



To: SUNDA Project Cooperatives

Dated: November 29, 2016

Re: Reference Block Design for Utility Scale PV Solar System

Purpose: Provide a reference PV system block design with simple, convenient features, which is intended to reduce field time and provide for monitoring features. This is a reference design and will need to be adjusted for the particulars of a field site, including electrical string length (based on minimum site temperatures), climatic conditions (such as wind and snow loads), row spacing (based on latitude), land contours, shading, and others. Typical engineering time for such adjustment is intended to be, and historically has been, about 100 hrs for site specific modifications.

What's included: a cover sheet that provides a drawing sheet list, site plans (layouts, trenching and grounding), single line diagrams, schedules, labels, partial plans for inverter pad/mounting, conduit details and stringing plans for arrays.

Design Criteria and Attributes used in creating this design:

- Maximize ground coverage ratio, expandable symmetric block
- Efficient design, allowing for most of the array construction to be duplicated
- Combiner box locations optimized to reduce DC conductors, avoiding jumpers or other pull boxes in unusual locations
- Equipment pad centrally located, driving reduced feeder cost
- Access roads can be on either side
- Grounding and Surge Protection: metallic array parts, pad halo grounding, fence grounding, surge arrestors in gear
- MV switch is used as site AC disconnect, reduces pad footprint
- Racking system is ETL listed for grounding, reducing significant bonding requirements and on-site labor
- Racking has integrated wire management
- Racking design is very modular, fast to install and accessible height good for install
- AC Switchgear contains the AC bus, the step down transformer for local 120V power and the revenue meter for DAS
- Electrical equipment pad is conveniently accessible. Designed to provide easy service access, minimize concrete, optimize feeder stub ups
- Expandability and flexible re-design options to meet site specific issues
- Monitoring tool needs to be able to:
 - Provide system overview, historical output and on-site weather data
 - Public view website to view performance and track environmental offsets online or on any internet device
 - Assist remote troubleshooting
 - Optional features: cell-modem, online storage of data, historical data exports, monthly reporting, alarms, curtailment, fault codes and sensors (horizontal/plane of array pyranometers, wind speed/direction, humidity, ambient temp, cell temp, revenue grade meters, load or bus kw meters)

DISCLAIMER

While significant effort has been made to incorporate all applicable standards and ensure good engineering and correct practice in the development of this design, and this design has been used to develop actual field deployed, utility-scale, solar PV systems, no warranty or guaranty is made on this design for its fitness, suitability, safety or applicability for any purpose. Utilities must employ a trained engineer to interpret and adjust this reference design for the specific requirements of their application.

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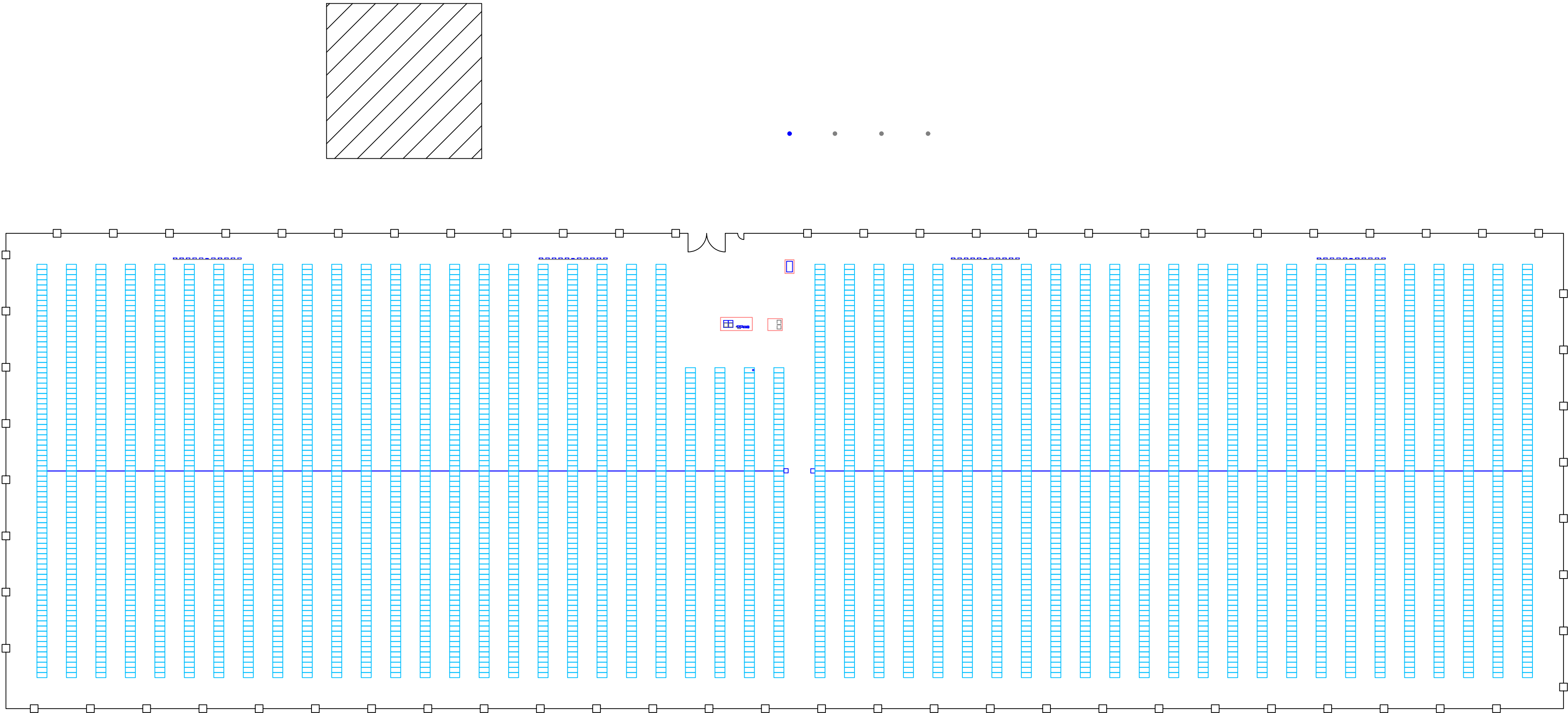
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SUNDA REFERENCE DESIGN

1,000KWac, 1,000Vdc
SINGLE AXIS TRACKER

SITE MAP



SYSTEM SUMMARY

AC SYSTEM SIZE: 1,000 KW AC
DC SYSTEM SIZE: 1,260 KW DC
STRING SIZE: (20) MODULES
STRING COUNT: (200) STRINGS
MODULES: (4,000) REC315PE72
INVERTERS: (40) SCHNEIDER_ELECTRIC CL25000NA
DC VOLTAGE: 1,000V
AC VOLTAGE: 480V, 3φ, 4 WIRE
PCC VOLTAGE: 12,470V, 3φ
ARRAY AZIMUTH: 180°
ARRAY TILT: 0°
RACKING: ATI SINGLE AXIS TRACKER

SHEET LIST

ELECTRICAL
PV0.1 COVER SHEET
PV0.2 GENERAL NOTES AND SYMBOLS
PV1.0 SINGLE LINE DIAGRAM
PV1.1 PV SCHEDULES
PV1.2 PV SCHEDULES
PV1.3 PV LABELS
PV2.0 SITE PLAN - ARRAY LAYOUT
PV2.1 SITE PLAN - FENCE LAYOUT
PV2.2 SITE PLAN - MEDIUM VOLTAGE ROUTING
PV2.3 SITE PLAN - INVERTER LAYOUT
PV2.4 SITE PLAN - DC FEEDER ROUTING
PV2.5 SITE PLAN - AC FEEDER ROUTING
PV2.6 SITE PLAN - COMMUNICATIONS FEEDER ROUTING
PV2.7 SITE PLAN - GROUNDING
PV3.0 PARTIAL PLAN - STRINGING LAYOUT PV_A
PV3.1 PARTIAL PLAN - STRINGING LAYOUT PV_B
PV3.2 PARTIAL PLAN - STRINGING LAYOUT PV_C
PV3.3 PARTIAL PLAN - STRINGING LAYOUT PV_D
PV4.0 PARTIAL PLAN - EQUIPMENT PAD DIMENSIONS
PV4.1 PARTIAL PLAN - EQUIPMENT PAD AC FEEDER ROUTING
PV4.2 PARTIAL PLAN - EQUIPMENT PAD COMMUNICATIONS FEEDER ROUTING
PV4.3 PARTIAL PLAN - EQUIPMENT PAD - GROUNDING
PV5.0 INVERTER MOUNTING DETAIL
PV5.1 FENCE GROUNDING DETAIL

PRELIMINARY
NOT FOR
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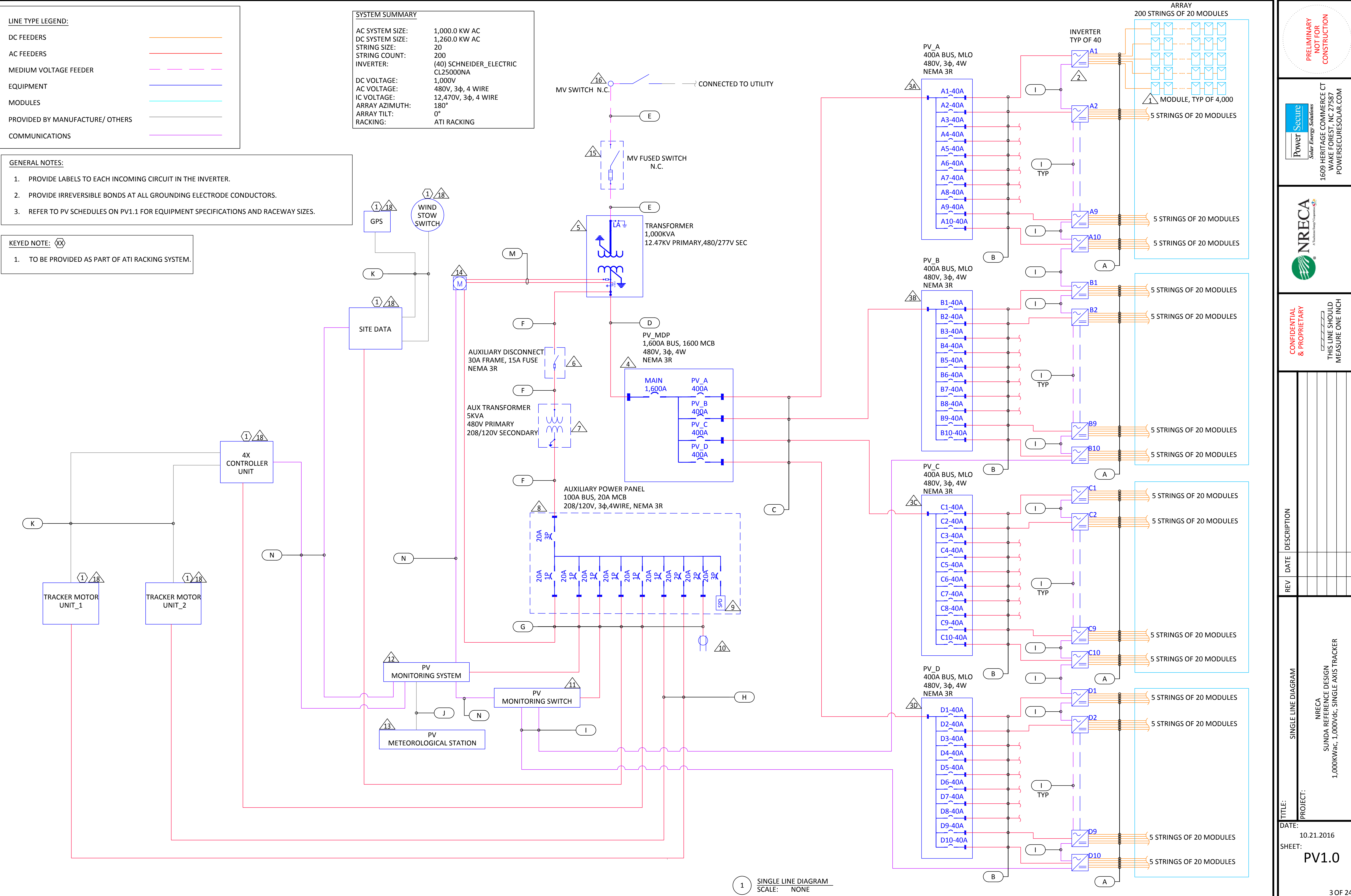
TITLE: COVER SHEET

PROJECT: NRECA
SUNDA REFERENCE DESIGN
1,000KWac, 1,000Vdc, SINGLE AXIS TRACKER

DATE: 10.21.2016

SHEET: PV0.1

1 OF 24



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REV	DATE	DESCRIPTION

TITLE: SINGLE LINE DIAGRAM

PROJECT: NRECA
SUNDA REFERENCE DESIGN
1,000KWac, 1,000Vdc, SINGLE AXIS TRACKER

DATE: 10.21.2016

SHEET: PV1.0

3 OF 24

EQUIPMENT SCHEDULE **EQUIPMENT IS NOTED BY 				
TAG	DESCRIPTION	QUANTITY	MANUFACTURER	NOTES
1	SOLAR PV MODULE	4,000	REC	315 WATT MODULE REFER TO MODULE SCHEDULE FOR SPECIFICATION. MODULES SHALL BE LABELED PER NEC 690 VI
2	INVERTER	40	SCHNEIDER_ELECTRIC	25 KWATT, 3PHASE 480 VOLT (REFER TO INVERTER RATING SCHEDULE FOR SPECIFICATION)
3A-3D	PV DISTRIBUTION PANEL	1	SQUARE-D	PV DISTRIBUTION PANEL, 400 AMP BUS MAIN LUG ONLY. REFER TO PANEL SCHEDULE FOR ADDITIONAL SPECIFICATIONS.
	PV_MDP	1	SQUARE-D	PV DISTRIBUTION PANEL, 1,600 AMP BUS WITH 1,600A MAIN CIRCUIT BREAKER. REFER TO PANEL SCHEDULE FOR ADDITIONAL SPECIFICATIONS.
5	MEDIUM VOLTAGE TRANSFORMER	1	ABB	1000 KVA, THREE PHASE, 12.47/7.2 KV YGRND PRIMARY, 480/277V YGRND SECONDARY. LIQUID COOLED, BAYONET FUSES ON PRIMARY SIDE.
6	DISCONNECT FOR AUXILIARY POWER PANEL	1	SQUARE-D	30 AMP 3 POLE FUSED DISCONNECT WITH (3) 15 AMP FUSES, NEMA 3R. PROVIDE STICKER LABEL TO BE VISIBLE WHEN FUSE IS REMOVED TO READ "MAX 15A".
7	5 KVA DISTRIBUTION TRANSFORMER	1	DONGAN	THREE PHASE GENERAL PURPOSE DRY TYPE TRANSFORMER, PRIMARY VOLTS 480 VAC, SECONDARY VOLTS 208/120 VAC, NEMA 3R ENCAPSULATED ENCLOSURE
8	AUXILIARY POWER PANEL	1	SQUARE-D	AUXILARY PANEL BOARD, 100 AMP BUS WITH 20 AMP MAIN CIRCUIT BREAKER. REFER TO PANEL SCHEDULE FOR ADDITIONAL SPECIFICATIONS.
9	SURGE PROTECTION DEVICE	1	SQUARE-D	NEMA 4X RATING, INTEGRATED OVER CURRENT PROTECTION, MOUNTED DIRECTLY TO ENCLOSURE OF EQUIPMENT, MANUFACTURER PROVIDED INSTALLATION MANUAL SHALL BE FOLLOWED EXACTLY
10	RECEPTACLE	1	PASS & SEYMOUR	120V, 20 AMP, WEATHER PROOF GFI DUPLEX RECEPTACLE.
11	PV MONITORING SWITCH	1	NETGEAR	SERIAL TO ETHERNET NETWORK SWITCH, PROVIDE IN NEMA 3R ENCLOSURE.
12	PV MONITORING SYSTEM	1	DRAKER	CENTRAL DATA ACQUISITION UNIT, NEMA 3R ENCLOSURE, LOCAL DATA STORAGE, INTEGRAL ETHERNET COMMUNICATIONS , WEB BASED DISPLAY AND LOCAL KEYPAD DISPLAY, PROVIDE 120V 1ϕ POWER SUPPLY
13	PV METEOROLOGICAL STATION	1	DRAKER	STATION INCLUDES: PLANE OF ARRAY PYRANOMETER, GLOBAL HORIZONTAL IRRADIANCE PYRANOMETER, BACK OF MODULE TEMPERATURE SENSOR, AMBIENT TEMPERATURE, AND WIND SENSORS
14	MONITORING METER	1	SHARK 100	REVENUE GRADE METER IN NEMA 3R ENCLOSURE
15	MEDIUM VOLTAGE SWITCH	1	S&C	15KV PAD MOUNTED SWITCH WITH INTEGRATED 60A STANDARD SPEED FUSES.
16	COORDINATED POLE MOUNTED SWITCH	1	ABB	SWITCH TO MEET THE REQUIREMENT OF THE UTILITY
17	GROUND ROD	6	HARGER OR EQUAL	3/4" DIAMETER, 10'-0" LONG COPPER CLAD GROUND ROD
18	ATI RACKING ACCESSORIES	1	ATI	TO BE PROVIDED WITH ATI RACKING. INCLUDES (1) 4X CONTROLLER UNIT, (2) TRACKER MOTOR, (1) SITE DATA, (1) GPS AND (1) WIND STOW SWITCH

EQUIPMENT SCHEDULE NOTES:
1. SPECIFIED MANUFACTURE OR EQUIVALENT SHALL BE PROVIDED.

FEEDER SCHEDULE												
**FEEDER IS NOTED BY												
A												
TAG	PHASE				NEUTRAL		GROUND		INSULATION	RACEWAY SIZE		
A	(1) SET OF	#NOTE1 (2) - (10)	#10	COPPER			(1)	#10	COPPER	PV	1-1/2"	
B	(1) SET OF	(3)	#8	COPPER	(1)	#8	COPPER	(1)	#8	COPPER	THWN-2	1"
C	(2) SET OF	(3)	250 KCMIL	ALUMINUM	(1)	250 KCMIL	ALUMINUM	(1)	#1	ALUMINUM	THWN-2	2-1/2"
D	(6) SET OF	(3)	500 KCMIL	ALUMINUM	(1)	500 KCMIL	ALUMINUM	(1)	350 KCMIL	ALUMINUM	THWN-2	3-1/2"
E NOTE6	(1) SET OF	(3)	#1/0	ALUMINUM					MV TR-XLPE WITH CONCENTRIC NEUTRAL		4"	
	F	(1) SET OF	(3)	#12	COPPER	(1)	#12	COPPER	(1)	#12	COPPER	THWN-2
G	(1) SET OF	(1)	#12	COPPER	(1)	#12	COPPER	(1)	#12	COPPER	THWN-2	3/4"
H	(1) SET OF	(2)	#12	COPPER			(1)	#12	COPPER	THWN-2	3/4"	
I	RS-485: BELDEN 3107A											3/4"
J	PROVIDED BY DRAKER											3/4"
K	CONTROL WIRES PROVIDED BY ATI											3/4"
L								(1)	#6	COPPER	BARE	
M	(1) SET OF	(7)	#12	COPPER						THWN-2		3/4"
N	CAT5E OR CAT6 ETHERNET CABLE: BELDEN 7937A OR EQUIVALENT											3/4"
O								(1)	#3/0	COPPER	BARE	

FEEDER SCHEUDLE NOTES:

1. (#) - DENOTES QUANTITY OF DC PHASE WIRES TO BE PROVIDED.

2. WHERE MULTIPLE CONDUITS ARE NOTED, THE RACEWAYS SHALL BE PROVIDED IN PARALLEL.

3. REFER TO RACEWAY APPLICATION SCHEDULE FOR RACEWAY TYPE.

4. ALL RACEWAY SIZES ARE NEC MINIMUM REQUIREMENTS, LARGER CONDUITS ARE PERMITTED FOR EASE OF INSTALLATION.

5. PV SOURCE CIRCUITS SHALL NOT BE REQUIRED TO BE IN RACEWAY IF CONDUCTORS ARE NOT READILY ACCESSIBLE AND NOT EXPOSED TO PHYSICAL DAMAGE. BELOW GRADE PV SOURCE CIRCUITS SHALL BE IN RACEWAY.

