

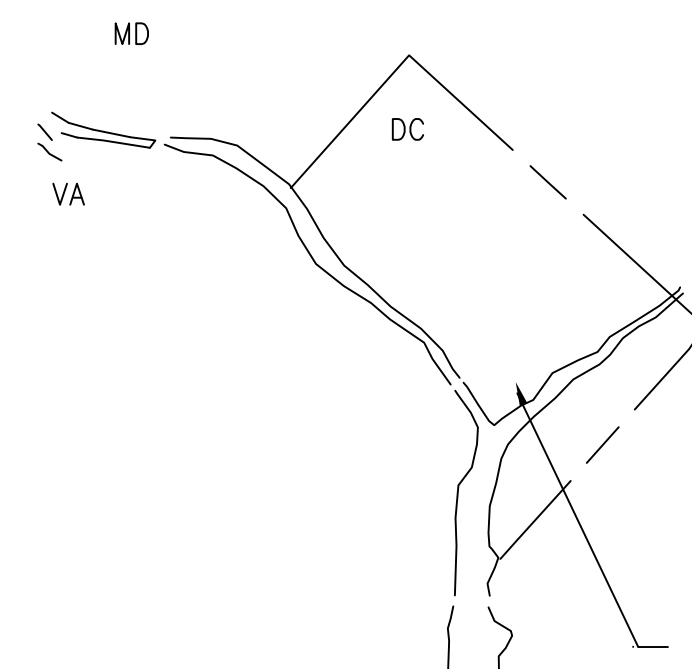
WASHINGTON NAVY YARD BUILDING 126

WASHINGTON, DC

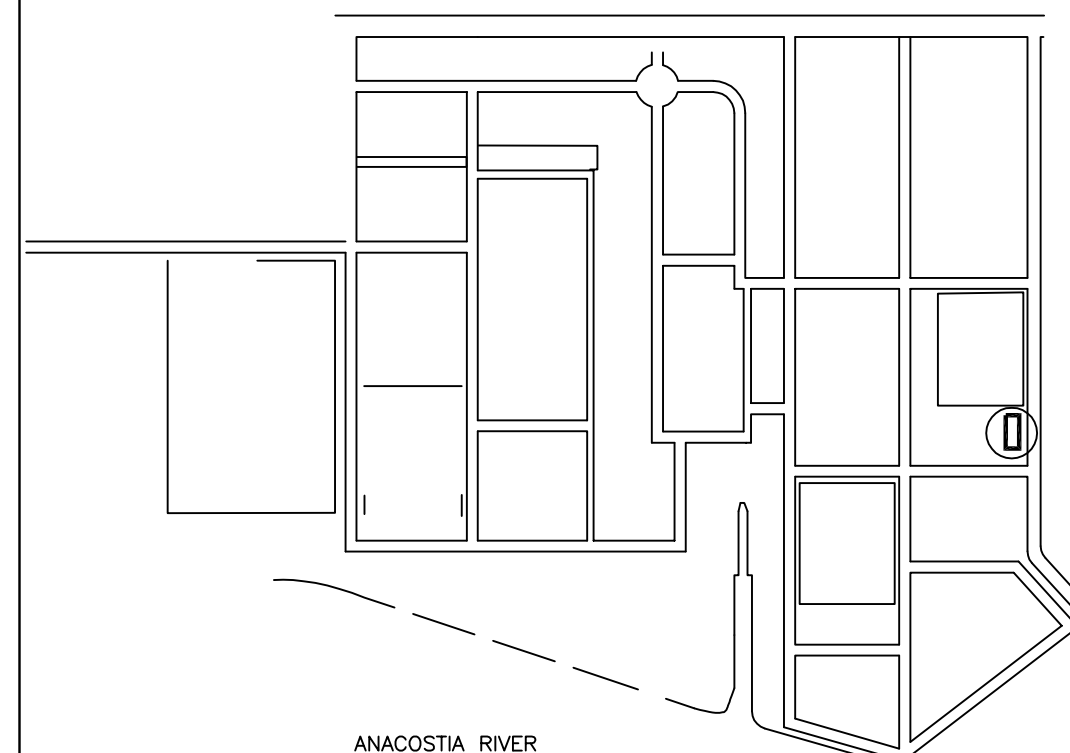
DRAWING INDEX

Page	Title	Complete
Cover	Cover Page	X
E1.00	Existing Lighting and Receptacles	X
E2.00	PV Single Line Diagram and Notes	X
E2.01	PV Details	X
E2.02	PV Products	X
E2.03	Wind Turbine Products	X
C1.00	Site Plan	X
C1.01	PV Site Plan	X
C1.02	PV Canopy and Wind Turbines on Garage	X

