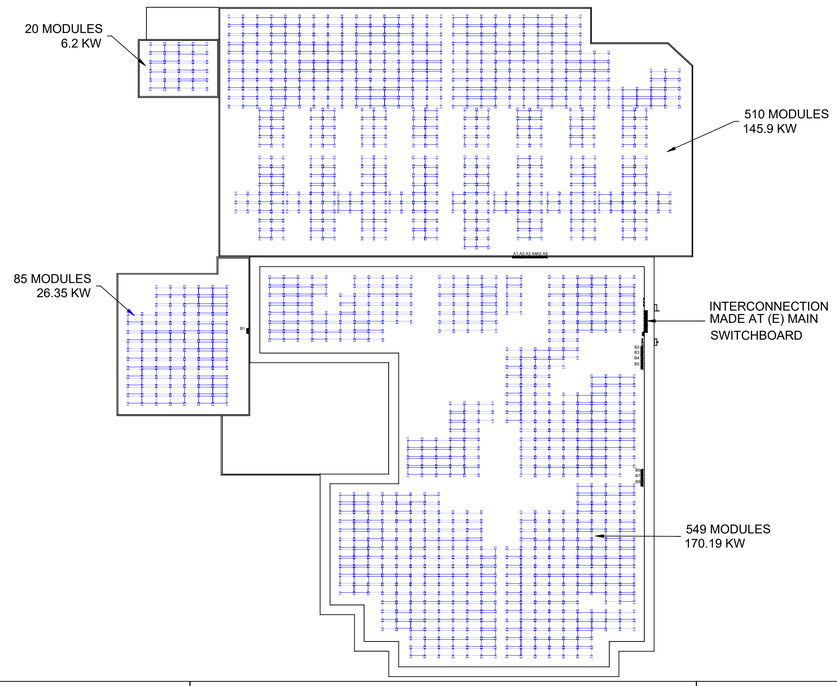
PROJECT NAME HERE
348.64 KWDC ROOF MOUNTED SOLAR POWER SYSTEM
STREET ADDRESS, CITY, STATE ZIPCODE

PROJECT INFORMATION

PROJECT DESCRIPTION:
PROPOSED INSTALLATION OF ROOF MOUNTED SOLAR ELECTRIC SYSTEM



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PROJECT TEAM

PROJECT DEVELOPER

SOLAR EPC CONTRACTOR

ELECTRICAL ENGINEER

STRUCTURAL ENGINEER

APPLICABLE CODES

BUILDING: 2013 CALIFORNIA BUILDING CODE

STRUCTURE: 2013 CALIFORNIA BUILDING CODE

MECHANICAL: 2013 CALIFORNIA MECHANICAL CODE

ELECTRICAL: 2013 CALIFORNIA ELECTRICAL CODE, (NEC 2011 NATIONAL ELECTRIC CODE)

FIRE/LIFE SAFETY: 2013 CALIFORNIA FIRE CODE & CALIFORNIA DEPARTMENT OF FORESTRY AND FIRE PROTECTION OFFICE OF THE STATE FIRE MARSHALL SOLAR PHOTOVOLTAIC INSTALLATION GUIDELINE, APRIL 22, 2008

ENERGY: 2013 STATE OF CALIFORNIA TITLE 24 ENERGY REGULATIONS

SCOPE OF WORK

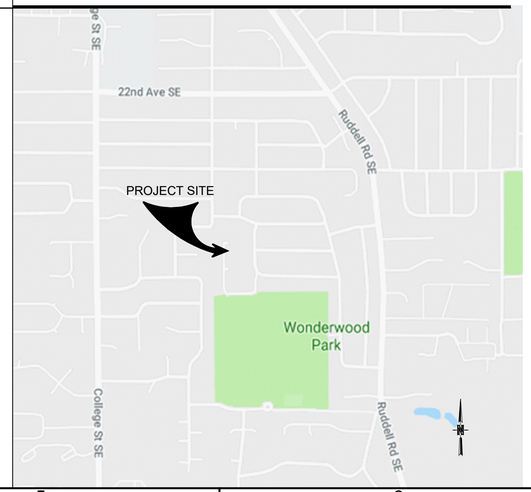
INSTALL 348.64 KWDC GRID-TIE PHOTOVOLTAIC SYSTEMS WITH PHOTOVOLTAIC MODULES AND STRING INVERTERS LOCATED ON ROOF. AC CONNECTIONS ARE MADE ON THE LOAD SIDE OF METER AT THE MAIN SWITCHBOARD.