6. PROVIDE 15KV RATED MEDIUM VOLTAGE FEEDERS WITH 100% INSULATION.

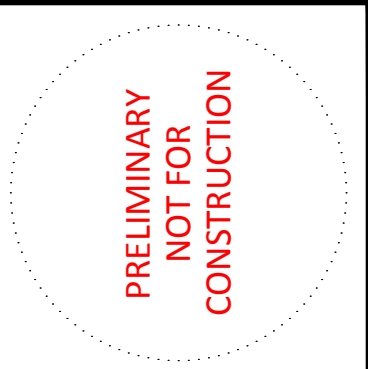
INVERTER SPECIFICATIONS


INVERTER DESIGNATION	
INVERTER MANUFACTURER	SCHNEIDER_ELECTRIC
INVERTER MODEL	CL25000NA
INVERTER QUANTITY	40
MAXIMUM DC VOLTAGE	1,000 V
AC POWER OUTPUT	25.0 KW
MODULE QUANTITY PER INVERTER	100
DC POWER INPUT	31.5 KW
DC/AC RATIO	126.00%
OUTPUT VOLTAGE	480V, 3ϕ
MAXIMUM OUTPUT CURRENT	31 A
MIN OCPD REQUIRED	40 A
MIN Vmp	500 V
MAX Vmp	800 V
START UP VOLTAGE	250 V
ENCLOSURE	NEMA 3R
MPPT QUANTITY	2
GROUNDING CONFIGURATION	UNGROUND

MODULE SPECIFICATIONS

MODULE MANUFACTURER	REC
MODULE MODEL	REC315PE72
MODULE QUANTITY	4000
MAX POWER (PMAX)	315 W
MAX POWER-POINT CURRENT (IMP)	8.62 A
MAX POWER-POINT VOLTAGE (VMP)	36.80 V
OPEN CIRCUIT VOLTAGE (VOC)	45.50 V
SHORT CIRCUIT CURRENT (ISC)	9.09 A
MAX SERIES FUSE	20 A
MAXIMUM DC VOLTAGE	1,000 V
VOC TEMP COEFF (%/°C)	-0.27
ISC TEMP COEFF (%/°C)	0.013
PMP TEMP COEFF (%/°C)	-0.4

MINIMUM CONDUIT REQUIRED PER APPLICATION	
APPLICATION	CONDUIT TYPE
ROOF MOUNTED (EXPOSED)	RMC
BUILDING INTERIOR (EXPOSED TO PHYSICAL DAMAGE)	RMC
BUILDING INTERIOR (PROTECTED FROM PHYSICAL DAMAGE)	EMT
BUILDING EXTERIOR (EXPOSED TO PHYSICAL DAMAGE)	RMC
BUILDING EXTERIOR (PROTECTED FROM PHYSICAL DAMAGE)	RMC
BELOW GRADE (IN DIRECT CONTACT WITH EARTH)	PVC SCHED 40
TRANSITION FROM BELOW GRADE TO ABOVE GRADE (EXPOSED TO PHYSICAL DAMAGE)	RMC
TRANSITION FROM BELOW GRADE TO ABOVE GRADE (PROTECTED FROM PHYSICAL DAMAGE)	PVC SCHED 80





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REV	DATE	DESCRIPTION

TITLE:
DATE:

PV SCHEDULES
PROJECT:

NRECA
SUNDA REFERENCE DESIGN
1,000KWac, 1,000Vdc, SINGLE AXIS TRACKER

PV_A																									
TYPE:																									
SERVICE SUPPL 480V, 3φ, 4 WIRE																									
BUS: 400 AMP																									
MAIN: MLO																									
FEEDER: REFER TO SINGLE LINE DIAGRAM																									
AIC RATING: 65,000																									
KVA									Ø	Ø										KVA					
A	B	C	COND	GND	NEU	PH						PH	NEU	GND	COND				A	B	C				
8.3			INVERTER A1	REFER TO SLD	40/3	1	A	A	2	40/3	REFER TO SLD	INVERTER A6	8.33						8.33						
	8.3					3	B	B	4														8.33		
		8.3				5	C	C	6															8.33	
8.3			INVERTER A2	REFER TO SLD	40/3	7	A	A	8	40/3	REFER TO SLD	INVERTER A7	8.33						8.33						
	8.3					9	B	B	10														8.33		
		8.3				11	C	C	12															8.33	
8.3			INVERTER A3	REFER TO SLD	40/3	13	A	A	14	40/3	REFER TO SLD	INVERTER A8	8.33						8.33						
	8.3					15	B	B	16														8.33		
		8.3				17	C	C	18															8.33	
8.3			INVERTER A4	REFER TO SLD	40/3	19	A	A	20	40/3	REFER TO SLD	INVERTER A9	8.33						8.33						
	8.3					21	B	B	22														8.33		
		8.3				23	C	C	24															8.33	
8.3			INVERTER A5	REFER TO SLD	40/3	25	A	A	26	40/3	REFER TO SLD	INVERTER A10	8.33						8.33						
	8.3					27	B	B	28														8.33		
		8.3				29	C	C	30															8.33	
																			41.7	41.7	41.7				
42	42	42																	TOTAL CONNECTED LOAD (KVA)			83.3	83.3	83.3	
																			TOTAL CONNECTED LOAD (A)			301	301	301	

PV_B																									
TYPE: SERVICE SUPPL 480V, 3φ, 4 WIRE BUS: 400 AMP MAIN: MLO FEEDER: REFER TO SINGLE LINE DIAGRAM AIC RATING: 65,000																									
KVA																					KVA				
A	B	C		COND	GND	NEU	PH		Ø	Ø			PH	NEU	GND	COND		A	B	C					
8.3			INVERTER B1	REFER TO SLD	40/3	1	A	A	2	40/3	REFER TO SLD	INVERTER B6	8.33						8.33						
	8.3					3	B	B	4														8.33		
		8.3				5	C	C	6															8.33	
8.3			INVERTER B2	REFER TO SLD	40/3	7	A	A	8	40/3	REFER TO SLD	INVERTER B7	8.33						8.33						
	8.3					9	B	B	10														8.33		
		8.3				11	C	C	12															8.33	
8.3			INVERTER B3	REFER TO SLD	40/3	13	A	A	14	40/3	REFER TO SLD	INVERTER B8	8.33						8.33						
	8.3					15	B	B	16														8.33		
		8.3				17	C	C	18															8.33	
8.3			INVERTER B4	REFER TO SLD	40/3	19	A	A	20	40/3	REFER TO SLD	INVERTER B9	8.33						8.33						
	8.3					21	B	B	22														8.33		
		8.3				23	C	C	24															8.33	
8.3			INVERTER B5	REFER TO SLD	40/3	25	A	A	26	40/3	REFER TO SLD	INVERTER B10	8.33						8.33						
	8.3					27	B	B	28														8.33		
		8.3				29	C	C	30															8.33	
																					41.7	41.7	41.7		
42	42	42																			TOTAL CONNECTED LOAD (KVA)				
																					83.3	83.3	83.3		
																					TOTAL CONNECTED LOAD (A)				
																					301	301	301		

AUXILIARY POWER PANEL																										
TYPE:																										
SERVICE SUPPLY: 208V, 3φ, 4 WIRE																										
BUS: 100 AMP																										
MAIN: 20 AMP MAIN CIRCUIT BREAKER																										
FEEDER: REFER TO SINGLE LINE DIAGRAM																										
AIC RATING: 25,000																										
VA																					VA					
A	B	C		COND	GND	NEU	IN			Ø	Ø			PH	NEU	GND	COND			A	B	C				
750			TRACKER MOTOR_1	REFER TO SLD	20/2	1	A	A	2	20/1	REFER TO SLD			RECEPTACLE			180									
	750					3	B	B	4	20/1	REFER TO SLD			SHARK METER					500							
		750	TRACKER MOTOR_2	REFER TO SLD	20/2	5	C	C	6	20/1	REFER TO SLD			PV MONITORING SYSTEM					500							
750						7	A	A	8	20/1	REFER TO SLD			4X CONTROLLER UNIT					60							
		50	PV MONITORING SWITCH	REFER TO SLD	20/1	9	B	B	10	20/1	REFER TO SLD			SITE DATA					60							
						SPACE	-	-	-	-	20/1	11	C	C	12	20/1	-	-	-	-	SPACE					
			MAIN CIRCUIT BREAKER	REFER TO SLD	20/3	13	A	A	14	20/3	FACTORY PROVIDED			SURGE PROTECTION DEVICE												
						15	B	B	16																	
						17	C	C	18																	
1500	750	800																			180	560	560			
																					TOTAL CONNECTED LOAD (VA)			1680	1310	1360
																					TOTAL CONNECTED LOAD (A)			14	10.9	11.3

INVERTER DC INPUT

XX

5 STRINGS

RATED MPP CURRENT

43.10 A

RATED MPP VOLTAGE

736.0 V

MAX SYSTEM VOLTAGE

988.38 V

MAX CIRCUIT CURRENT

56.81 A

WARNING

APPROPRIATE PPE REQUIRED. FAILURE TO COMPLY MAY RESULT IN DEATH OR INJURY. REFER TO NFPA 70E.

WARNING: ELECTRIC SHOCK HAZARD

DO NOT TOUCH TERMINALS. TERMINALS ON BOTH THE LINE AND LOAD SIDE MAY BE ENERGIZED IN THE OPEN POSITION.

WARNING: ELECTRIC SHOCK HAZARD

THE DC CONDUCTORS OF THIS PHOTOVOLTAIC SYSTEM ARE UNGROUNDED AND MAY BE ENERGIZED.

WHITE LETTERING ON RED BACKGROUND
TYPICAL OF 40:A1-A10, B1-B10, C1-C10, D1-D10

INVERTER AC OUTPUT

XX

AC OUTPUT CURRENT

31 A

NOMINAL AC VOLTAGE

480 V

WARNING

APPROPRIATE PPE REQUIRED. FAILURE TO COMPLY MAY RESULT IN DEATH OR INJURY. REFER TO NFPA 70E.

WARNING: ELECTRIC SHOCK HAZARD

DO NOT TOUCH TERMINALS. TERMINALS ON BOTH THE LINE AND LOAD SIDE MAY BE ENERGIZED IN THE OPEN POSITION.

WARNING

THIS EQUIPMENT IS FED BY MULTIPLE SOURCES (UTILITY AND PHOTOVOLTAIC)

WHITE LETTERING ON RED BACKGROUND
TYPICAL OF 40 INVERTERS (A1-A10, B1-B10, C1-C10, D1-D10)
REFER TO DISTRIBUTION PANEL SCHEDULES PV_A TO PV_D FOR LABEL VALUES.

PHOTOVOLTAIC AC DISCONNECT

XX

AC OUTPUT CURRENT

31 A

NOMINAL AC VOLTAGE

480 V

WARNING

APPROPRIATE PPE REQUIRED. FAILURE TO COMPLY MAY RESULT IN DEATH OR INJURY. REFER TO NFPA 70E.

WARNING: ELECTRIC SHOCK HAZARD

DO NOT TOUCH TERMINALS. TERMINALS ON BOTH THE LINE AND LOAD SIDE MAY BE ENERGIZED IN THE OPEN POSITION.

WARNING

THIS EQUIPMENT IS FED BY MULTIPLE SOURCES (UTILITY AND PHOTOVOLTAIC)

WHITE LETTERING ON RED BACKGROUND
TYPICAL OF 40 BREAKERS (A1-A10, B1-B10, C1-C10, D1-D10)
REFER TO DISTRIBUTION PANEL SCHEDULES PV_A TO PV_D FOR LABEL VALUES.

WARNING:

ELECTRIC SHOCK HAZARD. THE DC CONDUCTORS OF THIS PHOTOVOLTAIC SYSTEM ARE UNGROUNDED AND MAY BE ENERGIZED.

WHITE LETTERING ON RED BACKGROUND
THIS LABEL IS REQUIRED ON EXPOSED RACEWAY, CABLE TRAY, ENCLOSURES AND CONDUIT BODIES CONTAINING PHOTOVOLTAIC SOURCE CIRCUITS. SPACING AND LOCATION OF LABEL AS SPECIFIED PER NEC 690.35(F).

PHOTOVOLTAIC SYSTEM AC DISCONNECT

PV-X

AC OUTPUT CURRENT

310 A

NOMINAL AC VOLTAGE

480 V

WARNING

APPROPRIATE PPE REQUIRED. FAILURE TO COMPLY MAY RESULT IN DEATH OR INJURY. REFER TO NFPA 70E.

WARNING: ELECTRIC SHOCK HAZARD

DO NOT TOUCH TERMINALS. TERMINALS ON BOTH THE LINE AND LOAD SIDE MAY BE ENERGIZED IN THE OPEN POSITION.

WARNING

THIS EQUIPMENT IS FED BY MULTIPLE SOURCES (UTILITY AND PHOTOVOLTAIC)

WHITE LETTERING ON RED BACKGROUND
TYPICAL OF 4:PV_A, PV_B, PV_C AND PV_D BREAKERS OF PV_MDP.

PHOTOVOLTAIC SYSTEM AC DISCONNECT

PV-MDP

AC OUTPUT CURRENT

1,240 A

NOMINAL AC VOLTAGE

480 V

WARNING

APPROPRIATE PPE REQUIRED. FAILURE TO COMPLY MAY RESULT IN DEATH OR INJURY. REFER TO NFPA 70E.

WARNING: ELECTRIC SHOCK HAZARD

DO NOT TOUCH TERMINALS. TERMINALS ON BOTH THE LINE AND LOAD SIDE MAY BE ENERGIZED IN THE OPEN POSITION.

WARNING

THIS EQUIPMENT IS FED BY MULTIPLE SOURCES (UTILITY AND PHOTOVOLTAIC)

WHITE LETTERING ON RED BACKGROUND

PV_X DISTRIBUTION PANEL

480V, 3φ, 4W

400A BUS, MLO

WHITE LETTERING ON BLACK BACKGROUND
TYPICAL OF 4 PANEL BOARDS: PV_A, PV_B, PV_C AND PV_D

PV_MDP

480V, 3φ, 4W

1,600A BUS, 1,600 MCB

WHITE LETTERING ON BLACK BACKGROUND

AUXILIARY POWER DISCONNECT

WHITE LETTERING ON BLACK BACKGROUND.

5.0KVA AUXILIARY POWER TRANSFORMER

480:208/120V, 3φ

WHITE LETTERING ON BLACK BACKGROUND

AUXILIARY POWER PANEL

208/120V, 3φ

100A BUS, 20A MCB

WHITE LETTERING ON BLACK BACKGROUND

PHOTOVOLTAIC POWER SOURCE

MAX 1,000V

WHITE LETTERING ON BLACK BACKGROUND
THIS LABEL IS REQUIRED ON EXPOSED RACEWAY, CABLE TRAY, ENCLOSURES AND CONDUIT BODIES CONTAINING PHOTOVOLTAIC CIRCUITS. SPACING AND LOCATION OF LABEL AS SPECIFIED PER NEC 690.31(E)(4).

1000VDC WIRE

POSITIVE

RED OR YELLOW

NEGATIVE

BLACK

GROUND

GREEN OR BARE

WHITE LETTERING ON BLACK BACKGROUND
PROVIDE WARNING SIGNAGE AT EACH JUNCTION BOX, COMBINER BOX, DISCONNECT, AND ANY OTHER DEVICE WHERE ENERGIZE THAT CONTAINS 1000VDC WIRE.

480VAC WIRE

A PHASE

BROWN

B PHASE

ORANGE

C PHASE

YELLOW

GROUND

GREEN OR BARE

WHITE LETTERING ON BLACK BACKGROUND
PROVIDE WARNING SIGNAGE AT EACH JUNCTION BOX OR ANY OTHER DEVICE WHERE ENERGIZE THAT CONTAINS 360VAC WIRE.

120/208VAC WIRE

L1

BLACK

L2

RED

NEUTRAL

WHITE OR GRAY

GROUND

GREEN OR BARE

WHITE LETTERING ON BLACK BACKGROUND
PROVIDE WARNING SIGNAGE AT EACH JUNCTION BOX OR ANY OTHER DEVICE WHERE ENERGIZE THAT CONTAINS 120/240VAC WIRE.

12,470VAC WIRE

A PHASE

BROWN

B PHASE

ORANGE

C PHASE

YELLOW

GROUND

GREEN OR BARE

WHITE LETTERING ON BLACK BACKGROUND
PROVIDE WARNING SIGNAGE AT EACH JUNCTION BOX OR ANY OTHER DEVICE WHERE ENERGIZE THAT CONTAINS 12470VAC WIRE.

INVERTER XX

WHITE LETTERING ON BLACK BACKGROUND. TYPICAL OF 40

TRANSFORMER

WHITE LETTERING ON BLACK BACKGROUND. TYPICAL OF 1

MV FUSED SWITCH

WHITE LETTERING ON BLACK BACKGROUND. TYPICAL OF 1

PV PRODUCTION MONITORING SYSTEM

WHITE LETTERING ON BLACK BACKGROUND

PV PRODUCTION MONITORING SWITCH

WHITE LETTERING ON BLACK BACKGROUND.TYPICAL OF 1

PV PRODUCTION METEOROLOGICAL STATION

WHITE LETTERING ON BLACK BACKGROUND. TYPICAL OF 2

PV PRODUCTION METER

WHITE LETTERING ON BLACK BACKGROUND. TYPICAL OF 1

TRACKER MOTOR UNIT

WHITE LETTERING ON BLACK BACKGROUND. TYPICAL OF 2

4X CONTROL UNIT

WHITE LETTERING ON BLACK BACKGROUND. TYPICAL OF 1

SITE DATA

WHITE LETTERING ON BLACK BACKGROUND. TYPICAL OF 1

GPS

WHITE LETTERING ON BLACK BACKGROUND. TYPICAL OF 1

WIND STOW SWITCH

WHITE LETTERING ON BLACK BACKGROUND. TYPICAL OF 1

PV SERVICE

VOLTAGE:

XXX V

AVAILABLE FAULT CURRENT

XXX A

CALCULATED:

XX/XX/XXXX

OCPD AIC RATING

XXX,XXX A

WHITE LETTERING ON RED BACKGROUND

WARNING

ARC FLASH AND SHOCK HAZARD

APPROPRIATE PPE REQUIRED

XXX

VOLTAGE

XX

WORKING DISTANCE (INCHES)

XX

INCIDENT ENERGY (CAL/CM2)

XX

FLASH BOUNDARY (INCHES)

XX

LIMITED APPROACH (INCHES)

XX

RESTRICTED APPROACH (INCHES)

XX

GLOVE CLASS

XX

STUDY PERFORMED BY POWER

SECURE SOLAR ON XX/XX/XXXX

BLACK LETTERING ON WHITE BACKGROUND WITH ORANGE HEADER.
ARC FLASH VALUES TO BE DETERMINED BY ENGINEER OF RECORD BEFORE SYSTEM COMMISSIONING.

DANGER

ARC FLASH AND SHOCK HAZARD

NO SAFE PPE EXISTS

XXX

VOLTAGE

XX

WORKING DISTANCE (INCHES)

XX

INCIDENT ENERGY (CAL/CM2)

XX

FLASH BOUNDARY (INCHES)

XX

LIMITED APPROACH (INCHES)

XX

RESTRICTED APPROACH (INCHES)

XX

GLOVE CLASS

XX

STUDY PERFORMED BY POWER

SECURE SOLAR ON XX/XX/XXXX

BLACK LETTERING ON WHITE BACKGROUND WITH RED HEADER.
ARC FLASH VALUES TO BE DETERMINED BY ENGINEER OF RECORD BEFORE SYSTEM COMMISSIONING.

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REV

DATE

DESCRIPTION

TITLE:

PV LABELS

PROJECT:

NRECA
SUNDA REFERENCE DESIGN
1,000KWac, 1,000Vdc, SINGLE AXIS TRACKER

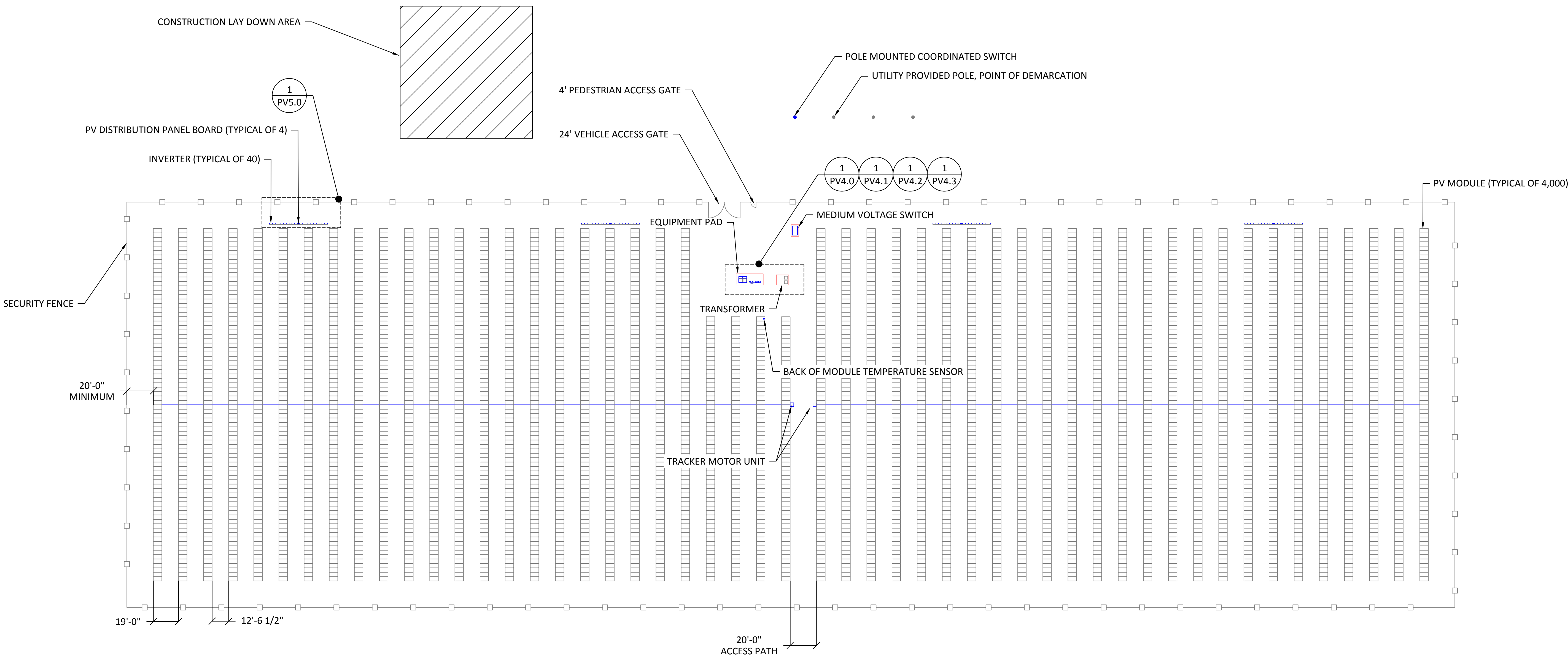
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10.21.2016

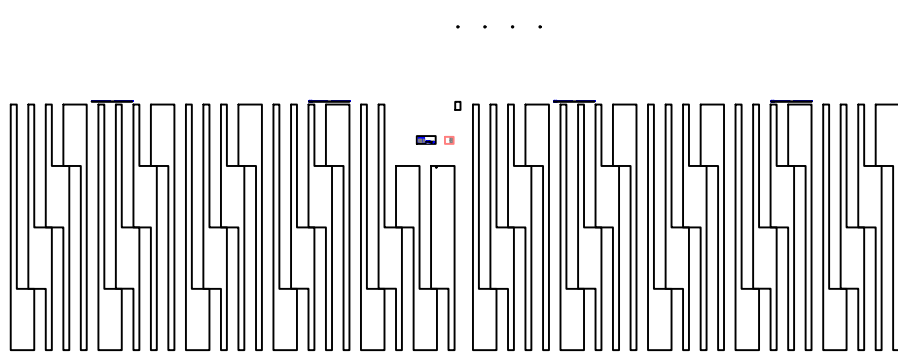
SHEET:

PV1.3

6 OF 24



1 SITE PLAN - ARRAY LAYOUT
SCALE: 1"=40'-0"



KEY PLAN - OVERALL ARRAY

- GENERAL NOTES:
1. REFER TO SINGLE LINE DIAGRAM ON PV1.0 FOR SPECIFICATIONS.
 2. REFER TO EQUIPMENT AND FEEDER SCHEDULES ON PV1.1 FOR SPECIFICATIONS.
 3. PROVIDE ATI SINGLE AXIS TRACKER. RACKING SYSTEM SHALL BE A PIER DRIVEN SYSTEM. EACH ROW SECTION SHALL CONTAIN 80 MODULES HIGH IN PORTRAIT. HORIZONTAL DISTANCE BETWEEN RACK SECTION SHALL BE SPECIFIED BY MANUFACTURER. THE RACKING SYSTEM SHALL BE UL LISTED FOR GROUNDING CONTINUITY. COMPONENTS WITHIN THE RACKING SYSTEM SHALL FORM AN ELECTRICALLY BONDED UNIT AND WILL REQUIRE ADDITIONAL BONDING FROM ONE INDIVIDUAL RACK SECTION TO ADJACENT SECTIONS. REFER TO MANUFACTURER PROVIDED DOCUMENTATION AND SEALED STRUCTURAL DOCUMENTATION.
 4. STRINGING FEEDERS SHALL BE ROUTED ALONG RACKING SYSTEM IN RACKING MANUFACTURERS PROVIDED INTEGRATED WIRE MANAGEMENT TRAY OR BELOW GRADE.