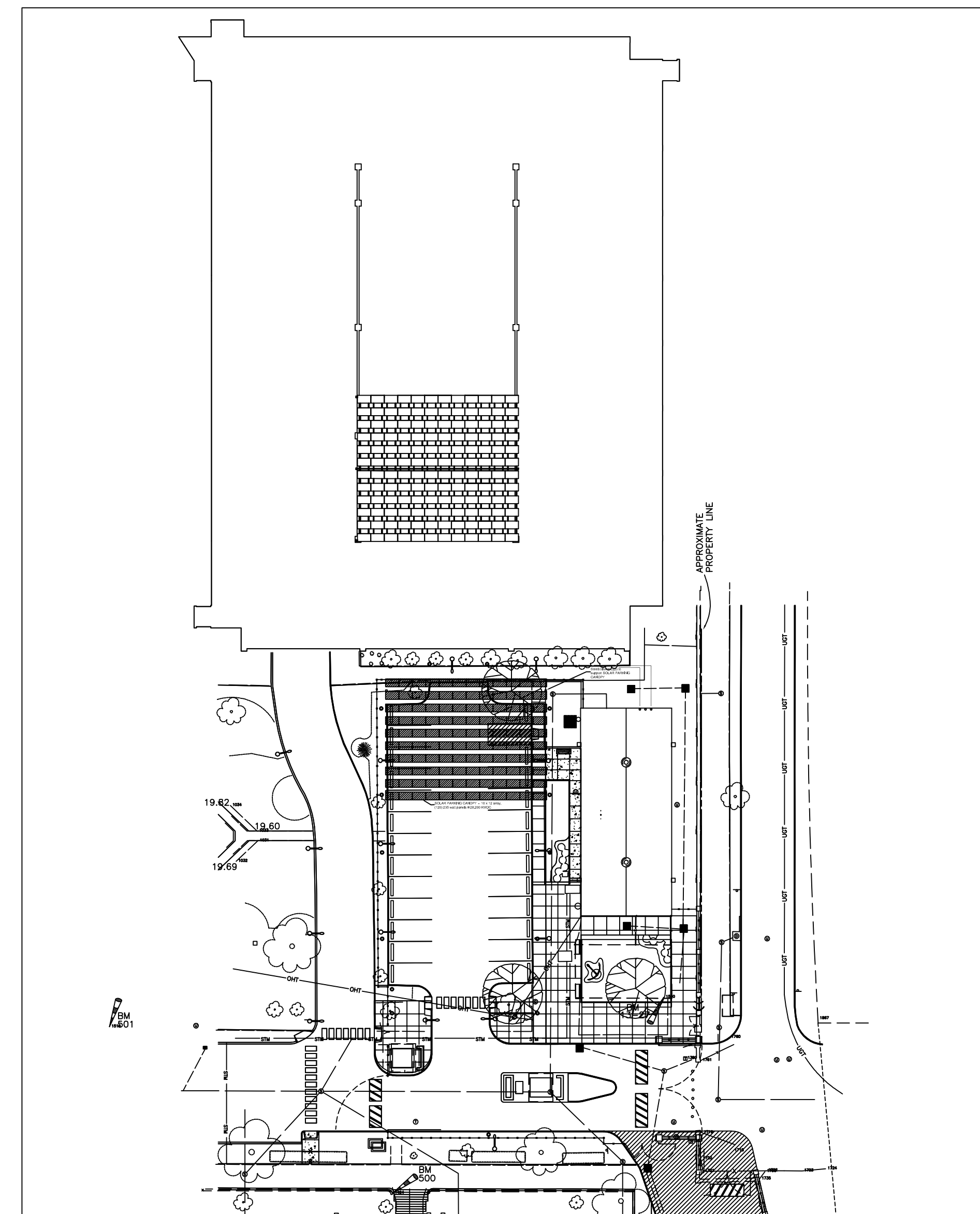
VICINITY MAP



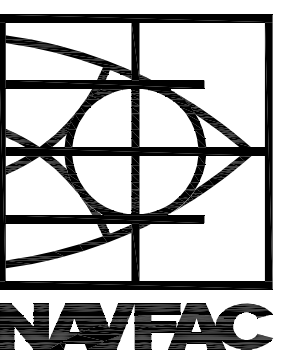
SITE LOCATION



OVERALL SITE PLAN



	DRAFT REVIEW	8/16/10	
	BID CONCEPT	8/31/10	
SYM	DESCRIPTION	DATE	APPR.



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License No. 0402045348



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PM	S. MILLER				

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DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
NAVFAC - PWD WASHINGTON

NAVFAC - PWD WASHINGTON

NSA WASHINGTON

WASHINGTON NAVY YARD, DC

WNV 126 ENERGY PROJECT

WNY 126 - ENERGY PROJECT

COVER SHEET

SCALE: AS NOTED (22X34)

EPROJECT NO.:	TBD
CONSTR. CONTR. NO.	

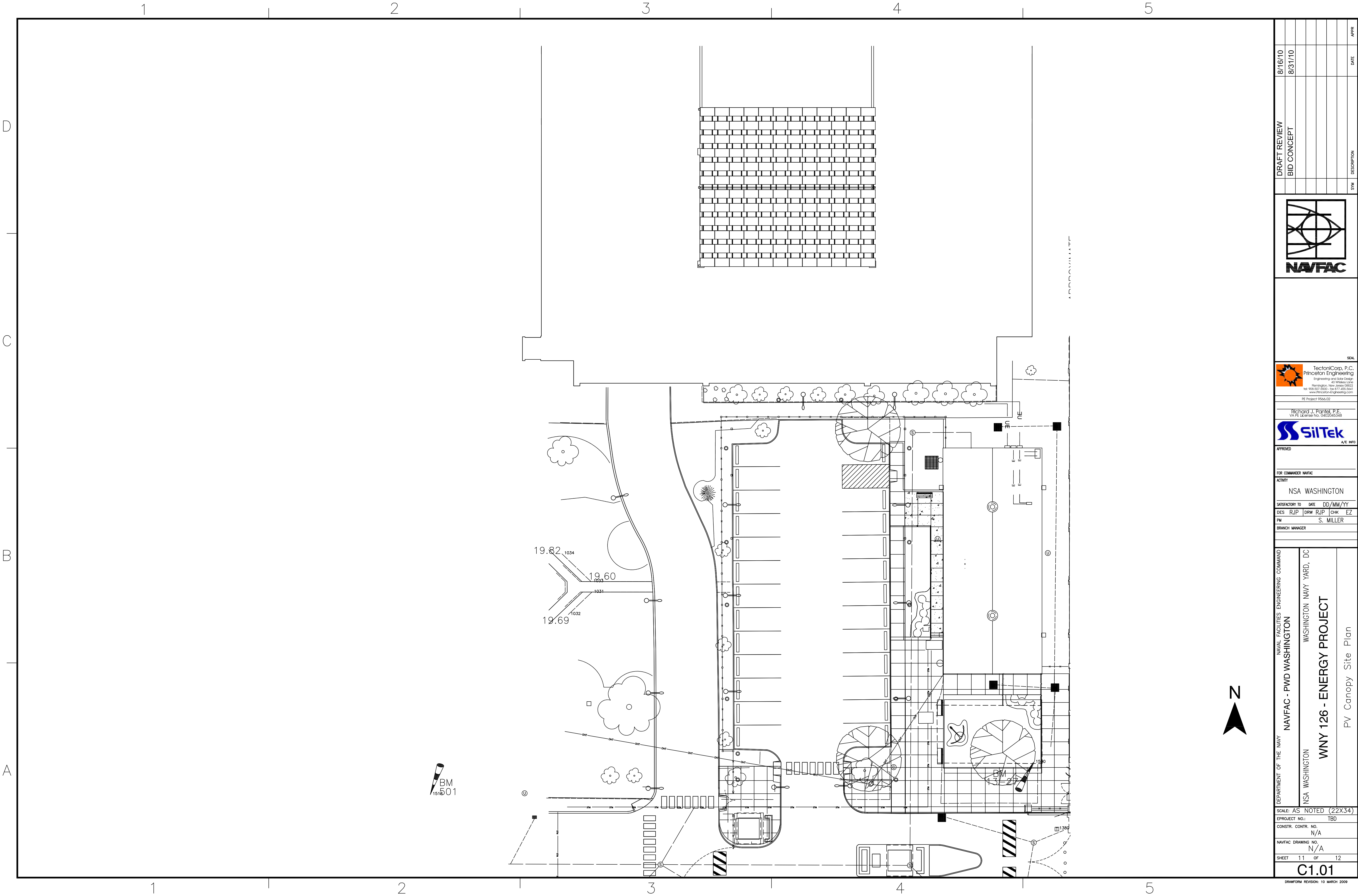
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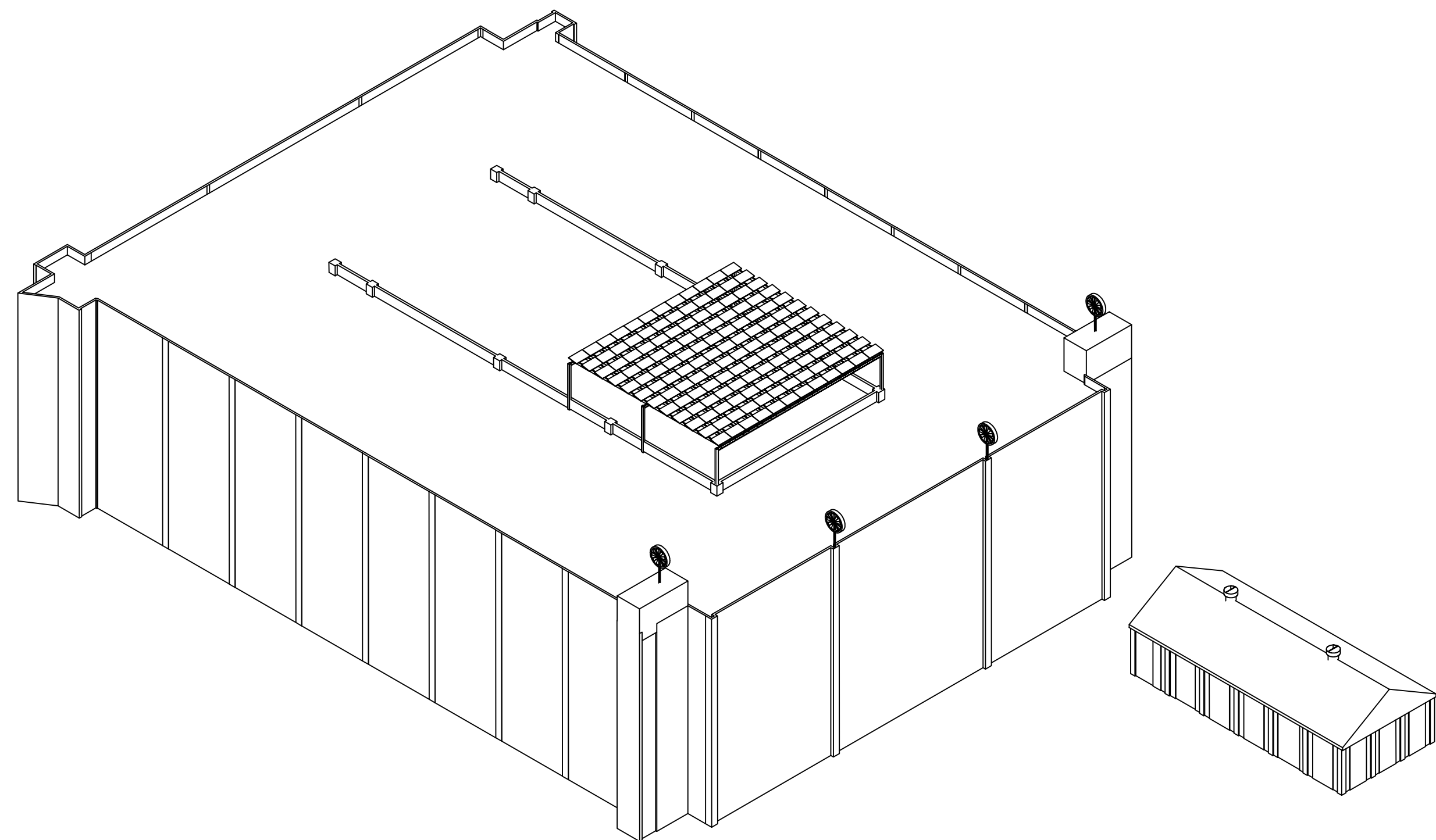
NAVFAC DRAWING NO.
N/A

