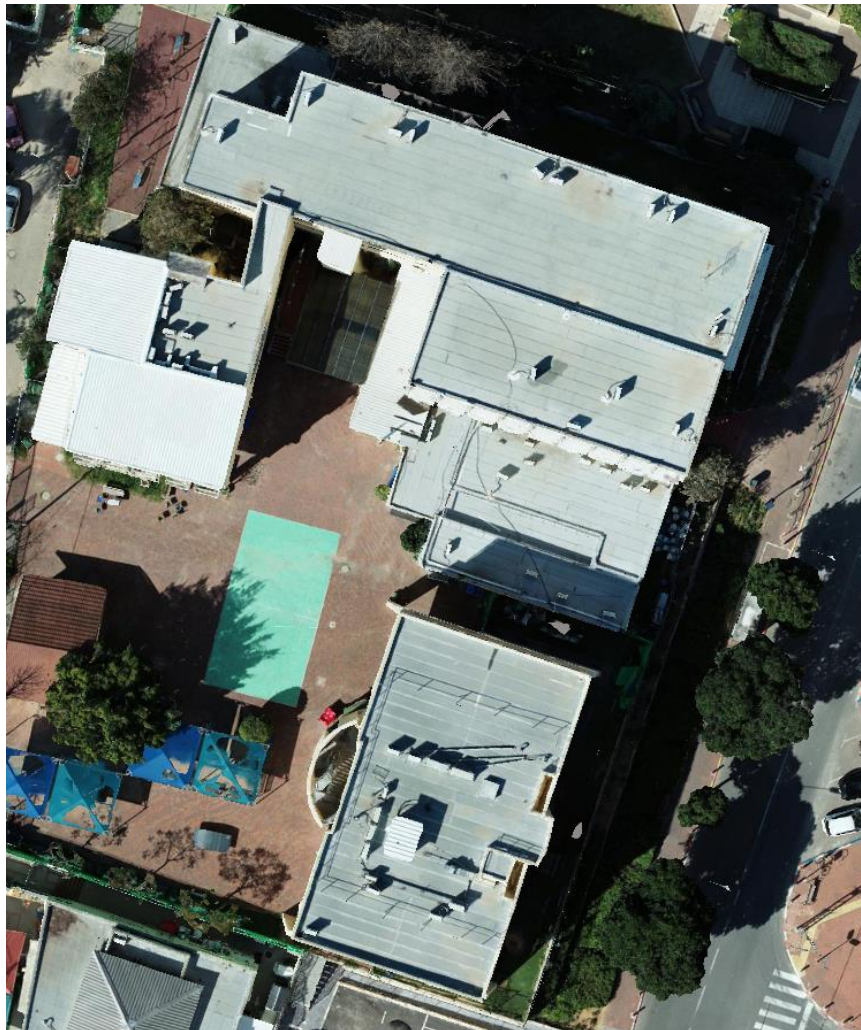


שחר אנרגיה – יגאל אלון

מערכת סולארית מתח נמוך – 66.96kW

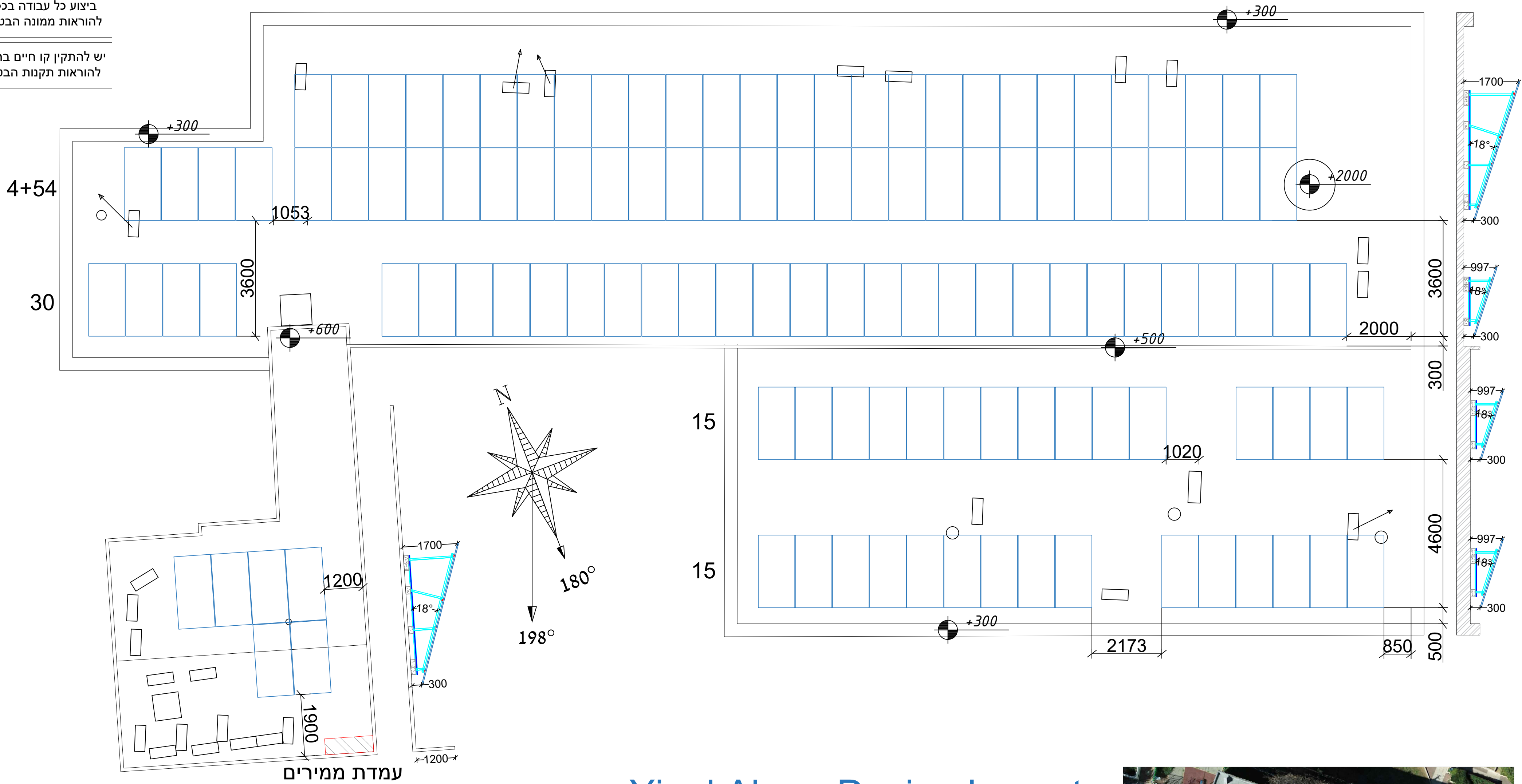


רשימת תוכניות:

- Yigal Alon School - G001 – הצבת פאנלים
- Yigal Alon School - G002 – חיווט פאנלים
- Yigal Alon School - B002 – קונסטרוקציה
- Yigal Alon School - E001 – חד קווי
- Yigal Alon School - C001 – חישוב הפסדי הולכה DC
- Yigal Alon School - C002 – חישוב הפסדי הולכה AC
- Yigal Alon School - C003 – סימולציה PVSyst

ביצוע כל עבודה בכפוף
להוראות ממונה הבטיחות

יש להתקין קו חיים בהתאם
להוראות תקנות הבטיחות



Yigal Alon - Design Layout

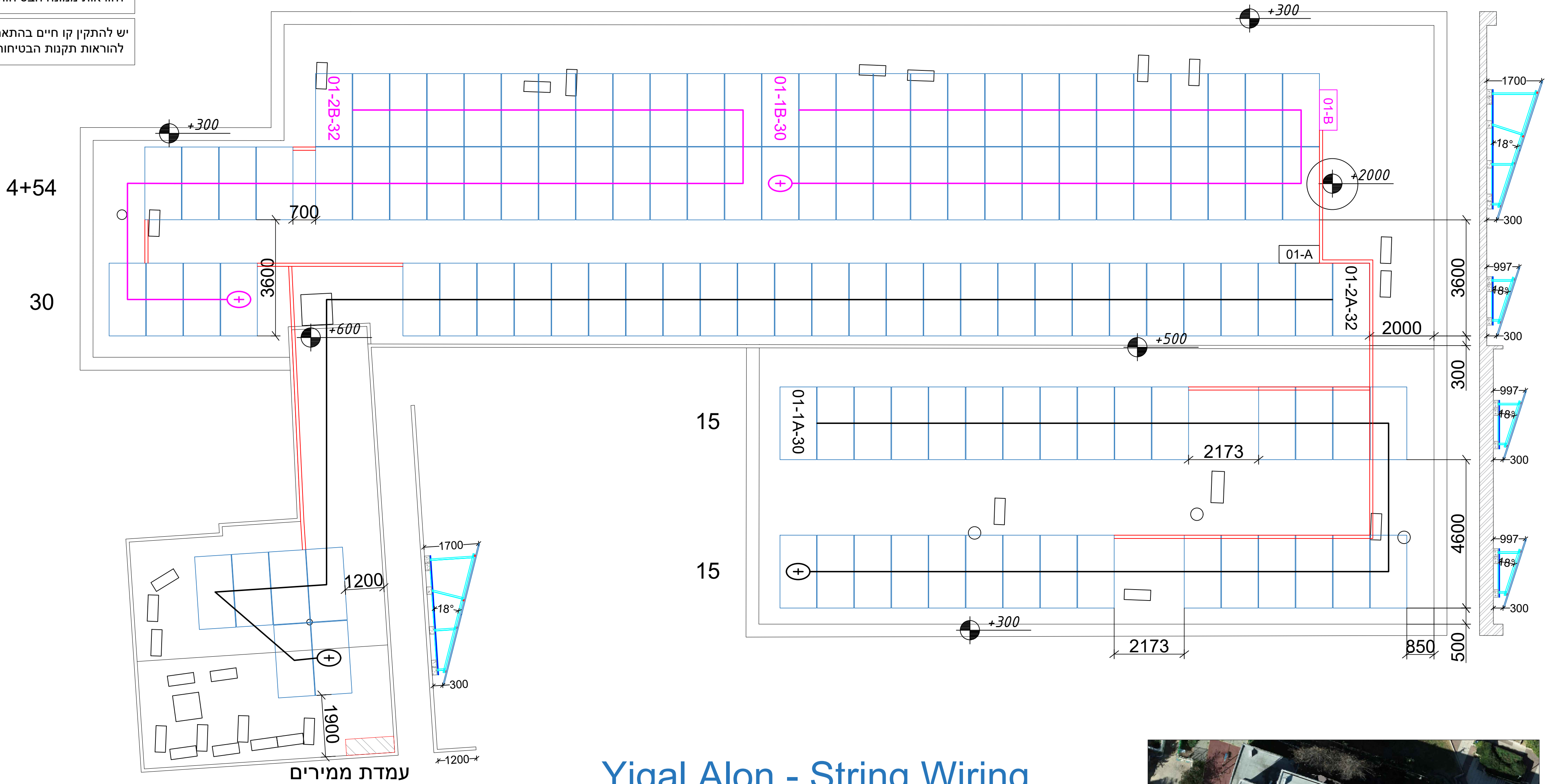
יגאל אלון, רמת גן - חלוקה לסטרינגים						540		הספק פאנל [W] :		
						124		כמות פאנלים :		
						50		הספק AC [kW] :		
						66.96		הספק DC [kWp] :		
						133.92%		יחס העמסה AC/DC :		
AC/DC	[kW] AC	הספק [kWp] DC	מ'ס פאנלים	P1100	מ'ס סטרינגים	אופטימיזר	Unit	סוג ממיר	ממיר	סוג גג
133.92%	50	66.96	30	15	2	Primary	SolarEdge 50kW	1	בטון	
			32	16						
			30	15	2					Secondary1
			32	16						
133.92%	50	66.96	124	62	סה"כ כמות:					



Title: תוכנית הצבת פאנלים		DRAWING NUMBER: Yigal Alon - G001				REV	DATE	DRAWN	COMMENTS	Panels		Inverters	Quant'
Client: שחר אנרגיה	Site location: רמת גן	DATE: 04/05/2021	Scale: ###	Print size: A3	Sheet: 1/1	###	###	###	###	Manuf': Chint [2256x1133x35]	Manuf': Solar Edge		
Designer: בוריס חברוב		APPROVAL / STAMP								Model: 540W	Model A: 50kW		1
Approved:										Quant': 124	Model B:		
STATUS: לאישור										Tilt: 18 Deg	Model C:		
REV: A0										Azimuth: 198 deg	Model D:		
										T.Power: 66.96 kW	T.Power: 50 kVA		