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REV	DATE	DESCRIPTION

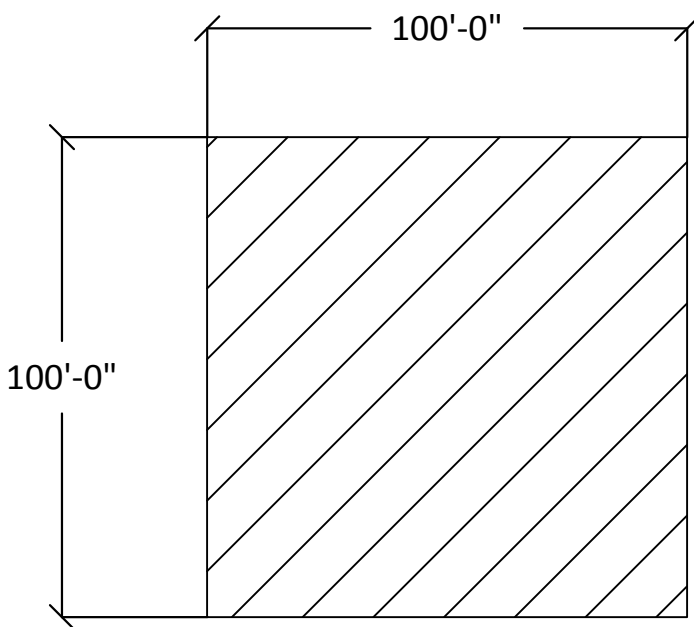
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DATE:
SHEET:

SITE PLAN - ARRAY LAYOUT

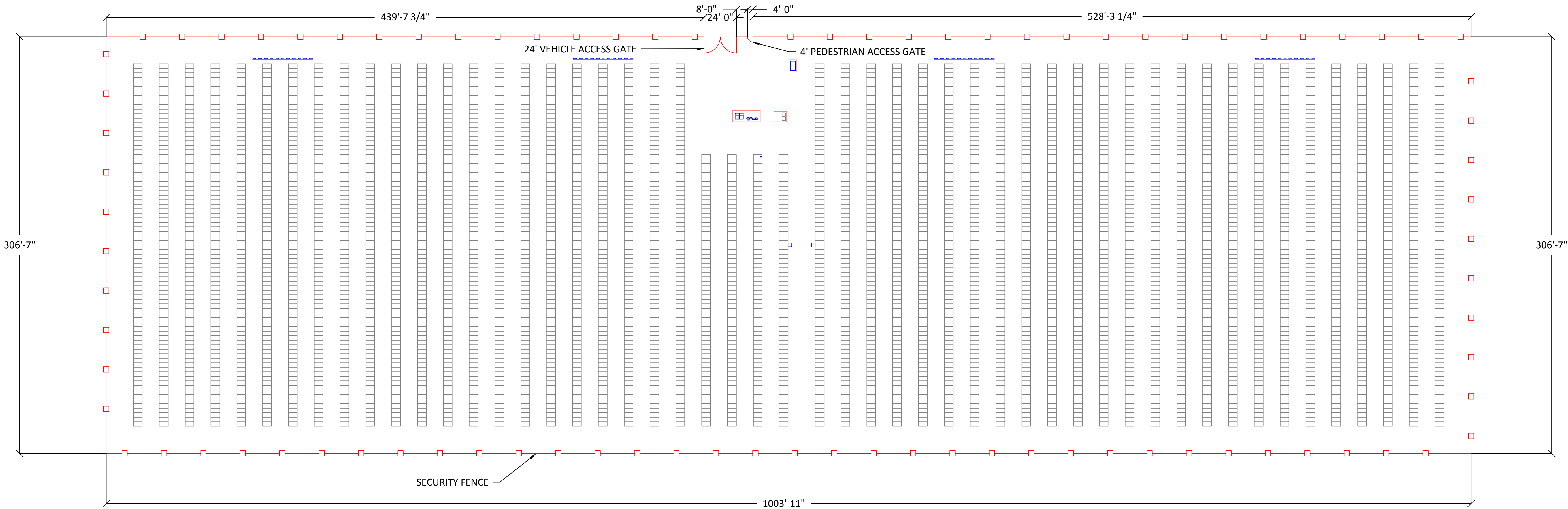
NRECA
SUNDA REFERENCE DESIGN
1,000KWac, 1,000Vdc, SINGLE AXIS TRACKER

PV2.0

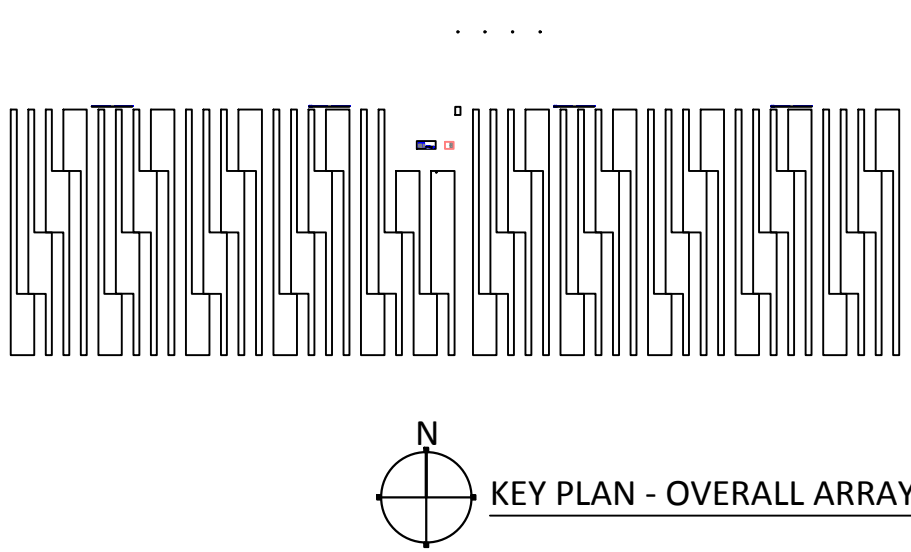
7 OF 24



- GENERAL NOTES:
1. TOTAL FENCE LENGTH IS APPROXIMATELY 2,620 FEET.
 2. FENCE SHALL BE 6'-0" TALL TOPPED WITH 3 STRING BARBED WIRE NO LESS THAN 12" IN HEIGHT. OVERALL HEIGHT OF 7'-0" MINIMUM PER NEC110.31.
 3. ONE PERMANENT VEHICLE ENTRANCE GATE, 24' MINIMUM IN WIDTH, LOCATED AS SHOWN.
 4. ONE PERMANENT PEDESTRIAN ENTRANCE GATE, 4' MINIMUM IN WIDTH, LOCATED AS SHOWN.
 5. REFER TO FENCE GROUNDING DETAIL ON PV5.1.



1 SITE PLAN - FENCE LAYOUT
SCALE: 1"=40'-0"



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REV	DATE	DESCRIPTION

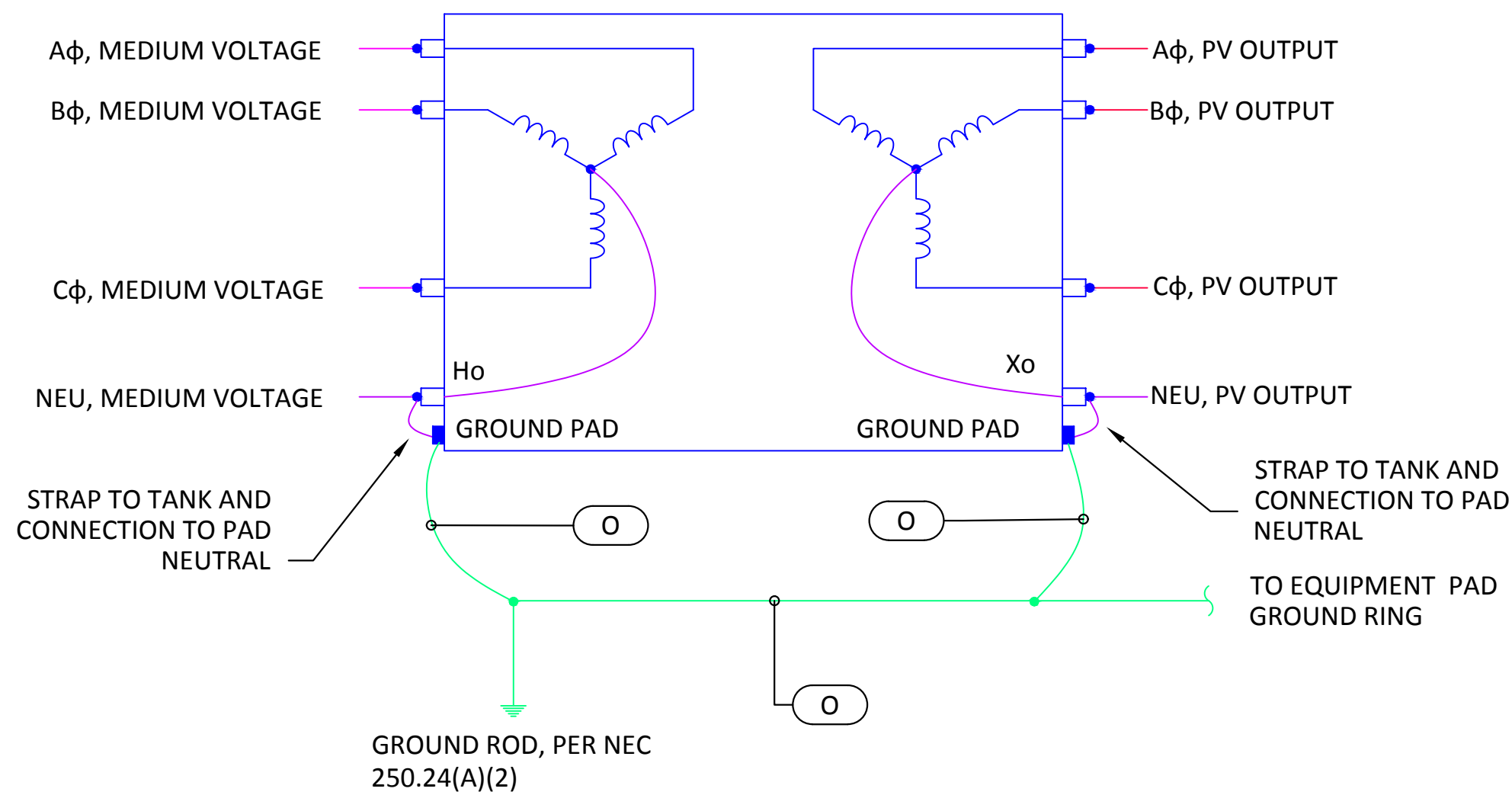
TITLE:
PROJECT:

SITE PLAN - FENCE LAYOUT
NRECA
SUNDA REFERENCE DESIGN
1,000KWac, 1,000Vdc, SINGLE AXIS TRACKER

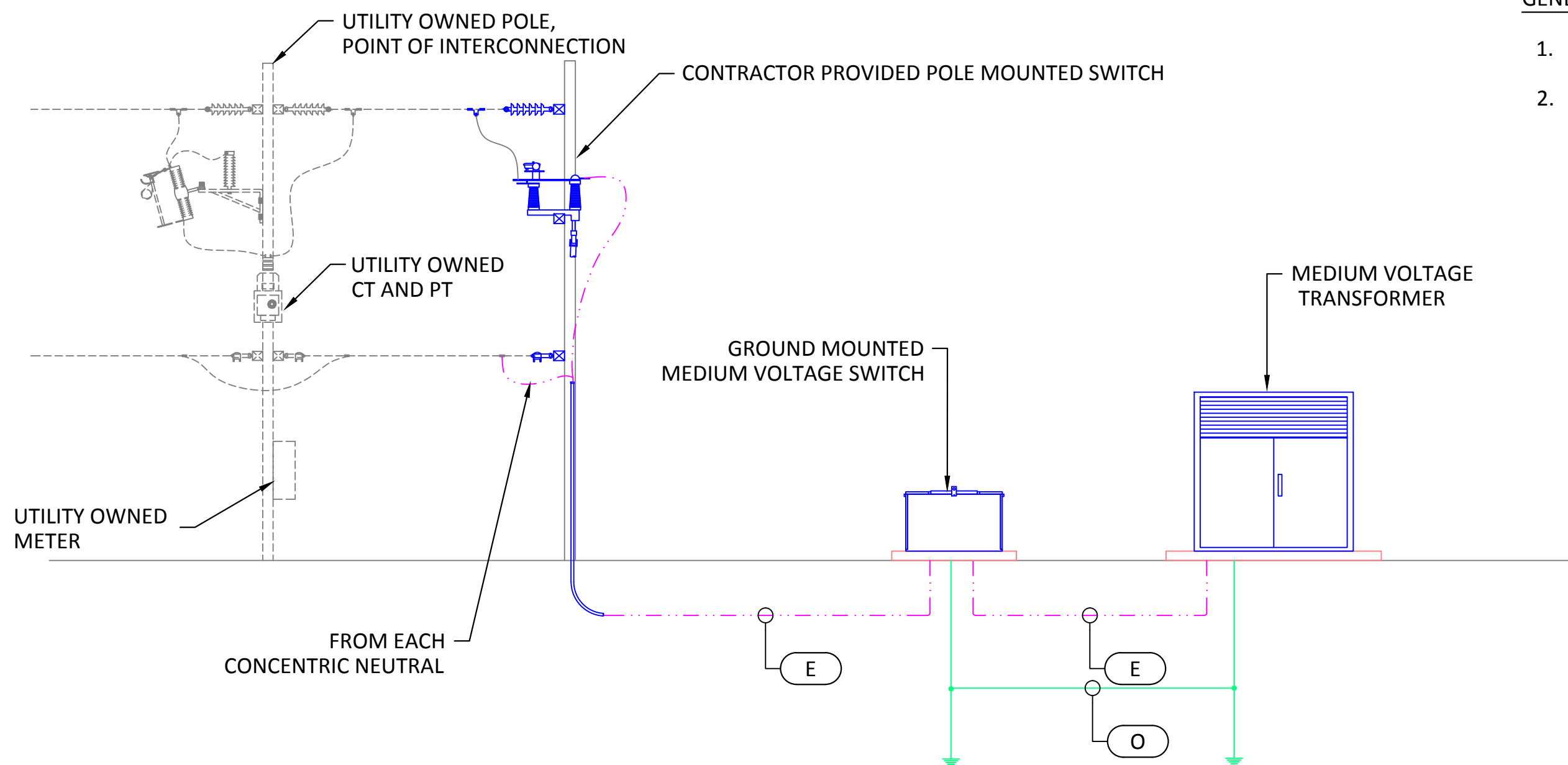
DATE:
SHEET:

10.21.2016
PV2.1

8 OF 24



2 MEDIUM VOLTAGE TRANSFORMER DETAIL
SCALE: NTS

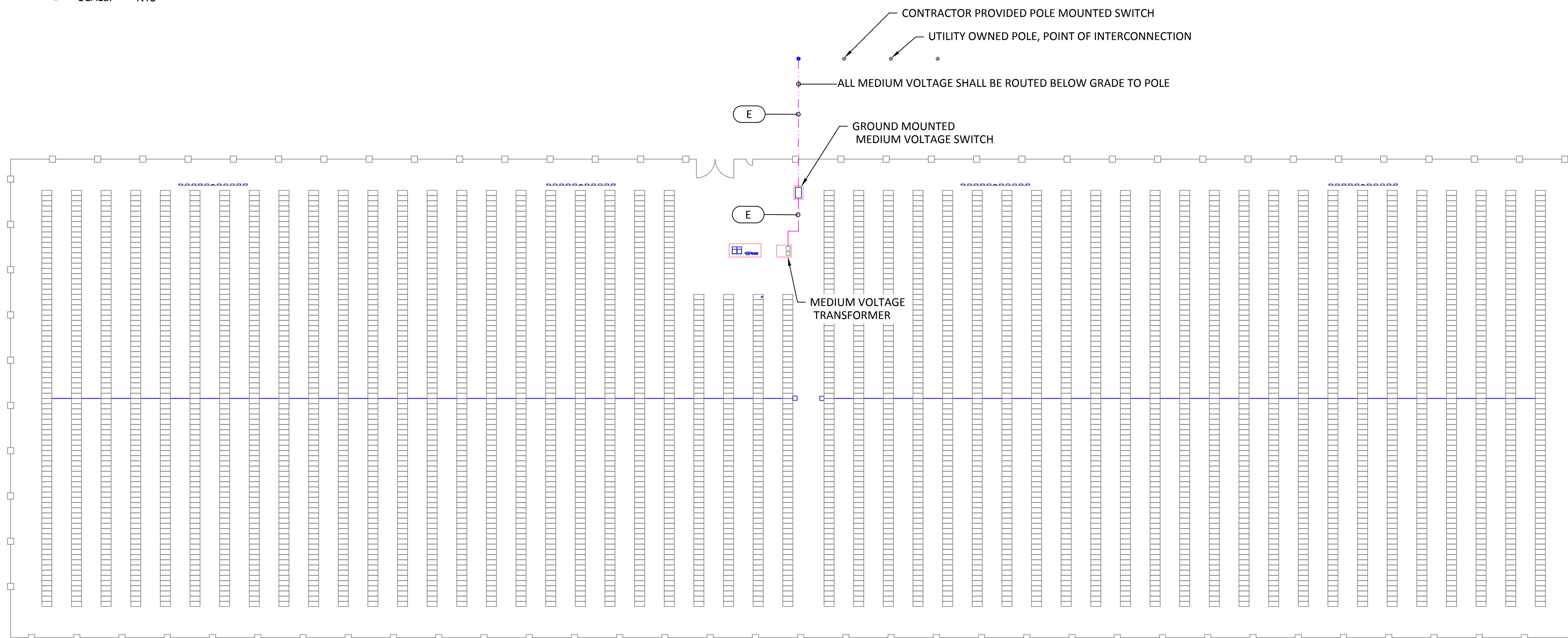


3 MEDIUM VOLTAGE INTERCONNECTION DETAIL
SCALE: NTS

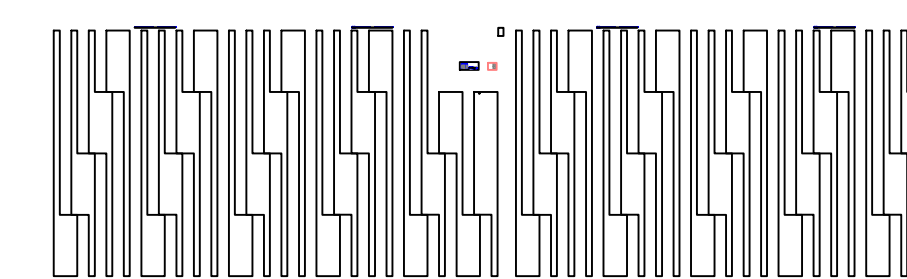
GENERAL NOTES:

1. REFER TO SINGLE LINE DIAGRAM ON PV1.0 FOR SPECIFICATIONS.
2. REFER TO EQUIPMENT AND FEEDER SCHEDULES ON PV1.1 FOR SPECIFICATIONS.

LINE TYPE LEGEND:	
MV FEEDERS	
FEEDERS/EQUIPMENT PROVIDED BY OTHERS	
UTILITY NEUTRAL	
NEW EQUIPMENT	
GROUNDING CONDUCTOR	



1 SITE PLAN - MEDIUM VOLTAGE ROUTING
SCALE: 1"=40'-0"



N
KEY PLAN - OVERALL ARRAY

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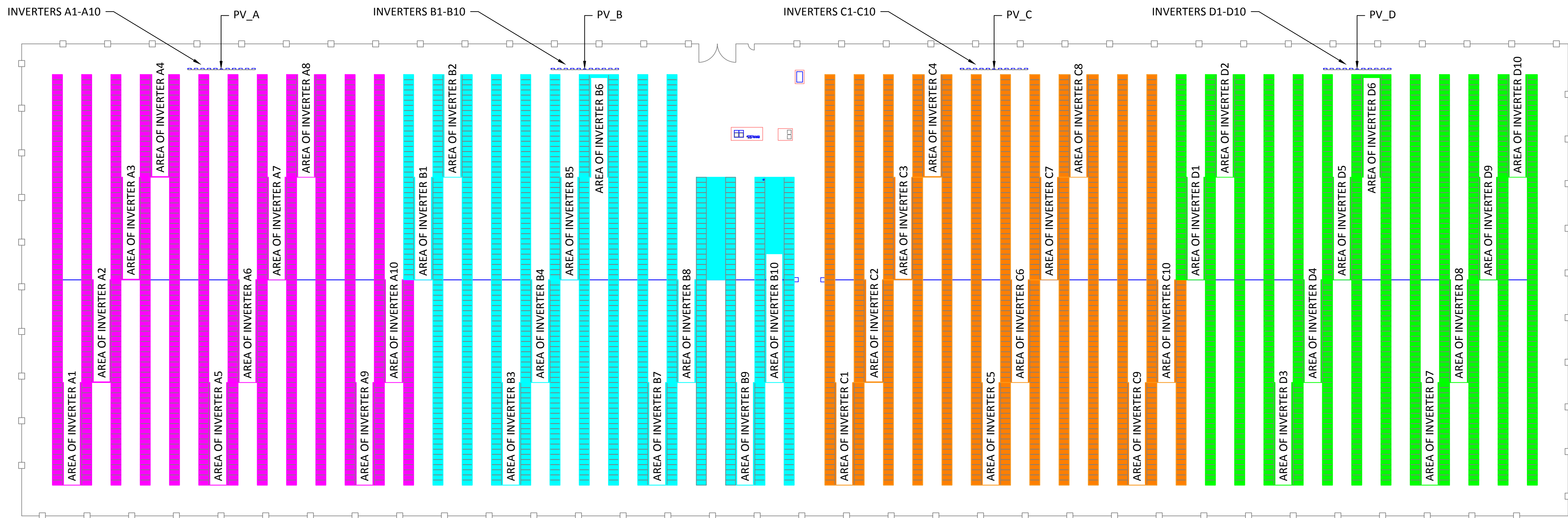


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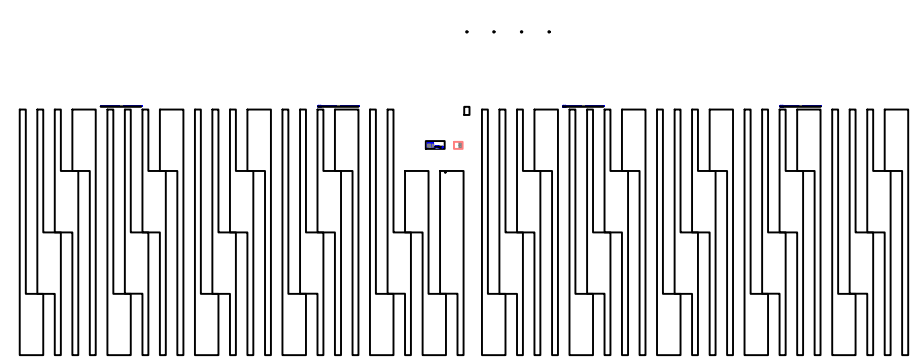
REV	DATE	DESCRIPTION