SHEET	1	OF	X
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COVER

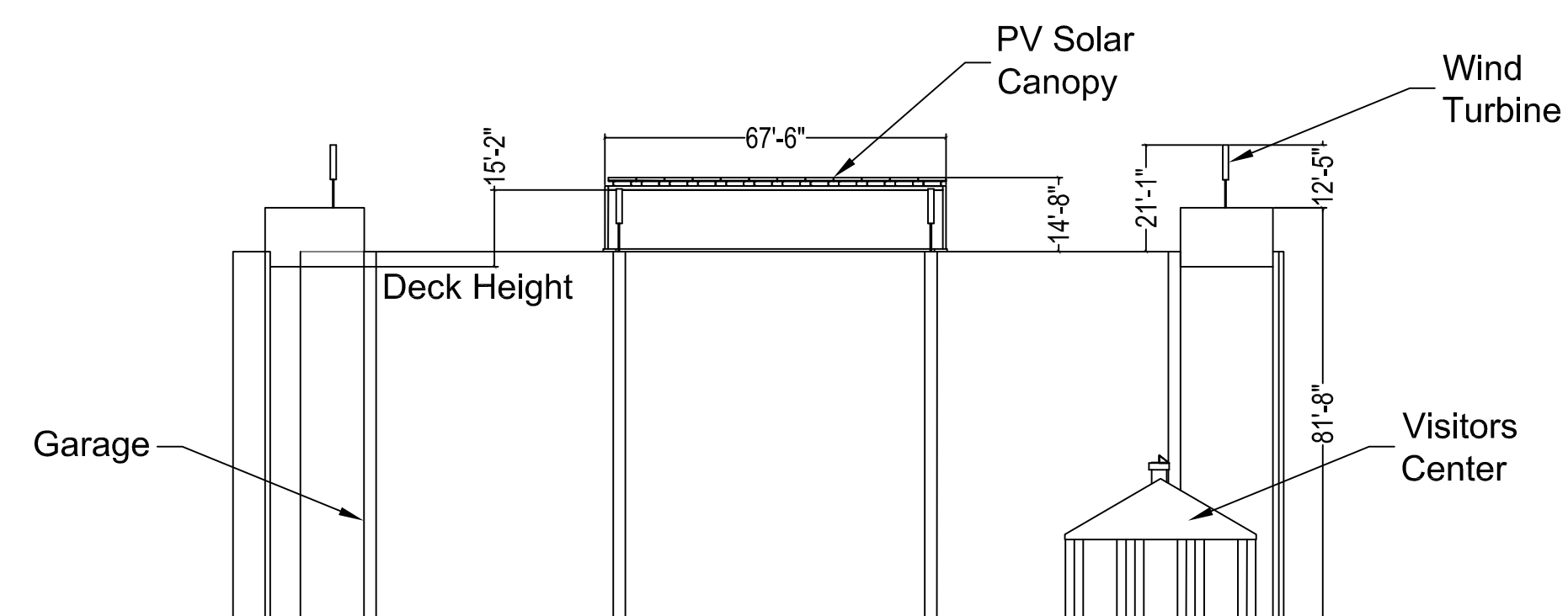
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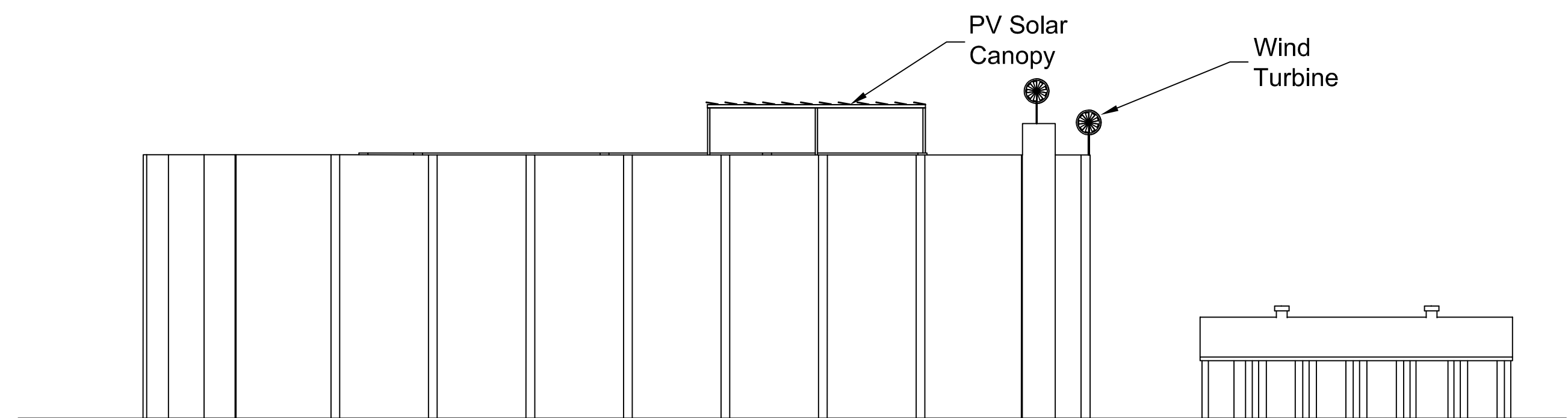
South West Isometric

