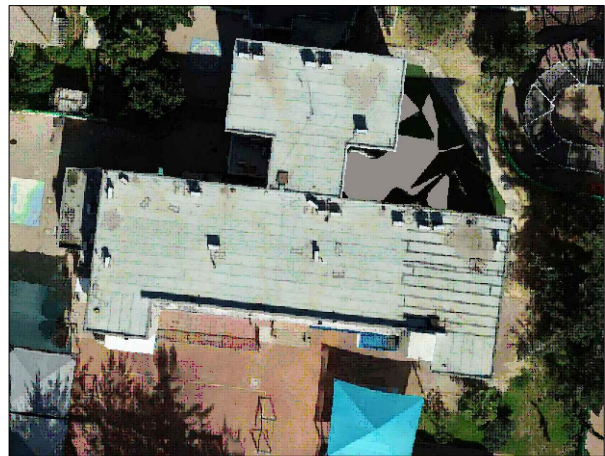
בית ספר נועם הרא"ה, רמת גן - חלקה לסטרינגים/ממירים						535	הספק פאנל בודד (W)
						118	מ"ס פאנלים כללי:
						100	הספק כללי AC (KW):
						63.13	הספק כללי DC (KW):
						125.19%	יחס AC/DC:
AC/DC	(kW) AC	הספק (kW) DC	מ"ס פאנלים	אופטימיזרים P1100	מ"ס סטרינגים	ממיר	סוג ממיר (kW)
125.19%	50	62.595	30	15	2	Primary	SE 50kW
			29	15			
			30	15	2	Secondary	
			28	14			
125.19%	50	62.595	117	59			
סה"כ כמות:							



ביצוע כל עבודה בכפוף
להוראות ממונה הבטיחות



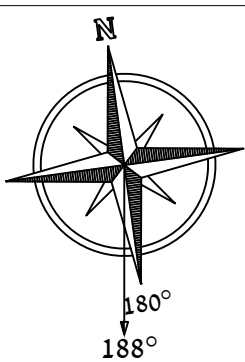
Title: תוכנית הצבת פאנלים		DRAWING NUMBER: Beit Sefer Noam Haroe - G001				REV	DATE	DRAWN	COMMENTS	Panels		Inverters		Quant'
Client: שחר אנרגיה	Site location: רמת גן	DATE: 24/02/2021	Scale: ####	Print size: A3	Sheet: 1/1	A 1	08/06/21	Roi N.	Layout Update	Manuf': Chint [2256x1133x35]	Manuf': Solar Edge			
		Designer: Roi Nakash	APPROVAL / STAMP							Model: 535W	Model A: 50kW			1
		Approved:								Quant': 117	Model B:			
		STATUS: לאישור								Tilt: 15/18 Deg	Model C:			
		REV: A 1								Azimuth: 188 Deg	Model D:			
										T.Power: 62.59kW	T.Power: 50kW			