THE MAJOR COMPONENTS OF THE SYSTEM CONSIST OF (920) CSUN 310-W & (244) CSUN 260W PV MODULES, BALLASTED PV MOUNTING SYSTEM, (14) SOLAREDGE 20KW /1000VDC:480VAC TRANSFORMER-LESS STRING INVERTERS, (1) NEMA-3R PANELBOARD, (1) VISIBLE BLADE AC DISCONNECT SWITCH, (1) SMUD METER SOCKET & (1) DATA ACQUISITION SYSTEM.

PV MODULES WILL BE INSTALLED ON A BALLASTED PV MOUNTING SYSTEM. THE MODULES WILL BE CONNECTED TO (14) INVERTERS AT MAXIMUM 980VDC. THE INVERTERS WILL LOCATED ON ROOF AND WILL BE CONNECTED TO A NEW DEDICATED 480VAC PANELBOARD. A 480V FEEDER WILL BE INSTALLED IN SURFACE CONDUIT ROUTED ALONG EXTERIOR WALL AND WILL CONNECT TO A NEW BREAKER IN THE MAIN SWITCHBOARD VIA THE VISIBLE AC DISCONNECT AND UTILITY CO. PRODUCTION METER.

SYSTEM MONITORING WILL BE PROVIDED VIA INTERNET CONNECTION. EQUIPMENT TO MONITOR INVERTER OUTPUT AND METROLOGICAL DATA WILL BE INSTALLED. METEOROLOGICAL STATION (MET) INCLUDES: IRRADIANCE METER, AMBIENT AND CELL TEMPERATURE SENSORS. THE MET STATION IS LOCATED ON THE ROOF.

VICINITY MAP



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PROJECT NUMBER:
00-000-0000

SHEET SIZE:
ARCH "D"
24" X 36" (610 x 914)

