

שחר אנרגיה - בית ספר ניצנים

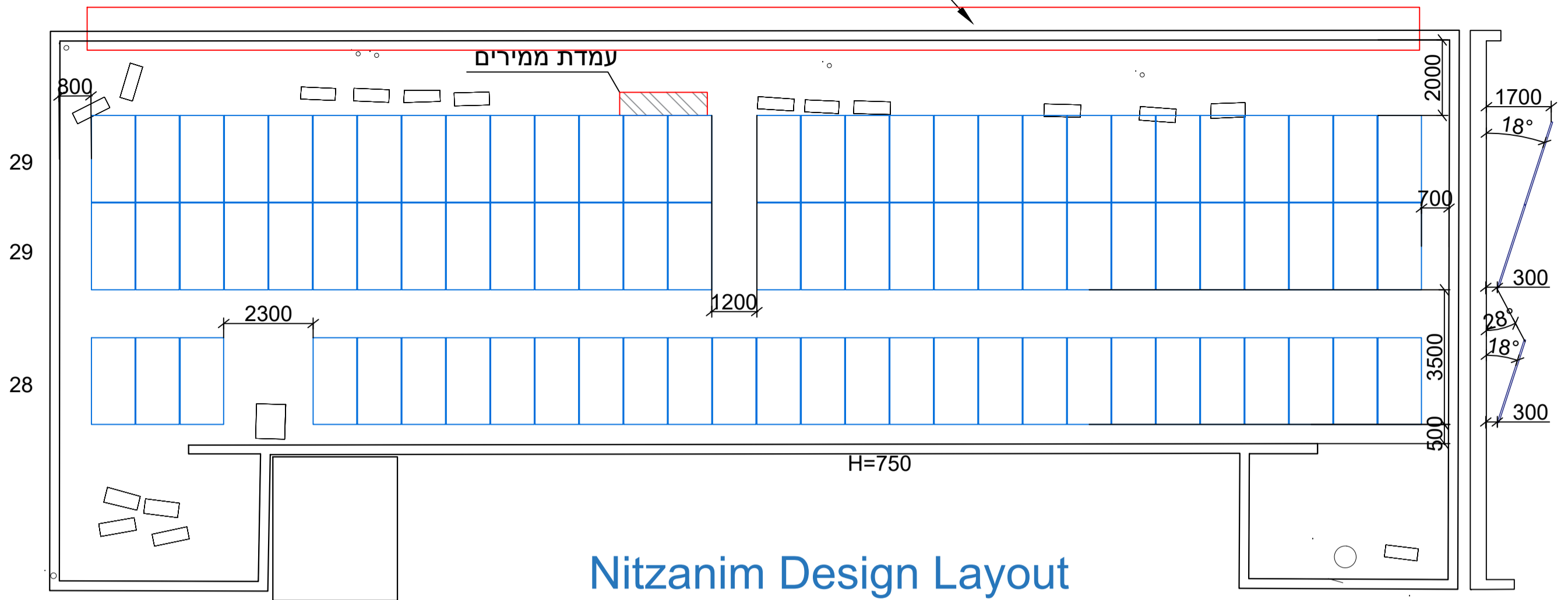
מערכת סולארית מתח נמוך – 95.8kW



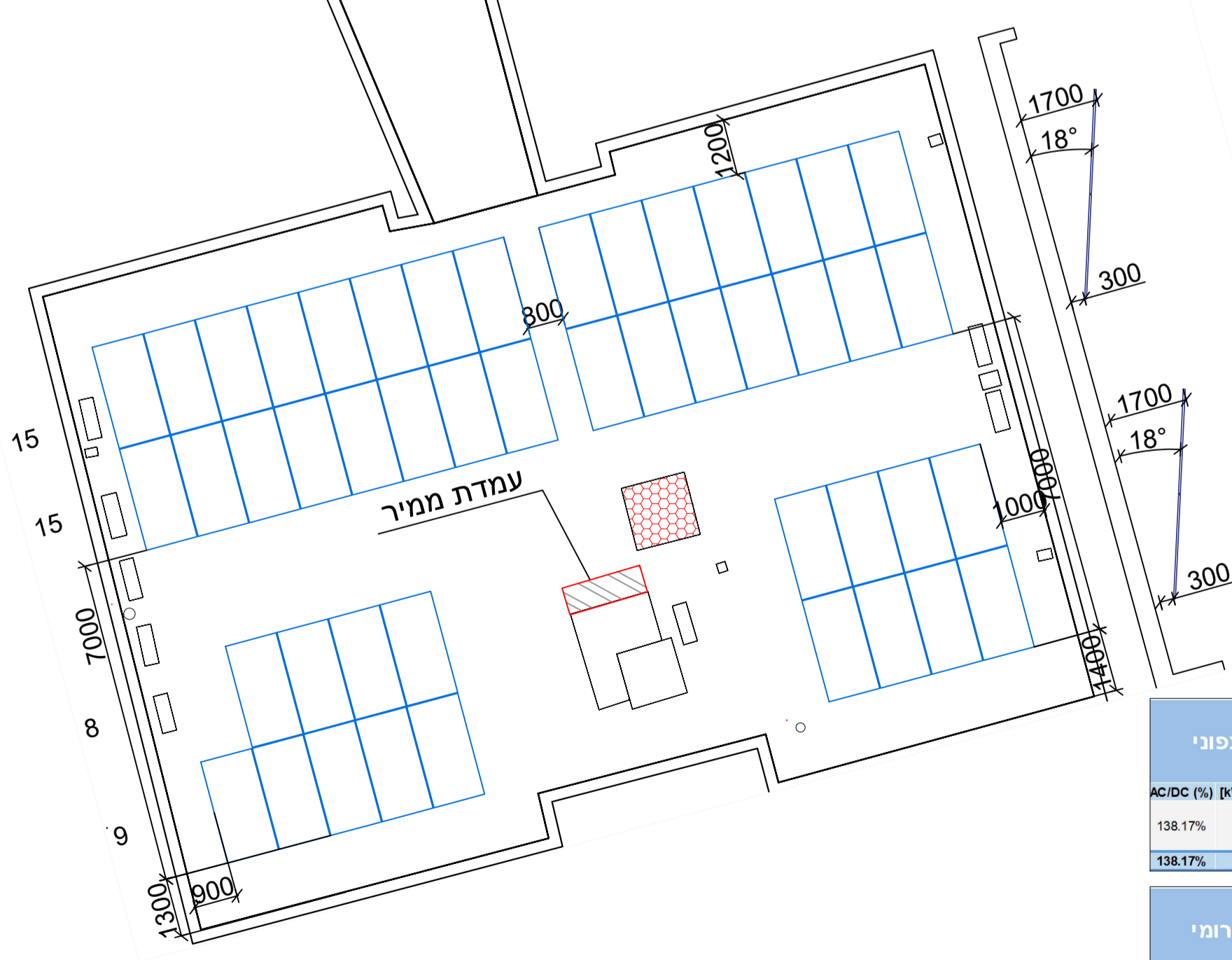
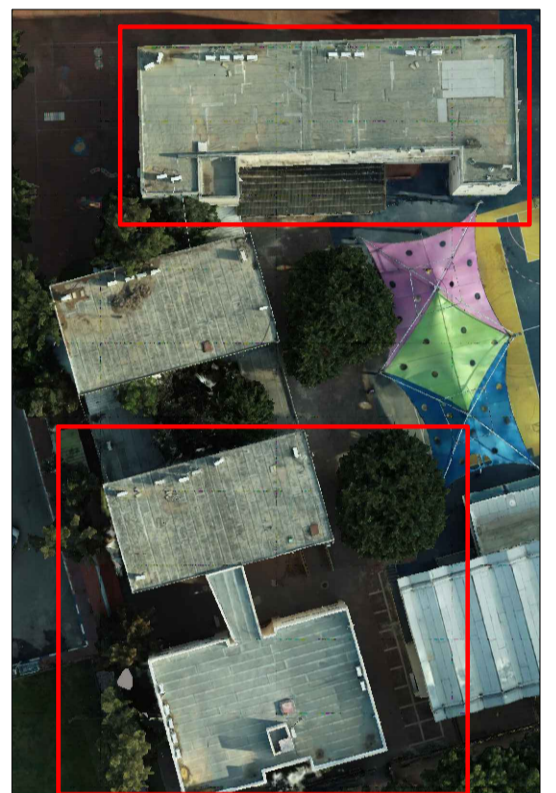
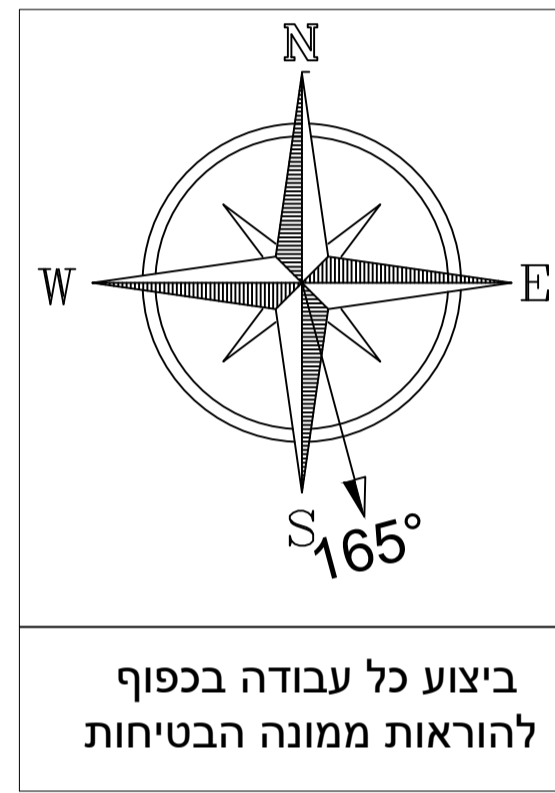
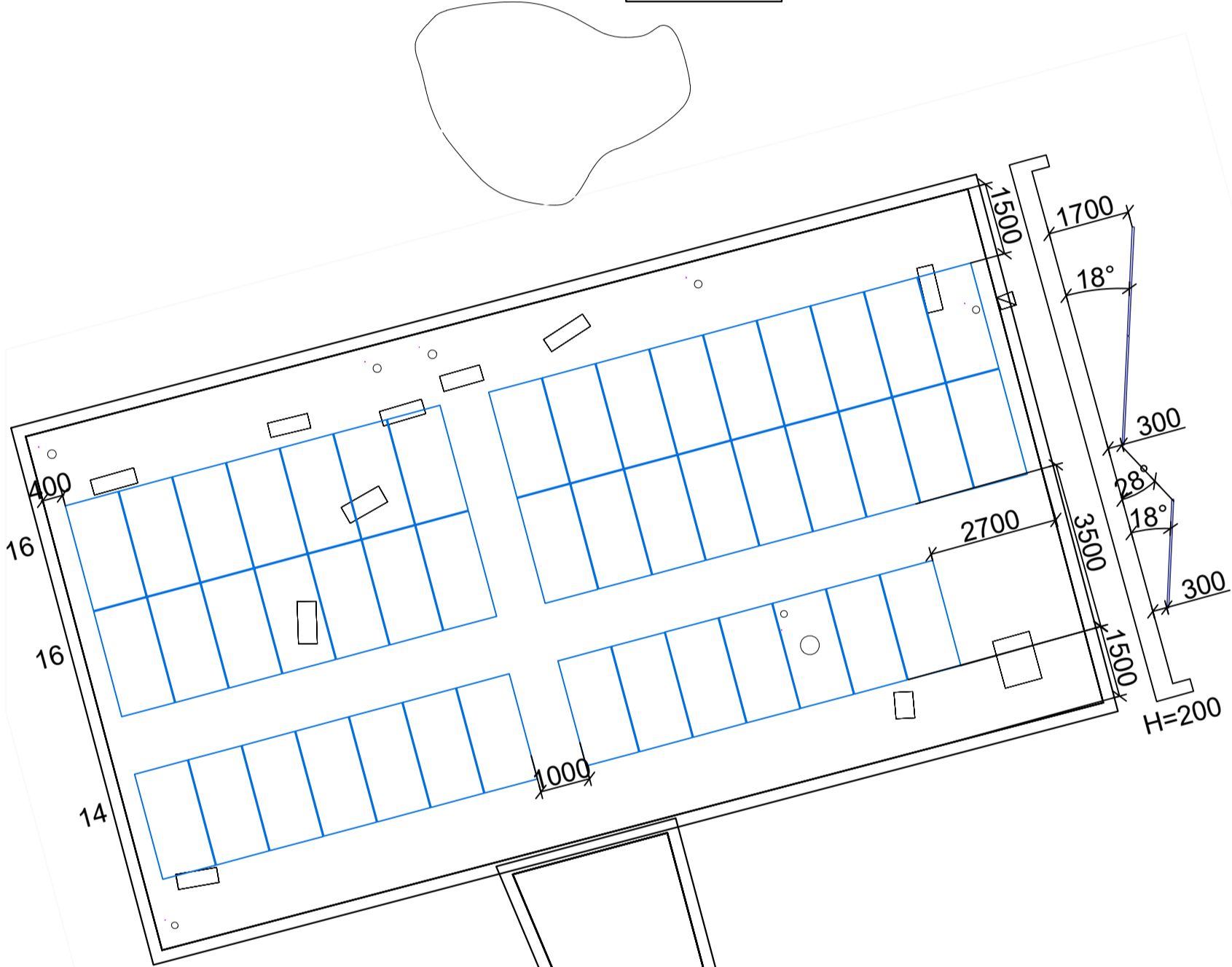
רשימת תוכניות:

- Nizanim School - G001 – הצבה כללית
- Nizanim School - G001 – גג צפוני הצבת פאנלים
- Nizanim School - G002 – גג צפוני חיווט פאנלים
- Nizanim School - E001 – גג צפוני חד קווי
- Nizanim School - C001 – גג צפוני סימולציה PVSystem
- Nizanim School - C003 – גג צפוני הפסדי הולכה DC
- Nizanim School - C004 – גג צפוני חישוב הפסדי הולכה AC
- Nizanim School - G001 – גג דרומי הצבת פאנלים
- Nizanim School - G002 – גג דרומי חיווט פאנלים
- Nizanim School - E001 – גג דרומי חד קווי
- Nizanim School - C001 – גג דרומי סימולציה PVSystem
- Nizanim School - C003 – גג דרומי הפסדי הולכה DC
- Nizanim School - C004 – גג דרומי חישוב הפסדי הולכה AC

יש להתקין קו חיים או מעקה בטיחות



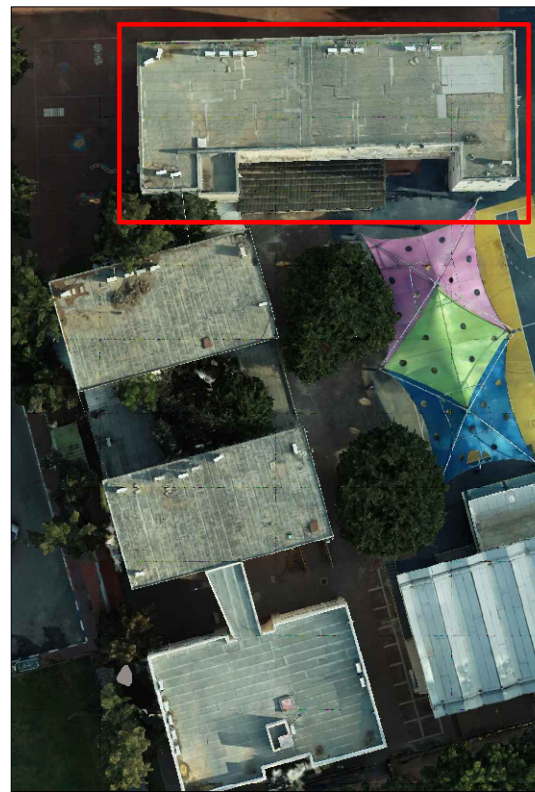
Nitzanim Design Layout



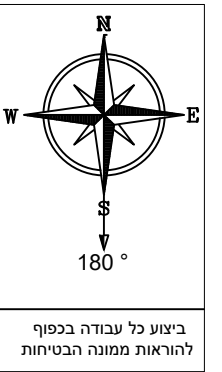
חלוקה לסטרינגים וממירים - ניצנים גג צפוני						
535	86	33.3 kW	46.0 kWp	138.17%	3	1
AC/DC (%)	הספק AC [kW]	הספק DC [kWp]	מס' פאנלים	P1100	מס' סטרינגים אפטימייזר	Unit
138.17%	33.3 kW	46.0 kWp	28	14	3	A
138.17%	33.3 kW	46.0 kWp	28	14	3	A
138.17%	33.3 kW	46.0 kWp	86	43	3	