ביצוע כל עבודה בכפוף
להוראות ממנה הבטיחות

יש להתקין קו חיים בהתאם
להוראות תקנות הבטיחות



עמדת ממרים

מקרא חיווט:

XX - YY - ZZ
מספר ממיר - XX
כניסת mppt - YY
כמות פאנלים - ZZ

⊕ — כיוון חיבור סטרינג

01-A קופסת איסוף סטרינג

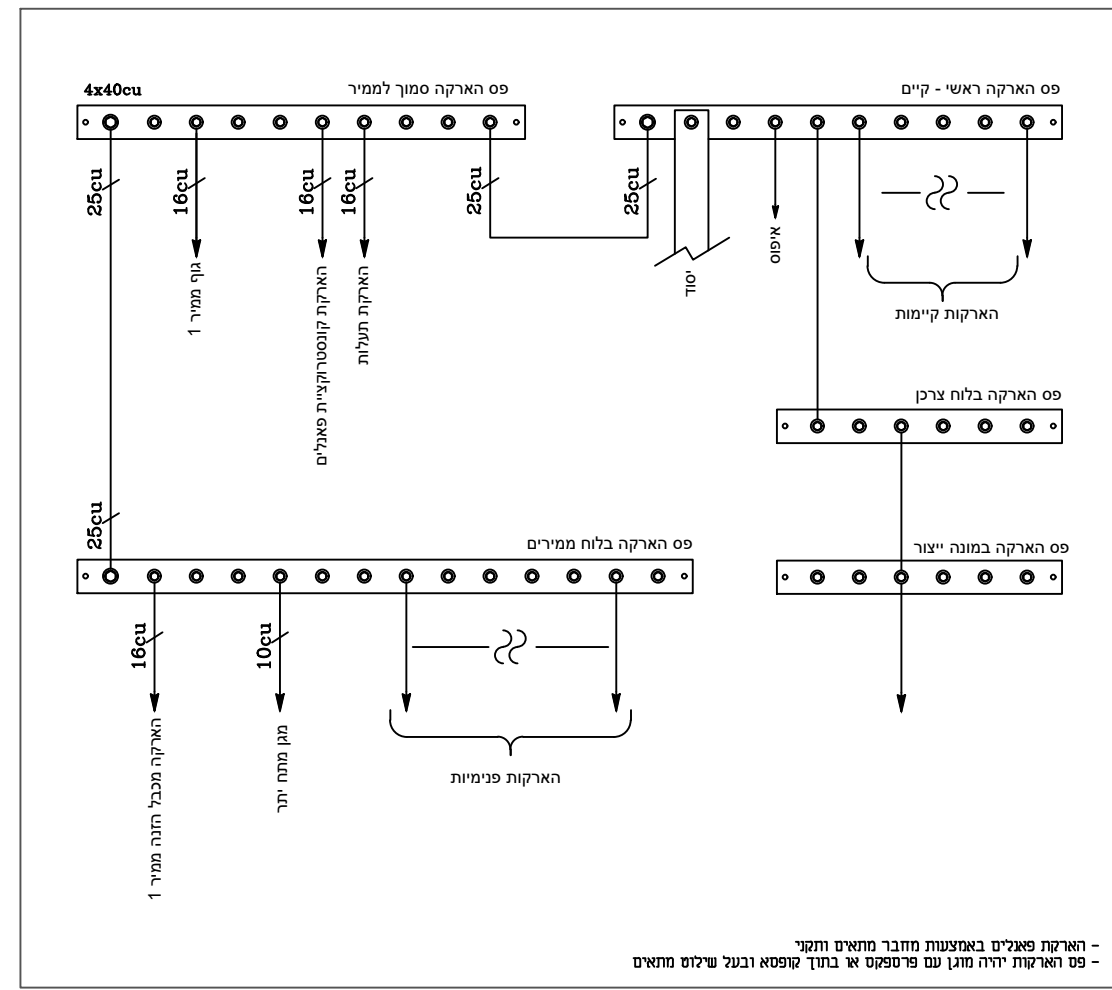
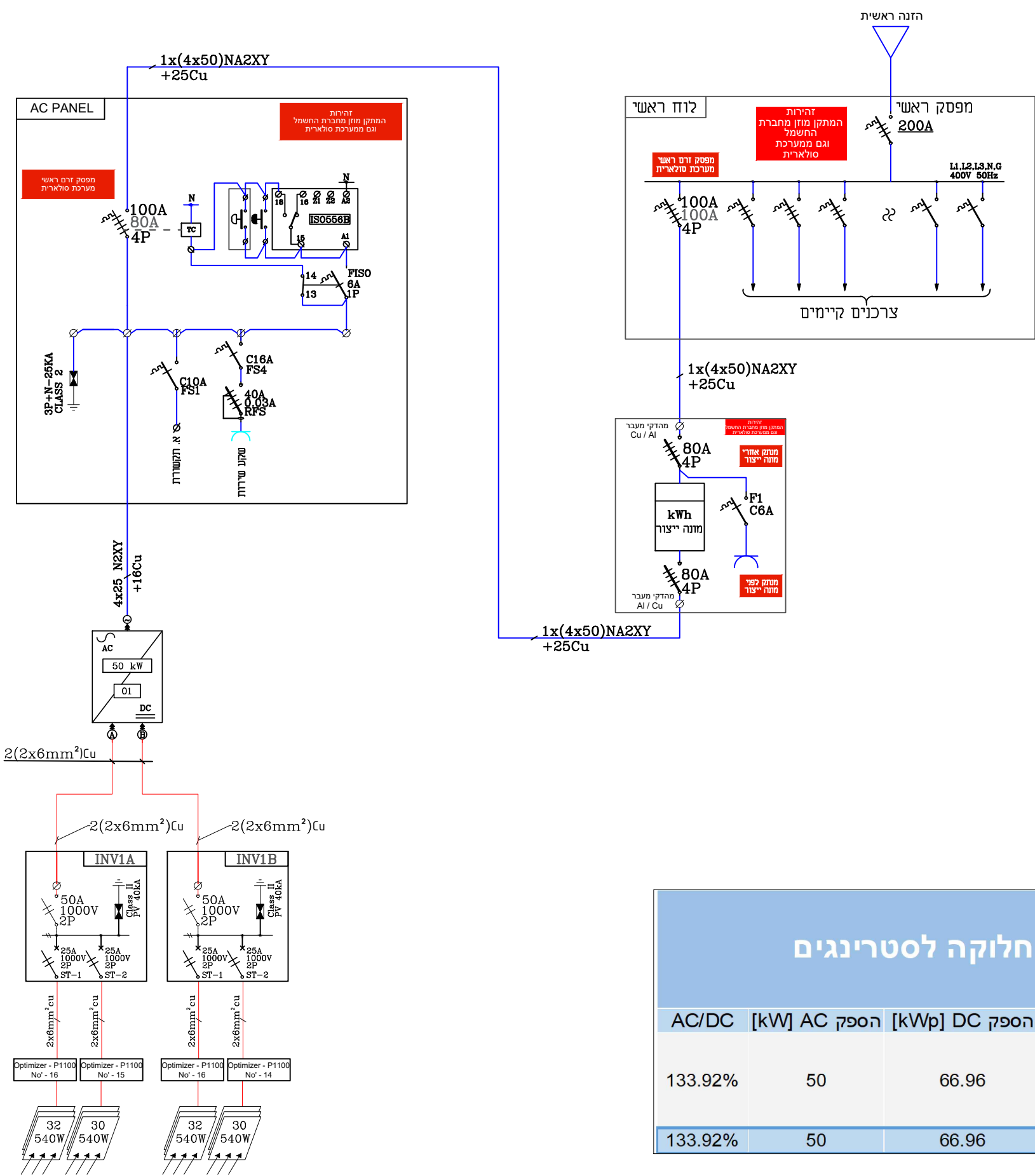
— רשת DC