REV #	DESCRIPTION	DATE
REV-A	30% IFR	00/00/00

DATE:	00/00/00
DRAWN BY:	CAD
CHECKED BY:	PM
APPROVED BY:	EOR

SHEET NAME:
TITLE SHEET

SHEET NUMBER:
G-001

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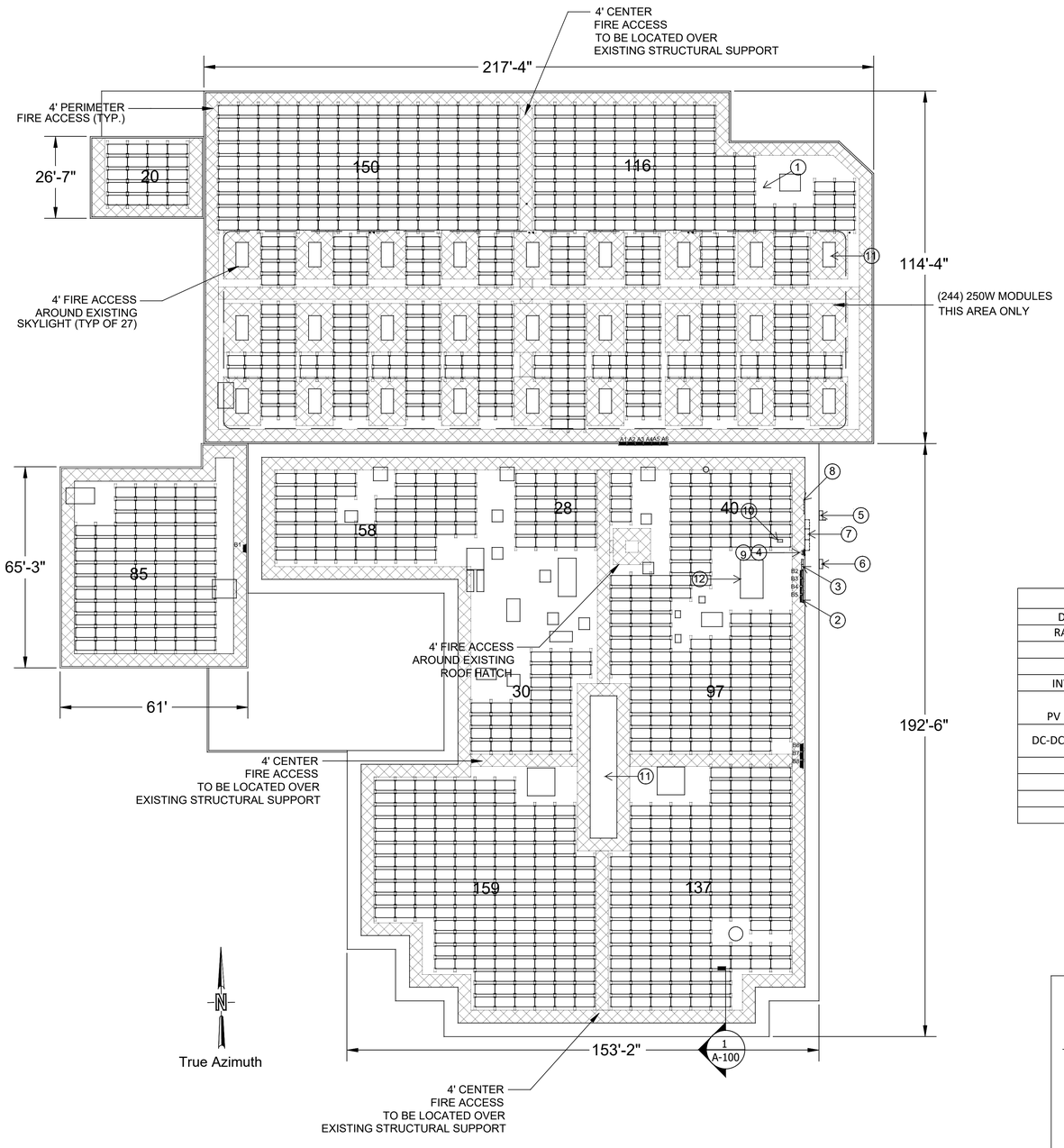
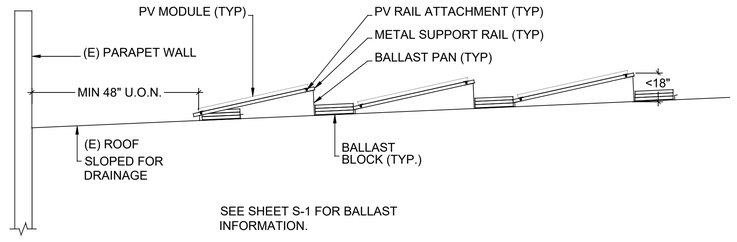


SYSTEM SUMMARY		
DEVICE	DESCRIPTION	QTY
RACKING	BALLASTED RACKING SYSTEM	1164
INVERTER	20KW SOLAREDGE	14
PV MODULE	CSUN-310	920
	CSUN-260	244
DC-DC CONVERTER	700 WATT POWER OPTIMIZER	463
	600 WATT POWER OPTIMIZER	124
	kWdc	348.64
	Kwac	280.00
	DC:AC RATIO:	1.25



SEE SHEET S-1 FOR BALLAST INFORMATION.

PLAN NOTES

1. ROOF MOUNTED PHOTOVOLTAIC MODULE ATTACHED TO KB RACKING BALLASTED SUPPORT SYSTEM. SEE MANUFACTURER'S INSTALLATION MANUAL FOR MORE INFORMATION. (TYP.)
2. SOLAREDGE INVERTER, MOUNTED TO PARAPET WALL (TYP)
3. 480V INVERTER BREAKER PANEL S1
4. DATA ACQUISITION SYSTEM
5. 480V VISIBLE BLADE AC PHOTOVOLTAIC DISCONNECT LOCATED NEXT TO (E) MSB
6. SOLAR PRODUCTION METER CABINET
7. (E) MAIN SWITCH BOARD LOCATED BEHIND OUTSIDE ROLL UP DOOR
8. EXISTING TELEPHONE BACKBOARD
9. METEOROLOGICAL STATION, MOUNTED TO PARAPET WALL, INSTALL HIGHER THAN NEAR-BY OBSTRUCTIONS
10. CELL TEMPERATURE SENSOR (WHEN REQUIRED BY CONTRACT)
11. (E) SKYLIGHT (TYP)
12. (E) ROOF MOUNTED MECHANICAL EQUIP. MAINTAIN SERVICE CLEARANCES (TYP.)