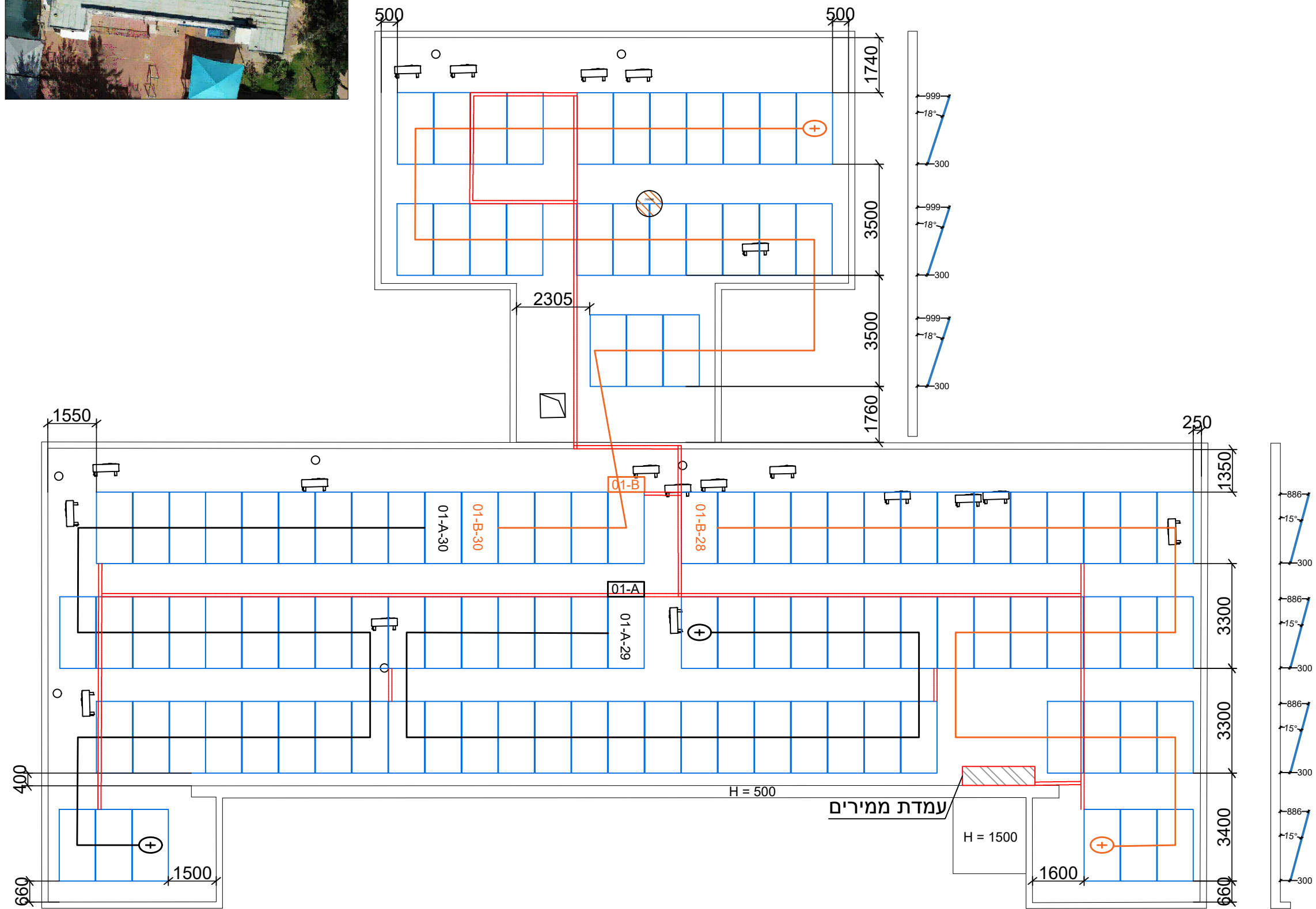
Beit Sefer Noam Haroe

String Wiring

בית ספר נועם הרא"ה, רמת גן - חלקה לסטרינגים/ממירים						535		הספק פאנל בדד (W)	
						118		מ"ס פאנלים כללי:	
						100		הספק כללי AC (KW):	
						63.13		הספק כללי DC (KW):	
						125.19%		חס AC/DC:	
AC/DC	הספק AC (kW)	הספק DC (kW)	מ"ס פאנלים	אופטימיזרים P1100	מ"ס סטרינגים	ממיר	סוג ממיר (kW)	כניסת mppt	גג
125.19%	50	62.595	30	15	2	Primary	SE 50kW	1	בטון