Yigal Alon - String Wiring

יגאל אלון, רמת גן - חלוקה לסטרינגים						540	הספק פאנל [W]
						124	כמות פאנלים
						50	הספק AC [kW]
						66.96	הספק DC [kWp]
						133.92%	יחס העמסה AC/DC
AC/DC	[kW] AC	הספק [kWp] DC	מ'ס פאנלים	P1100	מ'ס סטרינגים	אופטימיזצור	Unit
133.92%	50	66.96	30	15	2	Primary	סוג ממיר
			32	16			SolarEdge
			30	15		Secondary1	50kW
			32	16	2		ממיר
133.92%	50	66.96	124	62			סוג גג
							סה"כ כמות:



Title: תוכנית חיווט פאנלים		DRAWING NUMBER: Yigal Alon - G002				REV	DATE	DRAWN	COMMENTS	Panels		Inverters	Quant'
Client: שחר אנרגיה	Site location: רמת גן	DATE: 04/05/2021	Scale: ###	Print size: A3	Sheet: 1/1	A	###	###	###	Manuf': Chint [2256x1133x35]	Manuf': Solar Edge		
Designer: בוריס חברוב		APPROVAL / STAMP								Model: 540W	Model A: 50kW		1
Approved:										Quant': 124	Model B:		
STATUS: לאישור										Tilt: 18 Deg	Model C:		
										Azimuth: 198 deg	Model D:		
										T.Power: 66.96 kW	T.Power: 50 kVA		



- 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

Yigal Alon - Single Line

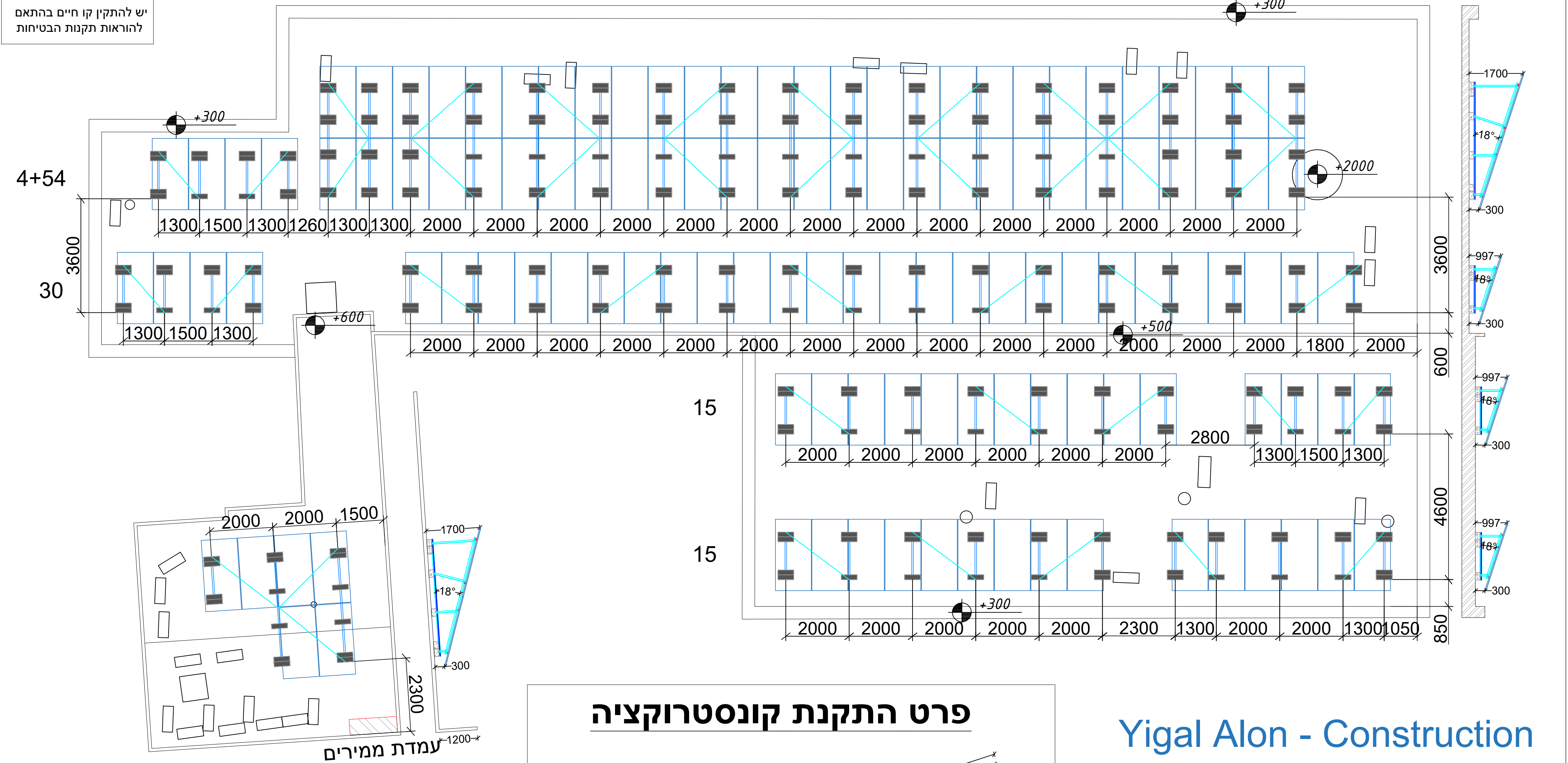
יגאל אלון, רמת גן - חלוקה לסטרינגים						540		הספק פאנל [W] :		
						124		כמות פאנלים :		
						50		הספק AC [kW] :		
						66.96		הספק DC [kWp] :		
						133.92%		יחס העמסה AC/DC :		
AC/DC	הספק AC [kW]	הספק DC [kWp]	מ'ס פאנלים	אופטימיזר P1100	מ'ס סטרינגים	Unit	סוג ממיר	ממיר	סוג גג	
133.92%	50	66.96	30	15	2	Primary	SolarEdge 50kW	1	בטון	
			32	16						
			30	15	2	Secondary1				
			32	16						
133.92%	50	66.96	124	62	סה"כ כמות:					