GENERAL NOTES

1. INSTALLING CONTRACTOR SHALL FIELD VERIFY ALL CONDITIONS, DIMENSIONS AND REQUIREMENTS PRIOR TO ORDERING EQUIPMENT OR PERFORMING ANY WORK .
2. NOTIFY ENGINEER OF ANY CONDITIONS WHICH WOULD AFFECT THE PERFORMANCE OF THE WORK IN ACCORDANCE WITH CONTRACT DRAWINGS AND SPECIFICATIONS.
3. REVIEW PATHWAY SETBACKS AND RACKING LAYOUT WITH FIRE INSPECTOR PRIOR TO INSTALLING MODULES.
4. ELECTRICAL EQUIPMENT SHALL BE FIRMLY SECURED TO THE SURFACE ON WHICH IT IS MOUNTED. NEC 110.13

2 A-100 ROOF PLAN
1" = 20'

1 A-100 PV MODULE ELEVATION
1/4" = 1'

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REV-A	30% IFR	00/00/00

DATE:	00/00/00
DRAWN BY:	CAD
CHECKED BY:	PM
APPROVED BY:	EOR

SHEET NAME: ROOF PLAN

SHEET NUMBER: G-100

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ELECTRICAL NOTES

GENERAL REQUIREMENTS

1. CONTRACTOR SHALL FURNISH ALL LABOR MATERIALS, SUPERVISION, TEMPORARY FACILITIES AND OTHER NECESSARY ITEMS AS REQUIRED TO COMPLETE THE WORK SPECIFIED TO PROVIDE A COMPLETE AND USABLE SYSTEM.

2. CONTRACTOR SHALL ASSUME FULL RESPONSIBILITY AND LIABILITY FOR COMPLIANCE WITH REGULATIONS PER FEDERAL OSHA AND LOCAL REGULATIONS PERTAINING TO WORK PRACTICES, PROTECTION OF WORKERS AND VISITORS TO THE SITE.

3. DRAWINGS ARE DIAGRAMMATIC, SITE CONDITIONS SHALL PREVAIL. IF NO SCALE IS GIVEN, DRAWINGS IS NOT TO SCALE. ALL DIMENSIONS SHALL BE VERIFIED BY CONTRACTOR AND SUBCONTRACTORS IN THE FIELD UPON COMMENCEMENT OF CONSTRUCTION.

4. THE EXITING CONDITIONS OF BELOW GROUND UTILITIES ARE TAKEN FROM EXISTING RECORD DRAWINGS. THE LOCATION OF THESE UTILITIES IS APPROXIMATE ONLY. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO FIELD VERIFY THE EXACT LOCATION OF BELOW GROUND UTILITIES IN THE IMMEDIATE VICINITY OF SUBSURFACE WORK, WHETHER SHOWN ON THE DRAWINGS OR NOT.

5. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO INVESTIGATE THE EXISTING CONDITIONS AT THE JOB SITE. EXISTING SITE CONDITIONS SHALL PREVAIL OVER DRAWINGS. ANY CONFLICT OR DISCREPANCIES BETWEEN DRAWINGS AND SITE CONDITIONS, BETWEEN SPECIFICATIONS AND SITE CONDITIONS AND ANY UNUSUAL OR SPECIAL CONDITIONS SHALL BE BROUGHT TO THE ATTENTION OF THE CONTRACTING OFFICER.

6. ALL EQUIPMENT AND MATERIAL REMOVED FROM SITE SHALL BECOME PROPERTY OF THE CONTRACTOR HANDLING TRANSPORTATION AND DISPOSAL. CONTRACTOR SHALL MEET ALL LOCAL, STATE AND FEDERAL REQUIREMENTS.

7. THE CONTRACTOR SHALL USE SUFFICIENT BARRICADES AND/OR TEMPORARY FENCING TO RESTRICT NON-SITE PERSONNEL ACCESS TO CONSTRUCTION AREA.

8. ALL ELECTRICAL WORK SHALL COMPLY WITH THE LATEST EDITION OF THE NATIONAL ELECTRICAL CODE, BUILDING CODE AND LOCAL FIRE DEPARTMENT GUIDELINES.