			29	15					
			30	15					
			28	14					
125.19%	50	62.595	117	59					סה"כ כמות:



ביצוע כל עבודה בכפוף
להוראות ממונה הבטיחות



מקרא:

XX-YY-ZZ
XX- מספר ממיר
YY- מספר ממיר וכניסת mppt
ZZ- מספר פאנלים

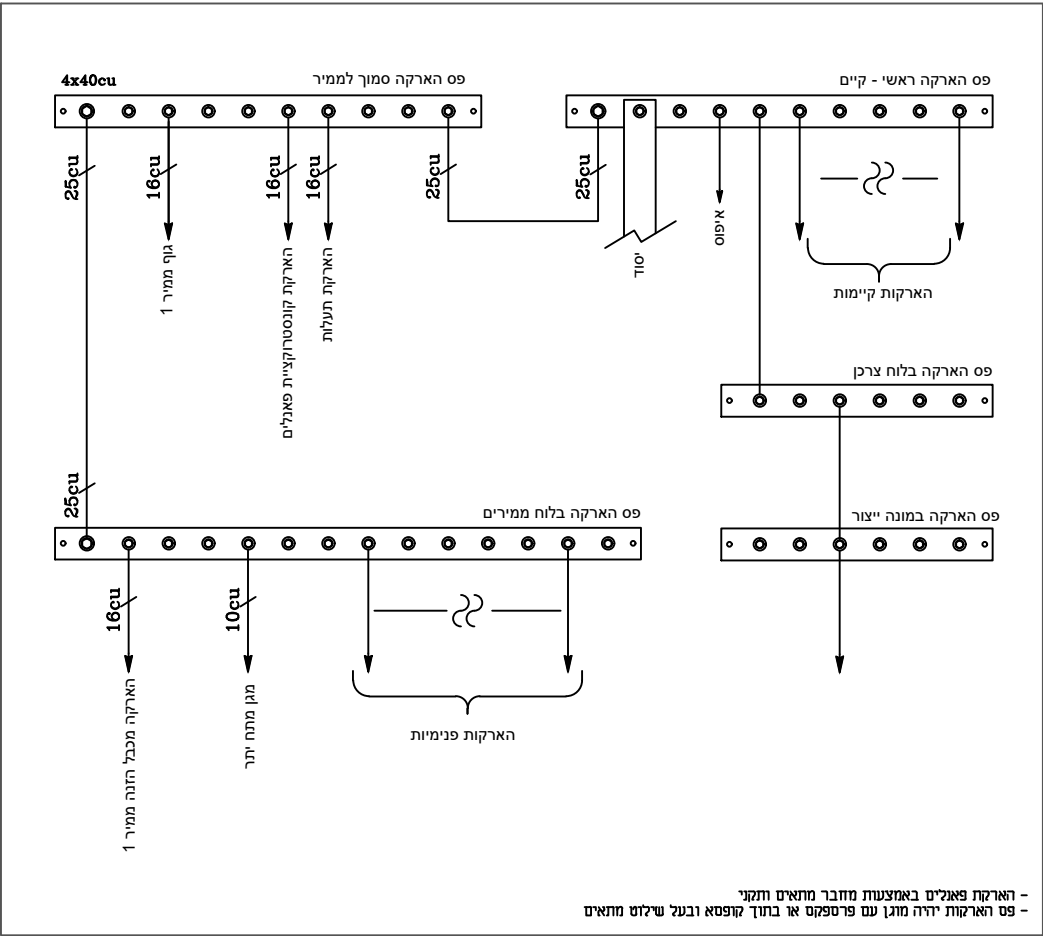
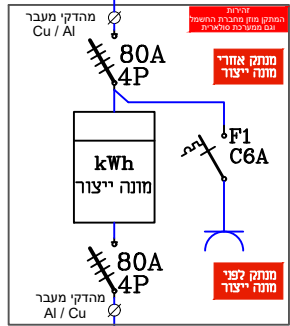
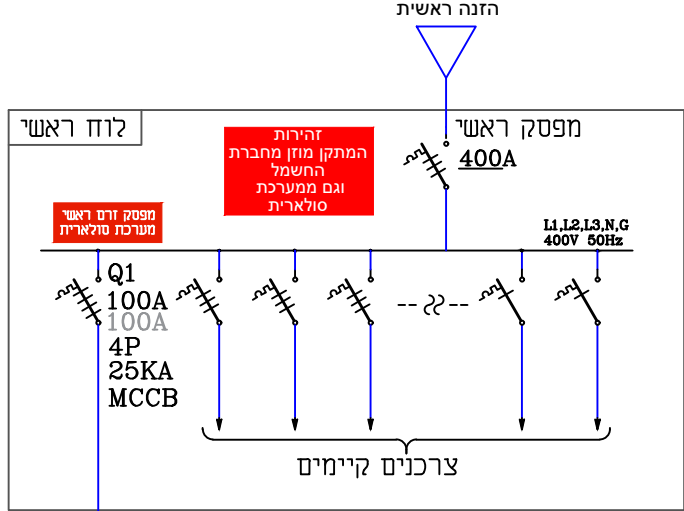
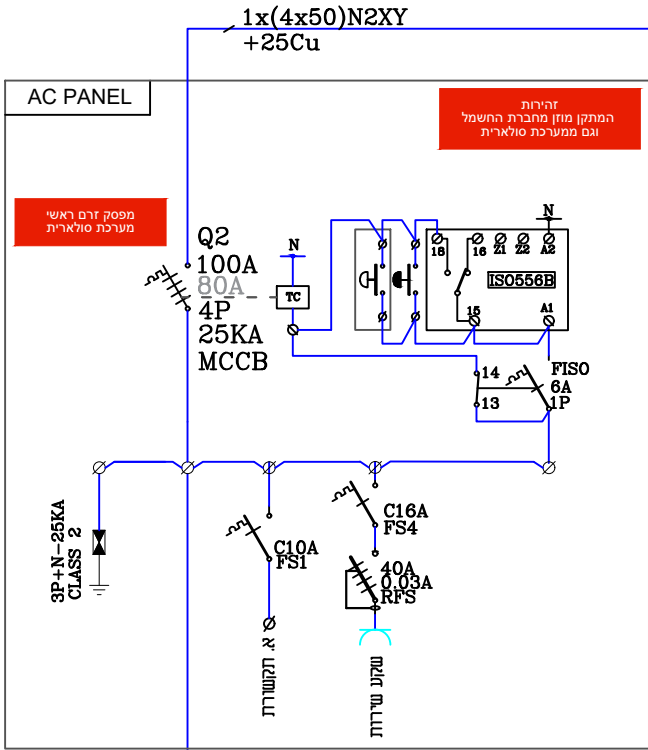
⊕ — כיוון חיבור סטרינג