חלוקה לסטרינגים וממירים - ניצנים גג דרומי						
535	93	33.3 kW	49.8 kWp	149.41%	3	1
AC/DC (%)	הספק AC [kW]	הספק DC [kWp]	מס' פאנלים	P1100	מס' סטרינגים אפטימייזר	Unit
149.41%	33.3 kW	49.8 kWp	32	16	3	A
149.41%	33.3 kW	49.8 kWp	31	16	3	A
149.41%	33.3 kW	49.8 kWp	30	15	3	A
149.41%	33.3 kW	49.8 kWp	93	47	3	

Title: תוכנית הצבה כללית		DRAWING NUMBER: Nitzanim school - G001		REV: A 1	DATE: 20/06/21	DRAWN: Roi N.	COMMENTS: Layout Update	Panels		Inverters		Quant'
Client: שחר אנרגיה	Site location: רמת גן	DATE: 24/02/2021	Scale: ###	Print size: A3	Sheet: 1/1			Manuf': Chint [2256x1133x35]	Manuf': Solar Edge			
Designer: Roi Nakash		APPROVAL / STAMP						Quant': 179	Model A: 33.3kW			
Approved:								Tilt: 18°	Model B:			
STATUS: לאישור		REV: A 1						Azimuth: 180° / 165°	Model C:			
ENERCITY RENEWABLE ENGINEERING								T.Power: 95.8kW	Model D:			
									T.Power: 66.6kW			

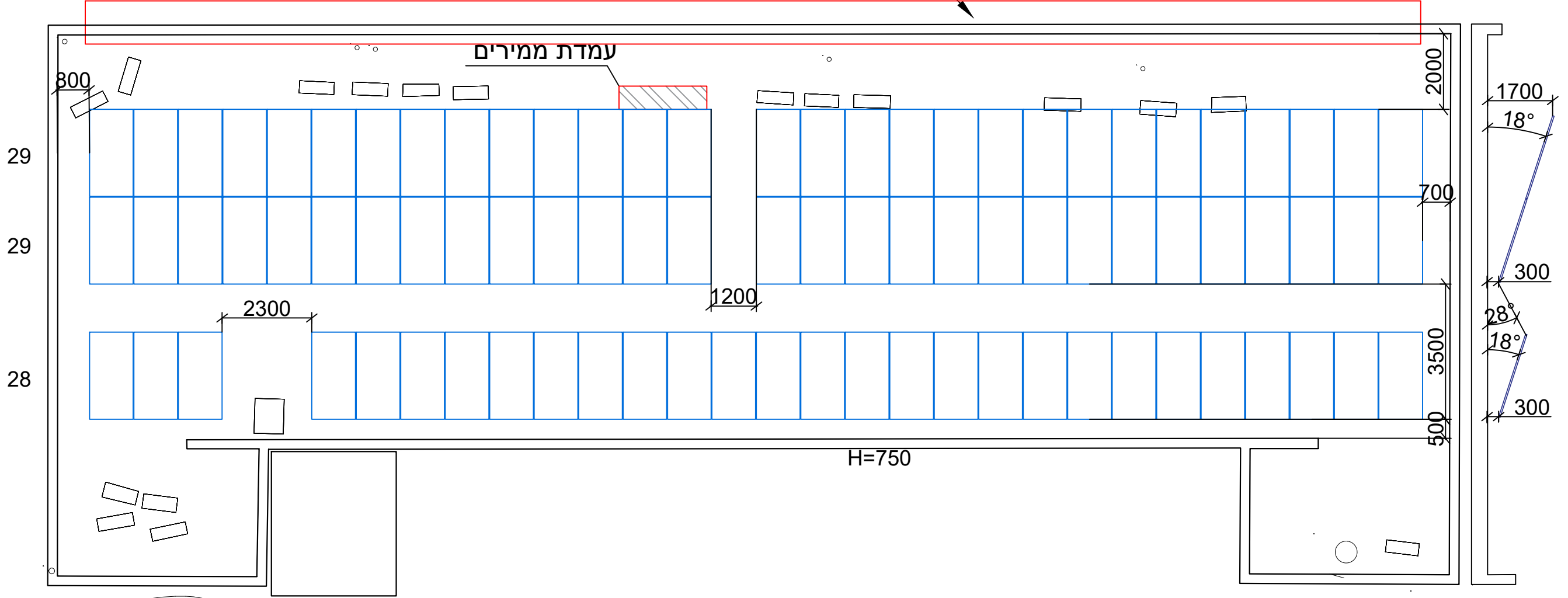


חלוקה לסטרינגים וממירים - ניצנים גג צפוני						535	הספק פאנל [W]:		
						86	כמות פאנלים:		
						33.3 kW	הספק AC [kW]:		
						46.0 kWp	הספק DC [kWp]:		
						138.17%	חסר העמסה AC/DC:		
AC/DC (%)	[kW]AC	[kWp]DC	מס' פאנלים	אופט מיזר P1100	מס' סטרינגים	Unit	סוג ממר	מס' ממר	סוג
138.17%	33.3 kW	46.0 kWp	30	15					
			28	14	3	A	SolarEdge 33.3kW	1	בטון
			28	14					
138.17%	33.3 kW	46.0 kWp	86	43	3				



Nitzanim Design Layout

יש להתקין קו חיים או מעקה בטיחות

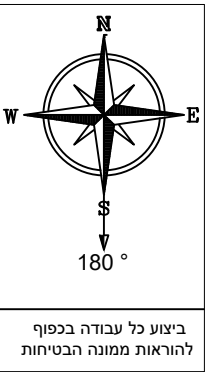


Title: תוכנית הצבת פאנלים		DRAWING NUMBER: Nitzanim school - G001		REV	DATE	DRAWN	COMMENTS	Panels		Inverters		Quant'
Client: שחר אנרגיה	Site location: רמת גן	DATE: 24/02/2021	Scale: ####	Print size: A3	Sheet: 1/1	A 1	20/06/21	Roi N.	Layout Update	Manuf': Chint [2256x1133x35]	Manuf': Solar Edge	
Designer: Roi Nakash		APPROVAL / STAMP							Model: 535W	Model A: 33.3kW	1	
Approved:									Quant': 86	Model B:		
STATUS: לאישור		REV: A 1							Tilt: 18°	Model C:		
									Azimuth: 180°	Model D:		
									T.Power: 46kW	T.Power: 33.3kW		

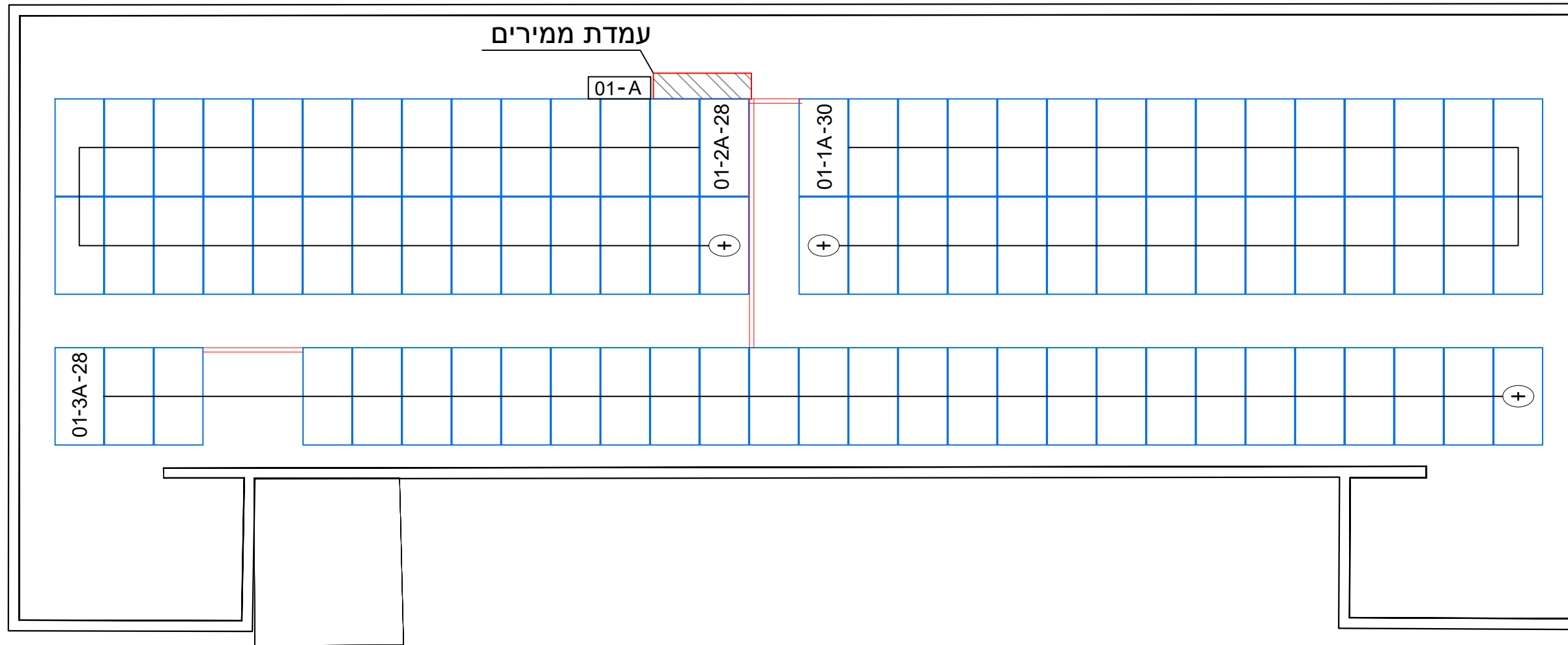




חלוקה לסטרינגים וממירים - ניצנים גג צפוני						535	הספק פאנל [W]:		
						86	כמות פאנלים:		
						33.3 kW	הספק AC [kW]:		
						46.0 kWp	הספק DC [kWp]:		
						138.17%	חסר העמסה AC/DC:		
AC/DC (%)	הספק AC [kW]	הספק DC [kWp]	מס' פאנלים	אופט מיזר P1100	מס' סטרינגים	Unit	סוג ממיר	מס' ממיר	סוג
138.17%	33.3 kW	46.0 kWp	30	15	3	A	SolarEdge 33.3kW	1	בטון
138.17%	33.3 kW	46.0 kWp	86	43	3				



Nitzanim - String Wiring



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 תעלת רשת

== מובל עילי קיימים/תעלה

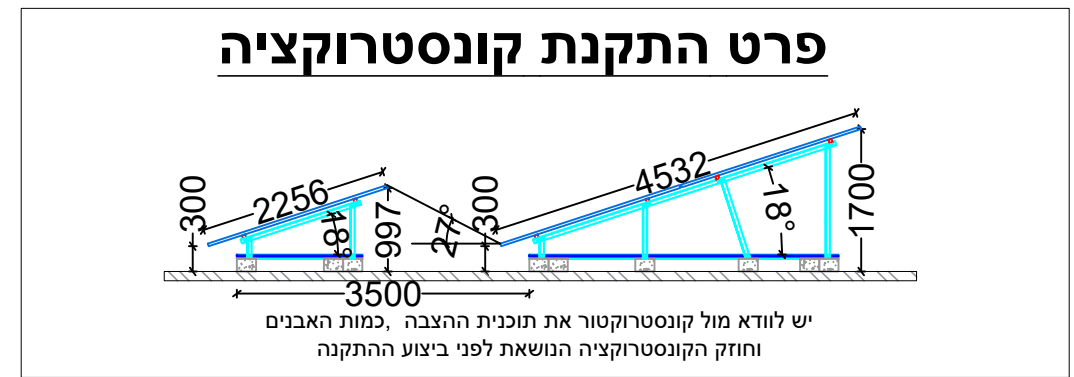
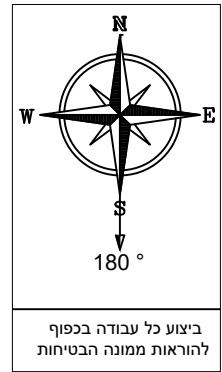
Title: תוכנית חיווט פאנלים		DRAWING NUMBER: Nitzanim school - G001		REV	DATE	DRAWN	COMMENTS	Panels		Inverters		Quant'
Client: שחר אנרגיה	Site location: רמת גן	DATE: 24/02/2021	Scale: ####	Print size: A3	Sheet: 1/1	A 1	String Wiring	Manuf': Chint [2256x1133x35]	Manuf': Solar Edge			
Designer: Roi Nakash		APPROVAL / STAMP						Model: 535W	Model A: 33.3kW			1
Approved:								Quant': 86	Model B:			
STATUS: לאישור		REV: A 1						Tilt: 18°	Model C:			
								Azimuth: 180°	Model D:			
								T.Power: 46kW	T.Power: 33.3kW			



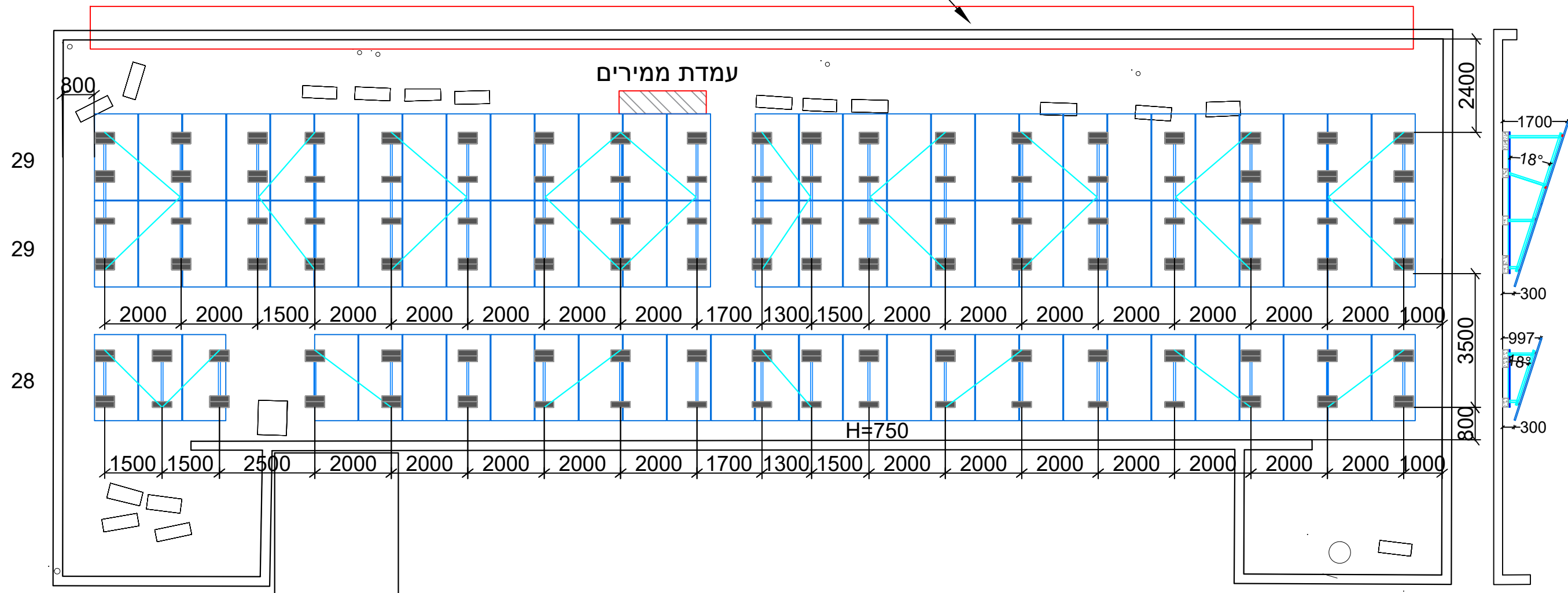


Nitzanim - Construction

כתב כמויות - רגליים גג צפוני		
כמות	תיאור	פריט
19	גובה מהרצפה: 300 מ"מ זווית: 18°	פאנל סדד
19	גובה מהרצפה: 300 מ"מ זווית: 18°	פאנל כפול
10	אורך 2.4 מ	דיאגונל
18	אורך 2.2 מ	
185	גובה: 150, רוחב: 230, אורך: 500	אבנים