9. PRIOR TO START OF PROJECT, COORDINATE WITH PROJECT MANAGER FOR LOCATING ALL EQUIPMENT AND STORAGE AREAS.

10. EXISTING SITE DAMAGED BY NEW CONSTRUCTION SHALL BE REPLACED OR REPAIRED TO A CONDITION EQUAL TO PRE-CONSTRUCTION, OR BETTER.

11. ALL CONDUITS EXPOSED IN ELECTRICAL PADS OR ROOMS SHALL BE OF TYPE AS SPECIFIED IN THE SINGLE LINE. ALL CONDUIT BELOW GRADE SHALL BE ELECTRICAL SCH-40 PVC. CONDUIT RUNS SHOWN ARE DIAGRAMMATIC, SURFACE CONDUIT SHALL BE SECURED AT 10 FT MINIMUM INTERVALS. CONTRACTOR SHALL PROVIDE DOCUMENTATION AND LEGIBLE DRAWINGS OF ALL CONDUIT PLACEMENT DEVIATING FROM PLANS.

12. ELECTRICAL DRAWINGS INDICATE NEW WORK, UNLESS OTHERWISE NOTED. EXISTING ELECTRICAL SYSTEMS ARE NOT SHOWN EXCEPT WHERE INTERFACING IS REQUIRED.

13. MAINTAIN CONTINUITY OF ALL EXISTING CIRCUITS OR PORTIONS THEREOF AFFECTED BY NEW WORK.

14. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO INVESTIGATE THE EXISTING SITE CONDITIONS. EXISTING CONDITIONS SHALL PREVAIL OVER DRAWINGS.IN THE EVENT OF CONFLICT OR DISCREPANCY ARISING FROM PLANS AND/OR SPECIFICATIONS AND/OR CONTRACT DOCUMENTS, CONTRACTOR SHALL NOTIFY CONSTRUCTION SUPERINTENDENT AND/OR PROJECT MANAGER AND IN NO CASE FURNISH AND INSTALL THE ITEM OF LESSER QUALITY WITHOUT APPROVAL. WHENEVER A GIVEN OPTION IS NOT SPECIFIED, MATERIALS SHALL BE FREE OF DEFECT AND BEST QUALITY AVAILABLE.

ELECTRICAL NOTES FOR NEW PHOTOVOLTAIC SYSTEM

1. THIS PROPOSED SOLAR ELECTRIC SYSTEM IS INTENDED TO OPERATE IN PARALLEL WITH POWER RECEIVED FROM THE UTILITY SERVICE PROVIDER.

2. THE PHOTOVOLTAIC SOURCE CIRCUITS AND PHOTOVOLTAIC OUTPUT CIRCUITS OF THIS PROPOSED SOLAR SYSTEM SHALL NOT BE CONTAINED IN THE SAME RACEWAY CABLE TRAY, CABLE, OUTLET BOX, JUNCTION BOX, OR SIMILAR FITTING AS FEEDERS OR BRANCH CIRCUITS OF OTHER SYSTEMS UNLESS THE CONDUCTORS OF THE DIFFERENT SYSTEMS ARE SEPARATED BY A PARTITION OR ARE CONNECTED TOGETHER.

3. THE CONNECTION TO THE MODULE OR PANEL OF THIS PROPOSED SOLAR ELECTRIC SYSTEM SHALL BE SO ARRANGED THAT REMOVAL OF A MODULE OR A PANEL FROM THE PHOTOVOLTAIC SOURCE CIRCUIT DOES NOT INTERRUPT A GROUNDING CONDUCTOR.

4. THE INVERTER FOR THE PROPOSED SOLAR ELECTRIC SYSTEM SHALL BE IDENTIFIED FOR USE IN SOLAR PHOTOVOLTAIC SYSTEMS. ALL EQUIPMENT SHALL BE UL APPROVED PER UL 1741.

5. THIS SYSTEM IS INTENDED TO CONNECT TO THE EXISTING FACILITY POWER SYSTEM AT ONE POINT. THIS CONNECTION SHALL BE IN COMPLIANCE WITH THE NEC NFPA 70 ARTICLES 690.64.

6. ALL SOURCE CIRCUITS SHALL HAVE INDIVIDUAL SOURCE CIRCUIT PROTECTION FOR TESTING AND ISOLATION. ALL COMBINER BOXES SHALL HAVE DISCONNECTION MEANS AT THE INVERTER FOR ISOLATION AND TESTING (MAINTENANCE DC DISCONNECTS).