scale 1/16" = 1'



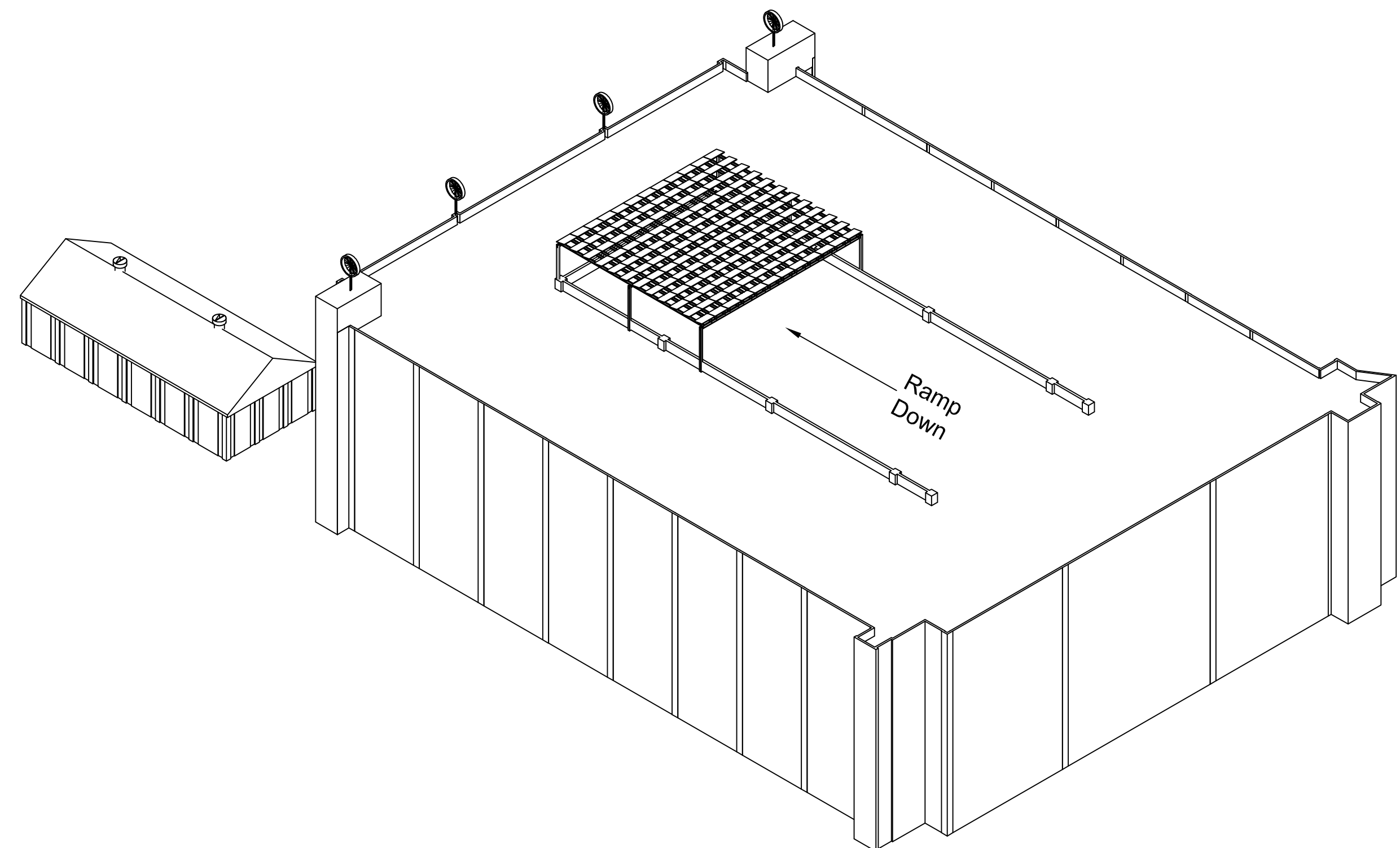
South Elevation

scale 1/16" = 1'