TITLE:	SITE PLAN - MEDIUM VOLTAGE ROUTING
PROJECT:	NRECA SUNDA REFERENCE DESIGN 1,000KWac, 1,000Vdc, SINGLE AXIS TRACKER

DATE: 10.21.2016
SHEET: PV2.2



1 SITE PLAN - INVERTER LAYOUT
SCALE: 1"=40'-0"



KEY PLAN - OVERALL ARRAY

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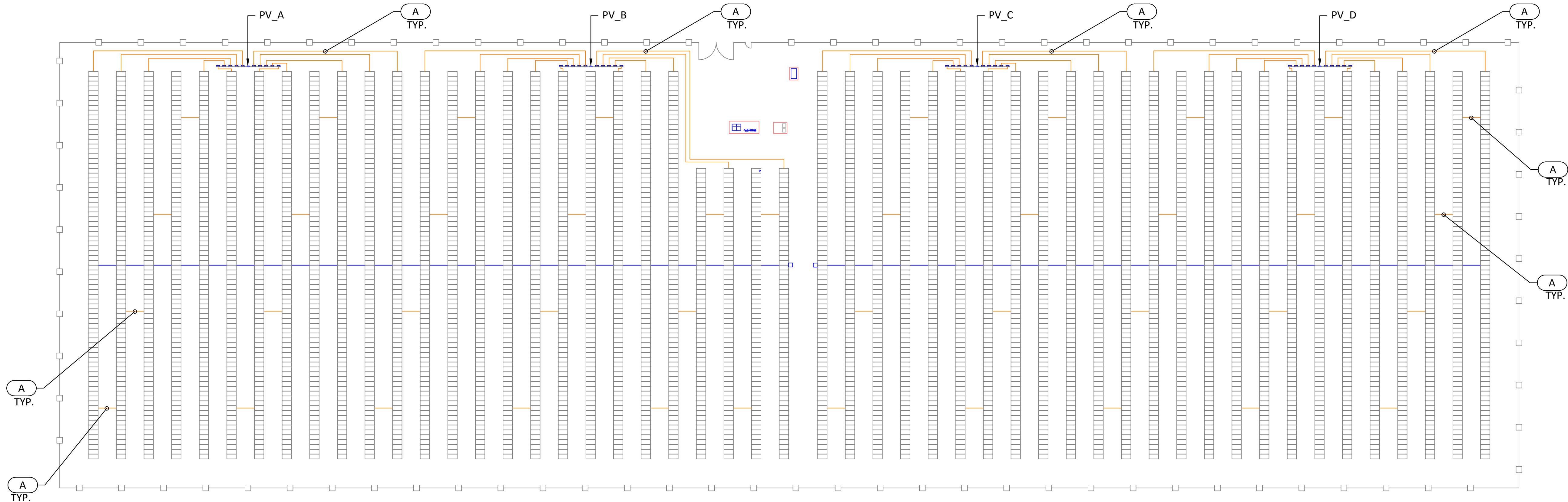
TITLE: SITE PLAN - INVERTER LAYOUT

PROJECT: NRECA
SUNDA REFERENCE DESIGN
1,000KWac, 1,000Vdc, SINGLE AXIS TRACKER

DATE: 10.21.2016

SHEET: PV2.3

10 OF 24

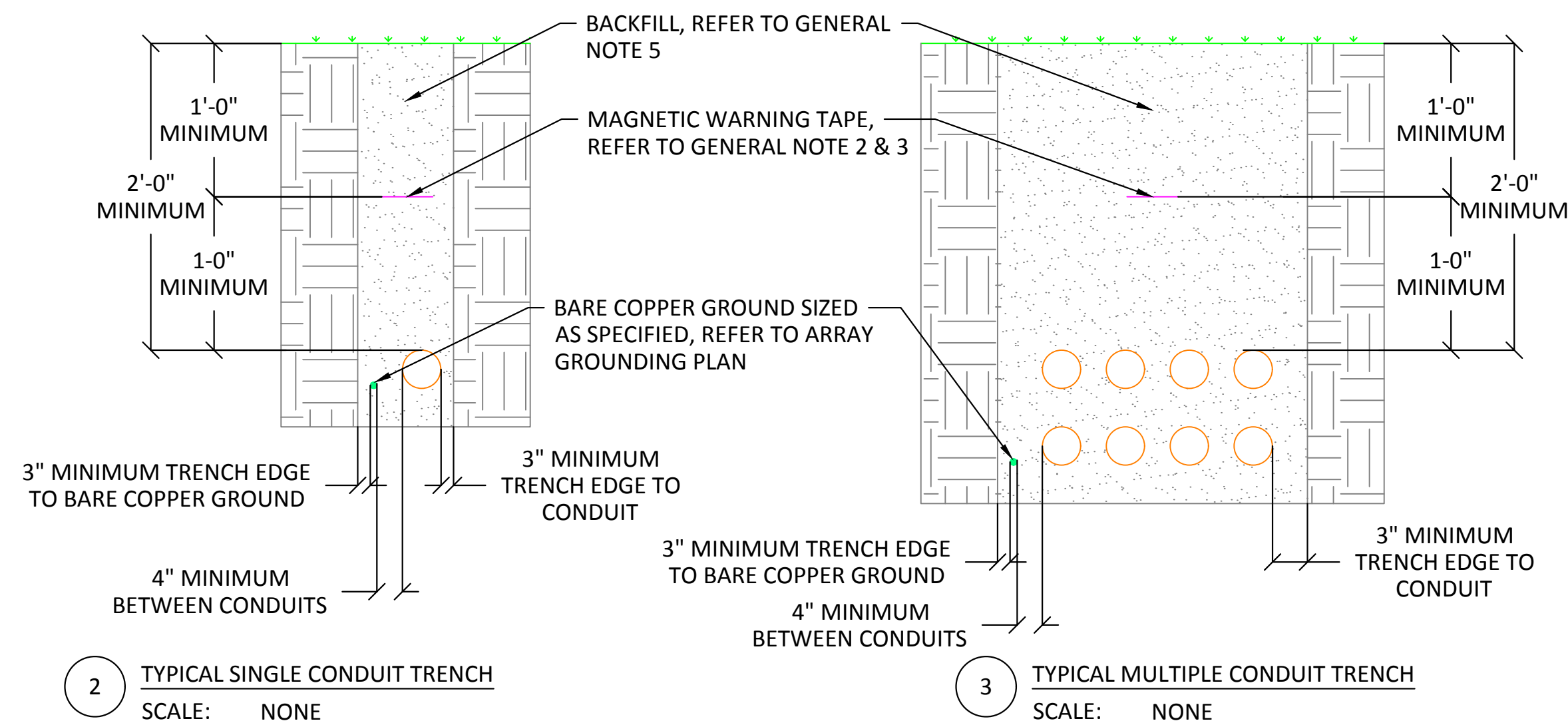


1 SITE PLAN - DC ROUTING
SCALE: 1"=40'-0"

FEEDER SCHEDULE **FEEDER IS NOTED BY A									
TAG	PHASE			NEUTRAL		GROUND		INSULATION	RACEWAY SIZE
A	(1 SET OF #NOTE1 (2) - (10)	#10	COPPER	(1)	#8	COPPER	(1)	#10	PV
B	(1 SET OF (3)	#8	COPPER	(1)	#8	COPPER	(1)	#8	THWN-2
C	(2 SET OF (3)	250 KCMIL	ALUMINUM	(1)	250 KCMIL	ALUMINUM	(1)	#1	THWN-2
D	(6 SET OF (3)	500 KCMIL	ALUMINUM	(1)	500 KCMIL	ALUMINUM	(1)	350 KCMIL	THWN-2
E NOTE#6	(1 SET OF (3)	#1/0	ALUMINUM					MV TR-XLPE WITH CONCENTRIC NEUTRAL	4"
F	(1 SET OF (3)	#12	COPPER	(1)	#12	COPPER	(1)	#12	THWN-2
G	(1 SET OF (1)	#12	COPPER	(1)	#12	COPPER	(1)	#12	THWN-2
H	(1 SET OF (2)	#12	COPPER				(1)	#12	THWN-2
I	RS-485: BELDEN 3107A								3/4"
J	PROVIDED BY DRAKER								3/4"
K	CONTROL WIRES PROVIDED BY ATI								3/4"
L						(1)	#6	COPPER	BARE
M	(1 SET OF (7)	#12	COPPER						THWN-2
N	CAT5E OR CAT6 ETHERNET CABLE: BELDEN 7937A OR EQUIVALENT								3/4"
O						(1)	#3/0	COPPER	BARE

FEEDER SCHEDULE NOTES:

- (#) - DENOTES QUANTITY OF DC PHASE WIRES TO BE PROVIDED.
- WHERE MULTIPLE CONDUITS ARE NOTED, THE RACEWAYS SHALL BE PROVIDED IN PARALLEL.
- REFER TO RACEWAY APPLICATION SCHEDULE FOR RACEWAY TYPE.
- ALL RACEWAY SIZES ARE NEC MINIMUM REQUIREMENTS, LARGER CONDUITS ARE PERMITTED FOR EASE OF INSTALLATION.
- PV SOURCE CIRCUITS SHALL NOT BE REQUIRED TO BE IN RACEWAY IF CONDUCTORS ARE NOT READILY ACCESSIBLE AND NOT EXPOSED TO PHYSICAL DAMAGE. BELOW GRADE PV SOURCE CIRCUITS SHALL BE IN RACEWAY.
- PROVIDE 15KV RATED MEDIUM VOLTAGE FEEDERS WITH 100% INSULATION.

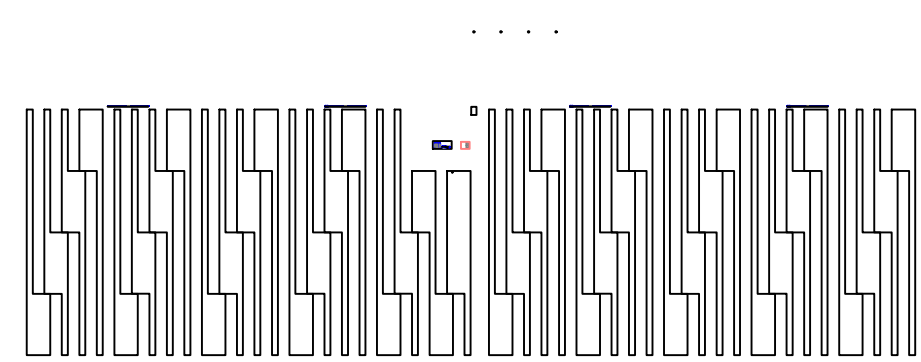


2 TYPICAL SINGLE CONDUIT TRENCH
SCALE: NONE

3 TYPICAL MULTIPLE CONDUIT TRENCH
SCALE: NONE

GENERAL NOTES:

- REFER TO EQUIPMENT SCHEDULE AND SINGLE LINE DIAGRAM FOR SPECIFICATIONS.
- ALL UNDERGROUND RACEWAY SHALL BE SCHEDULE 40 PVC. TRANSITIONS BELOW TO ABOVE GRADE SHALL BE PER CONDUIT STUB UP DETAIL.
- FOR TRENCHES 24" WIDE AND LESS, ONLY ONE RUN OF MAGNETIC ELECTRICAL WARNING TAPE SHALL BE REQUIRED PER DETAIL 3.
- FOR TRENCHES WIDER THAN 24" ONE PIECE OF TAPE SHALL BE LOCATED AT EACH SIDE OF THE TRENCH WITH ADDITIONAL RUNS PROVIDED AS NECESSARY. THE MAXIMUM DISTANCE BETWEEN TAPE RUNS SHALL BE 24" ON CENTER.
- TRENCH BOTTOMS: EXCAVATE TRENCHES 3" DEEPER THAN BOTTOM OF PIPE ELEVATION TO ALLOW FOR BEDDING COURSE. HAND EXCAVATE FOR BELL OF PIPE. EXCAVATE TRENCHES 3" DEEPER THAN ELEVATION REQUIRED IN ROCK OR OTHER UNYIELDING BEARING MATERIAL TO ALLOW BEDDING COURSE.
- ALL BACKFILL SHOULD BE FREE OF MATERIALS THAT MAY DAMAGE THE CONDUIT OR CABLE SYSTEM. BACKFILL WITHIN 150 MM (6 IN) OF THE CONDUIT OR CABLE SHOULD BE FREE OF SOLID MATERIAL GREATER THAN 100 MM (2 IN) IN MAXIMUM DIMENSION OR WITH SHARP EDGES LIKELY TO DAMAGE IT. THE BALANCE OF BACKFILL SHOULD BE FREE OF SOLID MATERIAL GREATER THAN 200 MM (8 IN) IN MAXIMUM DIMENSION. BACKFILL MATERIAL SHOULD BE ADEQUATELY COMPACTED.
- REFER TO ARRAY GROUNDING DETAIL FOR BARE COPPER GROUND TRENCH ROUTING.
- FEEDER ROUTING SHOWN DIAGRAMMATICALLY, COORDINATION WITH SITE CONDITIONS REQUIRED.



KEY PLAN - OVERALL ARRAY

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REV	DATE	DESCRIPTION

SITE PLAN - DC FEEDER ROUTING

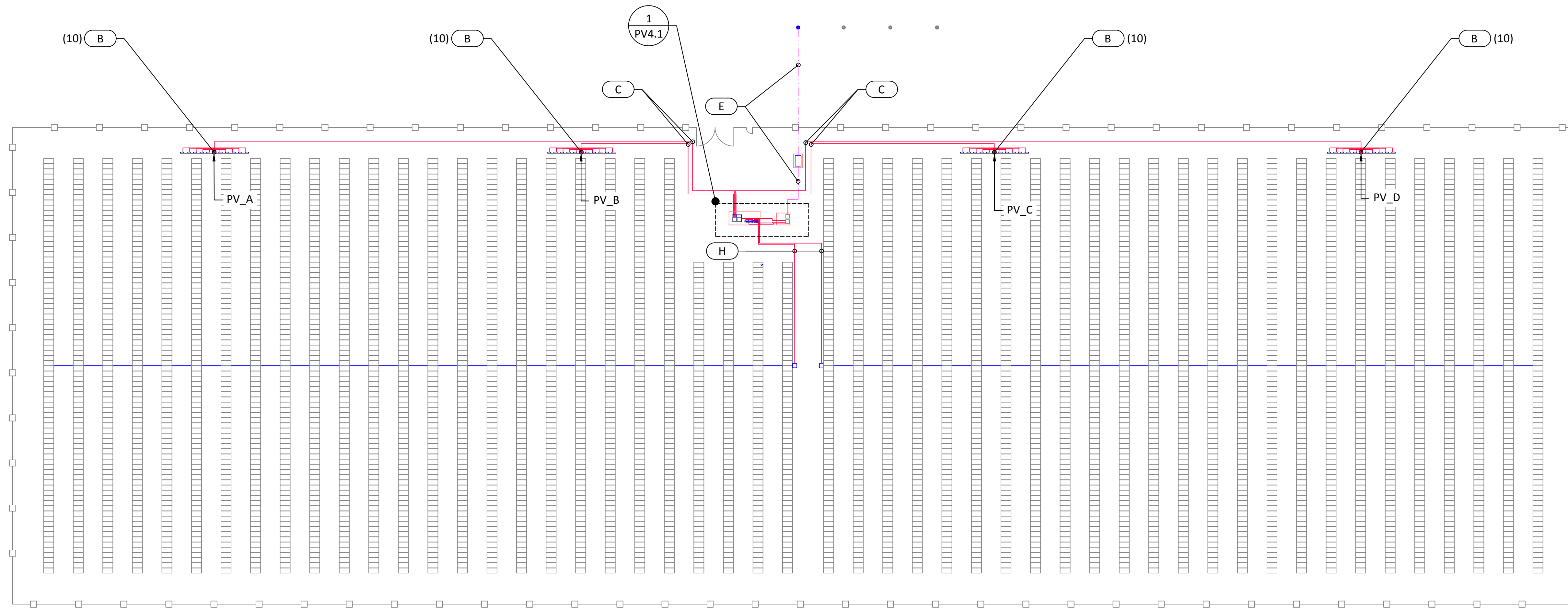
PROJECT:
NRECA
SUNDA REFERENCE DESIGN
1,000kWac, 1,000Vdc, SINGLE AXIS TRACKER

TITLE:
DATE:
SHEET:

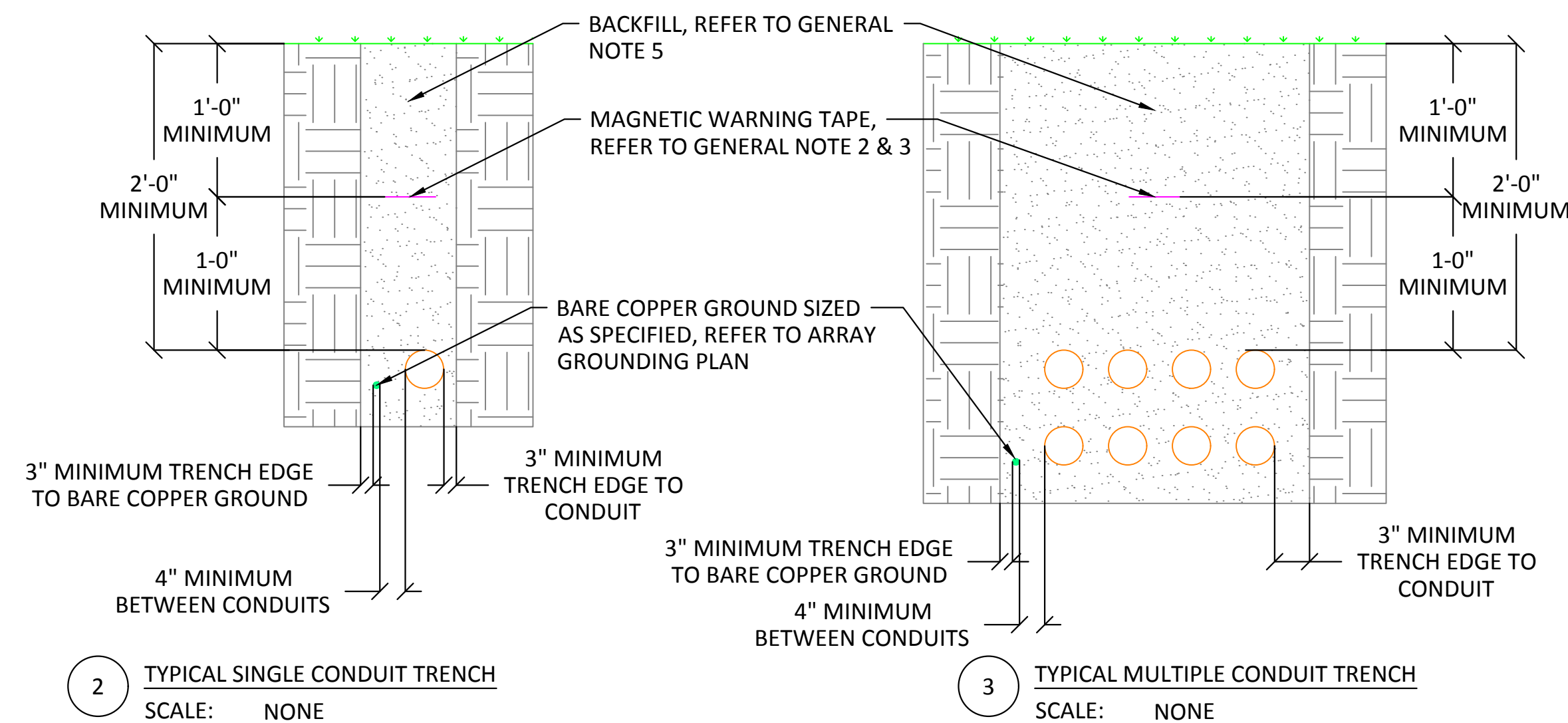
10.21.2016

PV2.4

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1 SITE PLAN - AC ROUTING
SCALE: 1"=40'-0"



2 TYPICAL SINGLE CONDUIT TRENCH
SCALE: NONE

3 TYPICAL MULTIPLE CONDUIT TRENCH
SCALE: NONE

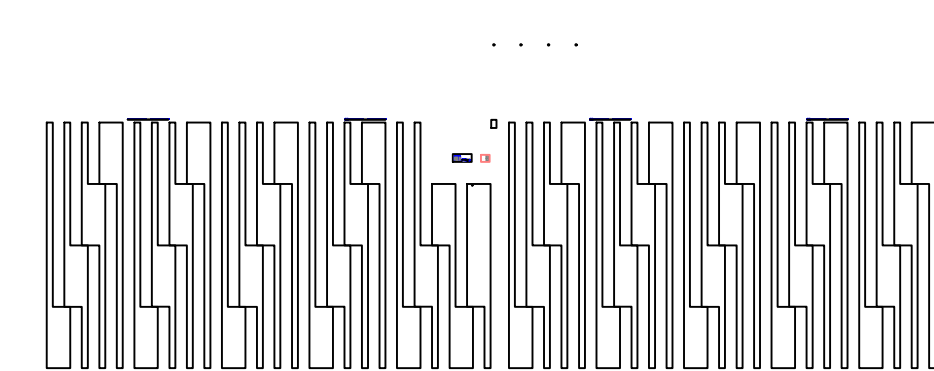
GENERAL NOTES:

- REFER TO EQUIPMENT SCHEDULE AND SINGLE LINE DIAGRAM FOR SPECIFICATIONS.
- ALL UNDERGROUND RACEWAY SHALL BE SCHEDULE 40 PVC. TRANSITIONS BELOW TO ABOVE GRADE SHALL BE PER CONDUIT STUB UP DETAIL.
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- REFER TO ARRAY GROUNDING DETAIL FOR BARE COPPER GROUND TRENCH ROUTING.
- FEEDER ROUTING SHOWN DIAGRAMMATICALLY, COORDINATION WITH SITE CONDITIONS REQUIRED.

FEEDER SCHEDULE									
**FEEDER IS NOTED BY (A)									
TAG	PHASE				NEUTRAL		GROUND		RACEWAY SIZE
A	(1) SET OF	(2) - (10)	#10	COPPER	(1)	#8	COPPER	PV	1-1/2"
B	(1) SET OF	(3)	#8	COPPER	(1)	#8	COPPER	THWN-2	1"
C	(2) SET OF	(3)	250 KCMIL	ALUMINUM	(1)	250 KCMIL	ALUMINUM	THWN-2	2-1/2"
D	(6) SET OF	(3)	500 KCMIL	ALUMINUM	(1)	500 KCMIL	ALUMINUM	THWN-2	3-1/2"
E ^{NOTE#6}	(1) SET OF	(3)	#1/0	ALUMINUM				MV TR-XLPE WITH CONCENTRIC NEUTRAL	4"
F	(1) SET OF	(3)	#12	COPPER	(1)	#12	COPPER	THWN-2	3/4"
G	(1) SET OF	(1)	#12	COPPER	(1)	#12	COPPER	THWN-2	3/4"
H	(1) SET OF	(2)	#12	COPPER	(1)	#12	COPPER	THWN-2	3/4"
I	RS-485: BELDEN 3107A								3/4"
J	PROVIDED BY DRAKER								3/4"
K	CONTROL WIRES PROVIDED BY ATI								3/4"
L							(1) #6	COPPER	BARE
M	(1) SET OF	(7)	#12	COPPER				THWN-2	3/4"
N	CAT5E OR CAT6 ETHERNET CABLE: BELDEN 7937A OR EQUIVALENT								3/4"
O							(1) #3/0	COPPER	BARE

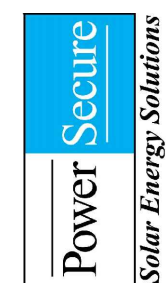
FEEDER SCHEDULE NOTES:

- (#) - DENOTES QUANTITY OF DC PHASE WIRES TO BE PROVIDED.
- WHERE MULTIPLE CONDUITS ARE NOTED, THE RACEWAYS SHALL BE PROVIDED IN PARALLEL.
- REFER TO RACEWAY APPLICATION SCHEDULE FOR RACEWAY TYPE.
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- PROVIDE 15KV RATED MEDIUM VOLTAGE FEEDERS WITH 100% INSULATION.