7. ALL DISCONNECTS AND COMBINERS SHALL BE SECURED FROM UNAUTHORIZED & UNQUALIFIED PERSONNEL BY LOCK OR LOCATION.

8. ALL EXPOSED CABLES, SUCH AS MODULE LEADS SHALL BE SECURED WITH MECHANICAL OR OTHER SUNLIGHT RESISTANT MEANS.

9. INVERTER AND PV EQUIPMENT SHALL BE INSTALLED IN A SECURE AREA, SUCH AS A FENCED AREA.

10. MECHANICAL AND ELECTRICAL SUPPORT COMPONENTS, INCLUDING STRUT, SHALL HAVE GALVANIZED FINISH.

11. HARDWARE SHALL BE STAINLESS STEEL OR PLATED STEEL.

12. DRAINAGE SHALL BE PROVIDED AS NECESSARY FOR ALL EXTERIOR EQUIPMENT ENCLOSURES.

13. DAMAGE TO FINISHES SHALL BE PROPERLY RESTORED

WIRING AND WIRING METHODS

1. EXPOSED PV MODULE WIRING WILL BE USE-2 / LISTED PV UV RESISTANT, 90 DEGREE CELSIUS, WET RATED.

2. WIRING NOT EXPOSED TO SUNLIGHT WILL BE THWN-2, 90 DEGREE CELSIUS, WET RATED.

3. ALL GROUNDED CONDUCTORS ARE WHITE OR GRAY. EQUIPMENT GROUNDING CONDUCTORS ARE GREEN OR BARE PER (NEC 200-6 (A), EX 5)

4. ALL D.C. FIELD WIRING SHALL BE TAGGED AT BOTH ENDS WITH PERMANENT WIRE MARKERS

5. LIQUID TIGHT FLEXIBLE METAL CONDUIT IS GENERALLY SUITABLE FOR INSTALLATION IN WET AND DRY LOCATIONS. SHOULD IT BE EMPLOYED, SUPPORTS WILL BE NO MORE 12 INCHES FROM BOXES (JUNCTION BOX, CABINETS, OR CONDUIT FITTING) AND NO MORE THAN 54 INCHES APART PER NEC.

6. ALL CONDUCTORS BELOW 100A SHALL BE COPPER.

7. EXTERIOR CONDUIT SHALL BE RIGID GALVANIZED STEEL (R.G.S.). INTERIOR CONDUIT SHALL BE E.M.T.

8. LONG STRAIGHT EXPOSED CONDUIT RUNS, 100 FEET OR MORE, SHALL HAVE EXPANSION FITTINGS.

9. UNDERGROUND CONDUIT SHALL BE SUITABLE FOR DIRECT BURIAL OR CONCRETE ENCASED
INSTALLATIONS

DETECTION AND ISOLATION

1. THE INVERTERS ARE CAPABLE OF DETECTING AND INTERRUPTING GROUND FAULT CURRENTS PER NEC 690-5.

DISCONNECTING MEANS

1. MEANS SHALL BE PROVIDED TO DISCONNECT ALL CURRENT CARRYING CONDUCTORS OF THE PHOTOVOLTAIC POWER SOURCE FROM ALL OTHER CONDUCTORS IN THE BUILDING.

2. THE GROUNDED CONDUCTOR MAY HAVE A BOLTED OR TERMINAL DISCONNECTING MEANS TO ALLOW MAINTENANCE OR TROUBLESHOOTING BY QUALIFIED PERSONNEL.

3. THE DISCONNECTING MEANS SHALL NOT BE REQUIRED TO BE SUITABLE AS SERVICE EQUIPMENT AND SHALL BE RATED IN ACCORDANCE WITH SECTION 690-17.

4. EQUIPMENT SUCH AS PHOTOVOLTAIC SOURCE CIRCUITS, OVER CURRENT DEVICES, AND BLOCKING DIODES SHALL BE PERMITTED ON THE PHOTOVOLTAIC SIDE OF THE PHOTOVOLTAIC DISCONNECTING MEANS.

DISCONNECTION OF PHOTOVOLTAIC EQUIPMENT

1. MEANS SHALL BE PROVIDED TO DISCONNECT EQUIPMENT SUCH AS INVERTERS, AND THE LIKE FROM ALL UNGROUNDED CONDUCTORS OF ALL SOURCES. IF THE EQUIPMENT IS ENERGIZED FROM MORE THAN ONE SOURCE, THE DISCONNECTING MEANS SHALL BE GROUPED AND IDENTIFIED.