JB - A קופסת איסוף סטרינג

— 100 DC רשת תעלה

— מובל עילי קיימים/תעלה

Title: תוכנית חיווט פאנלים		DRAWING NUMBER: Beit Sefer Noam Haroe - G002				REV	DATE	DRAWN	COMMENTS	Panels		Inverters		Quant'
Client: שחר אנרגיה	Site location: רמת גן	DATE: 24/02/2021	Scale: ####	Print size: A3	Sheet: 1/1	A 1	08/06/21	Roi N.	String Wiring	Manuf': Chint [2256x1133x35]	Model: 535W	Manuf': Solar Edge	Model A: 50kW	1
		Designer: Roi Nakash	APPROVAL / STAMP							Quant': 117		Model B:		
		Approved:								Tilt: 15/18 Deg		Model C:		
		STATUS: לאישור								Azimuth: 188 Deg		Model D:		
		REV: A 1								T.Power: 62.59kW		T.Power: 50kW		



- הארקות פאנלים באמצעות מחבר מתאים וחוקי
- פס הארקות יידוה מוגן עם פרטקטס או בתוך קופסה ובעל שילוט מתאים

- Notes:
1. Elec. panel should be compatible with IL elec. norm 61439
 2. Cables, cores, ducts & modules should be marked with proper marking
 3. Live elec. contacts must be insulated

Beit Sefer Noam Haroe Single Line

בית ספר נועם הרא"ה, רמת גן - חלוקה לסטרינגים/ממירים							535	הספק פאנל בודד (W)
							118	מ"ס פאנלים כללי :
							100	הספק כללי AC (kW) :
							63.13	הספק כללי DC (kW) :
							125.19%	הספק כללי AC/DC :
AC/DC	(kW) AC	הספק DC (kW)	מ"ס פאנלים	אופטימיזרים P1100	מ"ס סטרינגים	ממיר	סוג ממיר (kW)	גג
125.19%	50	62.595	30	15	2	Primary	SE 50kW	1
125.19%	50	62.595	29	15	2	Secondary		
125.19%	50	62.595	30	15	2			
125.19%	50	62.595	28	14	2			
125.19%	50	62.595	117	59				סה"כ כמות

Title: תוכנית חד קווית		DRAWING NUMBER: Beit Sefer Noam Haroe - E001				REV	DATE	DRAWN	COMMENTS	Panels		Inverters		Quant'
Client: שחר אנרגיה		Site location: רמת גן		DATE: 24/02/2021	Scale: ####	Print size: A3	Sheet : 1/1	Roi N.	SLD Update	Manuf': Chint [2256x1133x35]	Manuf': Solar Edge			
				Designer: Roi Nakash	APPROVAL / STAMP					Model: 535W	Model A: 50kW	1		
				Approved:						Quant': 117	Model B:			
				STATUS: לאישור	REV: A 1					Tilt: 15/18 Deg	Model C:			
										Azimuth: 188 Deg	Model D:			
										T.Power: 62.59kW	T.Power: 50kW			