Title: תוכנית חד קווית		DRAWING NUMBER: Yigal Alon - E001		REV	DATE	DRAWN	COMMENTS	Panels		Inverters		Quant'
Client: שחר אנרגיה	Site location: רמת גן	DATE: 04/05/2021	Scale: ###	Print size: A3	Sheet: 1/1		####	Manuf: Chint [2256x1133x35]	Manuf: Solar Edge			
		Designer: בוריס חברוב	APPROVAL / STAMP					Model: 540W	Model A: 50kW	1		
		Approved:					Quant: 124	Model B:				
		STATUS: לאישור			REV: A0		Tilt: 18 Deg	Model C:				
							Azimuth: 198 deg	Model D:				
								T.Power: 66.96 kW	T.Power: 50 kVA			

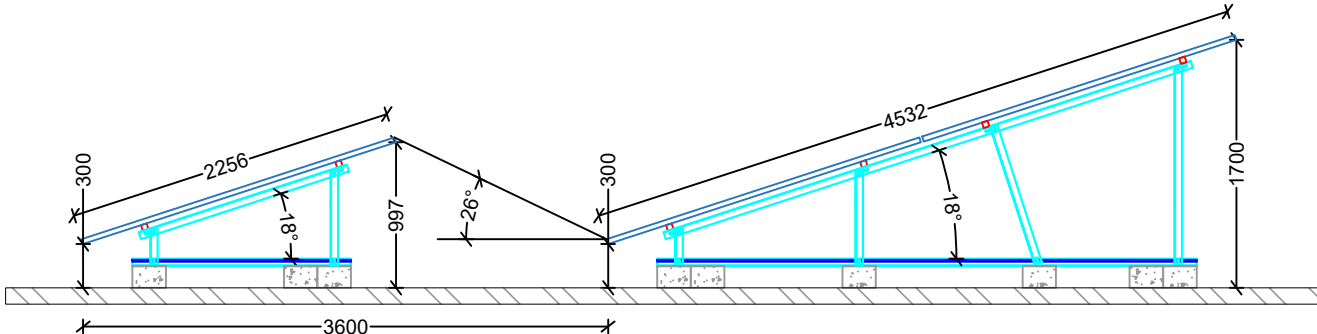
ביצוע כל עבודה בכפוף
להוראות ממנה הבטיחות

יש להתקין קו חיים בהתאם
להוראות תקנות הבטיחות

יש להתקין קו חיים בהתאם להוראות תקנות הבטיחות



פרט התקנת קונסטרוקציה



יש לוודא מול קונסטרוקטור את תוכנית ההצבה, כמות האבנים וחוזק הקונסטרוקציה הנושאת לפני ביצוע ההתקנה

Yigal Alon - Construction

כתב כמיות - רגליים		
כמות	תיאור	פריט
46	גובה מהרצפה: 300 מ"מ זווית: 18°	פאנל בודד
1	גובה מהרצפה: בהתאם לגובה פאנל זווית: 18°	פאנל בודד [פאנל עליון]
19	גובה מהרצפה: 300 מ"מ זווית: 18°	פאנל כפול
41	אורך 2.3 מ	דיאגונל
303	39 ק"ג גובה: 150, רוחב: 230, אורך: 500	אבנים

Title: תוכנית קונסטרוקציה			DRAWING NUMBER: Yigal Alon - G001				REV			DATE			DRAWN			COMMENTS			Panels			Inverters			Quant'
Client: שחר אנרגיה		Site location: רמת גן		DATE: 04/05/2021		Scale: ####		Print size: A3		Sheet: 1/1		A□		####		####		####		Manuf:' Chint [2256x1133x35]		Manuf:' Solar Edge			
 שחר אנרגיה חברת הנדסה מתחדשת DESIGNER: בוריס חברוב APPROVED: STATUS: לאישור REV: A□ APPROVAL / STAMP												Model: 540W				Model A: 50kW		1							
												Quant:' 124				Model B:									
												Tilt: 18 Deg				Model C:									
												Azimuth: 198 deg				Model D:									
												T.Power: 66.96 kW				T.Power: 50 kVA									

DC CABLE CALCULATION & POWER LOSSES

DATA		Cable Calculation										Production Losses	
Module Type	540	mm^2	Copper			Aluminum						Grid Load	100%
Imp [A]	12.86		4	6	16	25	35	50	95	120	240	Power Losses	0.60%
Vmp [V]	41.60												
Module amount	124	Length										Power Losses	404W
Total Power [kWp]	66,960		0	480	0	0	0	0	0	0	0		

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 %	
1A	62	62	2	33480	25.72	64.50	3.59	2	6	50	4.6	119	0.35%	DCCB / DCB to INV Losses
ST-1	32	32	1	17280	12.86	36.75	3.59	1	6	35	3	42	0.24%	String Losses
ST-2	30	30	1	16200	12.86	36.75	3.59	1	6	35	3	42	0.26%	
												202	0.60%	Total losses
1B	62	62	2	33480	25.72	64.50	3.59	2	6	50	4.6	119	0.35%	DCCB / DCB to INV Losses
ST-1	32	32	1	17280	12.86	36.75	3.59	1	6	35	3	42	0.24%	String Losses
ST-2	30	30	1	16200	12.86	36.75	3.59	1	6	35	3	42	0.26%	
												202	0.60%	Total losses
												404	0.60%	TOTAL