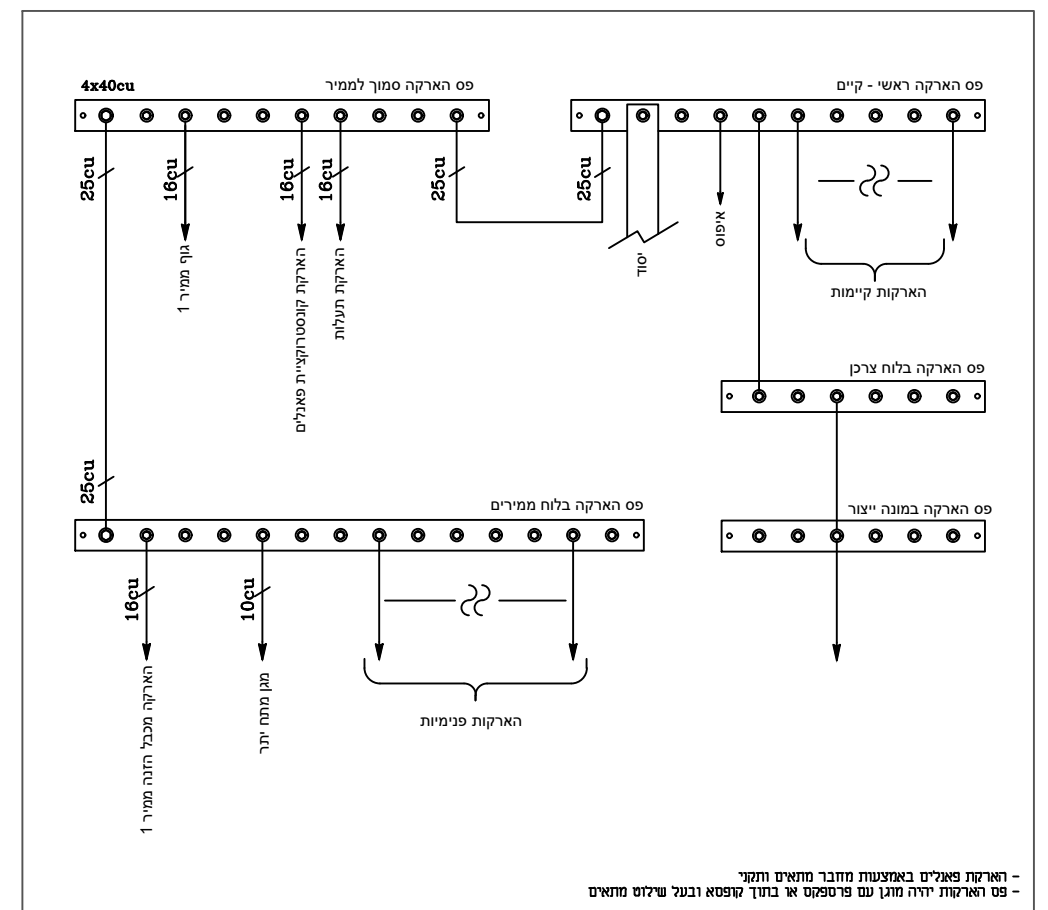
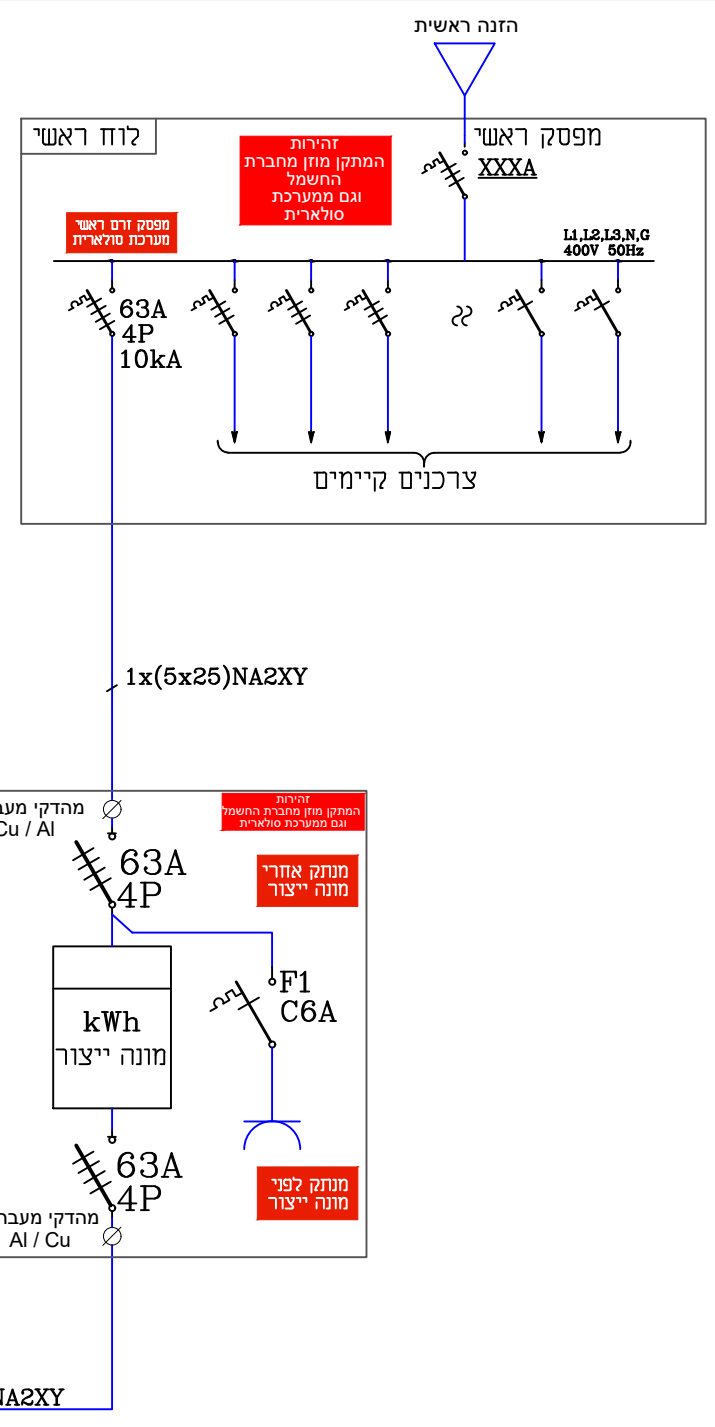
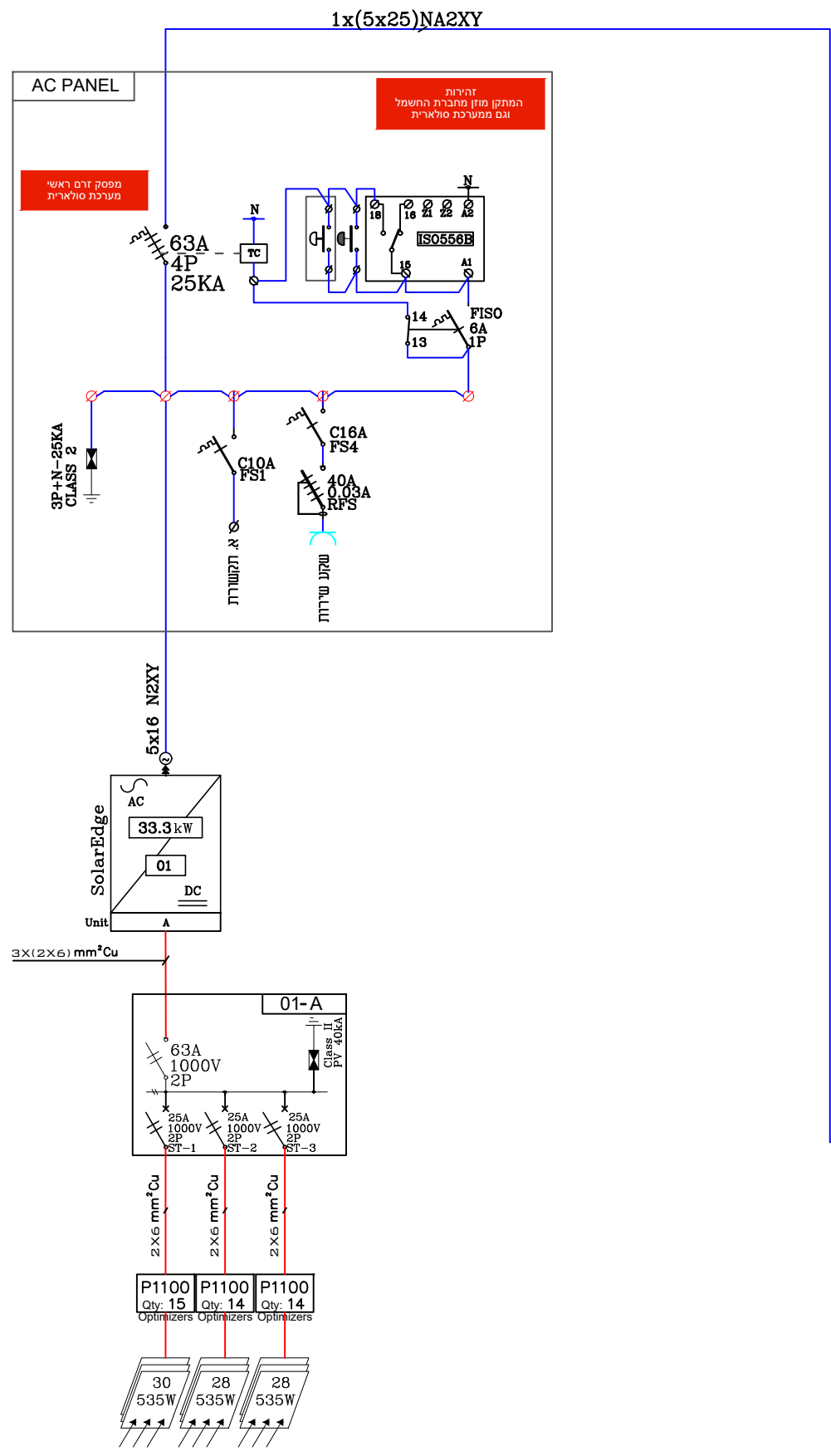
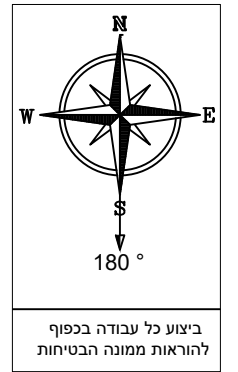
יש להתקין קו חיים או מעקה בטיחות



Title: תוכנית קונסטרוקציה		DRAWING NUMBER: Nitzanim school - 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	20/06/21	Roi N.	Manuf': Chint [2256x1133x35]	Manuf': Solar Edge		
Designer: Roi Nakash		APPROVAL / STAMP							Model: 535W	Model A: 33.3kW		1
Approved:									Quant': 86	Model B:		
STATUS: לאישור		REV: A 1							Tilt: 18°	Model C:		
									Azimuth: 180°	Model D:		
									T.Power: 46kW	T.Power: 33.3kW		



Nitzanim - Single Line



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

חלוקה לסטרינגים וממירים - ניצנים גג צפוני					הספק פאנל [W]:	535		
					כמות פאנלים:	86		
					הספק AC [kW]:	33.3 kW		
					הספק DC [kWp]:	46.0 kWp		
					חסר העמסה AC/DC:	138.17%		
AC/DC (%)	הספק AC [kW]	הספק DC [kWp]	מס' פאנלים	מס' סטרינגים	אופטימיזר P1100	סוג ממיר	מס' ממיר	סוג
138.17%	33.3 kW	46.0 kWp	30	3	15	SolarEdge	1	בטון
138.17%	33.3 kW	46.0 kWp	86	3	43			

Title: תוכנית חד קוויית		DRAWING NUMBER: Nitzanim school - 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	20/06/21	Roi N.	SLD	Manuf': Chint [2256x1133x35]	Manuf': Solar Edge			
Designer: Roi Nakash		APPROVAL / STAMP								Model: 535W	Model A: 33.3kW			1
Approved:										Quant': 86	Model B:			
STATUS: לאישור		REV: A 1								Tilt: 18°	Model C:			
										Azimuth: 180°	Model D:			
										T.Power: 46kW	T.Power: 33.3kW			



PVsyst - Simulation report

Grid-Connected System

Project: SHR Ramat Gan_Nitzanim

Variant: New simulation variant

Tables on a building

System power: 46.0 kWp

Ramat Gan - Israel

Author

Green Panel (Israel)



PVsyst V7.1.8

VCO, Simulation date:
23/06/21 15:24
with v7.1.8

Project summary

Geographical Site		Situation		Project settings	
Ramat Gan		Latitude	32.08 °N	Albedo	0.20
Israel		Longitude	34.81 °E		
		Altitude	46 m		
		Time zone	UTC+2		
Meteo data					
Ramat Gan					
Meteonorm 7.3 (1990-2004), Sat=100% - Synthetic					

System summary

Grid-Connected System		Tables on a building		User's needs	
PV Field Orientation		Near Shadings		Unlimited load (grid)	
Fixed plane		According to strings			
Tilt/Azimuth	18 / 0 °	Electrical effect	100 %		
System information					
PV Array					
Nb. of modules	86 units	Inverters		1 Unit	
Pnom total	46.0 kWp	Nb. of units		33.3 kWac	
		Pnom total		1.382	
		Pnom ratio			

Results summary

Produced Energy	77.90 MWh/year	Specific production	1693 kWh/kWp/year	Perf. Ratio PR	76.92 %
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**PVsyst V7.1.8**

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23/06/21 15:24
with v7.1.8

General parameters

Grid-Connected System		Tables on a building			
PV Field Orientation		Sheds configuration		Models used	
Orientation		Nb. of sheds	4 units	Transposition	Perez
Fixed plane		Sizes		Diffuse	Perez, Meteonorm
Tilt/Azimuth	18 / 0 °	Sheds spacing	3.20 m	Circumsolar	separate
		Collector width	3.79 m		
		Ground Cov. Ratio (GCR)	118.5 %		
		Shading limit angle			
		Limit profile angle	109.4 °		
Horizon		Near Shadings		User's needs	
Free Horizon		According to strings		Unlimited load (grid)	
		Electrical effect	100 %		

PV Array Characteristics

PV module		Inverter	
Manufacturer	Longi Solar	Manufacturer	SolarEdge
Model	LR5-72 HPH 535 M	Model	SE33.3K-EU-APAC/AUS (400V)
(Original PVsyst database)		(Original PVsyst database)	
Unit Nom. Power	535 Wp	Unit Nom. Power	33.3 kWac
Number of PV modules	86 units	Number of inverters	1 Unit
Nominal (STC)	46.0 kWp	Total power	33.3 kWac
Array #1 - PV Array			
Number of PV modules	56 units	Number of inverters	0.7 Unit
Nominal (STC)	29.96 kWp	Total power	21.7 kWac
Optimizer Array	2 Strings x 14 In series		
At operating cond. (50°C)		Operating voltage	750 V
Pmpp	27.39 kWp	Pnom ratio (DC:AC)	1.30
Output of optimizers			
Voper	750 V		
I at Poper	37 A		
SolarEdge Power Optimizer			
Model	P1100 Worldwide		
Unit Nom. Power	1100 W		
Modules	1 String x 2 in series		
Array #2 - Sub-array #2			
Number of PV modules	30 units	Number of inverters	0.3 Unit
Nominal (STC)	16.05 kWp	Total power	11.6 kWac
Optimizer Array	1 String x 15 In series		
At operating cond. (50°C)		Operating voltage	750 V
Pmpp	14.68 kWp	Pnom ratio (DC:AC)	1.30
Output of optimizers			
Voper	750 V		
I at Poper	20 A		
SolarEdge Power Optimizer			
Model	P1100 Worldwide		
Unit Nom. Power	1100 W		
Modules	1 String x 2 in series		



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PV Array Characteristics

Total PV power		Total inverter power	
Nominal (STC)	46 kWp	Total power	33 kWac
Total	86 modules	Nb. of inverters	1 Unit
Module area	220 m ²	Pnom ratio	1.38
Cell area	199 m ²		