PVsyst - Simulation report

Grid-Connected System

Project: SHR Ramat Gan_HaRoe

Variant: New simulation variant

Sheds on a building

System power: 62.1 kWp

Ramat Gan - Israel

Author

Green Panel (Israel)



Project: SHR Ramat Gan_HaRoe

Variant: New simulation variant

PVsyst V7.1.8

VC0, Simulation date:
09/06/21 16:38
with v7.1.8

Project summary

Geographical Site

Ramat Gan

Israel

Situation

Latitude 32.08 °N

Longitude 34.81 °E

Altitude 46 m

Time zone UTC+2

Project settings

Albedo 0.20

Meteo data

Ramat Gan

Meteonorm 7.3 (1990-2004), Sat=100% - Synthetic

System summary

Grid-Connected System

PV Field Orientation

Fixed planes 2 orientations

Tilts/azimuths 15 / 8 °

18 / 8 °

Sheds on a building

Near Shadings

According to strings

Electrical effect 100 %

User's needs

Unlimited load (grid)

System information

PV Array

Nb. of modules

116 units

Pnom total

62.1 kWp

Inverters

Nb. of units

2 units

Pnom total

50.0 kWac

Pnom ratio

1.241

Results summary

Produced Energy 105.3 MWh/year

Specific production

1697 kWh/kWp/year

Perf. Ratio PR

77.70 %

Table of contents

Project and results summary	2
General parameters, PV Array Characteristics, System losses	3
Near shading definition - Iso-shadings diagram	6
Main results	7
Loss diagram	8
Special graphs	9



PVsyst V7.1.8

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09/06/21 16:38
with v7.1.8

General parameters

Grid-Connected System

PV Field Orientation

Orientation

Fixed planes 2 orientations
Tilts/azimuths 15 / 8 °
18 / 8 °

Horizon

Free Horizon

Sheds on a building

Sheds configuration

Nb. of sheds 17 units

Sizes

Sheds spacing 3.30 m
Collector width 2.26 m
Ground Cov. Ratio (GCR) 68.4 %

Shading limit angle

Limit profile angle 27.5 °

Near Shadings

According to strings
Electrical effect 100 %

Models used

Transposition Perez
Diffuse Perez, Meteonorm
Circumsolar separate

User's needs

Unlimited load (grid)

PV Array Characteristics

PV module

Manufacturer Longi Solar
Model LR5-72 HPH 535 M

(Original PVsyst database)

Unit Nom. Power 535 Wp
Number of PV modules 116 units
Nominal (STC) 62.1 kWp

SolarEdge Power Optimizer

Model P1100 Worldwide
Unit Nom. Power 1100 W
Modules 1 String x 2 in series

Array #1 - PV Array

Orientation #1
Tilt/Azimuth 15/8 °
Number of PV modules 60 units
Nominal (STC) 32.1 kWp
Optimizer Array 2 Strings x 15 In series

At operating cond. (50°C)

Pmpp 29.35 kWp
Output of optimizers
Voper 750 V
I at Poper 39 A

Array #2 - Sub-array #3

Orientation #1
Tilt/Azimuth 15/8 °
Number of PV modules 28 units
Nominal (STC) 14.98 kWp
Optimizer Array 1 String x 14 In series

At operating cond. (50°C)

Pmpp 13.70 kWp
Output of optimizers
Voper 750 V
I at Poper 18 A

Inverter

Manufacturer SolarEdge
Model SE50K/SE75K Unit

(Original PVsyst database)

Unit Nom. Power 25.0 kWac
Number of inverters 2 units
Total power 50.0 kWac

Operating voltage 750 V
Pnom ratio (DC:AC) 1.16

Number of inverters 0.5 Unit
Total power 12.1 kWac

Operating voltage 750 V
Pnom ratio (DC:AC) 1.16

**PVsyst V7.1.8**

VC0, Simulation date:
09/06/21 16:38
with v7.1.8

PV Array Characteristics**Array #3 - Sub-array #3**

Orientation	#2		
Tilt/Azimuth	18/8 °		
Number of PV modules	28 units	Number of inverters	0.5 Unit
Nominal (STC)	14.98 kWp	Total power	12.1 kWac
Optimizer Array	1 String x 14 In series		
At operating cond. (50°C)		Operating voltage	750 V
Pmpp	13.70 kWp	Pnom ratio (DC:AC)	1.17
Output of optimizers			
Voper	750 V		
I at Poper	18 A		
Total PV power		Total inverter power	
Nominal (STC)	62 kWp	Total power	50 kWac
Total	116 modules	Nb. of inverters	2 units
Module area	297 m ²	Pnom ratio	1.24
Cell area	269 m ²		



PVsyst V7.1.8

VC0, Simulation date:
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Array losses

Array Soiling Losses

Loss Fraction 3.0 %

Thermal Loss factor

Module temperature according to irradiance
Uc (const) 25.0 W/m²K
Uv (wind) 0.0 W/m²K/m/s