66,960

TOTAL

DATA							AC CABLE CALCULATION & POWER LOSSES														Production Losses			
Module Type	540	Voltage [V]	400	Avg' Voltage Drop		0.73%																		
Imp [A]	12.86	Load [%]	100%	Max Voltage Drop		0.73%																		
Vmp [V]	41.60	Cos Ph	1	Power Losses		0.72%																		
Module amount	124	Total Power [kVA]	50.00			360.30W																		
Total Power [kWp]	66,960																							
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	124	67.0	50.00	72.17	4	4x25 NA2XY	Copper	25	1	Air	0.95	0.88	1	1	78.6	0.770	0.775	0.39	48.1	0.10%	0.73%	0.04%	
LVP	IEC Meter	124	67.0	50.00	72.17	30	4x50 NA2XY	Aluminum	50	1	Air	0.95	1	1	1	98.8	0.666	0.671	2.52	312.2	0.63%	0.63%	0.25%	
AC [kVA]	50.00																			360.3	Toatl Losses		0.72%	

PVsyst - Simulation report

Grid-Connected System

Project: SHR Ramat Gan_Yigal Alon

Variant: New simulation variant

Tables on a building

System power: 67.0 kWp

Ramat Gan - Israel

Author

Green Panel (Israel)

**PVsyst V7.2.8**

VC1, Simulation date:
09/11/21 10:41
with v7.2.8

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 plane

Tilt/Azimuth 18 / 17 °

Tables on a building**Near Shadings**

According to strings

Electrical effect 100 %

User's needs

Unlimited load (grid)

System information**PV Array**

Nb. of modules 124 units

Pnom total 67.0 kWp

Inverters

Nb. of units 2 units

Pnom total 50.0 kWac

Pnom ratio 1.339

Results summary

Produced Energy	112.7 MWh/year	Specific production	1684 kWh/kWp/year	Perf. Ratio PR	76.84 %
-----------------	----------------	---------------------	-------------------	----------------	---------

Table of contents

Project and results summary	2
General parameters, PV Array Characteristics, System losses	3
Near shading definition - Iso-shadings diagram	5
Main results	6
Loss diagram	7
Special graphs	8

**PVsyst V7.2.8**

VC1, Simulation date:
09/11/21 10:41
with v7.2.8

General parameters**Grid-Connected System****PV Field Orientation****Orientation**

Fixed plane
Tilt/Azimuth 18 / 17 °

Horizon

Free Horizon

Tables on a building**Sheds configuration**

Nb. of sheds 10 units
Sizes
Sheds spacing 5.80 m
Collector width 3.32 m
Ground Cov. Ratio (GCR) 57.3 %

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 540 M
(Original PVsyst database)

Unit Nom. Power 540 Wp
Number of PV modules 124 units
Nominal (STC) 67.0 kWp

SolarEdge Power Optimizer

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

Array #1 - PV Array

Number of PV modules 60 units
Nominal (STC) 32.4 kWp
Optimizer Array 2 Strings x 15 In series

At operating cond. (50°C)

Pmpp 29.62 kWp
Output of optimizers
Voper 750 V
I at Poper 39 A

Array #2 - Sub-array #3

Number of PV modules 64 units
Nominal (STC) 34.6 kWp
Optimizer Array 2 Strings x 16 In series

At operating cond. (50°C)

Pmpp 31.6 kWp
Output of optimizers
Voper 750 V
I at Poper 42 A

Total PV power

Nominal (STC) 67 kWp
Total 124 modules
Module area 317 m²
Cell area 287 m²

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

Number of inverters 1 unit
Total power 24.2 kWac

Operating voltage 750 V
Pnom ratio (DC:AC) 1.26

Number of inverters 1 unit
Total power 25.8 kWac

Operating voltage 750 V
Pnom ratio (DC:AC) 1.26

Total inverter power

Total power 50 kWac
Nb. of inverters 2 units
Pnom ratio 1.34

**PVsyst V7.2.8**

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with v7.2.8

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 %

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. 260 mΩ
Loss Fraction 1.5 % at STC