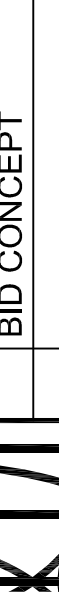


West Elevation

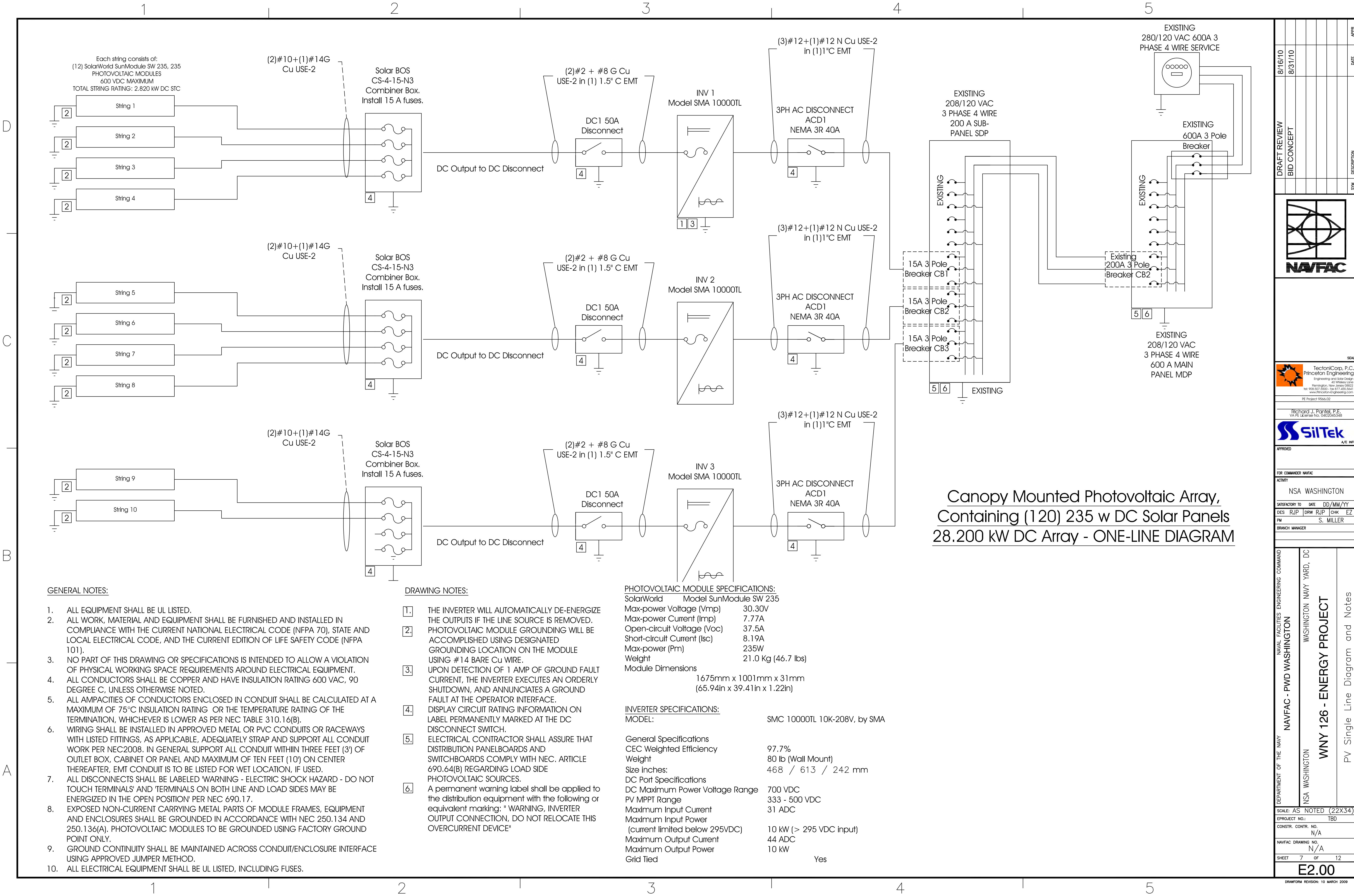
scale 1/16" = 1'



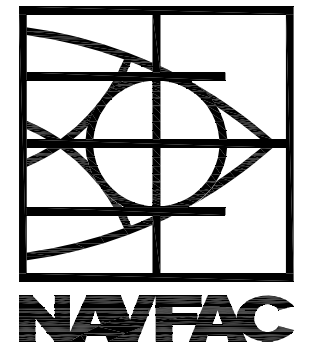
North East Isometric

scale 1/16" = 1'

DATE	8/31/10	APPR	
DESCRIPTION			
SYM			
			
	TectonCorp, P.C. Princeton Engineering Engineering and Risk Design 4076 Lakeside Huntington, New Jersey 08522 Tel: 908.557.5600; Fax: 973.425.5641 www.PrincetonEngineering.com		
PE Project 9566.02			
Richard J. Ruppel, P.E. VA PE License No. 04029545308			
			
A/E INFO			
APPROVED COMMANDER NAVFAC TIMOTHY NSA WASHINGTON			
DATE	DD/MM/YY	CHK	EZ
DESIGNED BY	RJP	DRWN	S. MILLER
PROJECT NO. 22X34 TBO			
NAVFAC - PWD WASHINGTON WASHINGTON NAVY YARD, DC WNY 126 - ENERGY PROJECT PV Canopy and Wind Turbines on Garage			
AS NOTED (22X34)			
CONTR. NO. N/A			
NAVFAC DRAWING NO. N/A			
SHEET	11	OF	12
C1.01			



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DEPARTMENT OF THE NAVY	NAVFAC - PWD WASHINGTON	WASHINGTON NAVY YARD, DC
NSA WASHINGTON	WNY 126 - ENERGY PROJECT	PV Single Line Diagram and Notes

SCALE: AS NOTED (22X34)	
PROJECT NO.: TBD	
CONSTR. CONTR. NO. N/A	
NAVFAC DRAWING NO. N/A	
SHEET 7 OF 12	
E2.00	

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Project Data	
Project Owner	NavFac
Site Location	Washington Navy Yard, Visitors' Center
Prepared by	Princeton Engineering
Engineer	Richard Pantel, P.E.
Date	1/8/2011
General Equipment Information	
Module Type:	SunModule SW 235
Module Manufacturer:	Solar World
Inverter Model #	Sunny Mini Central 10000TL
Inverter Manufacturer:	SMA
Service Type:	208/120 3-Phase Wye
Homerun size:	#10
Transformer:	None

Site Environmental Values	
Actual Site Location	Washington, DC
Records Site Location	Hightstown, NJ
Distance Btw Sites	Miles
Record Max Temp	41.0 °C
Record Min Temp	-26.0 °C

Weather.com
Weather.com

String Sizing Considerations (Voltage)		
# in Series	Voc Low T	Vmp High T
17	745	488
16	701	459
15	657	431
14	613	402
13	570	373
12	526	344
11	482	316
10	438	287
9	394	258
8	350	230
7	307	201
6	263	172
5	219	144

Allowable String Size
Invalid String Size
String Partially within Limits

Solar Module Electrical Characteristics	
Solar Module Part #	SunModule SW 235
Solar Module Manufacturer	Solar World
Power Rating	235 Watts
Voc per Module	37.5 Volts
Vmp per Module	30.3 Volts
Isc per Module	8.19 Amps
Imp per Module	7.77 Amps
Voltage Temp Factor	-0.33 %/°C
High Temp Vmp Factor	94.7%
Low Temp Voc Factor	116.8%
Minimum String Fuse Size	13 Amps
Actual String Fuse Size	15 Amps
Fuse Type	600 VDC Fast Acting
# Modules in Series / String	12 Modules
# of Mod in Series Override	12 Modules
KW / String	2.820 KW DC
String Voc, Low Temp Fctrd	526 VDC

NEC 690.7
NEC 690.7

Solar Module Physical Characteristics	
	Imperial
Length (in / mm)	65.94 1674.876
Width (in / mm)	39.41 1001.014
Depth (in / mm)	1.22 30.988
Weight (lb / kg)	46.70 21
Cable Length (in / mm)	37.40 950

Size
65.94in x 39.41in x 1.22in
1675mm x 1001mm x 31mm

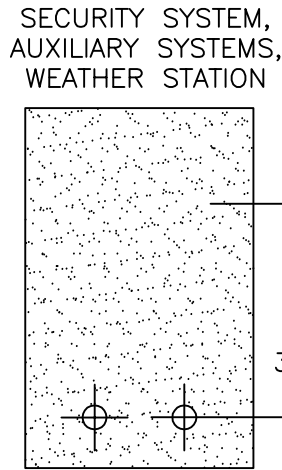
Inverter Characteristics	
Inverter Model #	PVP 30K-208V
Inverter Manufacturer	PV Powered
Rated Output Power	30.00 kW
Rated Output Voltage	208.00 Volts AC
Max Output Current	83.00 Amps AC
Maximum Input Current	109.00 Amps DC
Max System Voltage	600.00 Volts DC
Min Inverter Mpp Voltage	330.00 Volts DC