LID - Light Induced Degradation

Loss Fraction 2.0 %

Module Quality Loss

Loss Fraction 0.0 %

Module mismatch losses

Loss Fraction (Fixed voltage) 0.0 %

Strings Mismatch loss

Loss Fraction 0.1 %

IAM loss factor

ASHRAE Param: IAM = 1 - bo(1/cosi - 1)
bo Param. 0.05

DC wiring losses

Global wiring resistance 10 mΩ
Loss Fraction 1.5 % at STC

Array #1 - PV Array

Global array res. 262 mΩ
Loss Fraction 1.5 % at STC

Array #2 - Sub-array #3

Global array res. 562 mΩ
Loss Fraction 1.5 % at STC

Array #3 - Sub-array #3

Global array res. 562 mΩ
Loss Fraction 1.5 % at STC

System losses

Unavailability of the system

Time fraction 2.0 %
7.3 days,
3 periods

AC wiring losses

Inv. output line up to injection point

Inverter voltage 400 Vac tri
Loss Fraction 1.5 % at STC

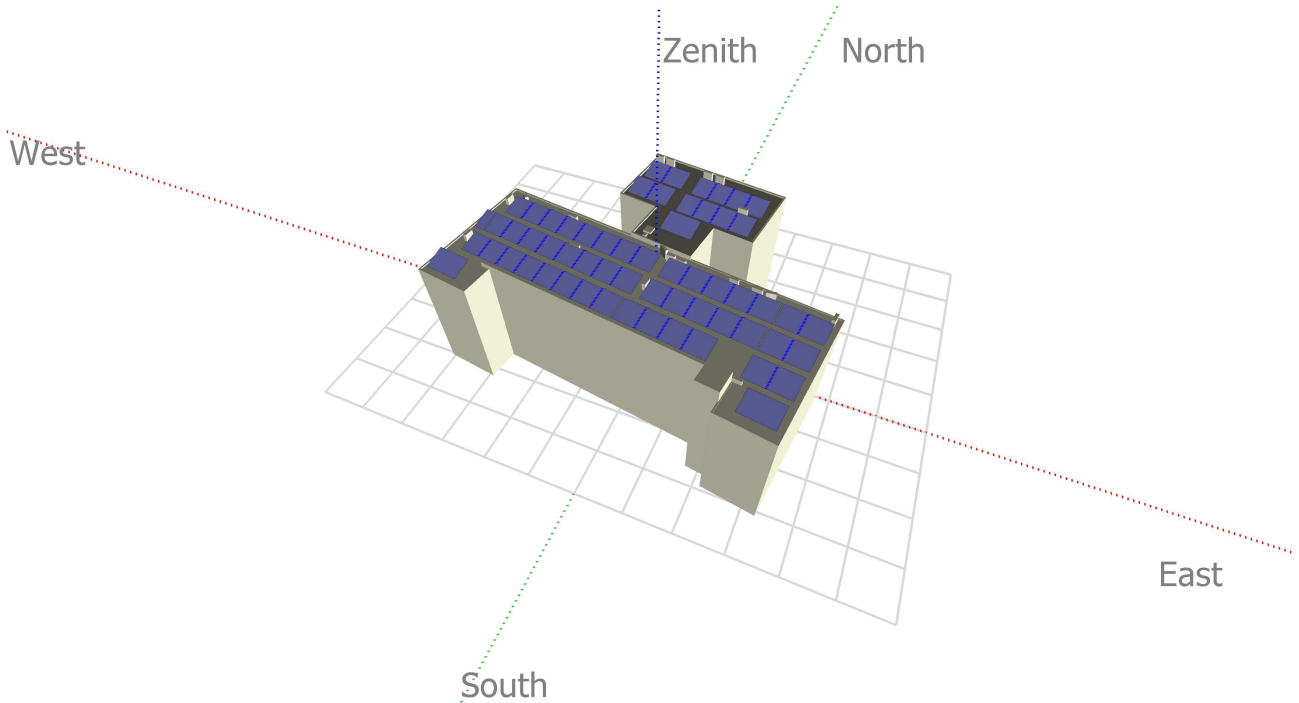
Global System

Wire section Alu 3 x 50 mm²
Wires length 63 m

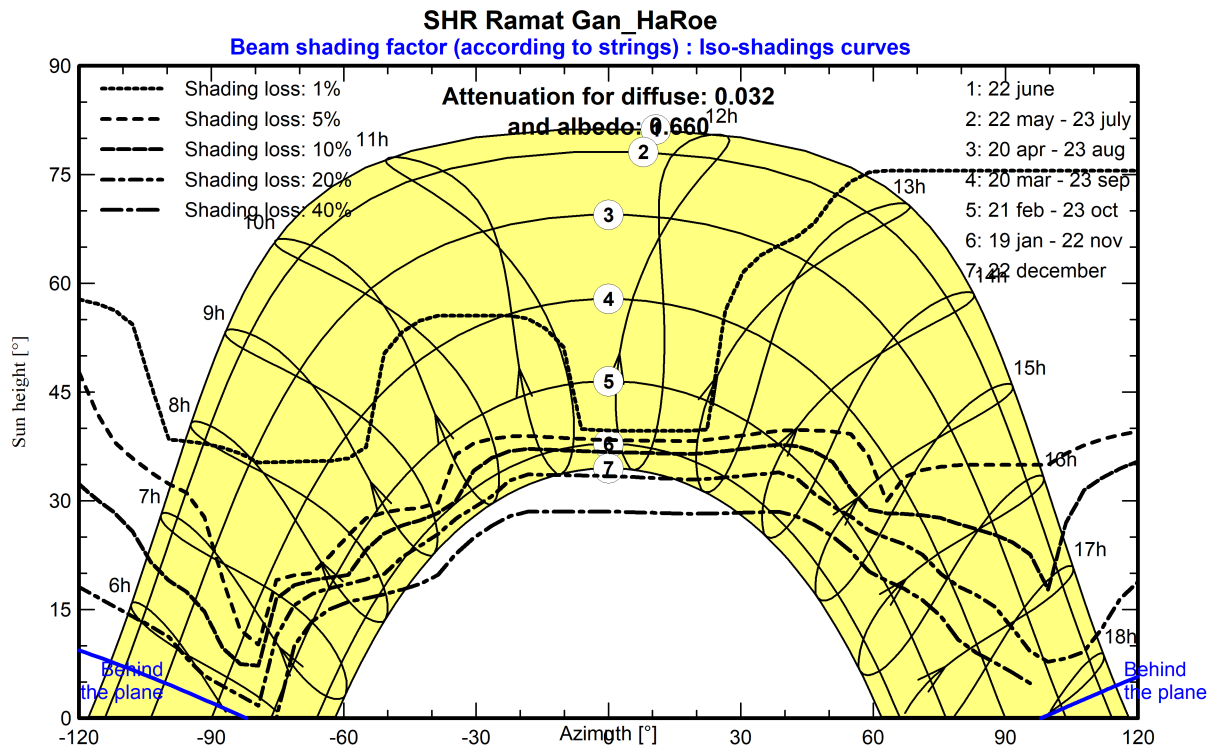


Near shadings parameter

Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram





Project: SHR Ramat Gan_HaRoe

Variant: New simulation variant

PVsyst V7.1.8

VC0, Simulation date:

09/06/21 16:38

with v7.1.8

Main results

System Production

Produced Energy

105.3 MWh/year

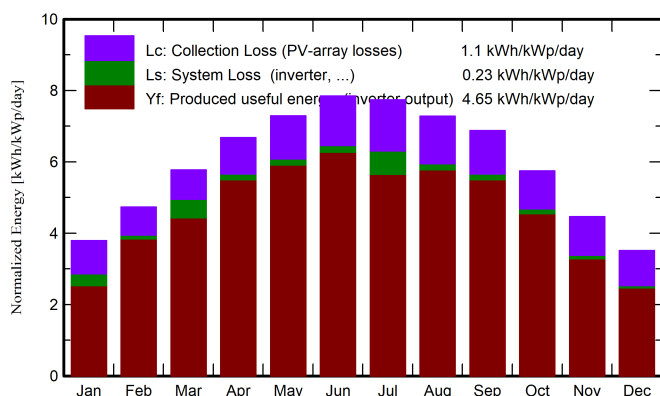
Specific production

1697 kWh/kWp/year

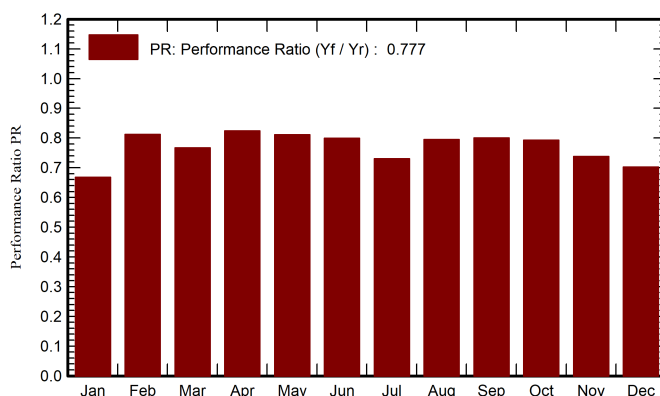
Performance Ratio PR

77.70 %

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

	GlobHor	DiffHor	T_Amb	GlobInc	GlobEff	EArray	E_Grid	PR
	kWh/m ²	kWh/m ²	°C	kWh/m ²	kWh/m ²	MWh	MWh	ratio
January	92.1	38.65	12.89	117.4	107.7	5.51	4.87	0.669
February	110.6	46.40	13.53	132.6	123.4	6.87	6.68	0.812
March	159.8	62.31	16.27	179.1	168.1	9.54	8.53	0.768
April	190.0	71.96	19.23	200.4	188.3	10.54	10.24	0.824
May	226.6	76.41	22.47	226.1	212.5	11.72	11.38	0.811
June	241.9	59.07	25.29	235.4	221.4	12.03	11.68	0.800
July	243.9	61.59	28.17	239.9	225.9	12.15	10.88	0.731
August	218.1	66.52	28.42	225.6	212.5	11.46	11.13	0.795
September	186.5	47.52	26.35	206.4	194.4	10.56	10.25	0.801
October	149.4	46.27	23.76	178.1	166.7	9.02	8.77	0.793
November	105.1	34.92	18.84	133.8	123.8	6.30	6.13	0.738
December	84.7	38.69	15.00	109.0	99.4	4.88	4.75	0.702
Year	2008.7	650.32	20.90	2183.8	2043.9	110.57	105.30	0.777