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Array losses

Array Soiling Losses		Thermal Loss factor		LID - Light Induced Degradation	
Loss Fraction	3.0 %	Module temperature according to irradiance		Loss Fraction	2.0 %
		Uc (const)	25.0 W/m²K		
		Uv (wind)	0.0 W/m²K/m/s		
Module Quality Loss		Module mismatch losses		Strings Mismatch loss	
Loss Fraction	0.0 %	Loss Fraction (Fixed voltage) 0.0 %		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		Array #2 - Sub-array #2			
Global array res.	281 mΩ	Global array res.	524 mΩ		
Loss Fraction	1.5 % at STC	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	84 m

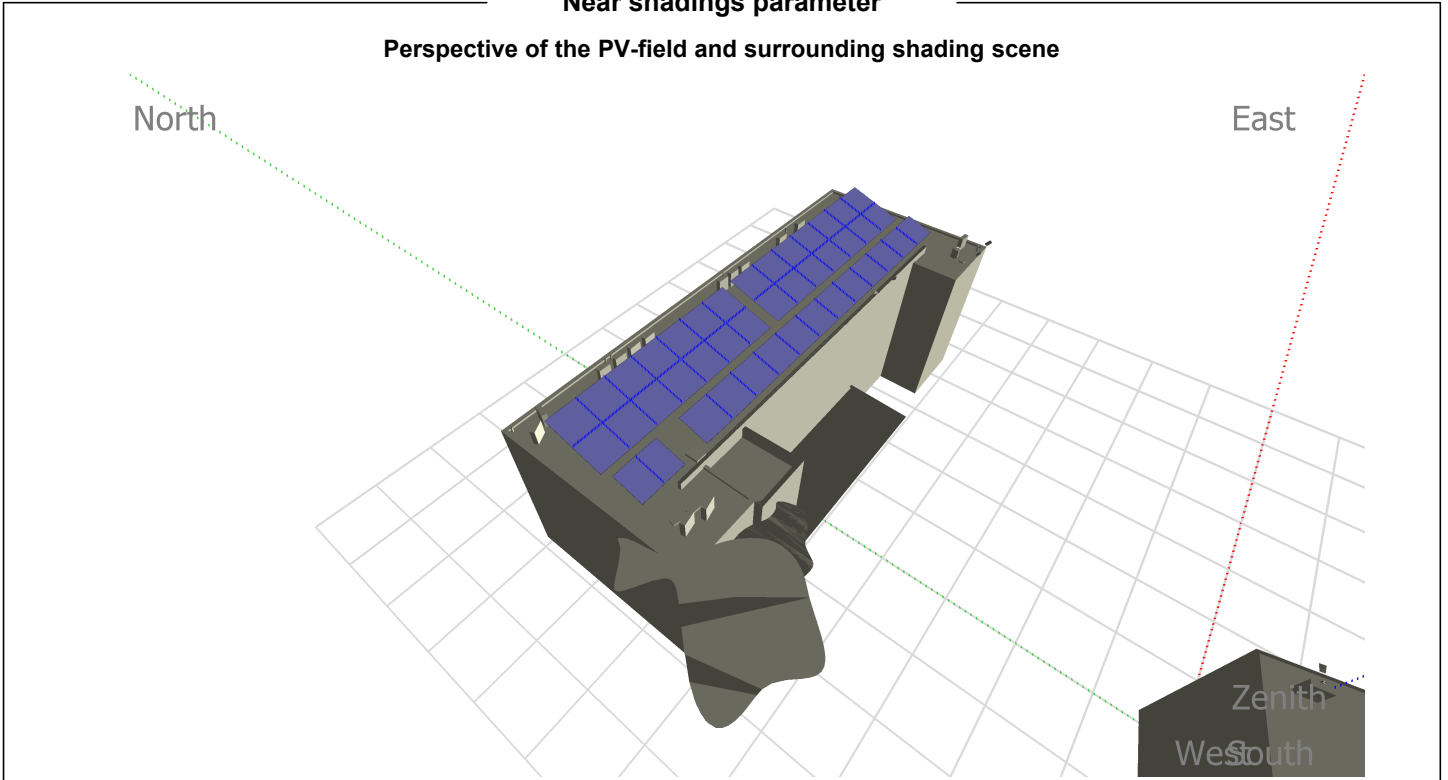


PVsyst V7.1.8

VC0, Simulation date:
23/06/21 15:24
with v7.1.8

Near shadings parameter

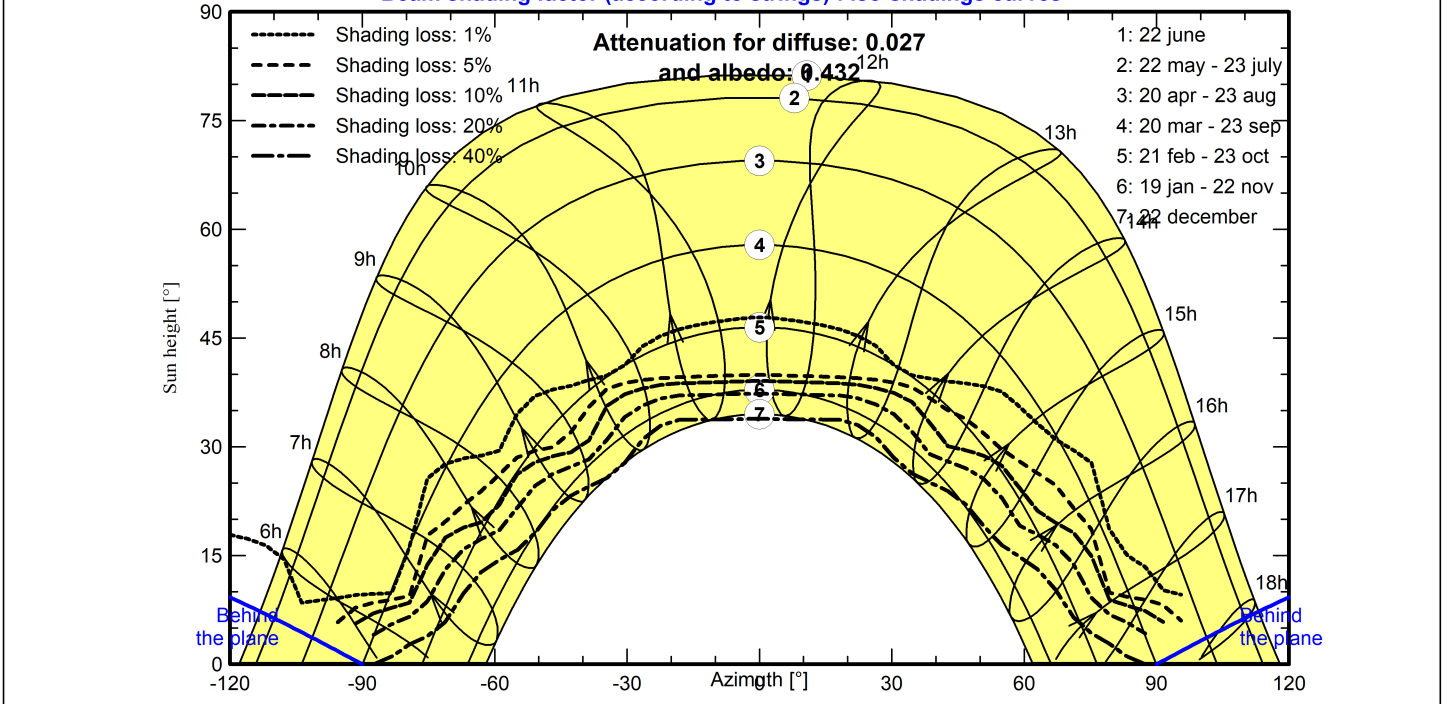
Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram

SHR Ramat Gan_Nitzanim

Beam shading factor (according to strings) : Iso-shadings curves





PVsyst V7.1.8

VCO, Simulation date:
23/06/21 15:24
with v7.1.8

Main results

System Production

Produced Energy 77.90 MWh/year

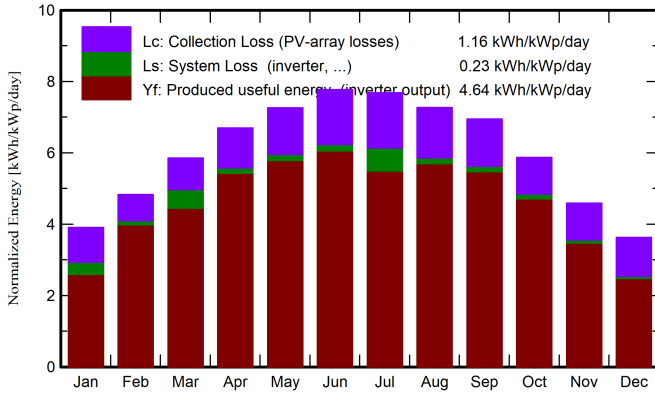
Specific production

1693 kWh/kWp/year

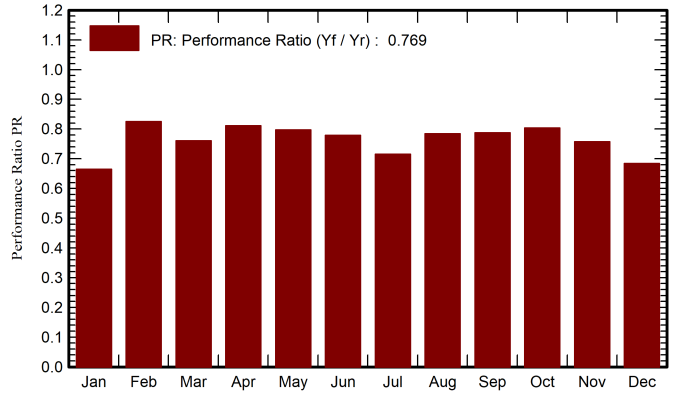
Performance Ratio PR

76.92 %

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

	GlobHor kWh/m ²	DiffHor kWh/m ²	T_Amb °C	GlobInc kWh/m ²	GlobEff kWh/m ²	EArray MWh	E_Grid MWh	PR ratio
January	92.1	38.65	12.89	121.2	111.5	4.197	3.707	0.665
February	110.6	46.40	13.53	135.4	126.5	5.285	5.142	0.826
March	159.8	62.31	16.27	181.4	170.7	7.097	6.347	0.760
April	190.0	71.96	19.23	200.9	189.0	7.712	7.496	0.811
May	226.6	76.41	22.47	225.1	211.5	8.501	8.261	0.797
June	241.9	59.07	25.29	233.3	219.3	8.609	8.364	0.779
July	243.9	61.59	28.17	238.2	224.1	8.756	7.841	0.716
August	218.1	66.52	28.42	225.4	212.4	8.364	8.128	0.784
September	186.5	47.52	26.35	208.5	196.7	7.774	7.554	0.788
October	149.4	46.27	23.76	181.9	170.9	6.917	6.726	0.804
November	105.1	34.92	18.84	137.6	127.9	4.928	4.794	0.757
December	84.7	38.69	15.00	112.4	102.8	3.630	3.539	0.684
Year	2008.7	650.32	20.90	2201.2	2063.4	81.769	77.900	0.769

Legends

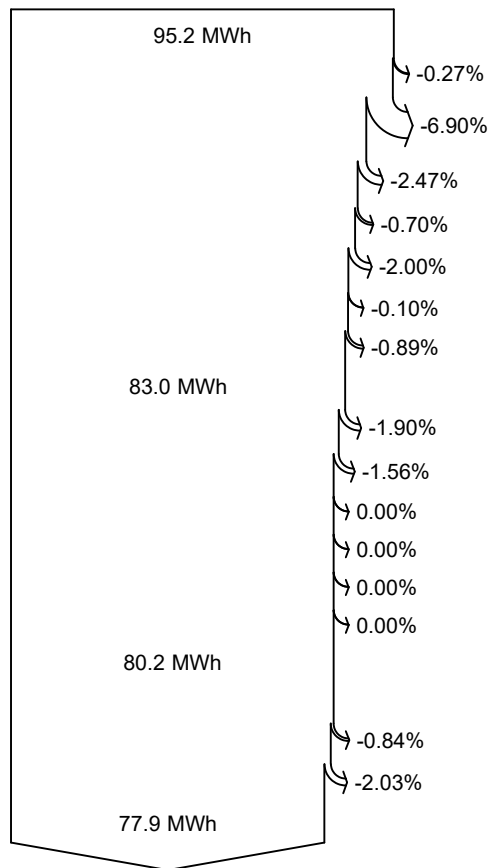
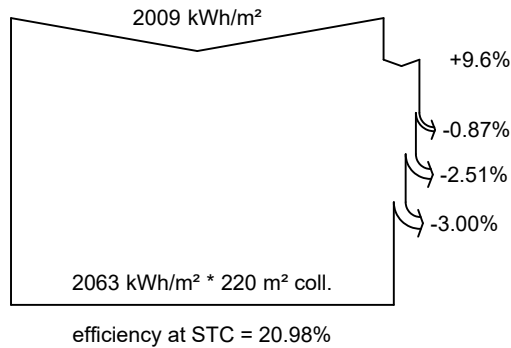
- GlobHor Global horizontal irradiation
- DiffHor Horizontal diffuse irradiation
- T_Amb Ambient Temperature
- GlobInc Global incident in coll. plane
- GlobEff Effective Global, corr. for IAM and shadings
- EArray Effective energy at the output of the array
- E_Grid Energy injected into grid
- PR Performance Ratio



PVsyst V7.1.8

VC0, Simulation date:
23/06/21 15:24
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 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