System Characteristics	
Number of Inverters	1
Number of Input KW	30.000 KW DC
Minimum Number of Panels	128
Minimum Number of Strings	10.67
Number of Strings to Use	10
String Override	10
Strings per Inverter	10
Number of Panels to Use	120
Actual KW Input	28.200 KW DC

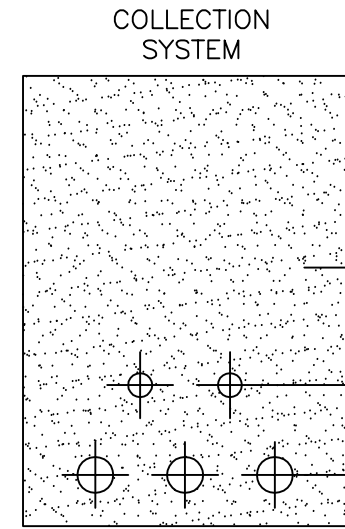
Wiring Criteria	
Max DC Voltage Drop Goal	2%
Max AC Voltage Drop Goal	2%

Conduit Routing Type:		Conductor	Temp Factor	L
Array Output:	RIGID (RMC/GRC)	4	Cu	0.87
Combiner Output:	Sch 40 PVC	5	AL	0.94
Sub-Comb/Disc Output:	RIGID (RMC/GRC)	4	AL	0.87
Inverter Output:	RIGID (RMC/GRC)	4	AL	0.87

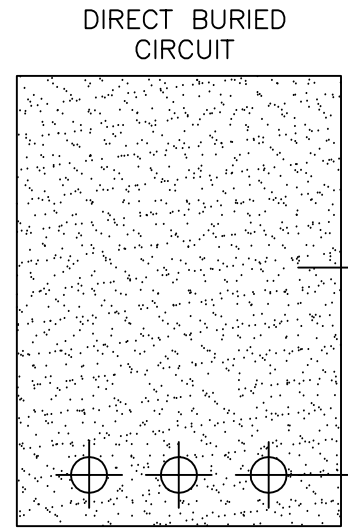
Monthly Averages for Washington, DC						
	Table Display	Graph Display				
	Avg. High	Avg. Low	Mean	Avg. Precip	Record High	Record Low
Jan	6°C	-3°C	2°C	81.5 mm	26°C (1950)	-26°C (1881)
Feb	8°C	-1°C	3°C	66.8 mm	29°C (1930)	-26°C (1899)
Mar	13°C	3°C	8°C	91.4 mm	34°C (1907)	-16°C (1873)
Apr	19°C	8°C	13°C	70.4 mm	35°C (2002)	-9°C (1923)
May	24°C	13°C	19°C	97.0 mm	37°C (1991)	1°C (1906)
Jun	29°C	18°C	24°C	79.5 mm	39°C (1874)	6°C (1897)
Jul	31°C	21°C	26°C	93.0 mm	41°C (1930)	11°C (1933)
Aug	30°C	21°C	25°C	87.4 mm	41°C (1918)	9°C (1986)
Sep	26°C	17°C	22°C	96.3 mm	40°C (1881)	2°C (1904)
Oct	20°C	10°C	15°C	81.8 mm	36°C (1941)	-3°C (1917)
Nov	14°C	4°C	9°C	77.0 mm	30°C (1974)	-12°C (1929)
Dec	8°C	0°C	4°C	77.5 mm	26°C (1998)	-25°C (1880)
Washington, DC Weather Facts						
July is the average warmest month.						
The highest recorded temperature was 41°C in 1930.						
The average coolest month is January.						
The lowest recorded temperature was -26°C in 1899.						
The most precipitation on average occurs in May.						



SOIL / Clean sand as determined in field
3/4" PVC SCH 40 CONDUIT (Qty. as req.)

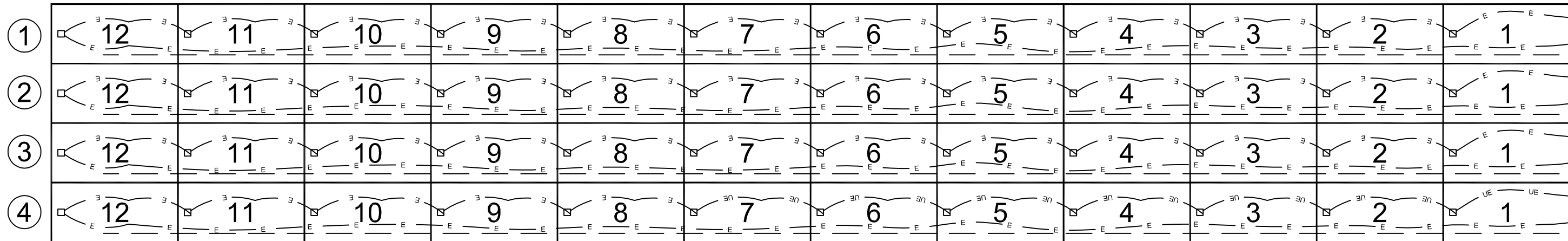


SOIL / Clean sand as determined in field
1" PVC SCH 40 CONDUIT (Qty. as req.)
2" PVC SCH 40 CONDUIT (Qty. as req.)