Legends

GlobHor Global horizontal irradiation

DiffHor Horizontal diffuse irradiation

T_Amb Ambient Temperature

GlobInc Global incident in coll. plane

GlobEff Effective Global, corr. for IAM and shadings

EArray Effective energy at the output of the array

E_Grid Energy injected into grid

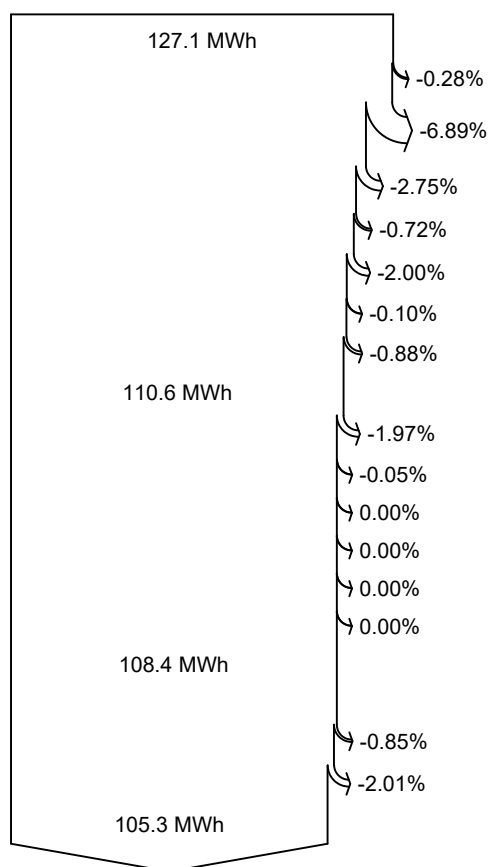
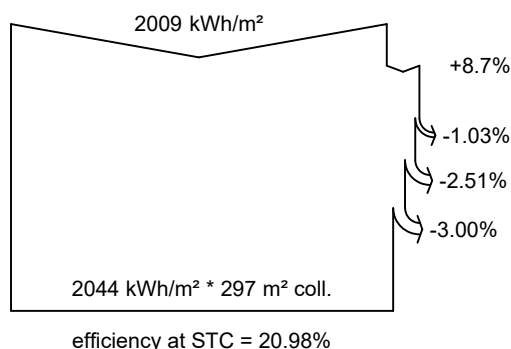
PR Performance Ratio



PVsyst V7.1.8

VC0, Simulation date:
09/06/21 16:38
with v7.1.8

Loss diagram



Global horizontal irradiation

Global incident in coll. plane

Near Shadings: irradiance loss

IAM factor on global

Soiling loss factor

Effective irradiation on collectors

PV conversion

Array nominal energy (at STC eff.)

PV loss due to irradiance level

PV loss due to temperature

Shadings: Electrical Loss acc. to strings

Optimizer efficiency loss

LID - Light induced degradation

Mismatch loss, modules and strings

Ohmic wiring loss

Array virtual energy at MPP

Inverter Loss during operation (efficiency)

Inverter Loss over nominal inv. power

Inverter Loss due to max. input current

Inverter Loss over nominal inv. voltage

Inverter Loss due to power threshold

Inverter Loss due to voltage threshold

Available Energy at Inverter Output

AC ohmic loss

System unavailability

Energy injected into grid



PVsyst V7.1.8

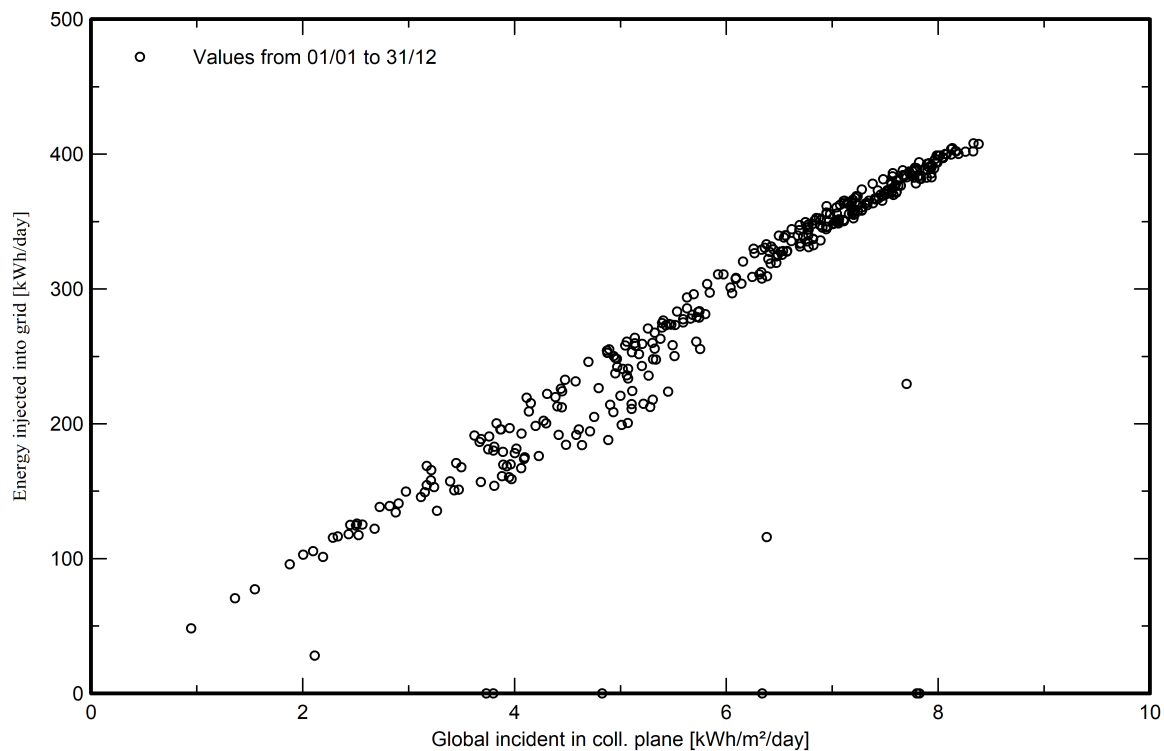
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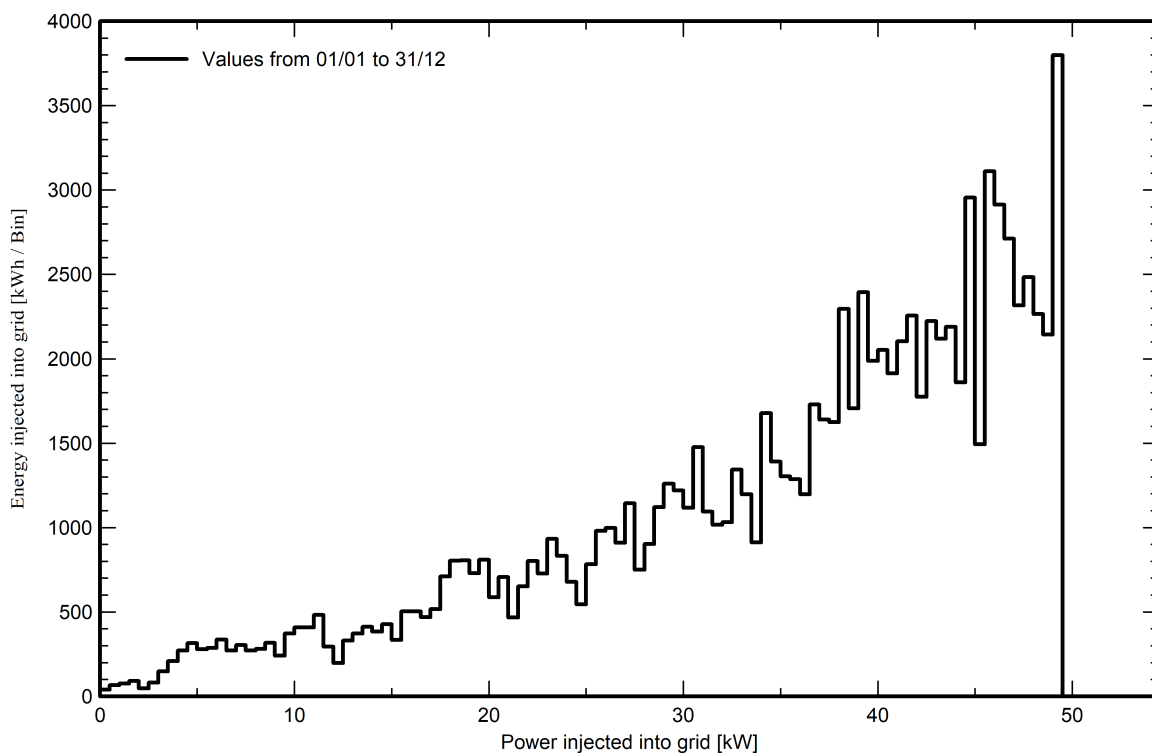
with v7.1.8