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

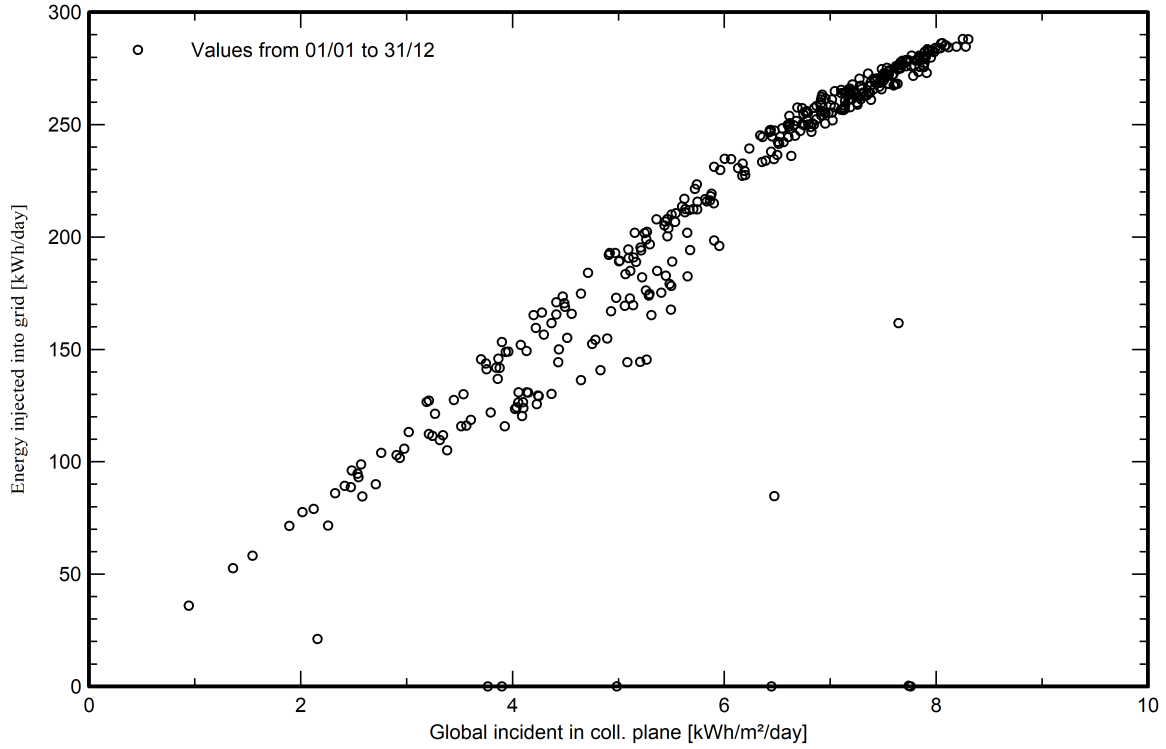


PVsyst V7.1.8

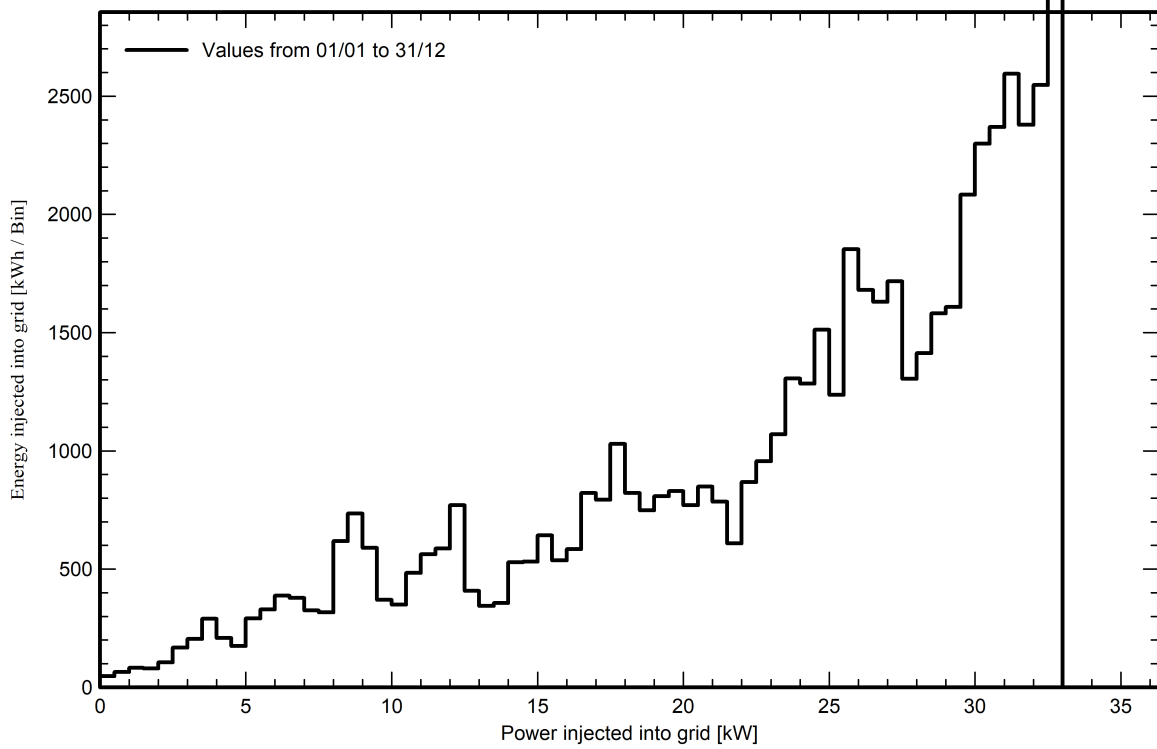
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with v7.1.8

Special graphs

Daily Input/Output diagram



System Output Power Distribution



DC CABLE CALCULATION & POWER LOSSES

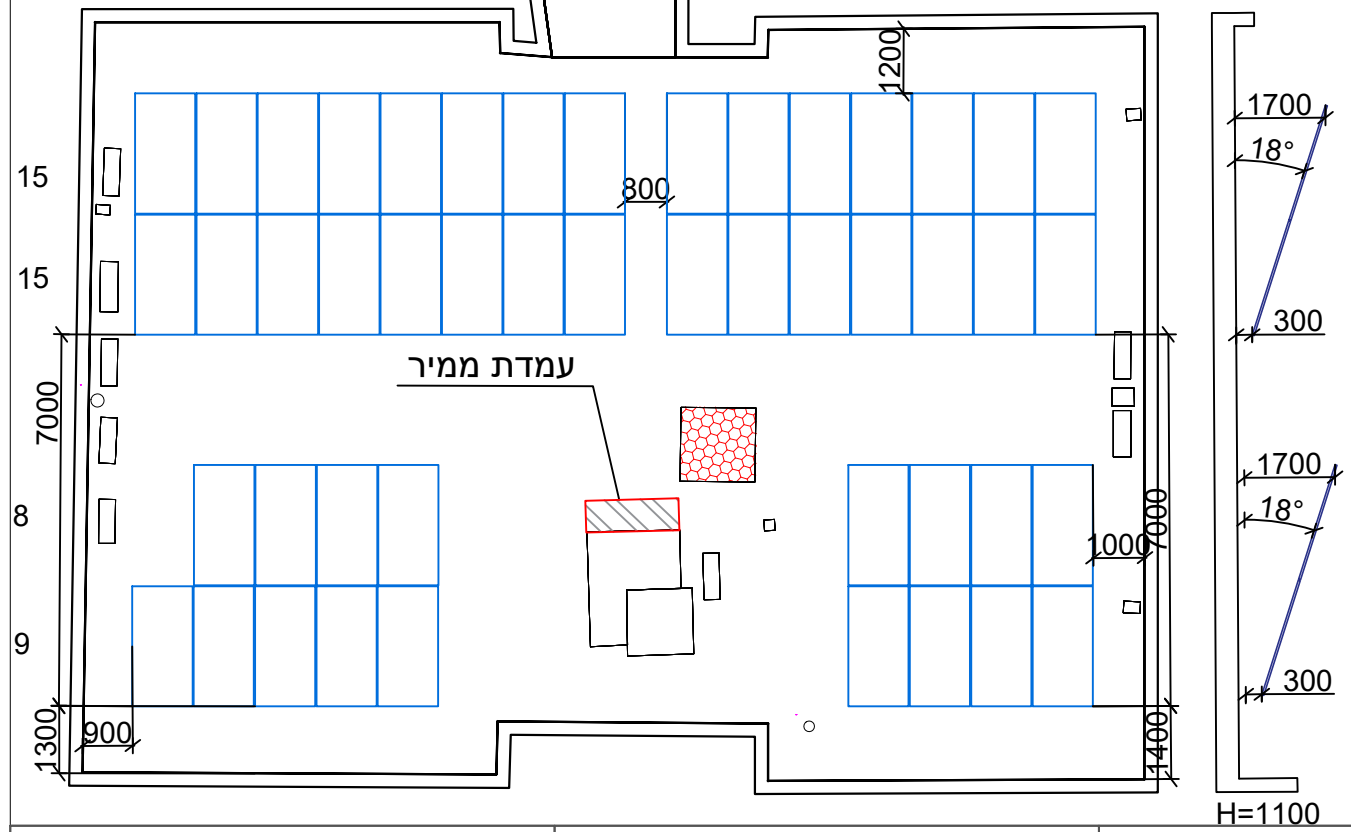
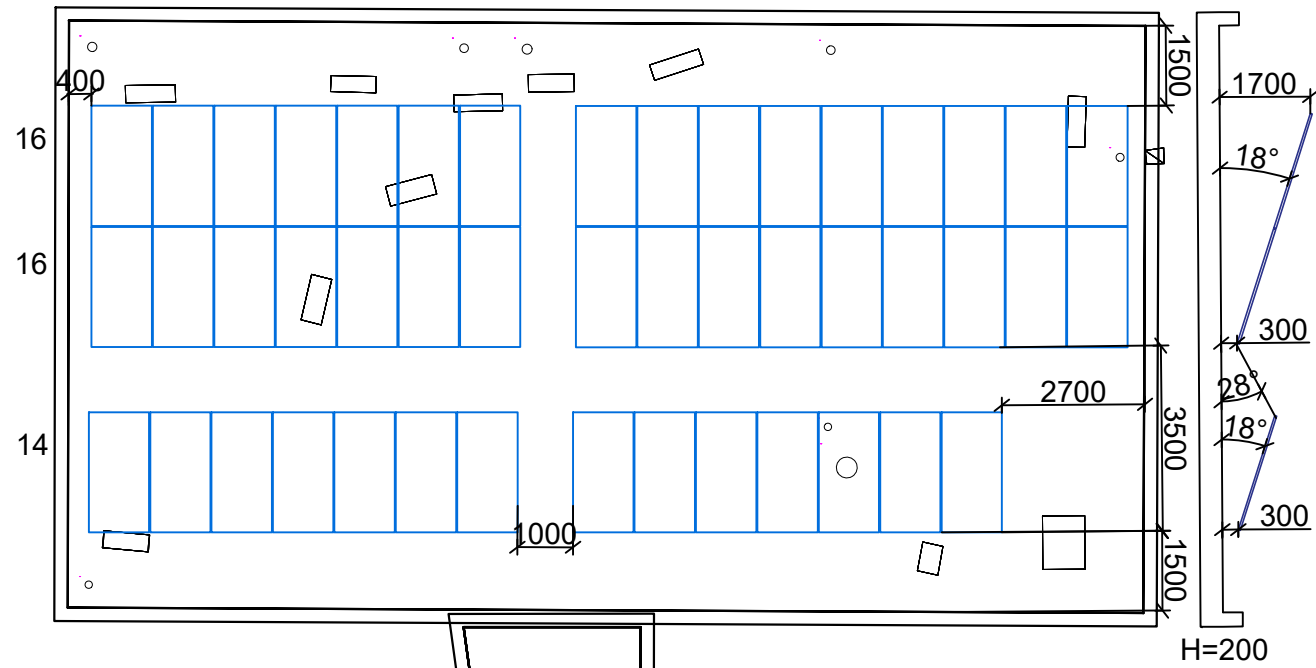
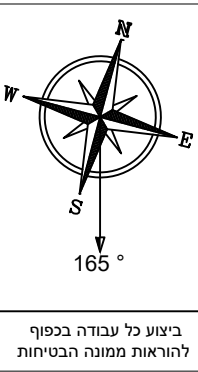
DATA		Cable Calculation										Production Losses	
Module Type	535	mm ²	Copper			Aluminum						Grid Load	100%
Imp [A]	12.86		4	6	16	25	35	50	95	120	240	Power Losses	0.32%
Vmp [V]	41.60	Length	0	230	0	0	0	0	0	0	0		0
Module amount	86												
Total Power [kWp]	46,010												

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	86	86	3	46010	38.58	96.75	3.59	3	6	5	0.5	18	0.04%	DCCB / DCB to INV Losses
ST-1	30	30	1	16050	12.86	36.75	3.59	1	6	35	3	42	0.26%	String Losses
ST-2	28	28	1	14980	12.86	36.75	3.59	1	6	35	3	42	0.28%	
ST-3	28	28	1	14980	12.86	36.75	3.59	1	6	40	4	47	0.32%	
												148	0.32%	Total losses
				46,010	TOTAL							148	0.32%	TOTAL

DATA				AC CABLE CALCULATION & POWER LOSSES																Production Losses				
Module Type	535	Voltage [V]	400	בית ספר ניצנים גג צפוני																Avg' Voltage Drop	0.49%			
Imp [A]	12.86	Load [%]	100%																	Max Voltage Drop	0.49%			
Vmp [V]	41.60	Cos Ph	1																	Power Losses	0.49%			
Module amount	86	Total Power [kVA]	33.30																		163.38W			
Total Power [kWp]	46,010																							

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 Ambient Temp'	K2 No' Cable sets	K3 No' Cables in Conduit	K4 Thermal resistance (W/km)	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	86	46.0	33.30	48.06	4	4x16 NA2XY Copper	16	1	Air	0.95	0.88	1	1	61.0	1.218	1.221	0.41	33.8	0.10%	0.49%	0.04%	
LVP	IEC Meter	86	46.0	33.30	48.06	15	4x25 NA2XY Aluminum	25	1	Air	0.95	1	1	1	69.4	1.247	1.250	1.56	129.6	0.39%	0.39%	0.15%	
AC [kVA]		33.30																		163.4	Total Losses		0.49%

Nitzanim Design Layout

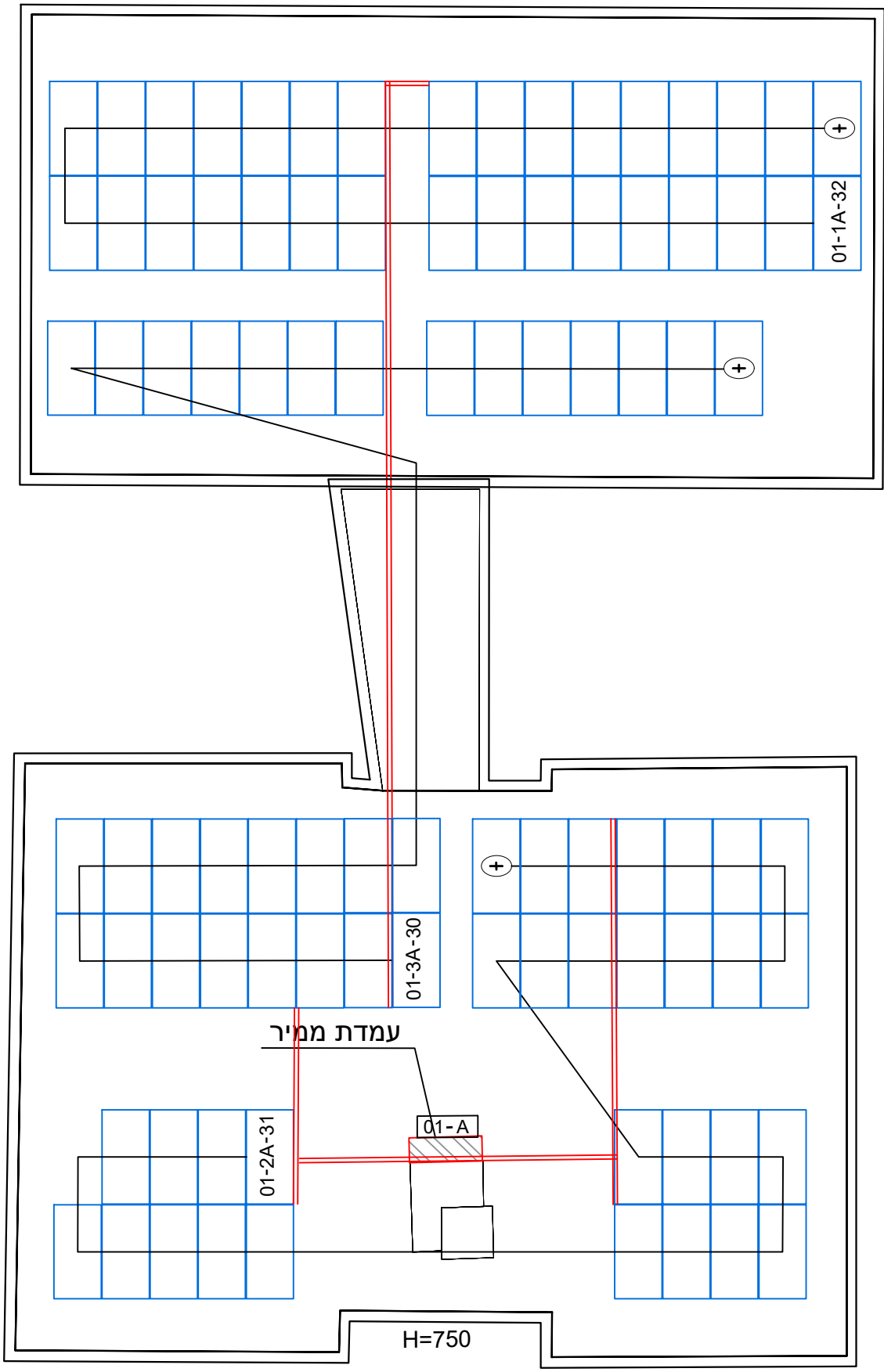
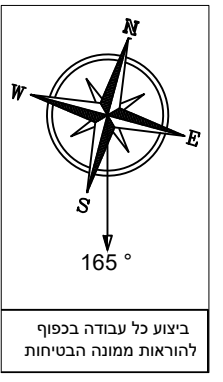


חלוקה לסטרינגים וממירים - ניצנים גג דרומי							535	הספק פאנל [W]:	
							93	כמות פאנלים:	
							33.3 kW	הספק AC [kW]:	
							49.8 kWp	הספק DC [kWp]:	
							149.41%	חסר העמסה AC/DC:	
AC/DC (%)	הספק AC [kW]	הספק DC [kWp]	מס' פאנלים	אופט מיזר P1100	מס' סטרינגים	Unit	סוג ממיר	מס' ממיר	סוג
149.41%	33.3 kW	49.8 kWp	32	16	3	A	SolarEdge	1	בטון
			31	16			33.3kW		
			30	15					
149.41%	33.3 kW	49.8 kWp	93	47	3				