KEY PLAN - OVERALL ARRAY

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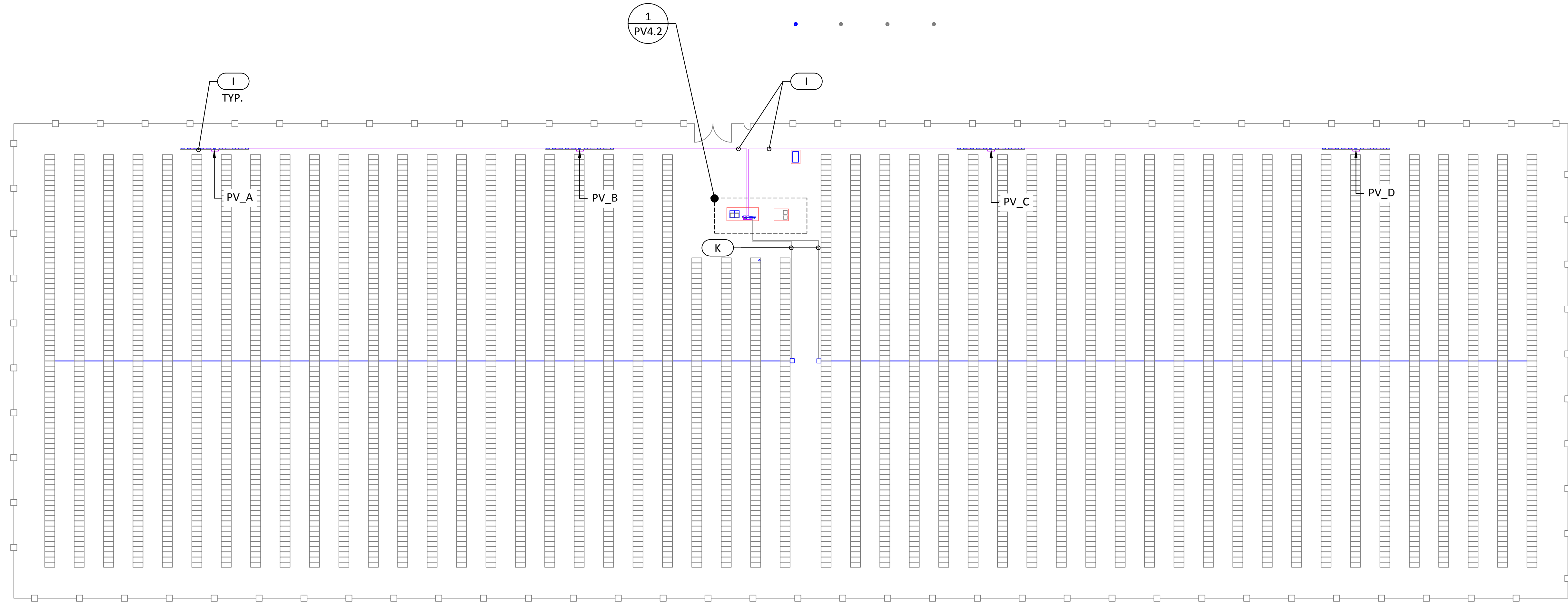
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SITE PLAN - AC FEEDER ROUTING

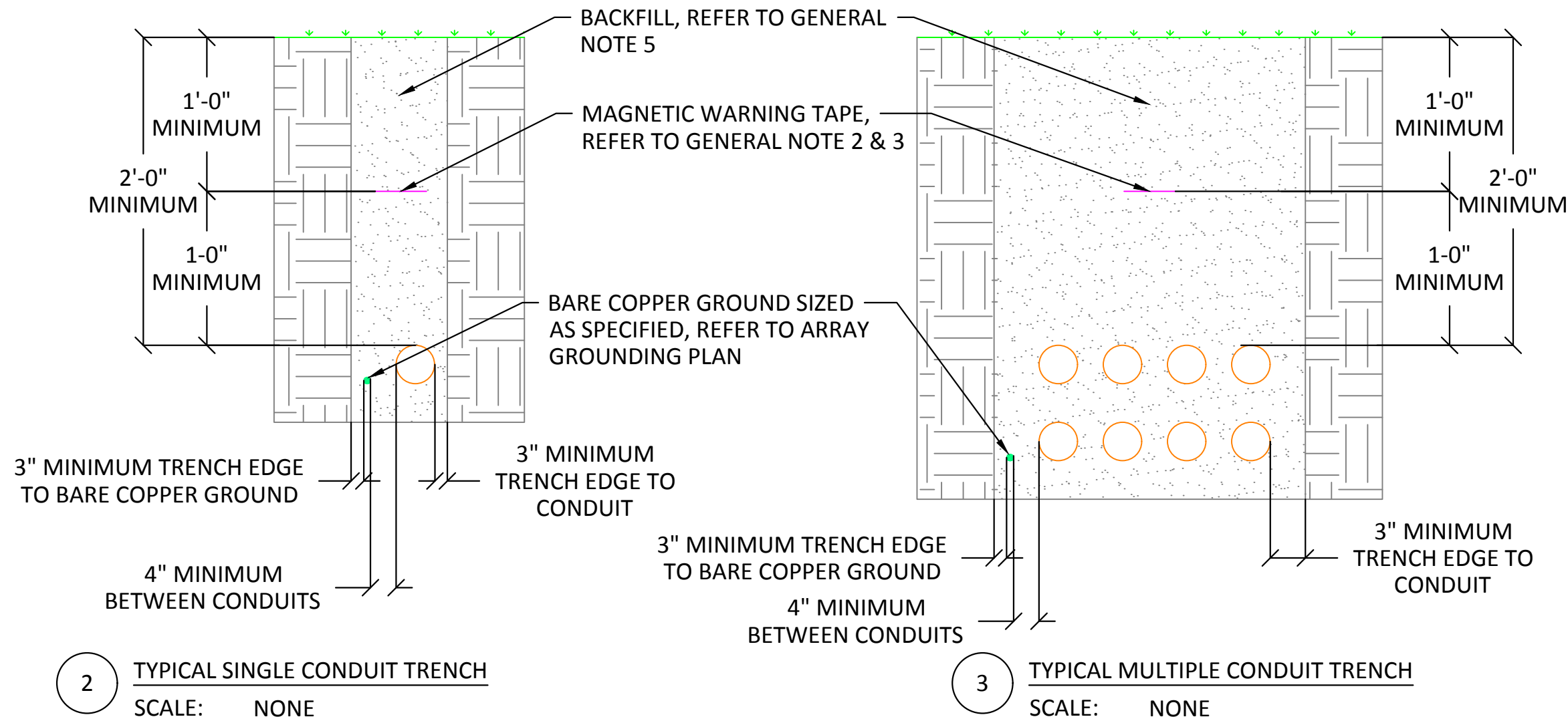
TITLE:
PROJECT:

DATE: 10.21.2016
SHEET: PV2.5

NRECA
SUNDA REFERENCE DESIGN
1,000KWac, 1,000Vdc, SINGLE AXIS TRACKER



1 SITE PLAN - COMMUNICATIONS ROUTING
SCALE: 1"=40'-0"

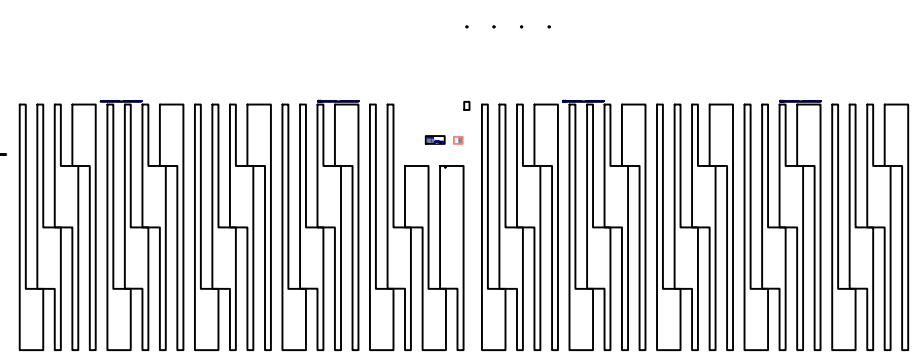


2 TYPICAL SINGLE CONDUIT TRENCH
SCALE: NONE

3 TYPICAL MULTIPLE CONDUIT TRENCH
SCALE: NONE

GENERAL NOTES:

- REFER TO EQUIPMENT SCHEDULE AND SINGLE LINE DIAGRAM FOR SPECIFICATIONS.
- ALL UNDERGROUND RACEWAY SHALL BE SCHEDULE 40 PVC. TRANSITIONS BELOW TO ABOVE GRADE SHALL BE PER CONDUIT STUB UP DETAIL.
- FOR TRENCHES 24" WIDE AND LESS, ONLY ONE RUN OF MAGNETIC ELECTRICAL WARNING TAPE SHALL BE REQUIRED PER DETAIL 3.
- FOR TRENCHES WIDER THAN 24" ONE PIECE OF TAPE SHALL BE LOCATED AT EACH SIDE OF THE TRENCH WITH ADDITIONAL RUNS PROVIDED AS NECESSARY. THE MAXIMUM DISTANCE BETWEEN TAPE RUNS SHALL BE 24" ON CENTER.
- TRENCH BOTTOMS: EXCAVATE TRENCHES 3" DEEPER THAN BOTTOM OF PIPE ELEVATION TO ALLOW FOR BEDDING COURSE. HAND EXCAVATE FOR BELL OF PIPE. EXCAVATE TRENCHES 3" DEEPER THAN ELEVATION REQUIRED IN ROCK OR OTHER UNYIELDING BEARING MATERIAL TO ALLOW BEDDING COURSE.
- ALL BACKFILL SHOULD BE FREE OF MATERIALS THAT MAY DAMAGE THE CONDUIT OR CABLE SYSTEM. BACKFILL WITHIN 150 MM (6 IN) OF THE CONDUIT OR CABLE SHOULD BE FREE OF SOLID MATERIAL GREATER THAN 100 MM (2 IN) IN MAXIMUM DIMENSION OR WITH SHARP EDGES LIKELY TO DAMAGE IT. THE BALANCE OF BACKFILL SHOULD BE FREE OF SOLID MATERIAL GREATER THAN 200 MM (8 IN) IN MAXIMUM DIMENSION. BACKFILL MATERIAL SHOULD BE ADEQUATELY COMPACTED.
- REFER TO ARRAY GROUNDING DETAIL FOR BARE COPPER GROUND TRENCH ROUTING.
- FEEDER ROUTING SHOWN DIAGRAMMATICALLY, COORDINATION WITH SITE CONDITIONS REQUIRED.



KEY PLAN - OVERALL ARRAY

FEEDER SCHEDULE **FEEDER IS NOTED BY									
TAG	PHASE			NEUTRAL		GROUND		INSULATION	RACEWAY SIZE
A	(1) SET OF	(2) - (10)	#10	COPPER		(1)	#10	COPPER	PV
B	(1) SET OF	(3)	#8	COPPER	(1)	#8	COPPER	THWN-2	1"
C	(2) SET OF	(3)	250 KCMIL	ALUMINUM	(1)	250 KCMIL	ALUMINUM	THWN-2	2-1/2"
D	(6) SET OF	(3)	500 KCMIL	ALUMINUM	(1)	500 KCMIL	ALUMINUM	THWN-2	3-1/2"
E ^{NOTE#6}	(1) SET OF	(3)	#1/0	ALUMINUM				MV TR-XLPE WITH CONCENTRIC NEUTRAL	4"
F	(1) SET OF	(3)	#12	COPPER	(1)	#12	COPPER	THWN-2	3/4"
G	(1) SET OF	(1)	#12	COPPER	(1)	#12	COPPER	THWN-2	3/4"
H	(1) SET OF	(2)	#12	COPPER		(1)	#12	COPPER	THWN-2
I	RS-485: BELDEN 3107A								3/4"
J	PROVIDED BY DRAKER								3/4"
K	CONTROL WIRES PROVIDED BY ATI								3/4"
L						(1)	#6	COPPER	BARE
M	(1) SET OF	(7)	#12	COPPER				THWN-2	3/4"
N	CAT5E OR CAT6 ETHERNET CABLE: BELDEN 7937A OR EQUIVALENT								3/4"
O						(1)	#3/0	COPPER	BARE

FEEDER SCHEDULE NOTES:

- (#) - DENOTES QUANTITY OF DC PHASE WIRES TO BE PROVIDED.
- WHERE MULTIPLE CONDUITS ARE NOTED, THE RACEWAYS SHALL BE PROVIDED IN PARALLEL.
- REFER TO RACEWAY APPLICATION SCHEDULE FOR RACEWAY TYPE.
- ALL RACEWAY SIZES ARE NEC MINIMUM REQUIREMENTS, LARGER CONDUITS ARE PERMITTED FOR EASE OF INSTALLATION.
- PV SOURCE CIRCUITS SHALL NOT BE REQUIRED TO BE IN RACEWAY IF CONDUCTORS ARE NOT READILY ACCESSIBLE AND NOT EXPOSED TO PHYSICAL DAMAGE. BELOW GRADE PV SOURCE CIRCUITS SHALL BE IN RACEWAY.
- PROVIDE 15KV RATED MEDIUM VOLTAGE FEEDERS WITH 100% INSULATION.

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REV	DATE	DESCRIPTION

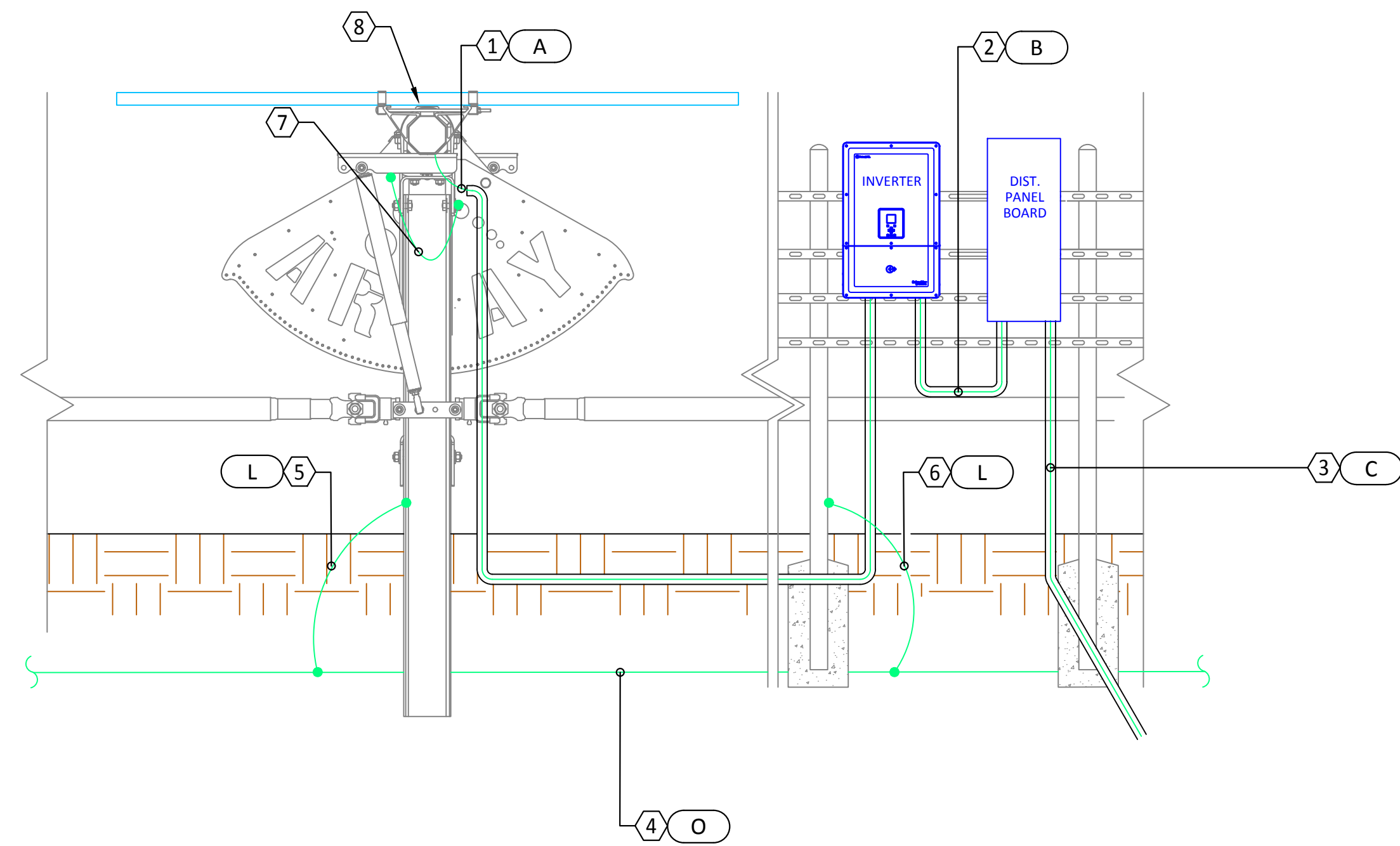
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PROJECT: NRECA
SUNDA REFERENCE DESIGN
1,000kWac, 1,000Vdc, SINGLE AXIS TRACKER

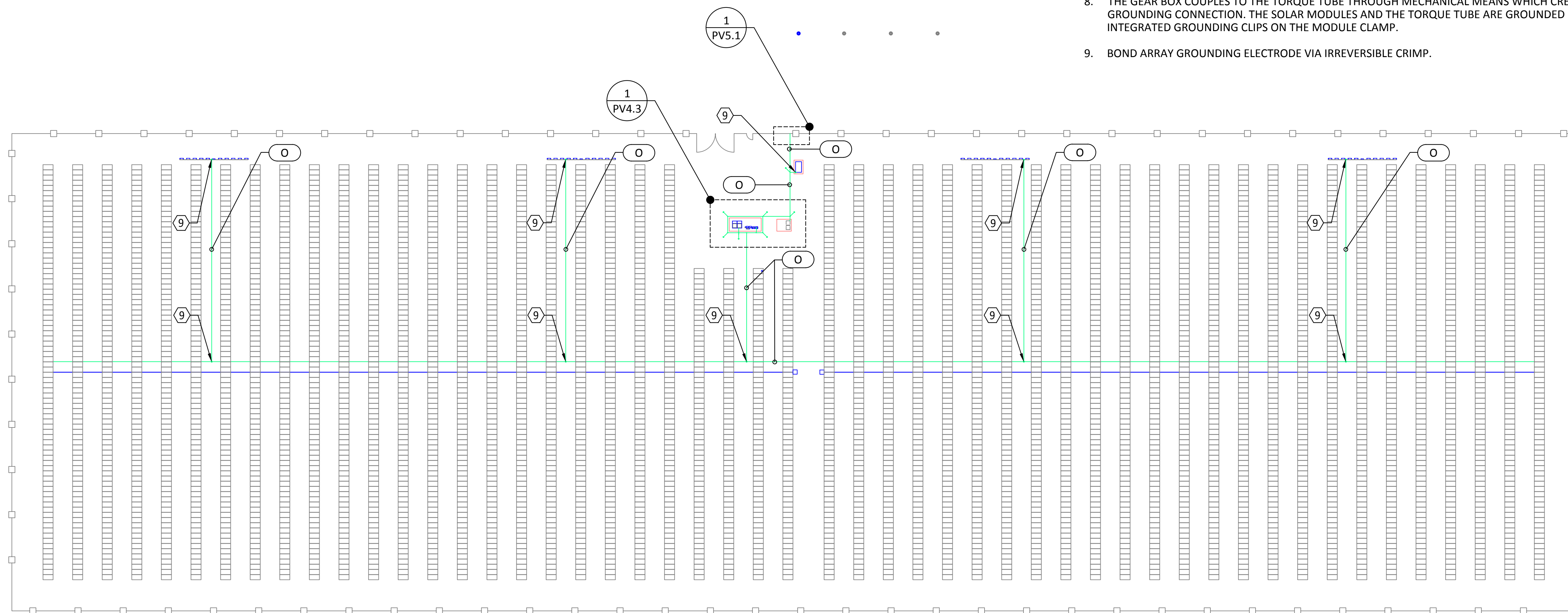
DATE: 10.21.2016

SHEET: PV2.6

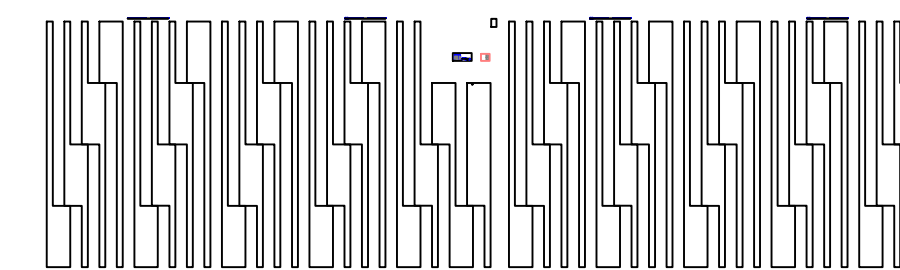
13 OF 24



2 SIDE ELEVATION - RACK GROUNDING
SCALE: NTS



1 SITE PLAN - ARRAY GROUNDING
SCALE: 1"=40'-0"



N
KEY PLAN - OVERALL ARRAY

GENERAL NOTES:

1. THE RACKING SYSTEM SHALL BE UL LISTED FOR GROUNDING CONTINUITY. COMPONENTS WITHIN THE RACKING SYSTEM SHALL FORM AN ELECTRICALLY BONDED UNIT AND REQUIRE ADDITIONAL BONDING FROM ONE INDIVIDUAL RACK SECTION TO ADJACENT SECTIONS.
2. REFER TO SINGLE LINE DIAGRAM AND SCHEDULES FOR SPECIFICATIONS.
3. ARRAY EQUIPMENT GROUND CONDUCTOR SHALL BE RUN IN TRENCH WITH INVERTERS FEEDERS WHERE POSSIBLE.
4. GROUND FEEDER ROUTING SHOWN DIAGRAMMATICALLY, COORDINATION WITH SITE CONDITIONS REQUIRED.
5. PROVIDE AT LEAST 6'-1/2" OF WORKING CLEARANCE FOR INVERTERS AS PER NEC 110.26(A)(3) OR TO THE HEIGHT OF THE EQUIPMENT, WHICHEVER IS GREATER.

KEYED NOTES: (#)

1. PROVIDE #10 COPPER (FEEDER A) EQUIPMENT GROUND CONDUCTOR (EGC) FROM THE INVERTER GROUND BAR TO RACK ON ADJOINING ROW. EGC SHALL BE RUN WITH ASSOCIATED STRING FEEDERS.
2. PROVIDE #8 COPPER (FEEDER B) EQUIPMENT GROUND CONDUCTOR (EGC) FROM INVERTER GROUND BUS BAR TO ASSOCIATED DISTRIBUTION PANEL BOARD. EGC SHALL BE RUN IN CONDUIT WITH ASSOCIATED AC OUTPUT CONDUCTORS.
3. PROVIDE #1 ALUMINIUM (FEEDER C) EQUIPMENT GROUND CONDUCTOR (EGC) FROM PV DISTRIBUTION PANEL INVERTER TO PV MAIN DISTRIBUTION PANEL BOARD. EGC SHALL BE RUN IN CONDUIT WITH ASSOCIATED AC OUTPUT CONDUCTORS.
4. PROVIDE ARRAY GROUNDING ELECTRODE THE LENGTH OF ARRAY.
5. PROVIDE #6 BARE COPPER (FEEDER L) BONDING JUMPER VIA IRREVERSIBLE CRIMP FROM ARRAY SUPPLEMENTAL GROUNDING CONDUCTOR IN TRENCH TO POST OF RACKING. IRREVERSIBLE CRIMP SHALL BE UL LISTED FOR GROUNDING AND BONDING. ENSURE ALL CONNECTIONS ARE TORQUED TO MANUFACTURER'S SPECIFICATIONS.
6. PROVIDE #6 BARE COPPER (FEEDER L) BONDING JUMPER VIA IRREVERSIBLE CRIMP FROM ARRAY SUPPLEMENTAL GROUNDING CONDUCTOR IN TRENCH TO THE INVERTER AND DISTRIBUTION PANEL BOARD MOUNTING STRUCTURE. IRREVERSIBLE CRIMP SHALL BE UL LISTED FOR GROUNDING AND BONDING.
7. GROUNDING STRAP FROM THE GEAR RACK TO THE POST PROVIDED BY RACKING MANUFACTURER.
8. THE GEAR BOX COUPLES TO THE TORQUE TUBE THROUGH MECHANICAL MEANS WHICH CREATES A PROPER GROUNDING CONNECTION. THE SOLAR MODULES AND THE TORQUE TUBE ARE GROUNDED BY MEANS OF INTEGRATED GROUNDING CLIPS ON THE MODULE CLAMP.
9. BOND ARRAY GROUNDING ELECTRODE VIA IRREVERSIBLE CRIMP.