Array #2 - Sub-array #3

Global array res. 244 mΩ
Loss Fraction 1.5 % at STC

System losses**Unavailability of the system**

Time fraction 3.5 %
12.8 days,
3 periods

AC wiring losses**Inv. output line up to injection point**

Inverter voltage 400 Vac tri
Loss Fraction 1.50 % at STC

Inverter: SE50K/SE75K Unit

Wire section (2 Inv.) Copper 2 x 3 x 50 mm²
Average wires length 195 m

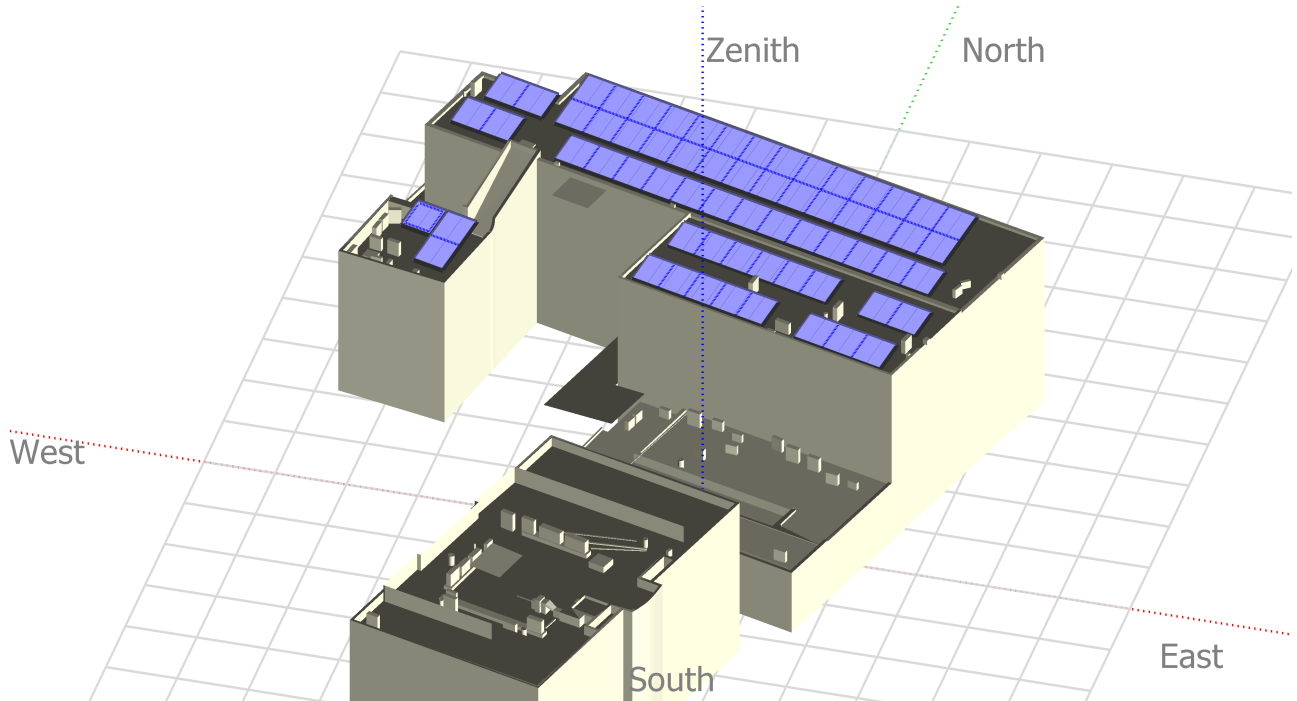


PVsyst V7.2.8

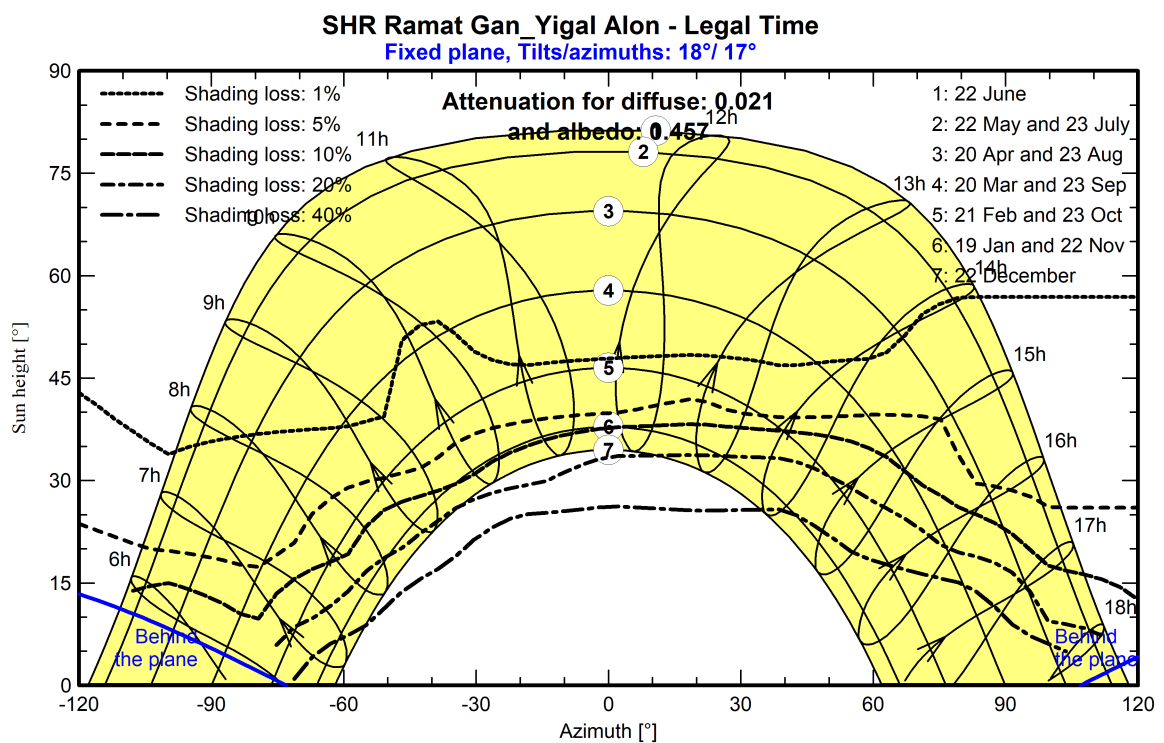
VC1, Simulation date:
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Near shadings parameter

Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram





Project: SHR Ramat Gan_Yigal Alon

Variant: New simulation variant

PVsyst V7.2.8

VC1, Simulation date:

09/11/21 10:41

with v7.2.8

Main results

System Production

Produced Energy

112.7 MWh/year

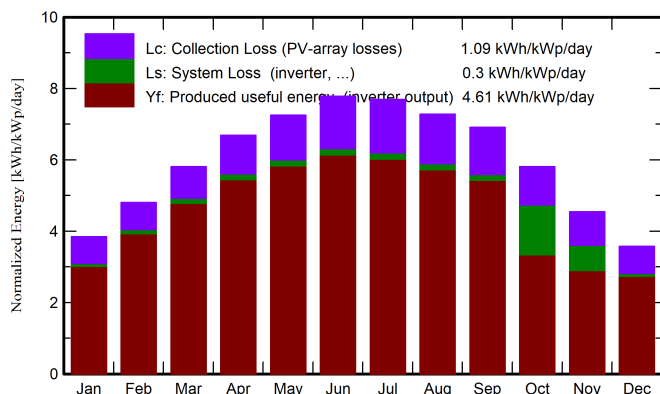
Specific production

1684 kWh/kWp/year

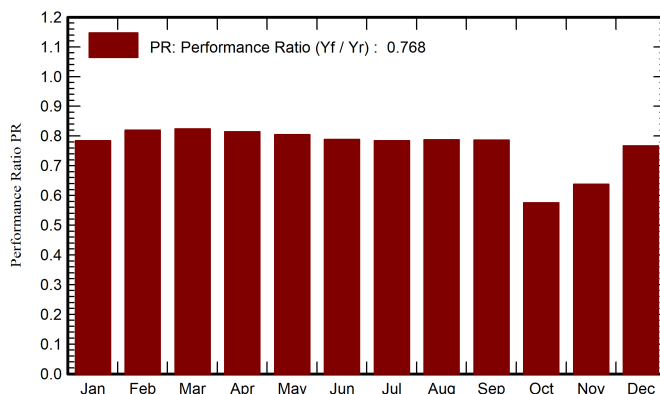
Performance Ratio PR

76.84 %

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	119.2	110.3	6.43	6.26	0.785
February	110.6	46.40	13.53	134.4	125.6	7.59	7.38	0.820
March	159.8	62.31	16.27	180.0	169.4	10.23	9.94	0.824
April	190.0	71.96	19.23	200.7	188.9	11.27	10.95	0.814
May	226.6	76.41	22.47	224.8	211.7	12.46	12.11	0.804
June	241.9	59.07	25.29	233.5	220.1	12.70	12.33	0.789
July	243.9	61.59	28.17	238.4	224.7	12.88	12.51	0.784
August	218.1	66.52	28.42	225.6	212.6	12.24	11.89	0.787
September	186.5	47.52	26.35	207.4	195.5	11.24	10.92	0.786
October	149.4	46.27	23.76	180.1	168.8	9.83	6.94	0.576
November	105.1	34.92	18.84	136.3	127.0	7.26	5.82	0.638
December	84.7	38.69	15.00	111.0	102.4	5.85	5.70	0.767
Year	2008.7	650.32	20.90	2191.2	2056.9	119.98	112.75	0.768

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

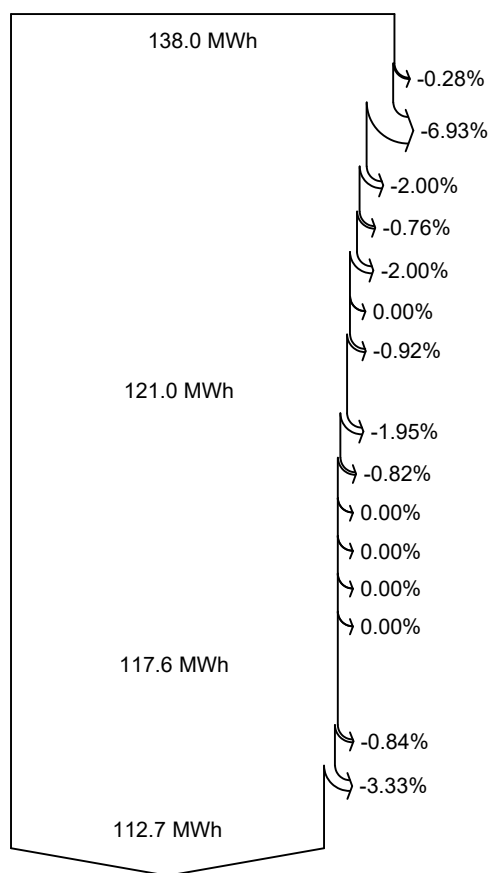
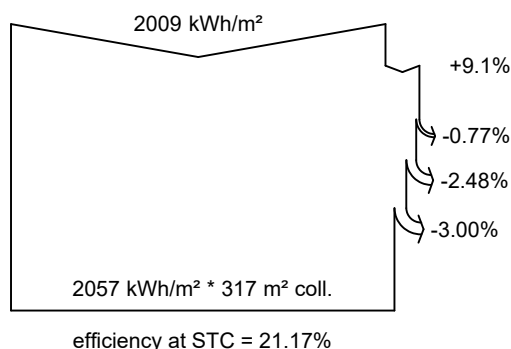
PR Performance Ratio



PVsyst V7.2.8

VC1, Simulation date:
09/11/21 10:41
with v7.2.8

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 effic.)

PV loss due to irradiance level

PV loss due to temperature

Shadings: Electrical Loss acc. to strings

Optimizer efficiency loss

LID - Light induced degradation

Module array mismatch loss

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 V7.2.8

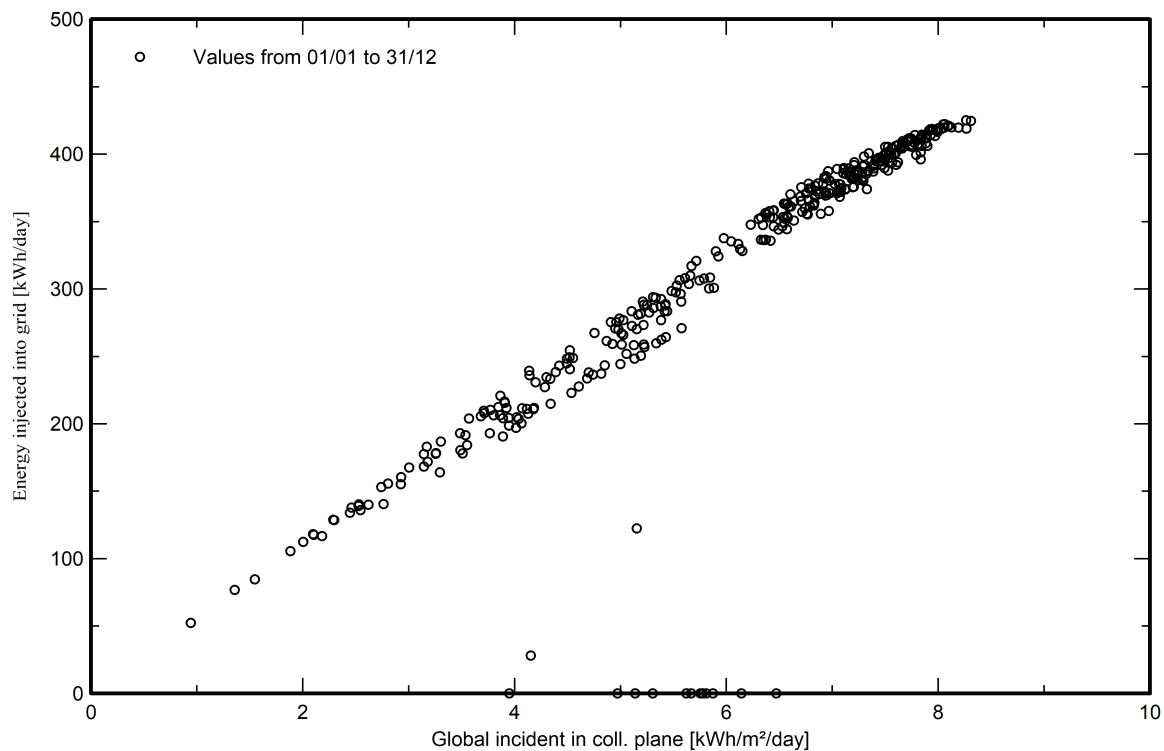
VC1, Simulation date:

09/11/21 10:41

with v7.2.8

Special graphs

Daily Input/Output diagram



System Output Power Distribution