Title: תוכנית הצבת פאנלים		DRAWING NUMBER: Nitzanim school - 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	20/06/21	Roi N.	Layout Update	Manuf': Chint [2256x1133x35]	Manuf': Solar Edge		
Designer: Roi Nakash		APPROVAL / STAMP							Model: 535W	Model A: 33.3kW		1	
Approved:									Quant': 93	Model B:			
STATUS: לאישור		REV: A 1							Tilt: 18°	Model C:			
									Azimuth: 165°	Model D:			
									T.Power: 49.8kW	T.Power: 33.3kW			



Nitzanim String Wiring



מקרא:

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

⊕ — כיוון חיבור סטרינג

JB - A קופסת איסוף סטרינג

— תעלת רשת 100 DC

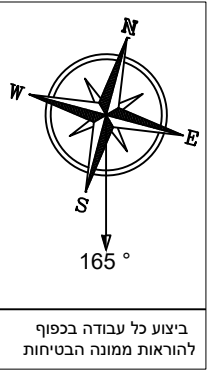
— מובל עילי קיימים/תעלה



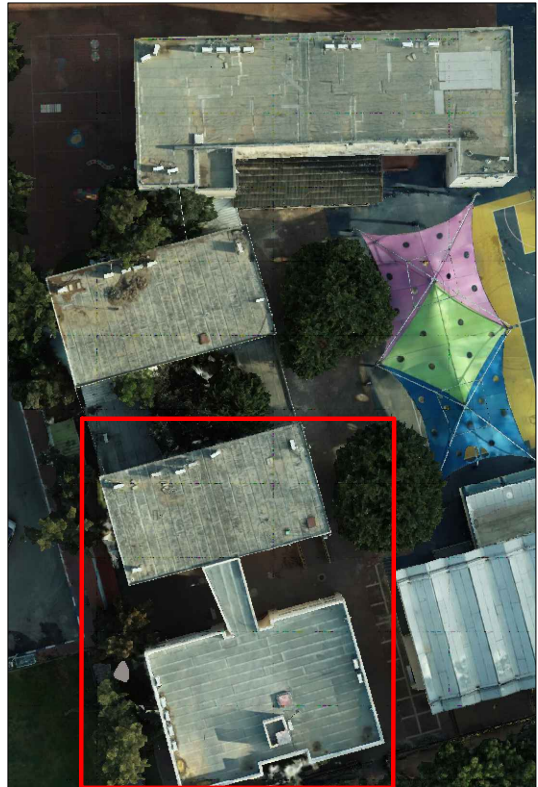
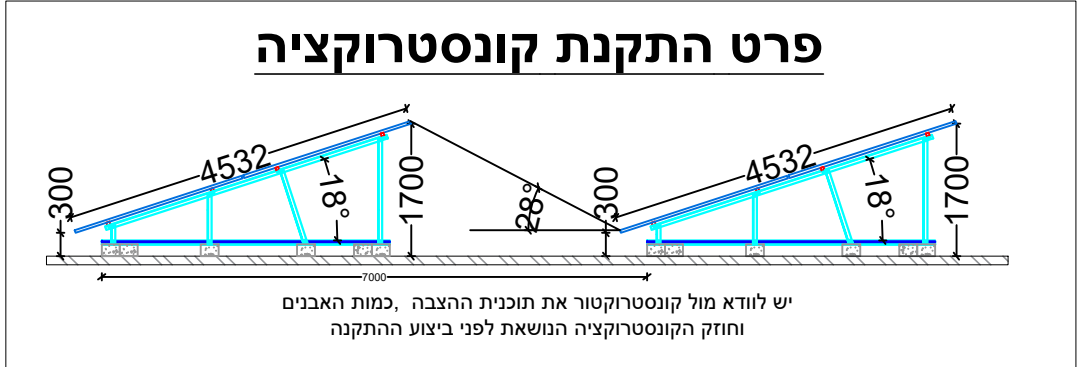
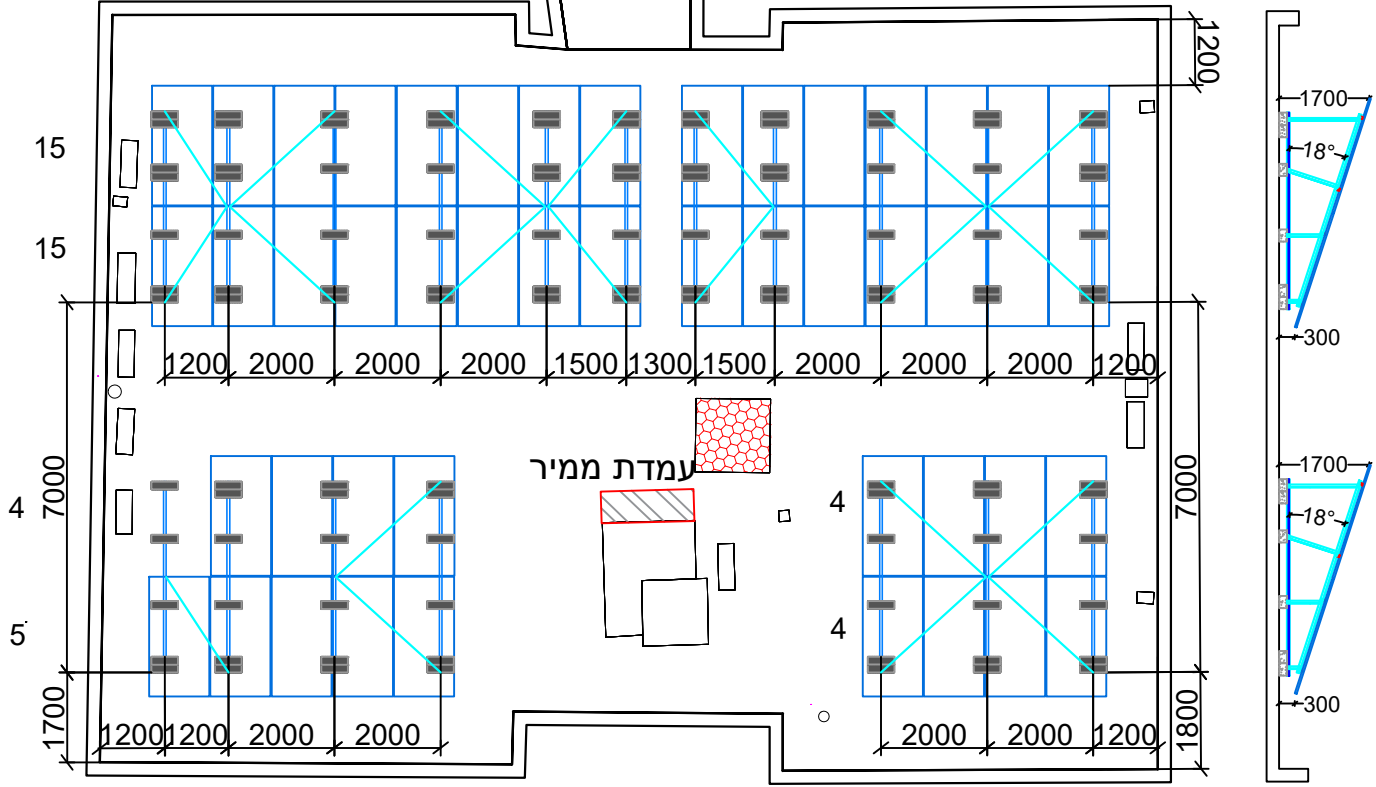
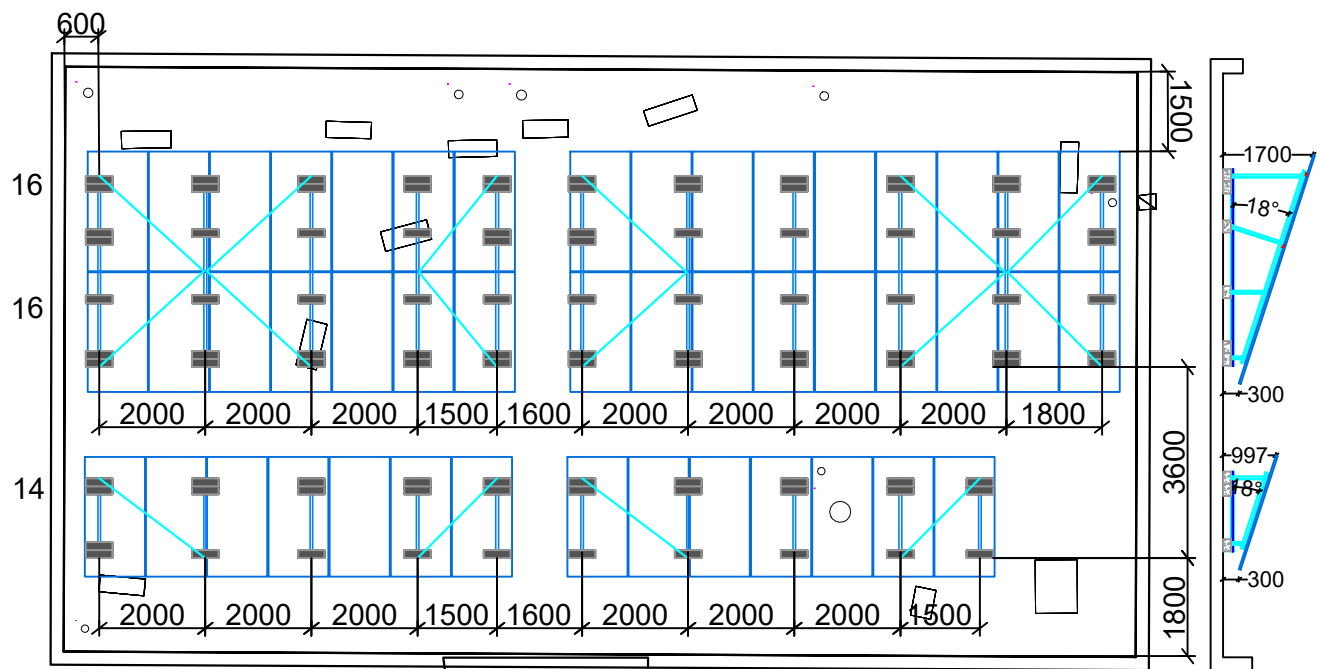
חלוקה לסטרינגים וממירים - ניצנים גג דרומי							535	הספק פאנל [W]:	
							93	כמות פאנלים:	
							33.3 kW	הספק AC [kW]:	
							49.8 kWp	הספק DC [kWp]:	
							149.41%	חסר העמסה AC/DC:	
AC/DC (%)	הספק AC [kW]	הספק DC [kWp]	מס' פאנלים	אופט מיזר P1100	מס' סטרינגים	Unit	סוג ממיר	מס' ממיר	סוג
149.41%	33.3 kW	49.8 kWp	32	16	3	A	SolarEdge 33.3kW	1	בטון
			31	16					
			30	15					
149.41%	33.3 kW	49.8 kWp	93	47	3				

Title: תוכנית חיווט פאנלים		DRAWING NUMBER: Nitzanim school - 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	20/06/21	Roi N.	String Wiring	Manuf': Chint [2256x1133x35]	Manuf': Solar Edge			
Designer: Roi Nakash		APPROVAL / STAMP								Model: 535W	Model A: 33.3kW			1
Approved:										Quant': 93	Model B:			
STATUS: לאישור		REV: A 1								Tilt: 18°	Model C:			
										Azimuth: 165°	Model D:			
										T.Power: 49.8kW	T.Power: 33.3kW			





ביצוע כל עבודה בכפוף להוראות ממנה הבטיחות



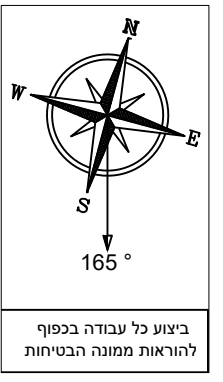
כתב כמויות - רגליים גג דרומי

כמות	תיאור	פריט
10	גובה מהרצפה: 300 מ"מ זווית: 18°	פאנל בודד
29	גובה מהרצפה: 300 מ"מ זווית: 18°	פאנל כפול
16	אורך 2.4 מ	ד יאג ונל
21	אורך 2.2 מ	
215	39 ק"ג גובה: 150, רוחב: 230, אורך: 500	אבנים