Special graphs

Daily Input/Output diagram



System Output Power Distribution



DC CABLE CALCULATION & POWER LOSSES

DATA		Cable Calculation										Production Losses	
Module Type	535	mm^2	Copper			Aluminum						Grid Load	100%
Imp [A]	17.28		4	6	16	25	35	50	95	120	240	Power Losses	0.77%
Vmp [V]	31.00												
Module amount	117	Length											
Total Power [kWp]	62,595		0	450	0	0	0	0	0	0	0		482W

Inverter	Module No'	Module No' Inv/String	Parallel Strings	Power [W]	Current [A]	Max Current Carrying Capacity [A]	Resistance [Ω/1000m]	No' Cable Sets	Cross section [mm^2]	Cable Lengh [M]	Voltage Drop [V]	Power losses [W]	ΔP %	
01-A	59	59	2	31565	34.56	64.50	3.59	2	6	25	3.1	107	0.34%	DCCB / DCB to INV Losses
ST-1	30	30	1	16050	17.28	36.75	3.59	1	6	45	6	96	0.60%	String Losses
ST-2	29	29	1	15515	17.28	36.75	3.59	1	6	40	5	86	0.55%	
												289	0.92%	Total losses
01-B	58	58	2	31030	34.56	64.50	3.59	2	6	25	3.1	0	0.00%	DCCB / DCB to INV Losses
ST-1	30	30	1	16050	17.28	36.75	3.59	1	6	50	6	107	0.67%	String Losses
ST-2	28	28	1	14980	17.28	36.75	3.59	1	6	40	5	86	0.57%	
												193	0.62%	Total losses
												482	0.77%	TOTAL

62,595

TOTAL

DATA				AC CABLE CALCULATION & POWER LOSSES																Production Losses			
Module Type	535	Voltage [V]	400																	Avg' Voltage Drop		0.20%	
Imp [A]	12.86	Load [%]	100%	בית ספר הרואה																Max Voltage Drop		0.20%	
Vmp [V]	41.60	Cos Ph	1																	Power Losses		0.20%	
Module amount	117	Total Power [kVA]	68.00																			98.71W	
Total Power [kWp]	62,595																						

FROM	TO	Module amount DC	DC Power [kW]	AC Power [kVA]	MAX AC Current [A]	Cable Length [m]	Cable Type		Cross Section [mm^2]	No' Cable sets	Installation type	K1	K2	K3	K4	Max Current Carrying Capacity [A]	R (at cable temp.) [Ω/Km]	Z (impedance) [Ω/Km]	ΔU Cable [V]	Power Losses [W]	ΔU Cable [%]	ΔU AC Line [%]	Power Losses [%]	
INV 1	LVP	117	62.6	50.00	72.17	4	4x35 NA2XY	Copper	35	1	Air	0.95	0.88	1	1	94.5	0.555	0.561	0.28	34.7	0.07%	0.20%	0.03%	
LVP	IEC Meter	117	62.6	50.00	72.17	10	4x50 NA2XY	Copper	50	1	Air	0.95	1	1	1	127.3	0.410	0.418	0.52	64.0	0.13%	0.13%	0.05%	
AC [kVA]	50.00																			98.7	Total Losses		0.20%	