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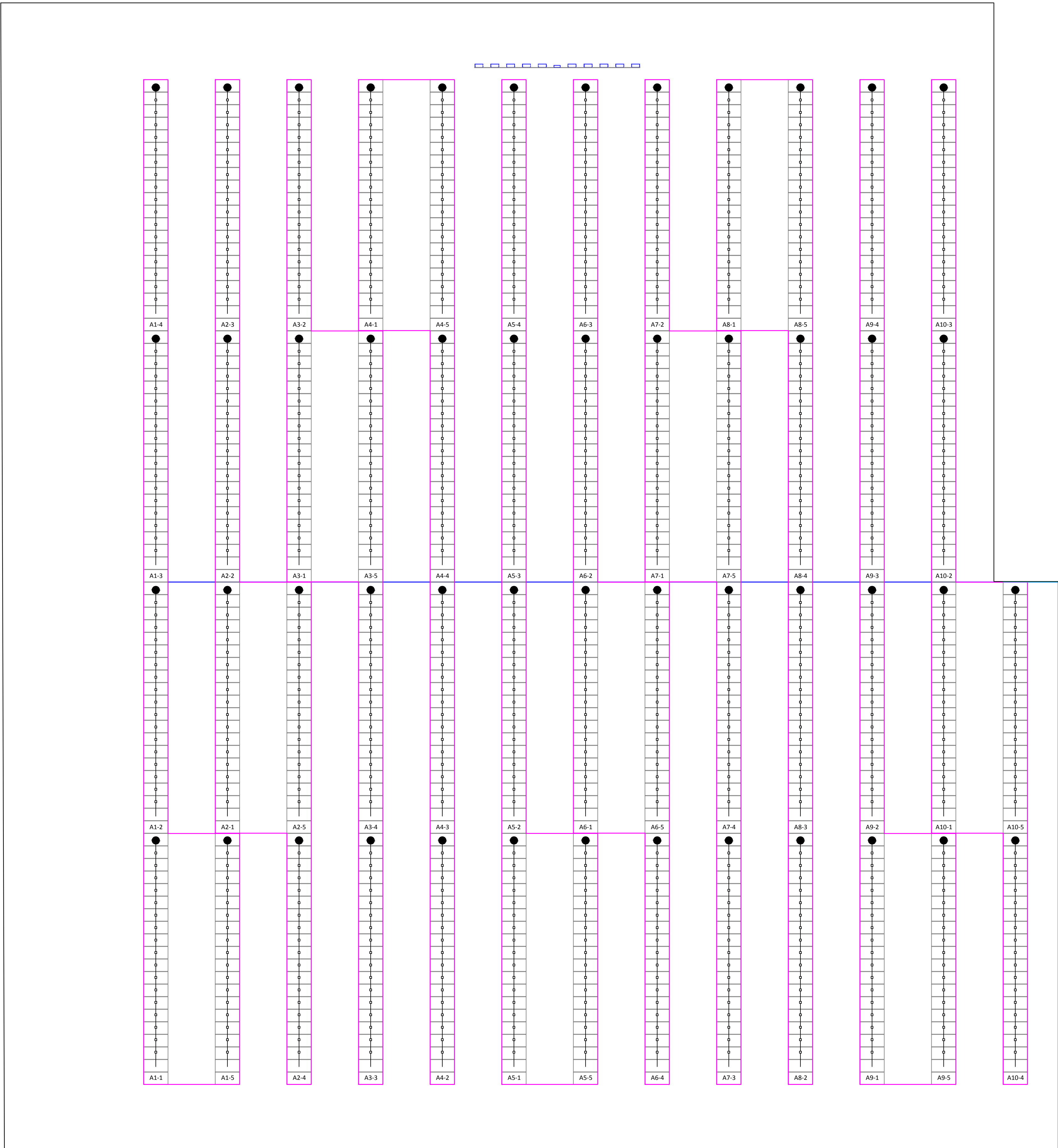


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REV DATE DESCRIPTION

TITLE: SITE PLAN - GROUNDING
PROJECT: NRECA
SUNDA REFERENCE DESIGN
1,000KWac, 1,000Vdc, SINGLE AXIS TRACKER

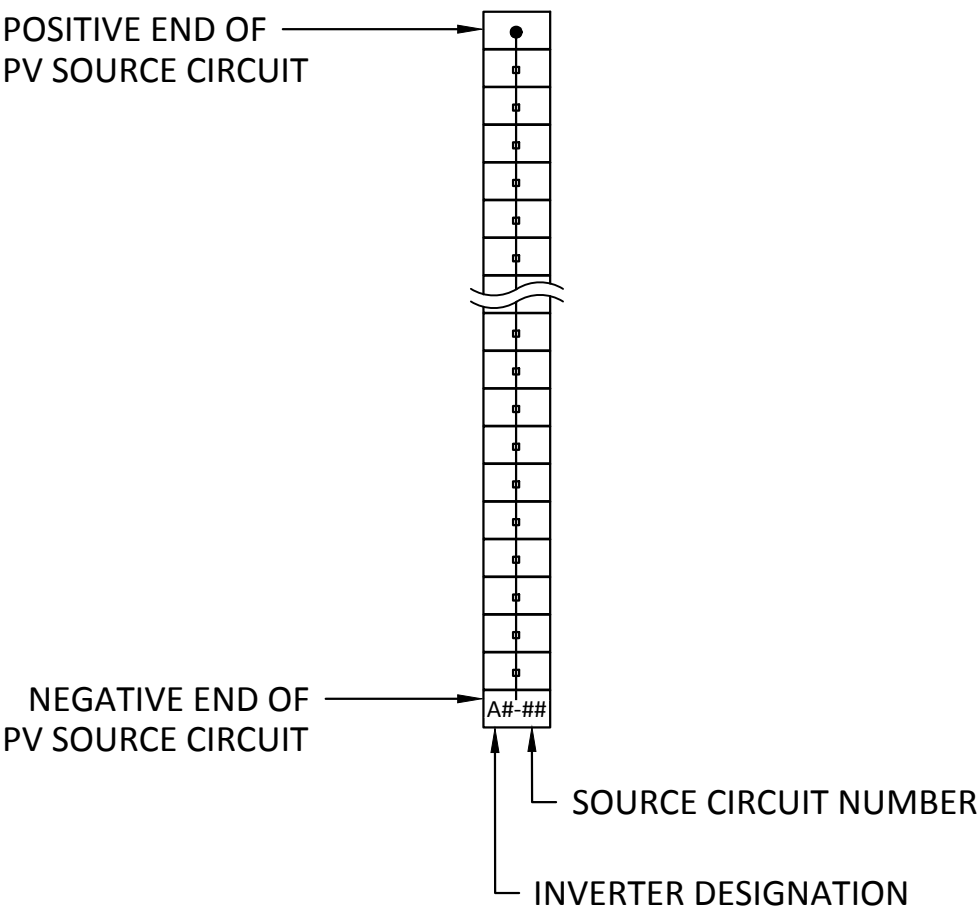
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SHEET: PV2.7



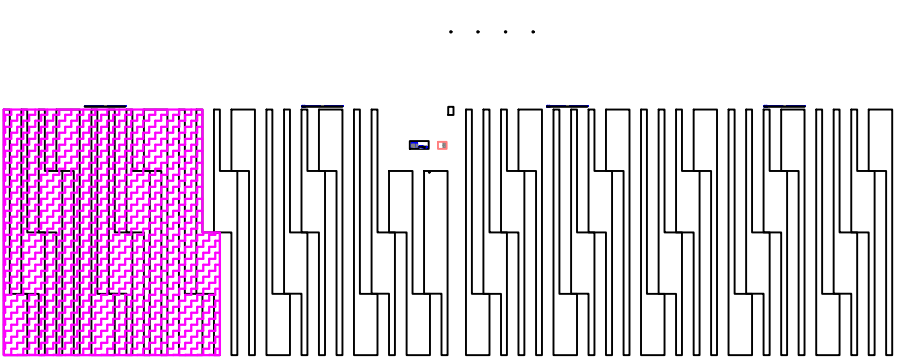
1 PARTIAL PLAN - STRINGING LAOUT PV_A
SCALE: 1/16"=1'-0"

GENERAL NOTES:

1. EACH STRING SHALL BE LABELED AS DESIGNATED WITH SHRINK TUBE.
2. LABELS SHALL BE LOCATED AT CONNECTOR ON BOTH POSITIVE AND NEGATIVE SIDES, AND AT THE CONNECTOR BOX.



2 TYPICAL ONE STRING DETAIL
SCALE: NONE



KEY PLAN - OVERALL ARRAY

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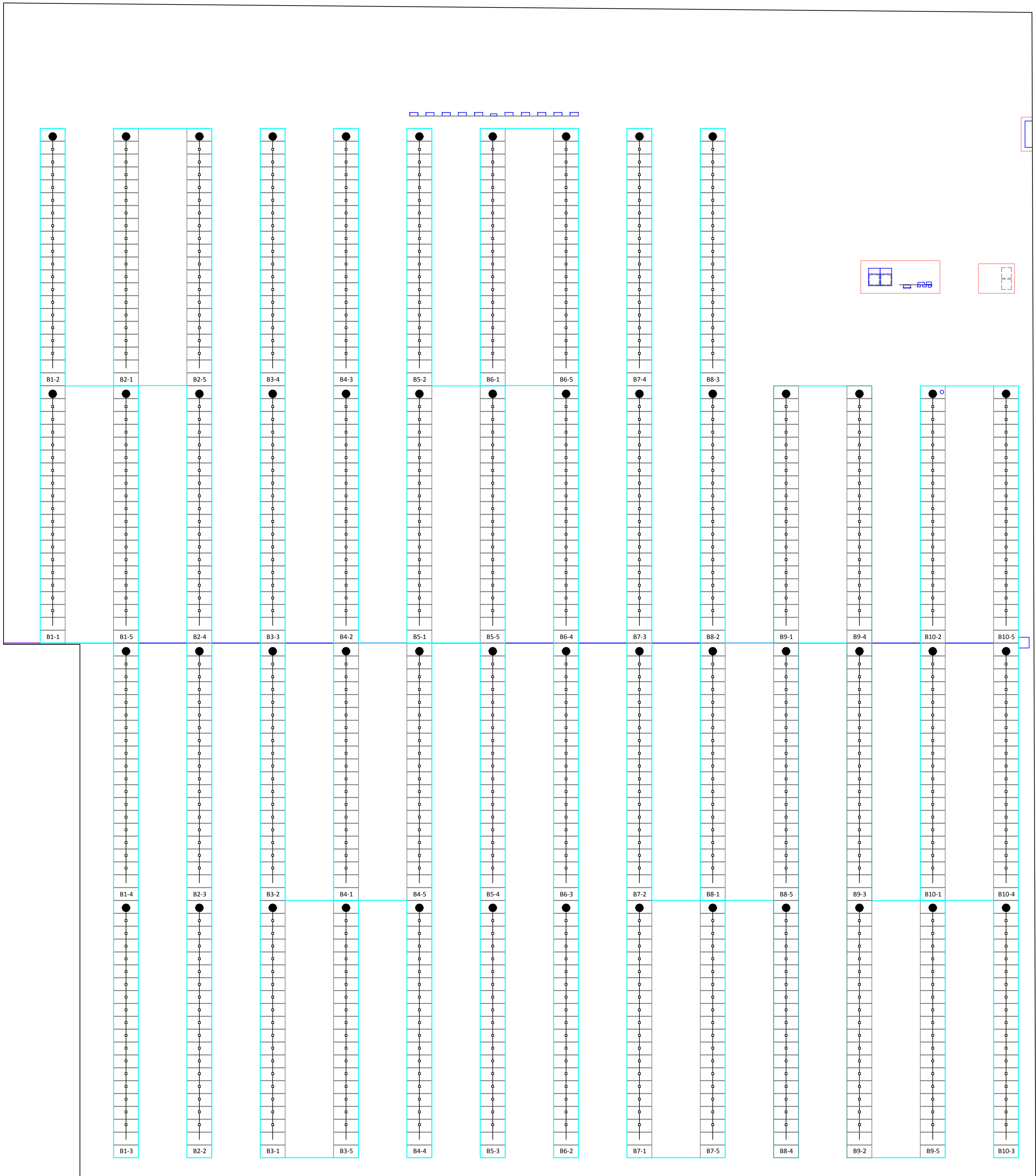
REV	DATE	DESCRIPTION

TITLE: PARTIAL PLAN - STRING LAYOUT PV_A

PROJECT: NRECA
SUNDA REFERENCE DESIGN
1,000KWac, 1,000Vdc, SINGLE AXIS TRACKER

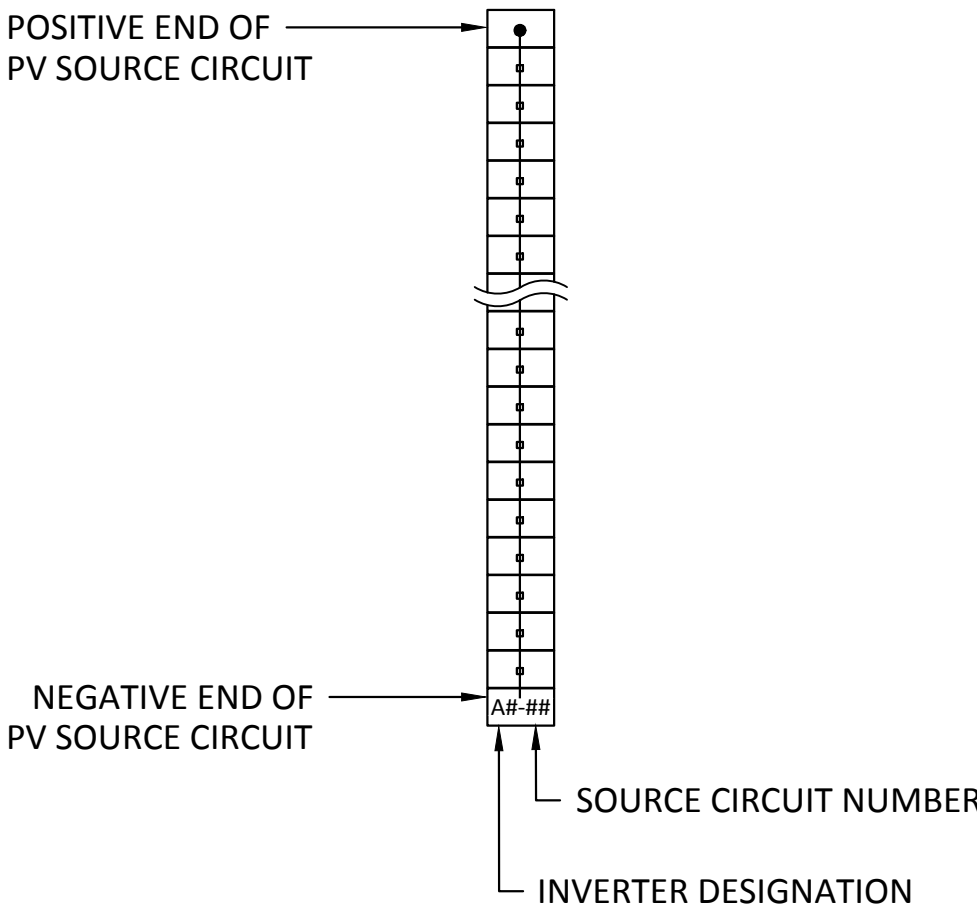
DATE: 10.21.2016
SHEET: PV3.0

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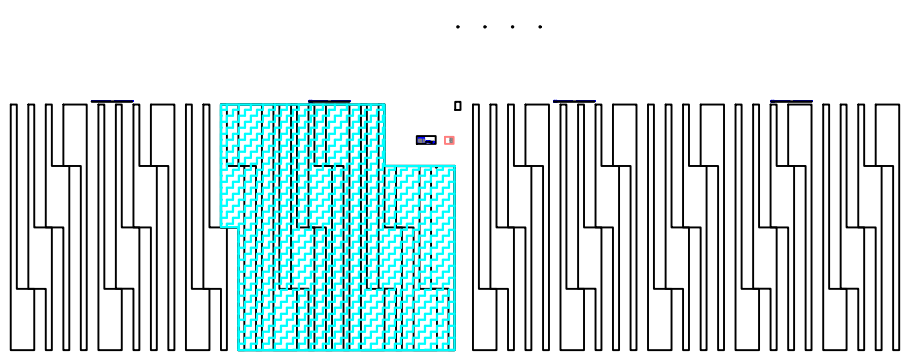


1 PARTIAL PLAN - STRINGING LAOUT PV_B
SCALE: 1/16"=1'-0"

- GENERAL NOTES:
1. EACH STRING SHALL BE LABELED AS DESIGNATED WITH SHRINK TUBE.
 2. LABELS SHALL BE LOCATED AT CONNECTOR ON BOTH POSITIVE AND NEGATIVE SIDES, AND AT THE CONNECTOR BOX.



2 TYPICAL ONE STRING DETAIL
SCALE: NONE



KEY PLAN - OVERALL ARRAY

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REV	DATE	DESCRIPTION

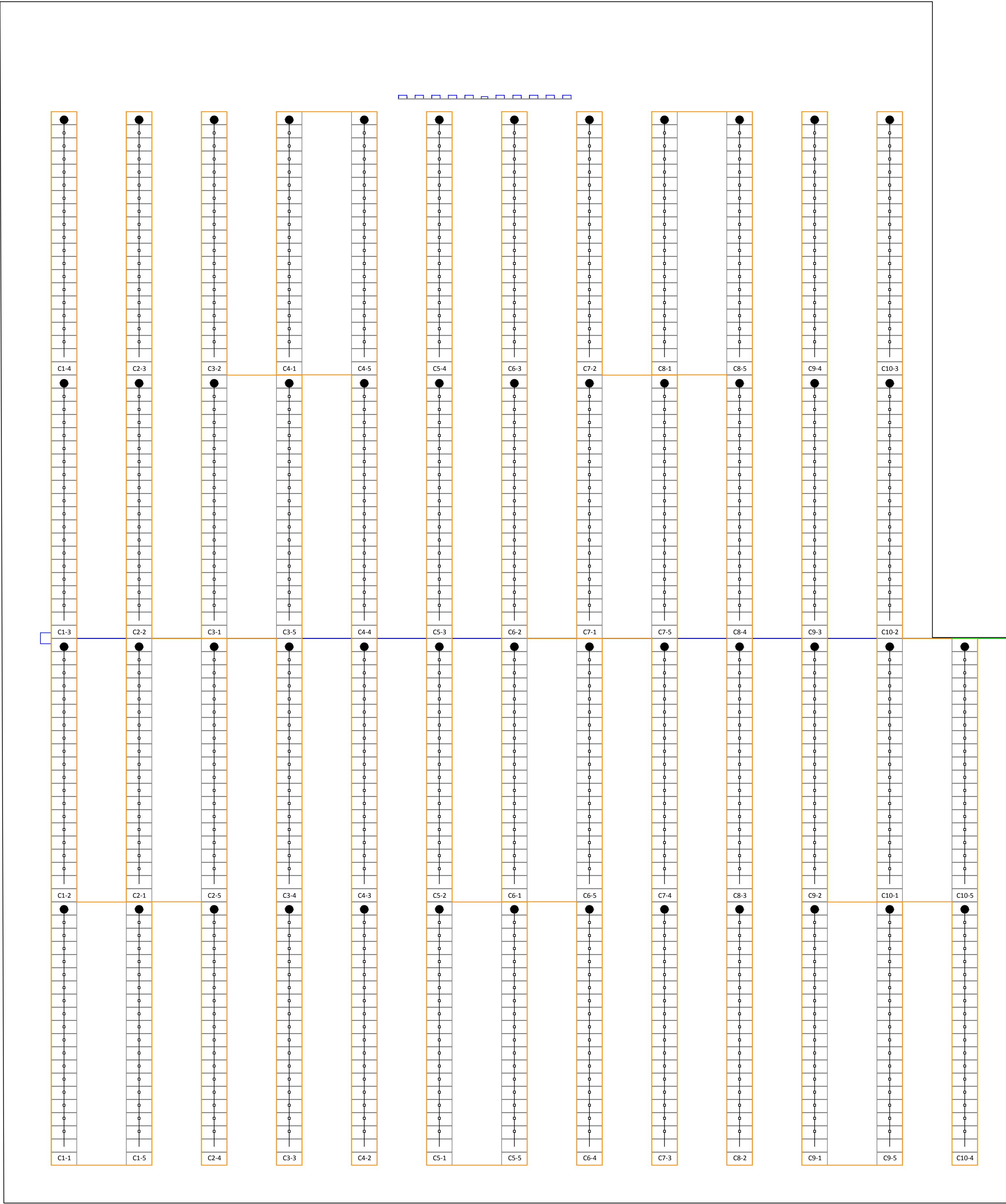
TITLE: PARTIAL PLAN - STRING LAYOUT PV_B

PROJECT: NRECA
SUNDA REFERENCE DESIGN
1,000KWac, 1,000Vdc, SINGLE AXIS TRACKER

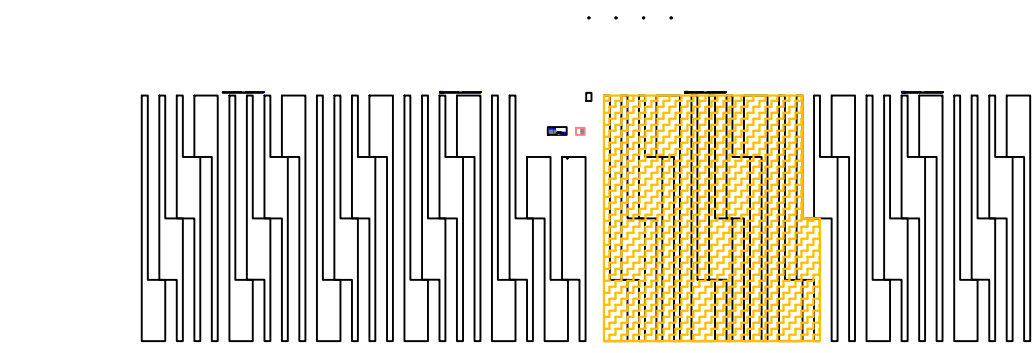
DATE: 10.21.2016

SHEET: PV3.1

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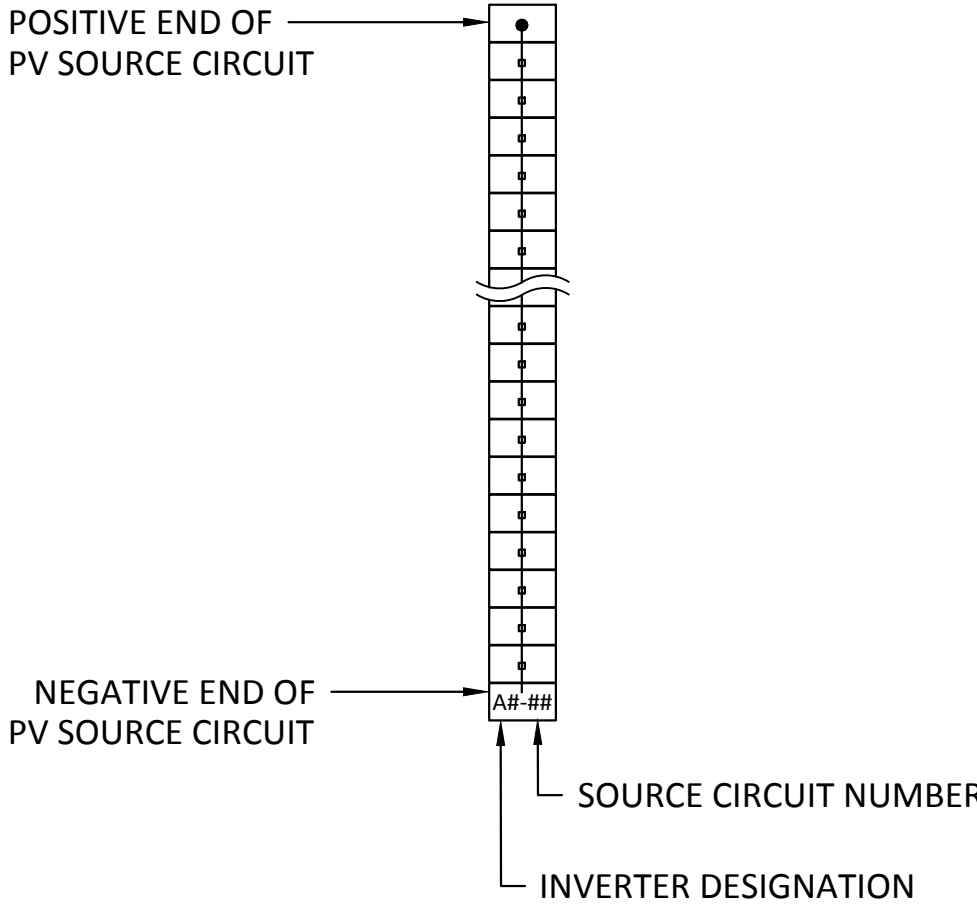


1 PARTIAL PLAN - STRINGING LAOUT PV_C
SCALE: 1/16"=1'-0"



KEY PLAN - OVERALL ARRAY

- GENERAL NOTES:
1. EACH STRING SHALL BE LABELED AS DESIGNATED WITH SHRINK TUBE.
 2. LABELS SHALL BE LOCATED AT CONNECTOR ON BOTH POSITIVE AND NEGATIVE SIDES, AND AT THE CONNECTOR BOX.