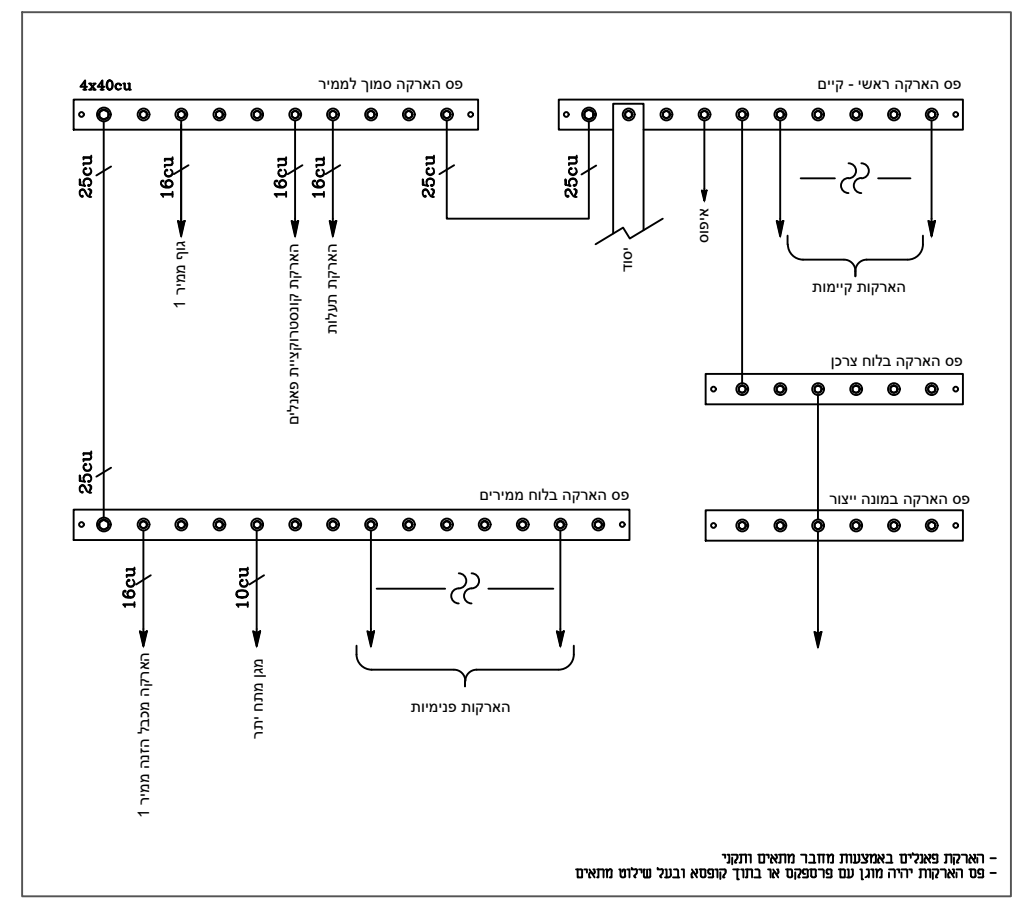
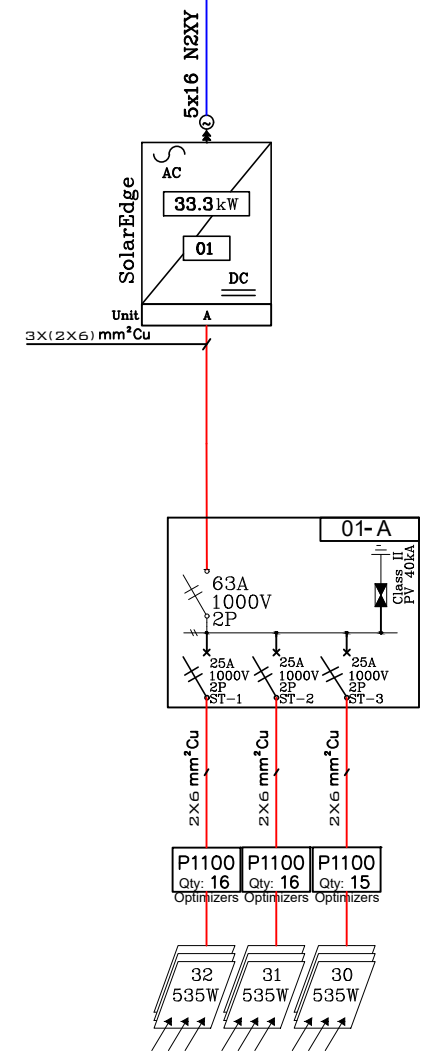
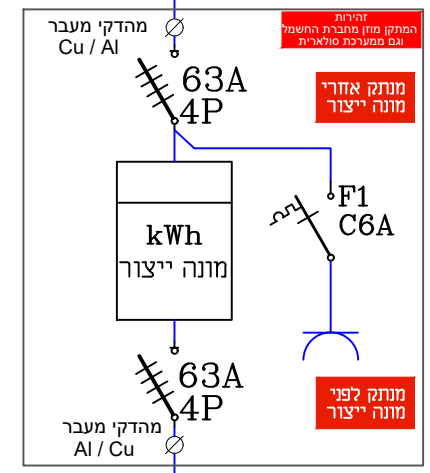
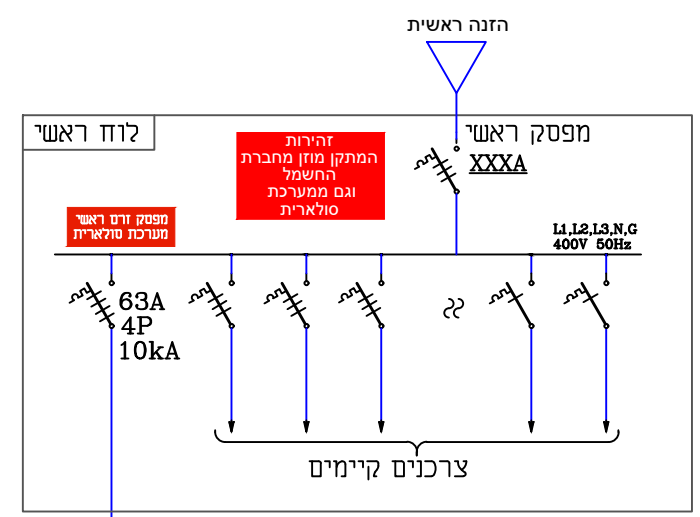
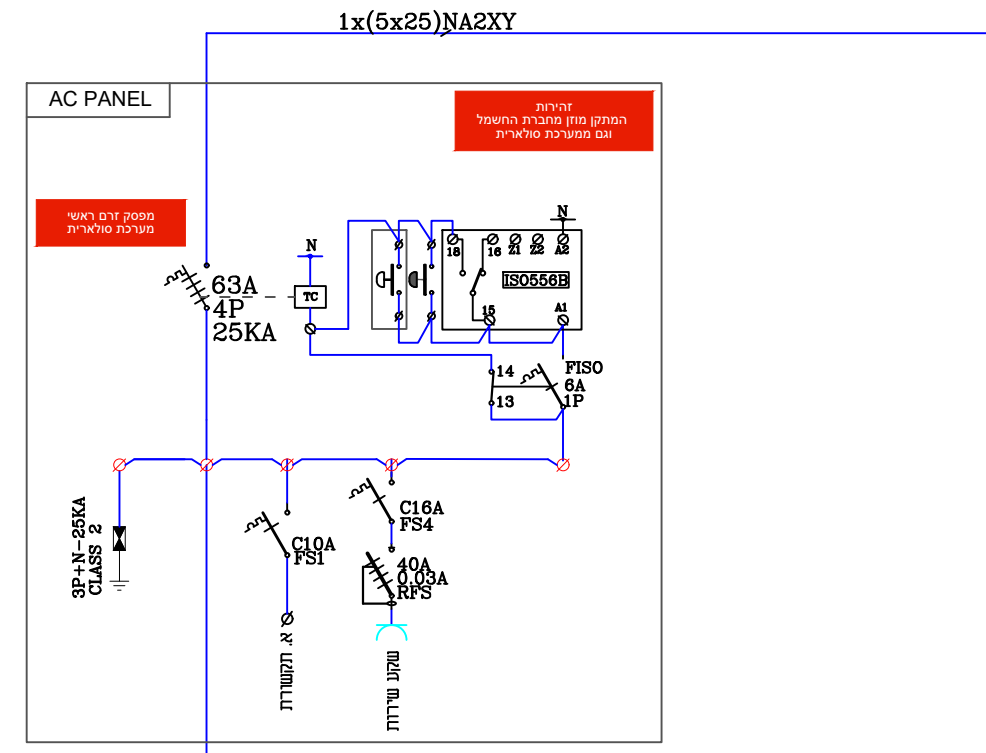
Title: תוכנית קונסטרוקציה		DRAWING NUMBER: Nitzanim school - G001			REV	DATE	DRAWN	COMMENTS	Panels		Inverters		Quant'
Client: שחר אנרגיה	Site location: רמת גן	DATE: 24/02/2021	Scale: ####	Print size: A3	Sheet: 1/1	A 1	20/06/21	Roi N.	Construction	Manuf': Chint [2256x1133x35]	Manuf': Solar Edge		
Designer: Roi Nakash		APPROVAL / STAMP							Model: 535W	Model A: 33.3kW	Model B:		1
Approved:									Quant': 93	Model C:			
STATUS: לאישור		REV: A 1							Tilt: 18°	Model D:			
									Azimuth: 165°	T.Power: 49.8kW	T.Power: 33.3kW		



Nitzanim Single Line



ביצוע כל עבודה בכפוף להוראות ממונה הבטיחות



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

חלוקה לסטרינגים וממירים - ניצנים גג דרומי							535	הספק פאנל [W]:	
							93	כמות פאנלים:	
							33.3 kW	הספק AC [kW]:	
							49.8 kWp	הספק DC [kWp]:	
							149.41%	חסר העמסה AC/DC:	
AC/DC (%)	[kW]AC הספק	[kWp]DC הספק	מס' פאנלים	אופט מיזר P1100	מס' סטרינגים	Unit	סוג ממיר	מס' ממיר	סוג
149.41%	33.3 kW	49.8 kWp	32	16	3	A	SolarEdge 33.3kW	1	בטון
149.41%	33.3 kW	49.8 kWp	93	47	3				

Title: תוכנית חד קווית		DRAWING NUMBER: Nitzanim school - 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	20/06/21	Roi N.	SLD	Manuf': Chint [2256x1133x35]	Manuf': Solar Edge			
Designer: Roi Nakash		APPROVAL / STAMP								Model: 535W	Model A: 33.3kW			
Approved:										Quant': 93	Model B:			
STATUS: לאישור		REV: A 1								Tilt: 18°	Model C:			
										Azimuth: 165°	Model D:			
										T.Power: 49.8kW	T.Power: 33.3kW			



PVsyst - Simulation report

Grid-Connected System

Project: SHR Ramat Gan_Nitzanim

Variant: South Roof

Tables on a building

System power: 49.2 kWp

Ramat Gan - Israel

Author

Green Panel (Israel)



PVsyst V7.1.8

VC1, Simulation date:
23/06/21 17:01
with v7.1.8

Project summary

Geographical Site		Situation		Project settings	
Ramat Gan		Latitude	32.08 °N	Albedo	0.20
Israel		Longitude	34.81 °E		
		Altitude	46 m		
		Time zone	UTC+2		
Meteo data					
Ramat Gan					
Meteonorm 7.3 (1990-2004), Sat=100% - Synthetic					

System summary

Grid-Connected System		Tables on a building		User's needs	
PV Field Orientation		Near Shadings		Unlimited load (grid)	
Fixed plane		According to strings			
Tilt/Azimuth	18 / -15 °	Electrical effect	100 %		
System information					
PV Array					
Nb. of modules	92 units	Inverters		1 Unit	
Pnom total	49.2 kWp	Nb. of units		33.3 kWac	
		Pnom total		1.478	
		Pnom ratio			

Results summary

Produced Energy	82.61 MWh/year	Specific production	1678 kWh/kWp/year	Perf. Ratio PR	76.53 %
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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

VC1, Simulation date:
23/06/21 17:01
with v7.1.8

General parameters

Grid-Connected System		Tables on a building		Models used	
PV Field Orientation		Sheds configuration		Transposition Perez	
Orientation		Nb. of sheds		Diffuse Perez, Meteororm	
Fixed plane		9 units		Circumsolar separate	
Tilt/Azimuth 18 / -15 °		Sizes			
		Sheds spacing 4.43 m			
		Collector width 3.97 m			
		Ground Cov. Ratio (GCR) 89.6 %			
		Shading limit angle			
		Limit profile angle 61.9 °			
Horizon		Near Shadings		User's needs	
Free Horizon		According to strings		Unlimited load (grid)	
		Electrical effect 100 %			

PV Array Characteristics

PV module		Inverter	
Manufacturer	Longi Solar	Manufacturer	SolarEdge
Model	LR5-72 HPH 535 M	Model	SE66.6K/SE100K-EU-APAC/AUS Unit (400V)
(Original PVsyst database)		(Original PVsyst database)	
Unit Nom. Power	535 Wp	Unit Nom. Power	33.3 kWac
Number of PV modules	92 units	Number of inverters	1 Unit
Nominal (STC)	49.2 kWp	Total power	33.3 kWac
Array #1 - PV Array		Array #1 - PV Array	
Number of PV modules	60 units	Number of inverters	0.7 Unit
Nominal (STC)	32.1 kWp	Total power	21.7 kWac
Optimizer Array	2 Strings x 15 In series		
At operating cond. (50°C)		At operating cond. (50°C)	
Pmpp	29.35 kWp	Operating voltage	750 V
Output of optimizers		Pnom ratio (DC:AC)	1.39
Voper	750 V		
I at Poper	39 A		
SolarEdge Power Optimizer		SolarEdge Power Optimizer	
Model	P1100 Worldwide		
Unit Nom. Power	1100 W		
Modules	1 String x 2 in series		
Array #2 - Sub-array #2		Array #2 - Sub-array #2	
Number of PV modules	32 units	Number of inverters	0.3 Unit
Nominal (STC)	17.12 kWp	Total power	11.6 kWac
Optimizer Array	1 String x 16 In series		
At operating cond. (50°C)		At operating cond. (50°C)	
Pmpp	15.65 kWp	Operating voltage	750 V
Output of optimizers		Pnom ratio (DC:AC)	1.39
Voper	750 V		
I at Poper	21 A		
SolarEdge Power Optimizer		SolarEdge Power Optimizer	
Model	P1100 Worldwide		
Unit Nom. Power	1100 W		
Modules	1 String x 2 in series		



PVsyst V7.1.8

VC1, Simulation date:
23/06/21 17:01
with v7.1.8

PV Array Characteristics

Total PV power		Total inverter power	
Nominal (STC)	49 kWp	Total power	33 kWac
Total	92 modules	Nb. of inverters	1 Unit
Module area	235 m ²	Pnom ratio	1.48
Cell area	213 m ²		



PVsyst V7.1.8

VC1, Simulation date:
23/06/21 17:01
with v7.1.8

Array losses

Array Soiling Losses		Thermal Loss factor		LID - Light Induced Degradation	
Loss Fraction	3.0 %	Module temperature according to irradiance		Loss Fraction	2.0 %
		Uc (const)	27.0 W/m²K		
		Uv (wind)	0.0 W/m²K/m/s		
Module Quality Loss		Module mismatch losses		Strings Mismatch loss	
Loss Fraction	0.0 %	Loss Fraction (Fixed voltage) 0.0 %		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		Array #2 - Sub-array #2			
Global array res.	262 mΩ	Global array res.	492 mΩ		
Loss Fraction	1.5 % at STC	Loss Fraction	1.5 % at STC		

System losses

Unavailability of the system	
Time fraction	2.0 %
	7.3 days,
	3 periods

AC wiring losses

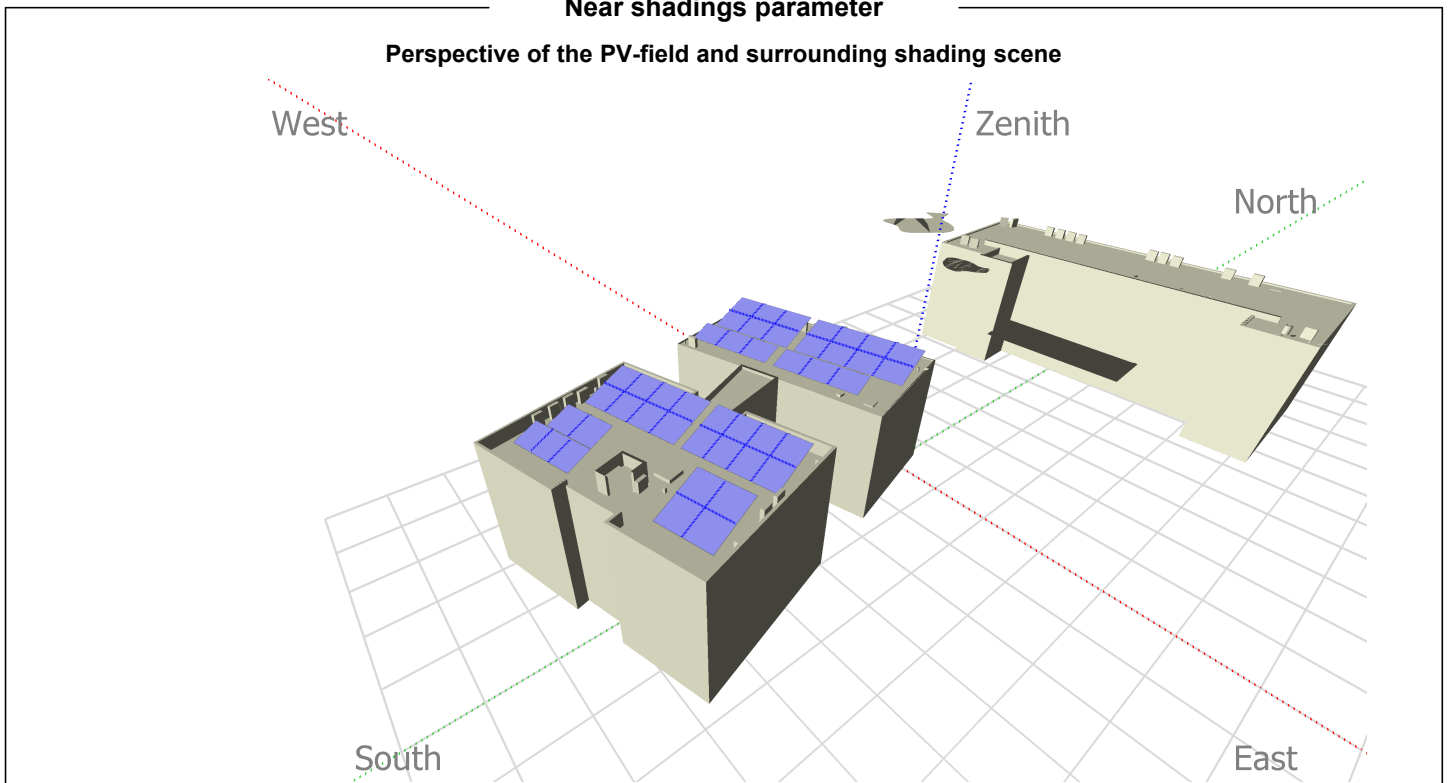
Inv. output line up to injection point	
Inverter voltage	400 Vac tri
Loss Fraction	1.5 % at STC
Global System	
Wire section	Alu 3 x 50 mm²
Wires length	79 m