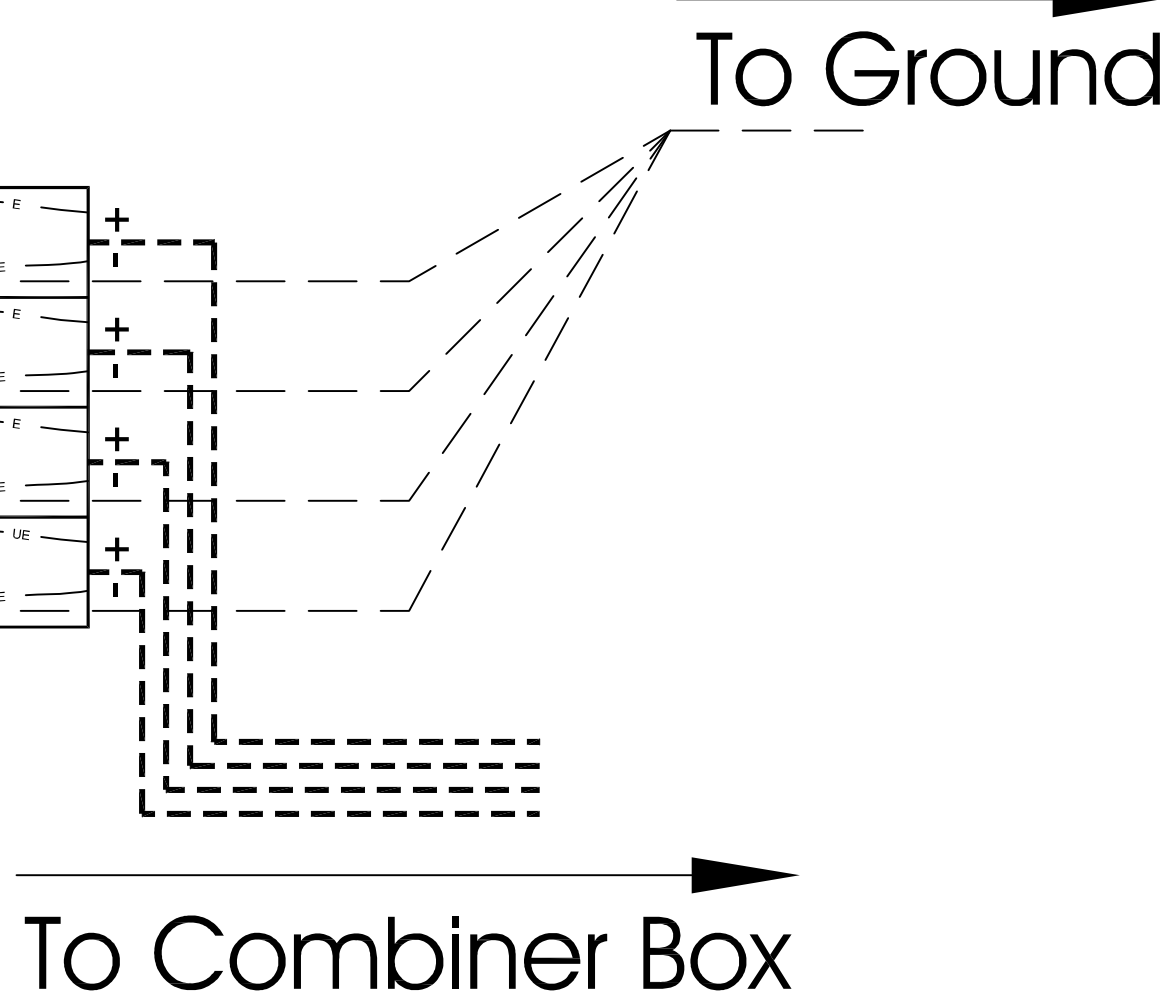


SOIL / Clean sand as determined in field
WIRES

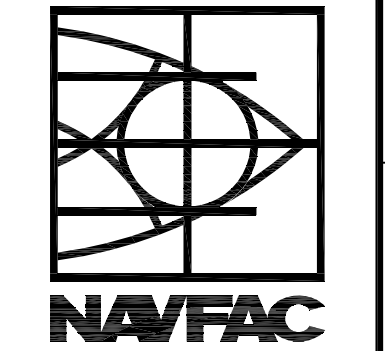
Electrical Trench Details



Electrical Wiring and Grounding per Row (typ)



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DEPARTMENT OF THE NAVY	NAVFAC - PWD WASHINGTON	WASHINGTON NAVY YARD, DC	WNY 126 - ENERGY PROJECT
NSA WASHINGTON			PV Details

SCALE: AS NOTED (22X34)	
EPROJECT NO.: TBD	
CONSTR. CONTR. NO. N/A	
NAVFAC DRAWING NO. N/A	
SHEET 7 OF 12	
E2.01	

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SolarBOS combiners can be specified with 4 to 36 input circuits, single or dual 190C output terminals, and NEMA-3, 3R, 4 or 4X steel or fiberglass enclosures. All combiner enclosures offer complete gasketed seals for better protection from the elements as well as plenty of wiring room for ease of installation.



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PERFORMANCE UNDER STANDARD TEST CONDITIONS (STC)

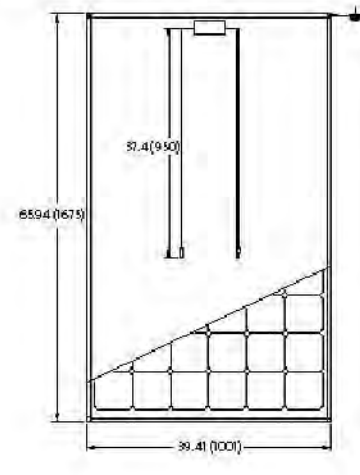
*STC: 1000 W/m², 25°C, AM 1.5

PERFORMANCE AT 800 W/m², NOCT, AM1.5

Minor reduction in efficiency under partly load conditions at 25°C: at 200 W/m², 95% (+/-3%) of the STC efficiency (1000 W/m²) is achieved.

SYSTEM INTEGRATION PARAMETERS

ADDITIONAL DATA



1) Temporarily, also modules with a frame height of 34 mm can be supplied.
Please inquire with your dealer.

2) The output identified by SolarWorld (P_{max}) is always higher than the nominal output (P_{nom}) of the module.

3) Depending on the market.

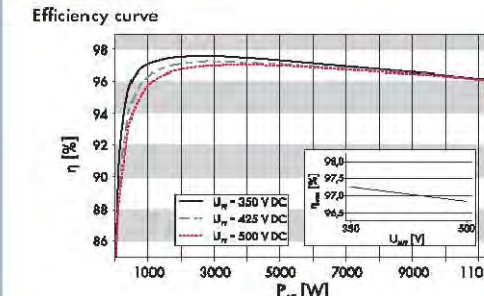
SolarWorld AG reserves the right to make specification changes without notice. This data sheet complies with the requirements of EN 50380.




Technical Data
SUNNY MINI CENTRAL 9000TL/10000TL/11000TL
with Reactive Power Control

	SMC 9000TP1R-10	SMC 10000TP1R-10	SMC 11000TP1R-10
Input (DC)			
Max. DC power for $\cos\phi = 1$	9300 W	10550 W	11600 W
Max. DC voltage	333 V ~ 500 V	333 V ~ 500 V	333 V ~ 500 V
24 voltage ratings, MPPT	25A	31A	34A
Max. input current	1	1	1
Number of MPPT trackers	1	1	1
Max. number of strings (panels)	5	5	5
Output (AC)			
Nominal AC power / max. AC power	9000 VA / 9000 VA	10000 VA / 10000 VA	11000 VA / 11000 VA
Max. output current	40 A	44 A	48 A
Nominal AC voltage / voltage	230 V ~ 240 V / 180 V ~ 240 V	220 V ~ 240 V / 180 V ~ 240 V	220 V ~ 240 V / 180 V ~ 240 V
AC frequency (auto-detection) / range	50 Hz / 50 Hz / ± 0.5 Hz	50 Hz / 50 Hz / ± 0.5 Hz	50 Hz / 50 Hz / ± 0.5 Hz
Phase shift (step up, adjustable)	0.8 leading, 0.8 lagging	0.8 leading, 0.8 lagging	0.8 leading, 0.8 lagging
AC connection / power balancing	single-phase /	single-phase /	single-phase /
Efficiency			
Max. efficiency	97.7 %	97.7 %	97.7 %
Protection devices			
DC reverse polarity protection	●	●	●
ESS DC load-disconnection switch	●	●	●
AC short-circuit protection	●	●	●
Ground-fault monitoring	●	●	●
Monitoring string fuses	○	○	○
Grounding (EMC Grid Ground)	●	●	●
Alpaka (active, modified-curve) monitoring unit	●	●	●
General Data			
Dimensions (W / H / D) in mm	468 / 513 / 342	468 / 513 / 342	468 / 513 / 342
Weight	approx. 33 kg	approx. 33 kg	approx. 33 kg
Operating temperature range	-25 °C ~ +40 °C	-25 °C ~ +40 °C	-25 °C ~ +40 °C
Noise	< 52 dBA	< 52 dBA	< 52 dBA
Consumption, operating (standby) / night	< 10 W / 0.25 W	< 10 W / 0.25 W	< 10 W / 0.25 W
Topology	transformers	transformers	transformers
Certification concept	OptiCool	OptiCool	OptiCool
● standard ○ optional	● ● ● ●	● ● ● ●	● ● ● ●
Features			
DC connection: MC2 / MC4 / Typo	○ ● ● ●	○ ● ● ●	○ ● ● ●
AC connection: solar meter	●	●	●
LC/Display	○ ●	○ ●	○ ●
Interface Bluetooth® / RS485	○ ●	○ ●	○ ●
Warranty 3 years / 10 years	○ ●	○ ●	○ ●
Certificate and approvals	www.SMA.de	www.SMA.de	www.SMA.de
● Standard ○ Optional			