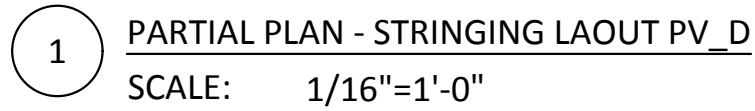


2 TYPICAL ONE STRING DETAIL
SCALE: NONE

REV	DATE	DESCRIPTION

TITLE:	PARTIAL PLAN - STRING LAYOUT PV_C
PROJECT:	NRECA SUNDA REFERENCE DESIGN 1,000kWac, 1,000Vdc, SINGLE AXIS TRACKER

DATE:	10.21.2016
SHEET:	PV3.2



2 TYPICAL ONE STRING DETAIL
SCALE: NONE



LINE TYPE LEGEND:

CONCRETE PAD	<div></div>
EQUIPMENT	<div></div>
PROVIDED BY MANUFACTURER/ OTHERS	<div></div>
CONDUIT WINDOW	<div></div>
AC FEEDERS	<div></div>
MEDIUM VOLTAGE FEEDERS	<div></div>

KEYED NOTES: ⚠

1. REPRESENTS GPS, WIND STOW SWITCH, SITE DATA AND 4X CONTROLLER LEFT TO RIGHT.

EQUIPMENT SCHEDULE **EQUIPMENT IS NOTED BY ⚠				
TAG	DESCRIPTION	QUANTITY	MANUFACTURER	NOTES
1	SOLAR PV MODULE	4,000	REC	315 WATT MODULE REFER TO MODULE SCHEDULE FOR SPECIFICATION. MODULES SHALL BE LABELED PER NEC 690 VI
2	INVERTER	40	SCHNEIDER_ELECTRIC	25 KWATT, 3PHASE 480 VOLT (REFER TO INVERTER RATING SCHEDULE FOR SPECIFICATION)
3A-3D	PV DISTRIBUTION PANEL	1	SQUARE-D	PV DISTRIBUTION PANEL, 400 AMP BUS MAIN LUG ONLY. REFER TO PANEL SCHEDULE FOR ADDITIONAL SPECIFICATIONS.
4	PV_MDP	1	SQUARE-D	PV DISTRIBUTION PANEL, 1,600 AMP BUS WITH 1,600A MAIN CIRCUIT BREAKER. REFER TO PANEL SCHEDULE FOR ADDITIONAL SPECIFICATIONS.
5	MEDIUM VOLTAGE TRANSFORMER	1	ABB	1000 KVA, THREE PHASE, 12.47/7.2 KV YGRND PRIMARY, 480/277V YGRND SECONDARY. LIQUID COOLED, BAYONET FUSES ON PRIMARY SIDE.
6	DISCONNECT FOR AUXILIARY POWER PANEL	1	SQUARE-D	30 AMP 3 POLE FUSED DISCONNECT WITH (3) 15 AMP FUSES, NEMA 3R. PROVIDE STICKER LABEL TO BE VISIBLE WHEN FUSE IS REMOVED TO READ "MAX 15A".
7	5 KVA DISTRIBUTION TRANSFORMER	1	DONGAN	THREE PHASE GENERAL PURPOSE DRY TYPE TRANSFORMER, PRIMARY VOLTS 480 VAC, SECONDARY VOLTS 208/120 VAC, NEMA 3R ENCAPSULATED ENCLOSURE
8	AUXILIARY POWER PANEL	1	SQUARE-D	AUXILARY PANEL BOARD, 100 AMP BUS WITH 20 AMP MAIN CIRCUIT BREAKER. REFER TO PANEL SCHEDULE FOR ADDITIONAL SPECIFICATIONS.
9	SURGE PROTECTION DEVICE	1	SQUARE-D	NEMA 4X RATING, INTEGRATED OVER CURRENT PROTECTION, MOUNTED DIRECTLY TO ENCLOSURE OF EQUIPMENT, MANUFACTURER PROVIDED INSTALLATION MANUAL SHALL BE FOLLOWED <u>EXACTLY</u>
10	RECEPTACLE	1	PASS & SEYMOUR	120V, 20 AMP, WEATHER PROOF GFI DUPLEX RECEPTACLE.
11	PV MONITORING SWITCH	1	NETGEAR	SERIAL TO ETHERNET NETWORK SWITCH, PROVIDE IN NEMA 3R ENCLOSURE.
12	PV MONITORING SYSTEM	1	DRAKER	CENTRAL DATA ACQUISITION UNIT, NEMA 3R ENCLOSURE, LOCAL DATA STORAGE, INTEGRAL ETHERNET COMMUNICATIONS , WEB BASED DISPLAY AND LOCAL KEYPAD DISPLAY, PROVIDE 120V 1ϕ POWER SUPPLY
13	PV METEOROLOGICAL STATION	1	DRAKER	STATION INCLUDES: PLANE OF ARRAY PYRANOMETER, GLOBAL HORIZONTAL IRRADIANCE PYRANOMETER, BACK OF MODULE TEMPERATURE SENSOR, AMBIENT TEMPERATURE, AND WIND SENSORS
14	MONITORING METER	1	SHARK 100	REVENUE GRADE METER IN NEMA 3R ENCLOSURE
15	MEDIUM VOLTAGE SWITCH	1	S&C	15KV PAD MOUNTED SWITCH WITH INTEGRATED 60A STANDARD SPEED FUSES.
16	COORDINATED POLE MOUNTED SWITCH	1	ABB	SWITCH TO MEET THE REQUIREMENT OF THE UTILITY
17	GROUND ROD	6	HARGER OR EQUAL	3/4" DIAMETER, 10'-0" LONG COPPER CLAD GROUND ROD
18	ATI RACKING ACCESSORIES	1	ATI	TO BE PROVIDED WITH ATI RACKING. INCLUDES (1) 4X CONTROLLER UNIT, (2) TRACKER MOTOR, (1) SITE DATA, (1) GPS AND (1) WIND STOW SWITCH

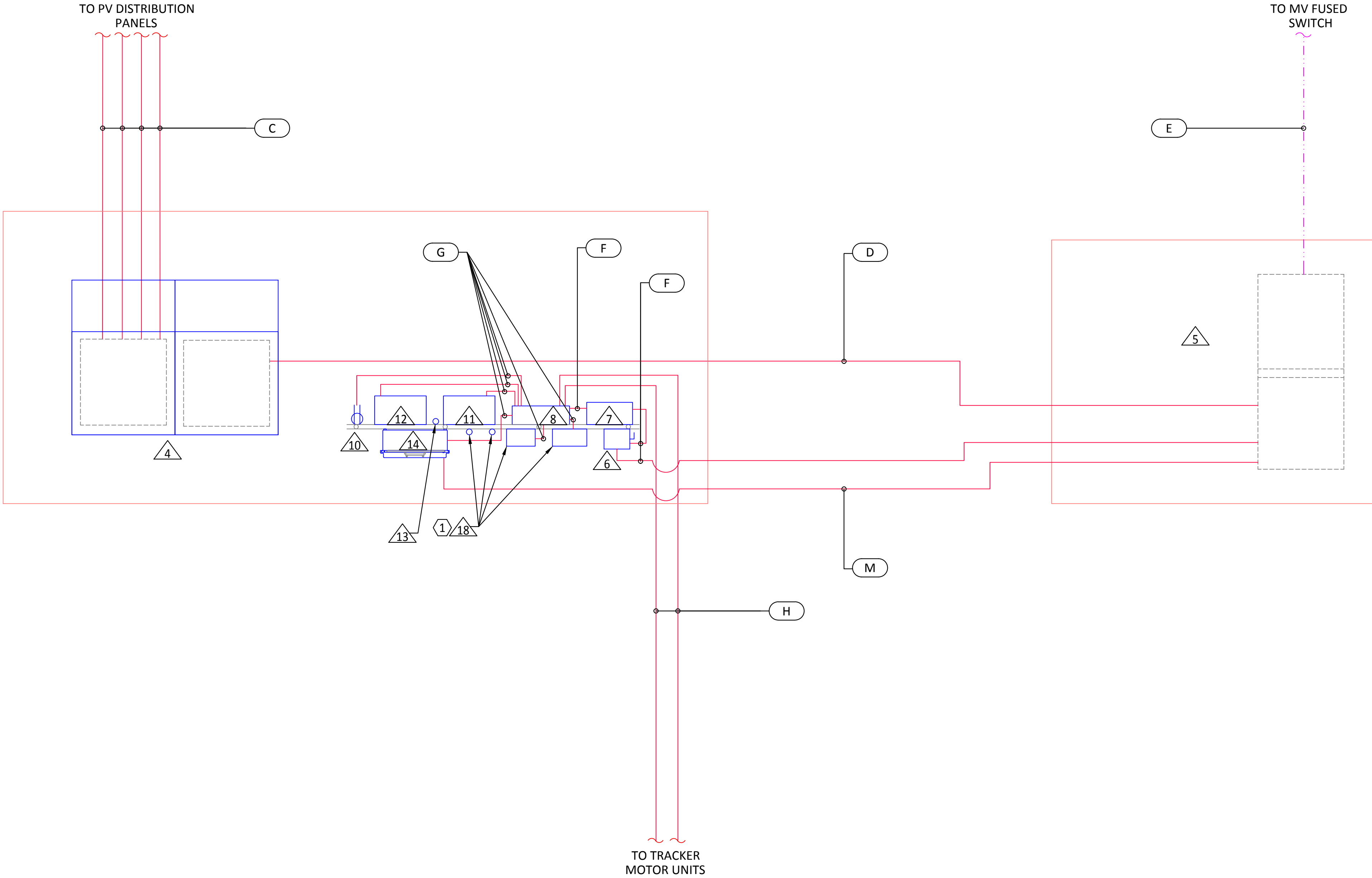
EQUIPMENT SCHEDULE NOTES:

1. SPECIFIED MANUFACTURE OR EQUIVALENT SHALL BE PROVIDED.

FEEDER SCHEDULE **FEEDER IS NOTED BY										A			
TAG	PHASE				NEUTRAL		GROUND		INSULATION	RACEWAY SIZE			
A	(1) SET OF	#NOTE1	(2) - (10)	#10	COPPER		(1)	#10	COPPER	PV	1-1/2"		
B	(1) SET OF		(3)	#8	COPPER	(1)	#8	COPPER		THWN-2	1"		
C	(2) SET OF		(3)	250 KCMIL	ALUMINUM	(1)	250 KCMIL	ALUMINUM	(1)	#1	ALUMINUM	THWN-2	2-1/2"
D	(6) SET OF		(3)	500 KCMIL	ALUMINUM	(1)	500 KCMIL	ALUMINUM	(1)	350 KCMIL	ALUMINUM	THWN-2	3-1/2"
E	NOTE#6	(1) SET OF	(3)	#1/0	ALUMINUM					MV TR-XLPE WITH CONCENTRIC NEUTRAL	4"		
F	(1) SET OF		(3)	#12	COPPER	(1)	#12	COPPER	(1)	#12	COPPER	THWN-2	3/4"
G	(1) SET OF		(1)	#12	COPPER	(1)	#12	COPPER	(1)	#12	COPPER	THWN-2	3/4"
H	(1) SET OF		(2)	#12	COPPER				(1)	#12	COPPER	THWN-2	3/4"
I	RS-485: BELDEN 3107A										3/4"		
J	PROVIDED BY DRAKER										3/4"		
K	CONTROL WIRES PROVIDED BY ATI										3/4"		
L							(1)	#6	COPPER		BARE		
M	(1) SET OF		(7)	#12	COPPER						THWN-2	3/4"	
N	CAT5E OR CAT6 ETHERNET CABLE: BELDEN 7937A OR EQUIVALENT										3/4"		
O							(1)	#3/0	COPPER		BARE		

FEEDER SCHEUDLE NOTES:

1. (#) - DENOTES QUANTITY OF DC PHASE WIRES TO BE PROVIDED.
2. WHERE MULTIPLE CONDUITS ARE NOTED, THE RACEWAYS SHALL BE PROVIDED IN PARALLEL.
3. REFER TO RACEWAY APPLICATION SCHEDULE FOR RACEWAY TYPE.
4. ALL RACEWAY SIZES ARE NEC MINIMUM REQUIREMENTS, LARGER CONDUITS ARE PERMITTED FOR EASE OF INSTALLATION.
5. PV SOURCE CIRCUITS SHALL NOT BE REQUIRED TO BE IN RACEWAY IF CONDUCTORS ARE NOT READILY ACCESSIBLE AND NOT EXPOSED TO PHYSICAL DAMAGE. BELOW GRADE PV SOURCE CIRCUITS SHALL BE IN RACEWAY.
6. PROVIDE 15KV RATED MEDIUM VOLTAGE FEEDERS WITH 100% INSULATION.



1 PARTIAL PLAN - EQUIPMENT PAD AC FEEDER ROUTING
SCALE: 1/2"=1'-0"

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REV	DATE	DESCRIPTION

TITLE: PARTIAL PLAN-EQUIPMENT PAD AC FEEDER ROUTING

PROJECT: NRECA
SUNDA REFERENCE DESIGN
1,000KWac, 1,000Vdc, SINGLE AXIS TRACKER

DATE: 10.21.2016

SHEET: PV4.1

LINE TYPE LEGEND:	
CONCRETE PAD	
EQUIPMENT	
PROVIDED BY MANUFACTURER/ OTHERS	
CONDUIT WINDOW	
COMMUNICATIONS	

KEYED NOTES: ⚡

1. REPRESENTS GPS, WIND STOW SWITCH, SITE DATA AND 4X CONTROLLER LEFT TO RIGHT.

EQUIPMENT SCHEDULE **EQUIPMENT IS NOTED BY ⚡				
TAG	DESCRIPTION	QUANTITY	MANUFACTURER	NOTES
1	SOLAR PV MODULE	4,000	REC	315 WATT MODULE REFER TO MODULE SCHEDULE FOR SPECIFICATION. MODULES SHALL BE LABELED PER NEC 690 VI
2	INVERTER	40	SCHNEIDER_ELECTRIC	25 KWATT, 3PHASE 480 VOLT (REFER TO INVERTER RATING SCHEDULE FOR SPECIFICATION)
3A-3D	PV DISTRIBUTION PANEL	1	SQUARE-D	PV DISTRIBUTION PANEL, 400 AMP BUS MAIN LUG ONLY. REFER TO PANEL SCHEDULE FOR ADDITIONAL SPECIFICATIONS.
4	PV_MDP	1	SQUARE-D	PV DISTRIBUTION PANEL, 1,600 AMP BUS WITH 1,600A MAIN CIRCUIT BREAKER. REFER TO PANEL SCHEDULE FOR ADDITIONAL SPECIFICATIONS.
5	MEDIUM VOLTAGE TRANSFORMER	1	ABB	1000 KVA, THREE PHASE, 12.47/7.2 KV YGRND PRIMARY, 480/277V YGRND SECONDARY. LIQUID COOLED, BAYONET FUSES ON PRIMARY SIDE.
6	DISCONNECT FOR AUXILIARY POWER PANEL	1	SQUARE-D	30 AMP 3 POLE FUSED DISCONNECT WITH (3) 15 AMP FUSES, NEMA 3R. PROVIDE STICKER LABEL TO BE VISIBLE WHEN FUSE IS REMOVED TO READ "MAX 15A".
7	5 KVA DISTRIBUTION TRANSFORMER	1	DONGAN	THREE PHASE GENERAL PURPOSE DRY TYPE TRANSFORMER, PRIMARY VOLTS 480 VAC, SECONDARY VOLTS 208/120 VAC, NEMA 3R ENCAPSULATED ENCLOSURE
8	AUXILIARY POWER PANEL	1	SQUARE-D	AUXILARY PANEL BOARD, 100 AMP BUS WITH 20 AMP MAIN CIRCUIT BREAKER. REFER TO PANEL SCHEDULE FOR ADDITIONAL SPECIFICATIONS.
9	SURGE PROTECTION DEVICE	1	SQUARE-D	NEMA 4X RATING, INTEGRATED OVER CURRENT PROTECTION, MOUNTED DIRECTLY TO ENCLOSURE OF EQUIPMENT, MANUFACTURER PROVIDED INSTALLATION MANUAL SHALL BE FOLLOWED EXACTLY
10	RECEPTACLE	1	PASS & SEYMOUR	120V, 20 AMP, WEATHER PROOF GFI DUPLEX RECEPTACLE.
11	PV MONITORING SWITCH	1	NETGEAR	SERIAL TO ETHERNET NETWORK SWITCH, PROVIDE IN NEMA 3R ENCLOSURE.
12	PV MONITORING SYSTEM	1	DRAKER	CENTRAL DATA ACQUISITION UNIT, NEMA 3R ENCLOSURE, LOCAL DATA STORAGE, INTEGRAL ETHERNET COMMUNICATIONS , WEB BASED DISPLAY AND LOCAL KEYPAD DISPLAY, PROVIDE 120V 1ϕ POWER SUPPLY
13	PV METEOROLOGICAL STATION	1	DRAKER	STATION INCLUDES: PLANE OF ARRAY PYRANOMETER, GLOBAL HORIZONTAL IRRADIANCE PYRANOMETER, BACK OF MODULE TEMPERATURE SENSOR, AMBIENT TEMPERATURE, AND WIND SENSORS
14	MONITORING METER	1	SHARK 100	REVENUE GRADE METER IN NEMA 3R ENCLOSURE
15	MEDIUM VOLTAGE SWITCH	1	S&C	15KV PAD MOUNTED SWITCH WITH INTEGRATED 60A STANDARD SPEED FUSES.
16	COORDINATED POLE MOUNTED SWITCH	1	ABB	SWITCH TO MEET THE REQUIREMENT OF THE UTILITY
17	GROUND ROD	6	HARGER OR EQUAL	3/4" DIAMETER, 10'-0" LONG COPPER CLAD GROUND ROD
18	ATI RACKING ACCESSORIES	1	ATI	TO BE PROVIDED WITH ATI RACKING. INCLUDES (1) 4X CONTROLLER UNIT, (2) TRACKER MOTOR, (1) SITE DATA, (1) GPS AND (1) WIND STOW SWITCH

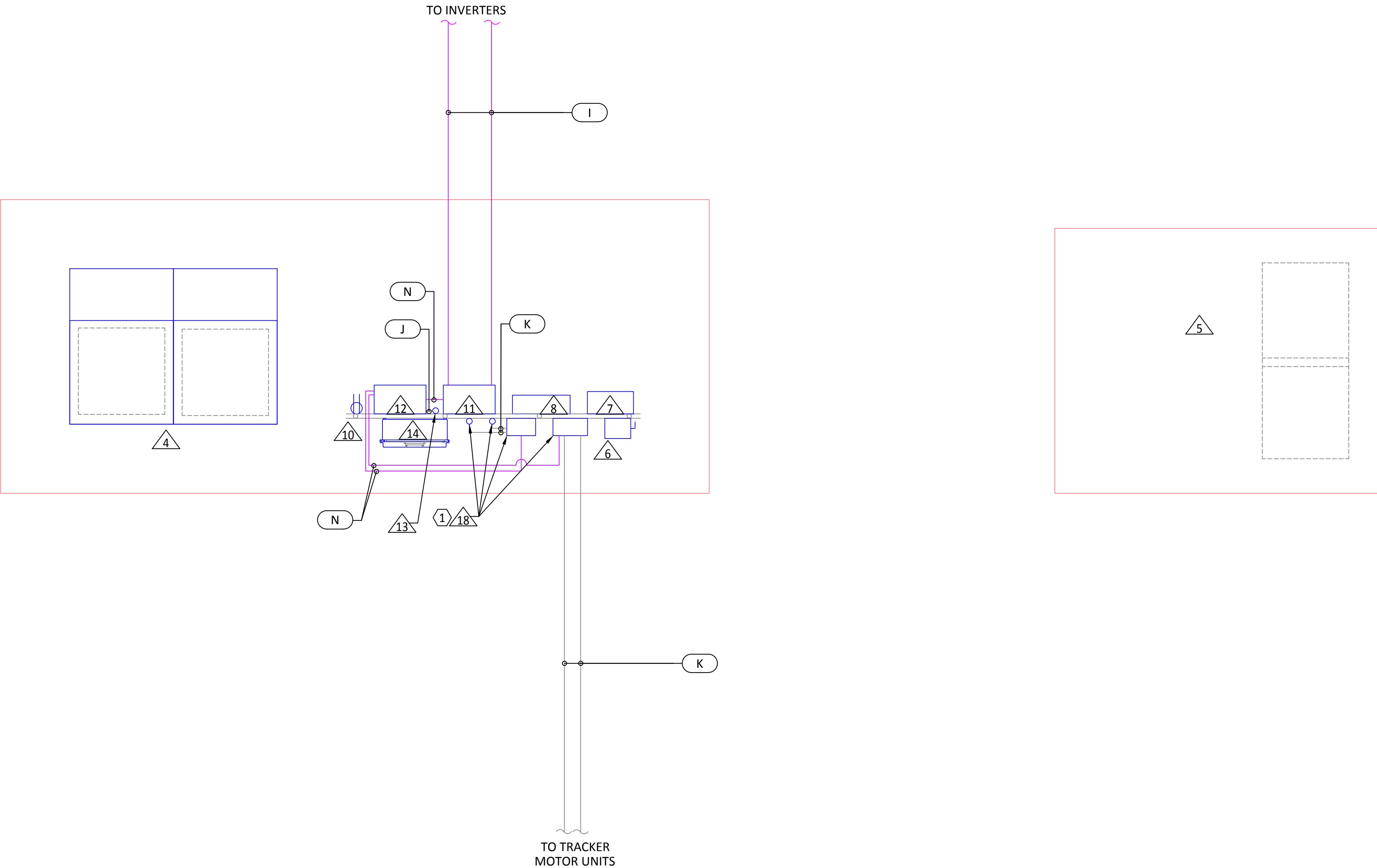
EQUIPMENT SCHEDULE NOTES:

1. SPECIFIED MANUFACTURE OR EQUIVALENT SHALL BE PROVIDED.

FEEDER SCHEDULE **FEEDER IS NOTED BY A									
TAG	PHASE				NEUTRAL		GROUND		INSULATION
A	(1) SET OF	#NOTE1	(2) - (10)	#10	COPPER		(1)	#10	COPPER
B	(1) SET OF	(3)	#8	COPPER	(1)	#8	COPPER	(1)	#8
C	(2) SET OF	(3)	250 KCMIL	ALUMINUM	(1)	250 KCMIL	ALUMINUM	(1)	#1
D	(6) SET OF	(3)	500 KCMIL	ALUMINUM	(1)	500 KCMIL	ALUMINUM	(1)	350 KCMIL
E	NOTE#6	(1) SET OF	(3)	#1/0	ALUMINUM				MV TR-XLPE WITH CONCENTRIC NEUTRAL
F	(1) SET OF	(3)	#12	COPPER	(1)	#12	COPPER	(1)	#12
G	(1) SET OF	(1)	#12	COPPER	(1)	#12	COPPER	(1)	#12
H	(1) SET OF	(2)	#12	COPPER			(1)	#12	COPPER
I	RS-485: BELDEN 3107A								3/4"
J	PROVIDED BY DRAKER								3/4"
K	CONTROL WIRES PROVIDED BY ATI								3/4"
L							(1)	#6	COPPER
M	(1) SET OF	(7)	#12	COPPER					THWN-2
N	CAT5E OR CAT6 ETHERNET CABLE: BELDEN 7937A OR EQUIVALENT								3/4"
O							(1)	#3/0	COPPER

FEEDER SCHEUDLE NOTES:

1. (#) - DENOTES QUANTITY OF DC PHASE WIRES TO BE PROVIDED.
2. WHERE MULTIPLE CONDUITS ARE NOTED, THE RACEWAYS SHALL BE PROVIDED IN PARALLEL.
3. REFER TO RACEWAY APPLICATION SCHEDULE FOR RACEWAY TYPE.
4. ALL RACEWAY SIZES ARE NEC MINIMUM REQUIREMENTS, LARGER CONDUITS ARE PERMITTED FOR EASE OF INSTALLATION.
5. PV SOURCE CIRCUITS SHALL NOT BE REQUIRED TO BE IN RACEWAY IF CONDUCTORS ARE NOT READILY ACCESSIBLE AND NOT EXPOSED TO PHYSICAL DAMAGE. BELOW GRADE PV SOURCE CIRCUITS SHALL BE IN RACEWAY.
6. PROVIDE 15KV RATED MEDIUM VOLTAGE FEEDERS WITH 100% INSULATION.



1

PARTIAL PLAN - EQUIPMENT PAD COMMUNICATIONS FEEDER ROUTING

SCALE: 1/2"=1'-0"

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THIS LINE SHOULD
MEASURE ONE INCH

REV

DATE

DESCRIPTION

TITLE:
PARTIAL PLAN-EQUIPMENT PAD COMMUNICATIONS FEEDER ROUTING

PROJECT:
NRECA
SUNDA REFERENCE DESIGN
1,000KWac, 1,000Vdc, SINGLE AXIS TRACKER

DATE:
10.21.2016

SHEET:
PV4.2

21 OF 24

LINE TYPE LEGEND:	
CONCRETE PAD	<div></div>
EQUIPMENT	<div></div>
PROVIDED BY MANUFACTURER/ OTHERS	<div></div>
CONDUIT WINDOW	<div></div>
GROUND FEEDERS	<div></div>

KEYED NOTES:

1. PROVIDE IRREVERSIBLE BOND TO GROUND RING.
2. REPRESENTS GPS, WIND STOW SWITCH, SITE DATA AND 4X CONTROLLER LEFT TO RIGHT.

EQUIPMENT SCHEDULE **EQUIPMENT IS NOTED BY <div></div>				
TAG	DESCRIPTION	QUANTITY	MANUFACTURER	NOTES
1	SOLAR PV MODULE	4,000	REC	315 WATT MODULE REFER TO MODULE SCHEDULE FOR SPECIFICATION. MODULES SHALL BE LABELED PER NEC 690 VI
2	INVERTER	40	SCHNEIDER_ELECTRIC	25 KWATT, 3PHASE 480 VOLT (REFER TO INVERTER RATING SCHEDULE FOR SPECIFICATION)
3A-3D	PV DISTRIBUTION PANEL	1	SQUARE-D	PV DISTRIBUTION PANEL, 400 AMP BUS MAIN LUG ONLY. REFER TO PANEL SCHEDULE FOR ADDITIONAL SPECIFICATIONS.
4	PV_MDP	1	SQUARE-D	PV DISTRIBUTION PANEL, 1,600 AMP BUS WITH 1,600A MAIN CIRCUIT BREAKER. REFER TO PANEL SCHEDULE FOR ADDITIONAL SPECIFICATIONS.
5	MEDIUM VOLTAGE TRANSFORMER	1	ABB	1000 KVA, THREE PHASE, 12.47/7.2 KV YGRND PRIMARY, 480/277V YGRND SECONDARY. LIQUID COOLED, BAYONET FUSES ON PRIMARY SIDE.
6	DISCONNECT FOR AUXILIARY POWER PANEL	1	SQUARE-D	30 AMP 3 POLE FUSED DISCONNECT WITH (3) 15 AMP FUSES, NEMA 3R. PROVIDE STICKER LABEL TO BE VISIBLE WHEN FUSE IS REMOVED TO READ "MAX 15A".
7	5 KVA DISTRIBUTION TRANSFORMER	1	DONGAN	THREE PHASE GENERAL PURPOSE DRY TYPE TRANSFORMER, PRIMARY VOLTS 480 VAC, SECONDARY VOLTS 208/120 VAC, NEMA 3R ENCAPSULATED ENCLOSURE
8	AUXILIARY POWER PANEL	1	SQUARE-D	AUXILARY PANEL BOARD, 100 AMP BUS WITH 20 AMP MAIN CIRCUIT BREAKER. REFER TO PANEL SCHEDULE FOR ADDITIONAL SPECIFICATIONS.
9	SURGE PROTECTION DEVICE	1	SQUARE-D	NEMA 4X RATING, INTEGRATED OVER CURRENT PROTECTION, MOUNTED DIRECTLY TO ENCLOSURE OF EQUIPMENT, MANUFACTURER PROVIDED INSTALLATION MANUAL SHALL BE FOLLOWED <u>EXACTLY</u>
10	RECEPTACLE	1	PASS & SEYMOUR	120V, 20 AMP, WEATHER PROOF GFI DUPLEX RECEPTACLE.
11	PV MONITORING SWITCH	1	NETGEAR	SERIAL TO ETHERNET NETWORK SWITCH, PROVIDE IN NEMA 3R ENCLOSURE.
12	PV MONITORING SYSTEM	1	DRAKER	CENTRAL DATA ACQUISITION UNIT, NEMA 3R ENCLOSURE, LOCAL DATA STORAGE, INTEGRAL ETHERNET COMMUNICATIONS , WEB BASED DISPLAY AND LOCAL KEYPAD DISPLAY, PROVIDE 120V 1 ϕ POWER SUPPLY
13	PV METEOROLOGICAL STATION	1	DRAKER	STATION INCLUDES: PLANE OF ARRAY PYRANOMETER, GLOBAL HORIZONTAL IRRADIANCE PYRANOMETER, BACK OF MODULE TEMPERATURE SENSOR, AMBIENT TEMPERATURE, AND WIND SENSORS
14	MONITORING METER	1	SHARK 100	REVENUE GRADE METER IN NEMA 3R ENCLOSURE
15	MEDIUM VOLTAGE SWITCH	1	S&C	15KV PAD MOUNTED SWITCH WITH INTEGRATED 60A STANDARD SPEED FUSES.
16	COORDINATED POLE MOUNTED SWITCH	1	ABB	SWITCH TO MEET THE REQUIREMENT OF THE UTILITY
17	GROUND ROD	6	HARGER OR EQUAL	3/4" DIAMETER, 10'-0" LONG COPPER CLAD GROUND ROD
18	ATI RACKING ACCESSORIES	1	ATI	TO BE PROVIDED WITH ATI RACKING. INCLUDES (1) 4X CONTROLLER UNIT, (2) TRACKER MOTOR, (1) SITE DATA, (1) GPS AND (1) WIND STOW SWITCH

EQUIPMENT SCHEDULE NOTES:
1. SPECIFIED MANUFACTURE OR EQUIVALENT SHALL BE PROVIDED.

FEEDER SCHEDULE **FEEDER IS NOTED BY												
A												
TAG	PHASE				NEUTRAL		GROUND		INSULATION	RACEWAY SIZE		
A	(1) SET OF	#NOTE1	(2) - (10)	#10	COPPER		(1)	#10	COPPER	PV	1-1/2"	
B	(1) SET OF	(3)		#8	COPPER		(1)	#8	COPPER	THWN-2	1"	
C	(2) SET OF	(3)	250	KCMIL	ALUMINUM		(1)	#1	ALUMINUM	THWN-2	2-1/2"	
D	(6) SET OF	(3)	500	KCMIL	ALUMINUM		(1)	350	KCMIL	ALUMINUM	THWN-2	3-1/2"
E	(1) SET OF	(3)	#1/0	ALUMINUM						MV TR-XLPE WITH CONCENTRIC NEUTRAL	4"	
F	(1) SET OF	(3)	#12	COPPER		(1)	#12	COPPER		THWN-2	3/4"	
G	(1) SET OF	(1)	#12	COPPER		(1)	#12	COPPER		THWN-2	3/4"	
H	(1) SET OF	(2)	#12	COPPER				(1)	#12	COPPER	THWN-2	3/4"
I	RS-485: BELDEN 3107A										3/4"	
J	PROVIDED BY DRAKER										3/4"	
K	CONTROL WIRES PROVIDED BY ATI										3/4"	
L							(1)	#6	COPPER	BARE		
M	(1) SET OF	(7)	#12	COPPER						THWN-2	3/4"	
N	CAT5E OR CAT6 ETHERNET CABLE: BELDEN 7937A OR EQUIVALENT										3/4"	
O							(1)	#3/0	COPPER	BARE		

FEEDER SCHEUDLE NOTES:

1. (#) - DENOTES QUANTITY OF DC PHASE WIRES TO BE PROVIDED.

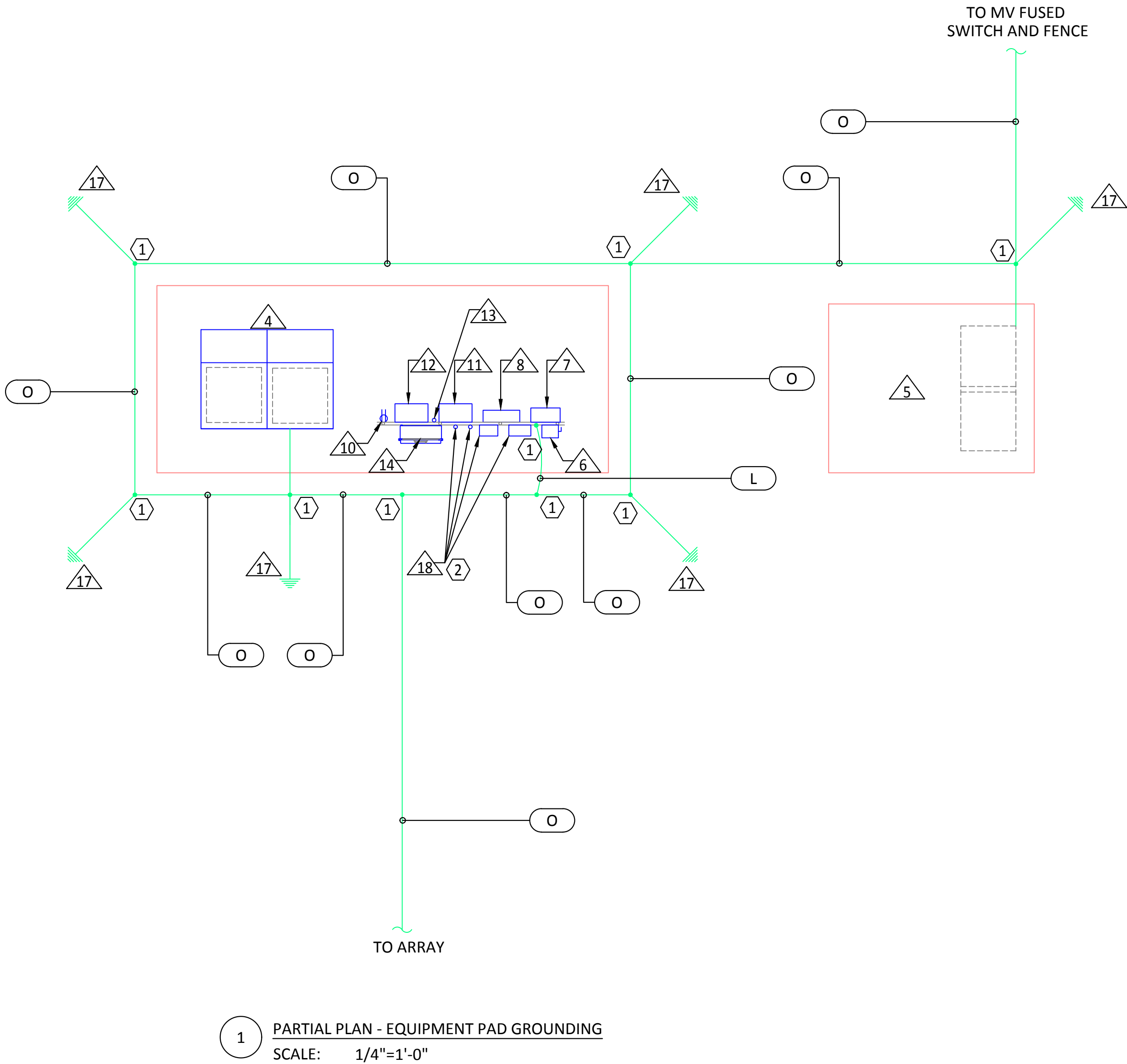
2. WHERE MULTIPLE CONDUITS ARE NOTED, THE RACEWAYS SHALL BE PROVIDED IN PARALLEL.

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4. ALL RACEWAY SIZES ARE NEC MINIMUM REQUIREMENTS, LARGER CONDUITS ARE PERMITTED FOR EASE OF INSTALLATION.

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6. PROVIDE 15KV RATED MEDIUM VOLTAGE FEEDERS WITH 100% INSULATION.



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TITLE:

PARTIAL PLAN-EQUIPMENT PAD GROUNDING

PROJECT:

NRECA
SUNDA REFERENCE DESIGN
1,000KWac, 1,000Vdc, SINGLE AXIS TRACKER

DATE:

10.21.2016

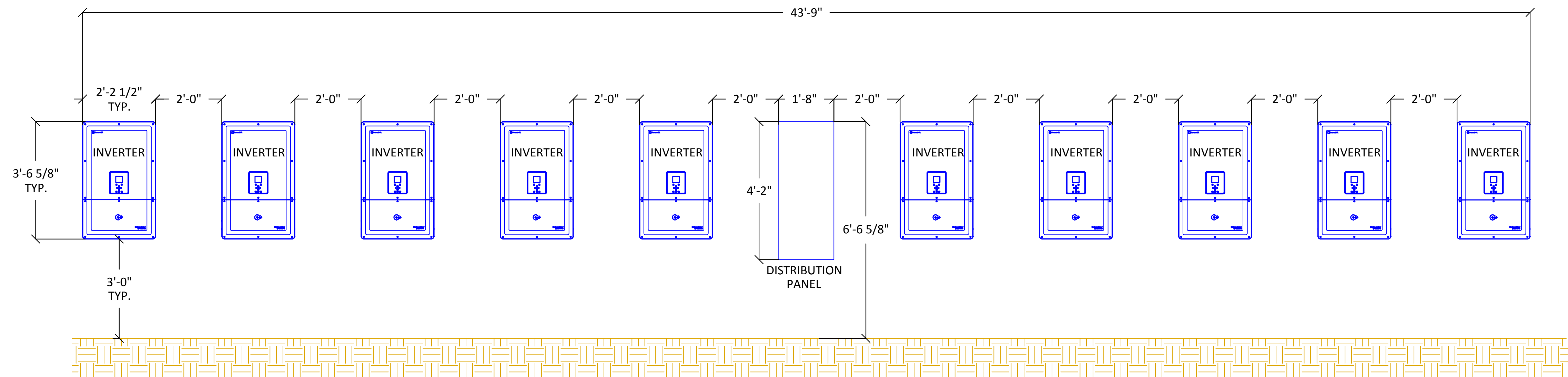
SHEET:

PV4.3

22 OF 24

GENERAL NOTES:

1. TYPICAL (10) INVERTERS AND (1) PV DISTRIBUTION PANEL ELEVATION APPLIES IN 4 UNIQUE LOCATIONS:
INVERTERS A1-A10 & PV_A INVERTERS B1-B10 & PV_B INVERTERS C1-C10 & PV_C AND INVERTERS D1-D10 & PV_D .



1 TYPICAL (10) INVERTERS AND (1) PV DISTRIBUTION PANEL ELEVATION
SCALE: NTS

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REV	DATE	DESCRIPTION

TITLE:	INVERTER MOUNTING DETAIL
PROJECT:	NRECA SUNDA REFERENCE DESIGN 1,000KWac, 1,000Vdc, SINGLE AXIS TRACKER

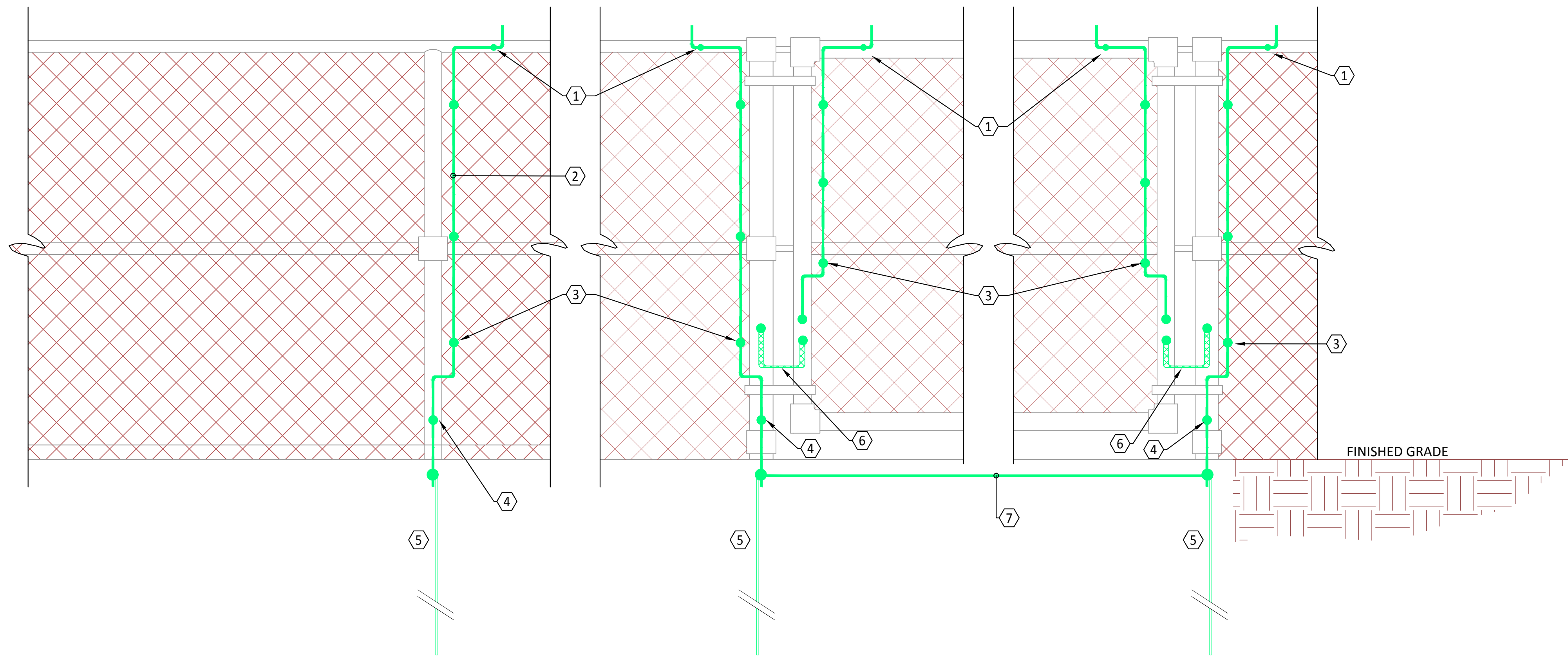
DATE: 10.21.2016
SHEET: PV5.0

GENERAL NOTES:

1. ALL FENCE GROUNDING POINTS SHALL BE LOCATED WITHIN FENCE PERIMETER.
2. GROUND CORNER POSTS AND ADDITIONAL POSTS AT 500' INTERVAL.
3. GROUND ALL GATE POSTS.

KEYED NOTES:

1. PROVIDE EXOTHERMIC WELD TO TOP RAIL.
2. #6 BARE COPPER WIRE, TYPICAL UNLESS NOTED OTHERWISE.
3. PROVIDE SPLIT BOLT TO CONNECT WIRE TO FENCE FABRIC.
4. PROVIDE EXOTHERMIC WELD TO FENCE POST.
5. 3/4" X 10' COPPER CLAD GROUND ROD BONDED TO BARE COPPER.
6. FLEXIBLE GROUND BRAID SECURED TO GATE.
7. GATES SHALL BE BONDED TOGETHER.



1 FENCE GROUNDING DETAIL
SCALE: NTS

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REV	DATE	DESCRIPTION

TITLE:	FENCE GROUNDING DETAIL
PROJECT:	NRECA SUNDA REFERENCE DESIGN 1,000KWac, 1,000Vdc, SINGLE AXIS TRACKER
DATE:	10.21.2016
SHEET:	PV5.1