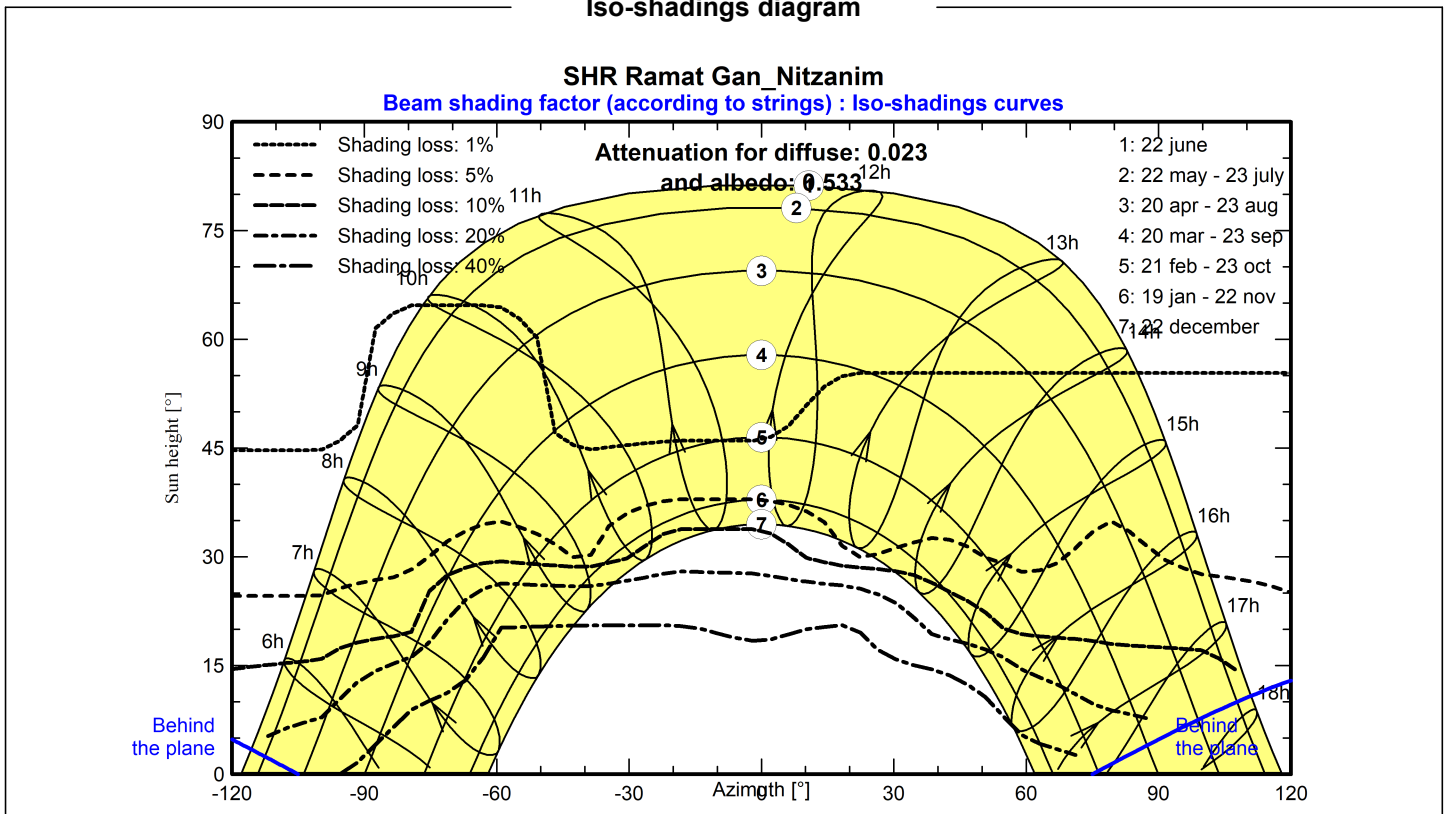
PVsyst V7.1.8

VC1, Simulation date:
23/06/21 17:01
with v7.1.8

Near shadings parameter



Iso-shadings diagram





PVsyst V7.1.8

VC1, Simulation date:
23/06/21 17:01
with v7.1.8

Main results

System Production

Produced Energy 82.61 MWh/year

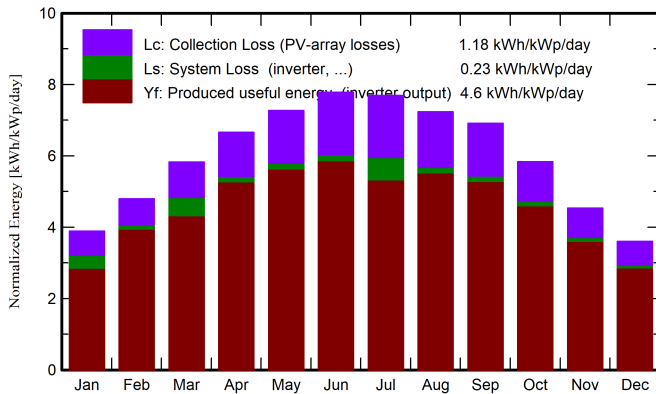
Specific production

1678 kWh/kWp/year

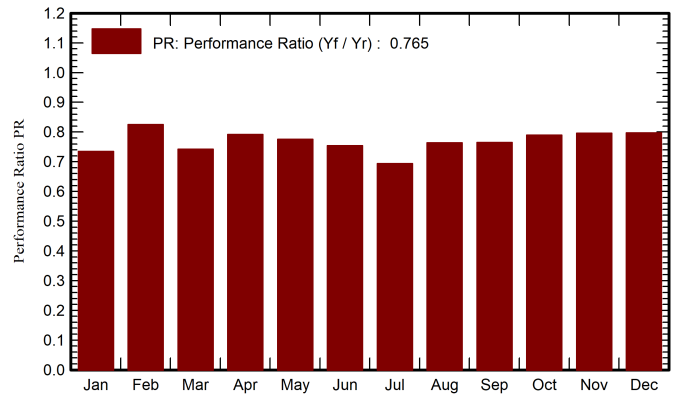
Performance Ratio PR

76.53 %

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

	GlobHor kWh/m ²	DiffHor kWh/m ²	T_Amb °C	GlobInc kWh/m ²	GlobEff kWh/m ²	EArray MWh	E_Grid MWh	PR ratio
January	92.1	38.65	12.89	120.7	111.4	4.916	4.364	0.735
February	110.6	46.40	13.53	134.2	125.3	5.601	5.451	0.825
March	159.8	62.31	16.27	180.7	169.8	7.388	6.600	0.742
April	190.0	71.96	19.23	199.8	188.1	8.015	7.793	0.792
May	226.6	76.41	22.47	225.4	211.8	8.855	8.608	0.776
June	241.9	59.07	25.29	233.5	219.4	8.921	8.670	0.754
July	243.9	61.59	28.17	238.4	223.9	9.095	8.138	0.694
August	218.1	66.52	28.42	224.3	211.3	8.677	8.434	0.764
September	186.5	47.52	26.35	207.5	195.4	8.031	7.807	0.764
October	149.4	46.27	23.76	180.9	169.5	7.230	7.031	0.790
November	105.1	34.92	18.84	136.2	126.8	5.486	5.338	0.797
December	84.7	38.69	15.00	111.5	102.8	4.490	4.376	0.797
Year	2008.7	650.32	20.90	2193.1	2055.4	86.703	82.607	0.765

Legends

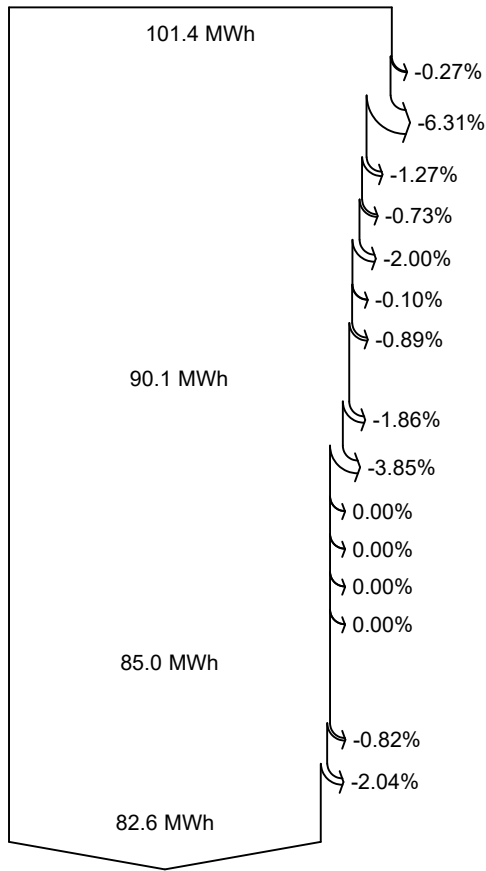
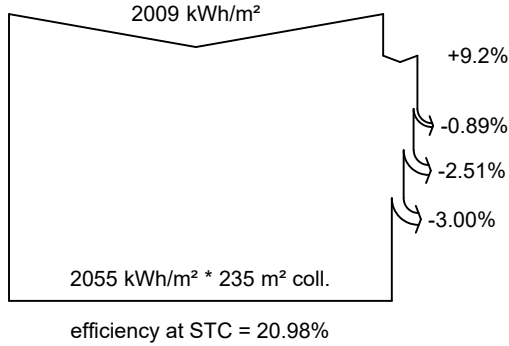
- GlobHor Global horizontal irradiation
- DiffHor Horizontal diffuse irradiation
- T_Amb Ambient Temperature
- GlobInc Global incident in coll. plane
- GlobEff Effective Global, corr. for IAM and shadings
- EArray Effective energy at the output of the array
- E_Grid Energy injected into grid
- PR Performance Ratio



PVsyst V7.1.8

VC1, Simulation date:
23/06/21 17:01
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 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

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

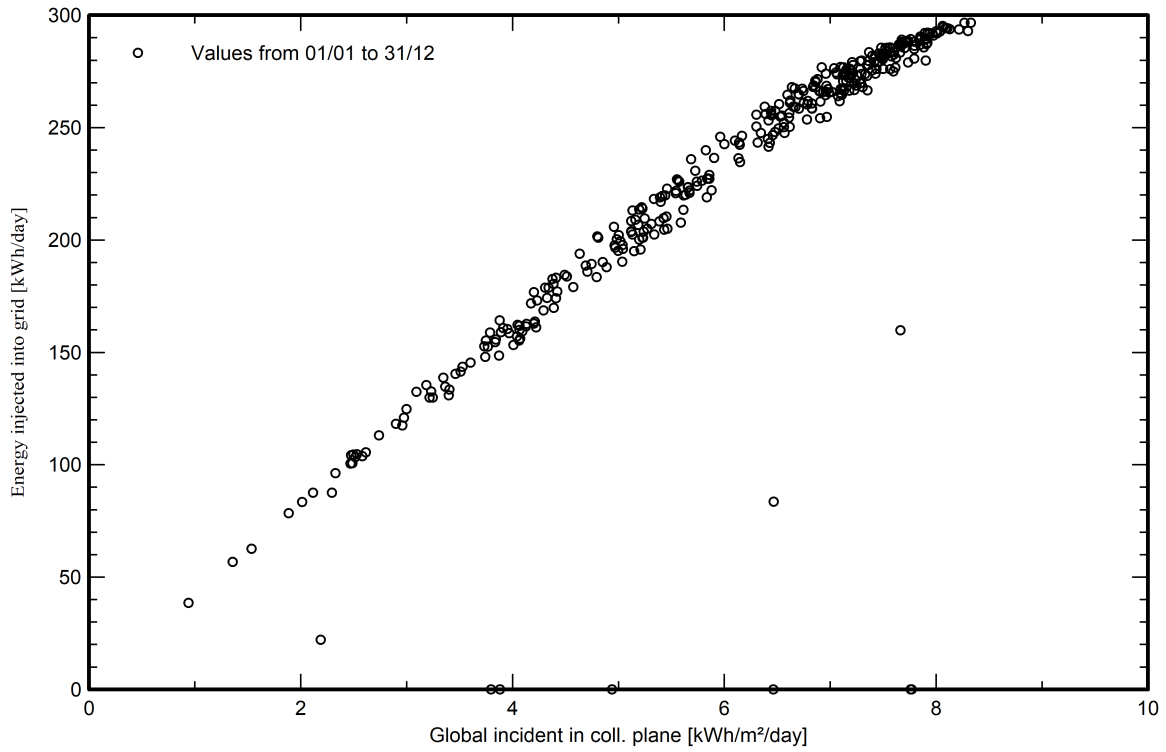


PVsyst V7.1.8

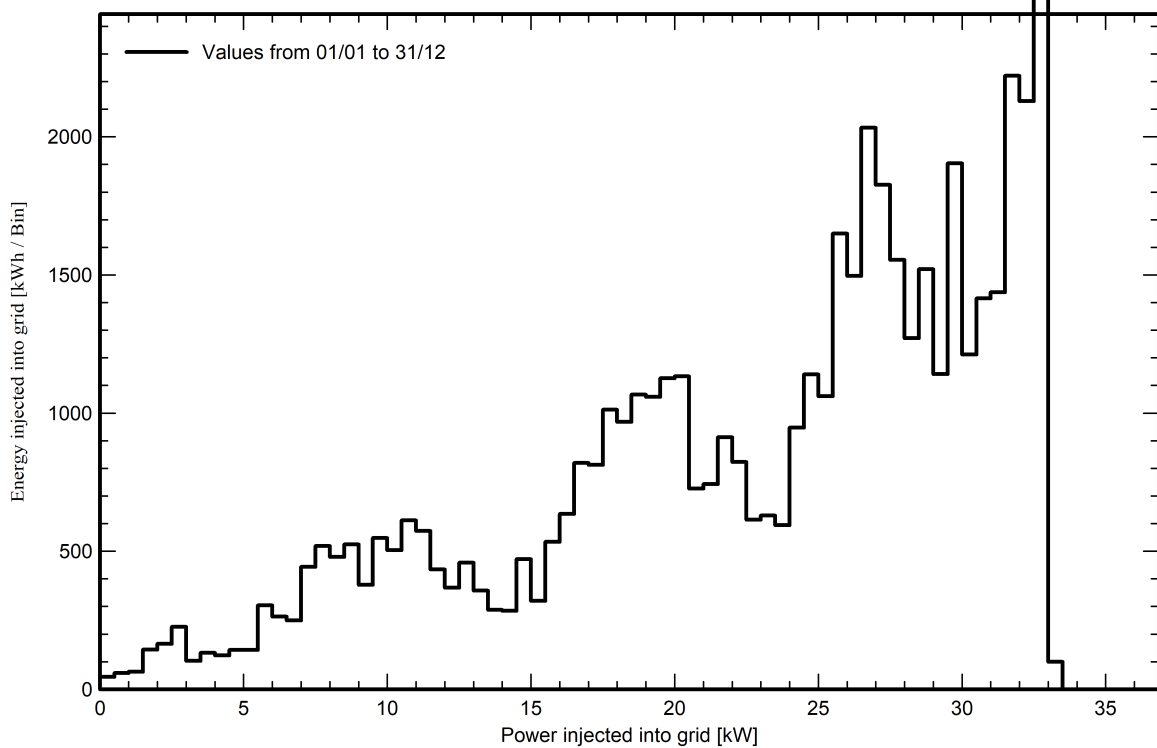
VC1, Simulation date:
23/06/21 17:01
with v7.1.8

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]	12.86		4	6	16	25	35	50	95	120	240	Power Losses	0.42%
Vmp [V]	41.60	Length	0	330	0	0	0	0	0	0	0		0
Module amount	93												
Total Power [kWp]	49,755												

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 Length [M]	Voltage Drop [V]	Power losses [W]	ΔP %	
01-A	93	93	3	49755	38.58	96.75	3.59	3	6	5	0.5	18	0.04%	DCCB / DCB to INV Losses
ST-1	32	32	1	17120	12.86	36.75	3.59	1	6	60	6	71	0.42%	String Losses
ST-2	31	31	1	16585	12.86	36.75	3.59	1	6	50	5	59	0.36%	
ST-3	30	30	1	16050	12.86	36.75	3.59	1	6	50	5	59	0.37%	
												208	0.42%	Total losses
				49,755	TOTAL							208	0.42%	TOTAL

DATA				AC CABLE CALCULATION & POWER LOSSES														Production Losses			
Module Type	535	Voltage [V]	400	בית ספר ניצנים גג דרומי														Avg' Voltage Drop		0.49%	
Imp [A]	12.86	Load [%]	100%															Max Voltage Drop		0.49%	
Vmp [V]	41.60	Cos Ph	1															Power Losses		0.49%	
Module amount	93	Total Power [kVA]	33.30																	163.38W	
Total Power [kWp]	49,755																				

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 Ambient Temp'	K2 No' Cable sets	K3 No' Cables in Conduit	K4 Thermal resistance (W/km)	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	93	49.8	33.30	48.06	4	4x16 NA2XY Copper	16	1	Air	0.95	0.88	1	1	61.0	1.218	1.221	0.41	33.8	0.10%	0.49%	0.04%	
LVP	IEC Meter	93	49.8	33.30	48.06	15	4x25 NA2XY Aluminum	25	1	Air	0.95	1	1	1	69.4	1.247	1.250	1.56	129.6	0.39%	0.39%	0.14%	
AC [kVA]		33.30																		163.4	Total Losses		0.49%