Data as of March 2019. Prices are pre-published data. Stand: March 2019



SMA Solar Technology AG



SEAL



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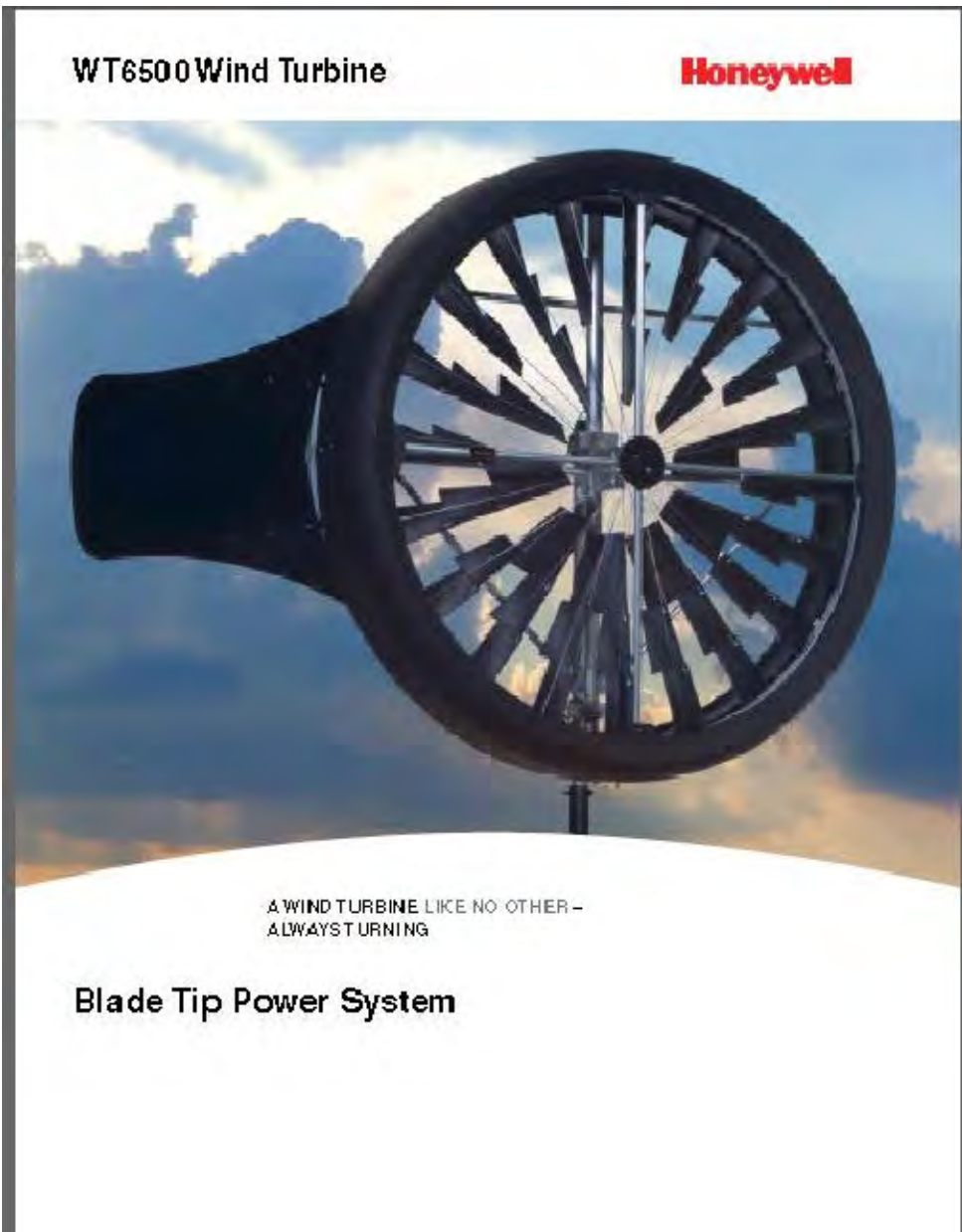
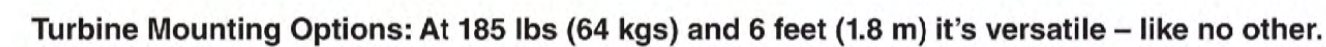
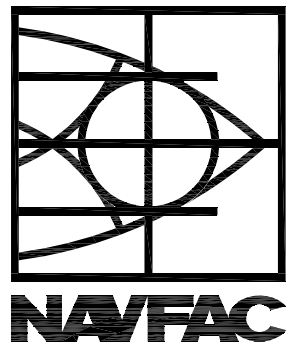
DEPARTMENT OF THE NAVY	NAVAL FACILITIES ENGINEERING COMMAND
NAVFAC - PWD WASHINGTON	
NSA WASHINGTON	WASHINGTON NAVY YARD, DC

WNY 126 - ENERGY PROJECT

PV Products

SCALE: AS NOTED (22X34)	
EPROJECT NO.:	TBD
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NAVFAC DRAWING NO.	N/A
SHEET 7	OF 12
E2.02	

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 Flemington, New Jersey 08822
 tel 908.507.5500 - fax 877.455.5541
www.Princeton-Engineering.com

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DEPARTMENT OF THE NAVY	NAVFAC - PWD WASHINGTON	NAVAL FACILITIES ENGINEERING COMMAND
NSA WASHINGTON	WASHINGTON NAVY YARD, DC	
WNY 126 - ENERGY PROJECT		
Wind Turbine Products		

SCALE: AS NOTED (22X34)		
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CONSTR. CONTR. NO.		N/A
NAVFAC DRAWING NO.		N/A
SHEET	7	OF 12
E2.03		
DRAWFORM REVISION: 10 MARCH 2009		