2. 690-16. FUSES. DISCONNECTING MEANS SHALL BE PROVIDED TO DISCONNECT A FUSE FROM ALL SOURCES OF SUPPLY IF THE FUSE IS ENERGIZED FROM BOTH DIRECTIONS AND IS ACCESSIBLE TO OTHER THAN QUALIFIED PERSONS. SUCH A FUSE IN A PHOTOVOLTAIC SOURCE CIRCUIT SHALL BE CAPABLE OF BEING DISCONNECTED INDEPENDENTLY OF FUSES IN OTHER PHOTOVOLTAIC SOURCE CIRCUITS.

3. ALL DISCONNECTS AND COMBINERS SHALL BE SECURED FROM UNAUTHORIZED AND UNQUALIFIED PERSONNEL BY EITHER LOCK OR LOCATION.

GROUNDING

1. EQUIPMENT GROUNDING CONDUCTORS WILL HAVE AS SHORT A DISTANCE TO GROUND AS POSSIBLE AND A MINIMUM NUMBER OF BENDS

121\U+101&855(17 &$55<,1* 0(7 $/ 3 $576 6+$// %(&+(&.(')25 3523(5 GROUNDING; NOTING THAT TERMINAL LUGS BOLTED ON AN ENCLOSURE'S FINISHED SURFACE MAY BE INSULATED BECAUSE OF PAINT/FINISH. PAINT/FINISH AT POINT OF CONTACT SHALL BE PROPERLY REMOVED.

3. MODULES SHALL BE GROUNDED WITH EQUIPMENT GROUNDING CONDUCTOR USING THE LISTED GROUNDING POINT AND MATERIAL FIT FOR THIS PURPOSE OR RACKING MANUFACTURER'S LISTED GROUNDING MEANS. GROUND LUGS SHALL BE RATED FOR OUTDOOR USE.

4. EXACT LOCATION OF GROUND RODS AND EQUIPMENT RODS AND EQUIPMENT SHALL BE DETERMINED IN FIELD. AVOID EXISTING UNDERGROUND UTILITIES.

5. INSTALLATION SHALL BE IN ACCORDANCE WITH THE LATEST NATIONAL ELECTRICAL CODE SECTION 250.

6. NO WELDING OF COLUMN ANCHOR BOLTS OR FOUNDATION REBAR SHALL BE ALLOWED. ALL WELDED CONNECTIONS SHALL BE MADE USING SEPARATE GROUNDING RODS AND BOLTS TO FACILITATE WELDING. GROUNDING RODS AND BOLTS SHALL CONFORM TO ASTM A 307 OR A 36. GROUNDING BOLTS OR RODS EXPOSED TO THE WEATHER SHALL BE GALVANIZED, STAINLESS STEEL, OR BRASS.

7. THE INSTALLED SYSTEM SHALL BE TESTED BY THE FALL-OF-POTENTIAL METHOD. THE CONTRACTOR SHALL BE REQUIRED TO FURNISH WRITTEN CERTIFICATION OF THE TEST.

8. GROUND RESISTANCE SHALL NOT EXCEED 25 OHMS. THE RESISTANCE TO GROUND SHALL BE MEASURED BY A LOW RESISTANCE TYPE "BIDDLE" GROUND TESTER OR EQUAL.
GROUND FAULT

CONSTRUCTION TESTING

1. PV ARRAY -
(A) INSPECT MODULES, RACKS, ROOF PROTECTION, COMBINER BOXES, GROUNDING, ELECTRICAL RACEWAY AND CABLE TRAY, EQUIPMENT SUPPORTS, ETC. TO VERIFY THAT THEY ARE INSTALLED IN ACCORDANCE WITH DRAWINGS, SPECIFICATIONS, CODES AND STANDARDS AND GOOD PRACTICE.

(B) INSPECT ALL CABLE AND WIRE TERMINATIONS. VERIFY ALL WIRE AND CABLE CONNECTIONS ARE PROPERLY TORQUED.

(C) INSURE ALL WIRE, CABLE, CONDUIT, CABLE TRAY, COMBINER BOXES ARE PROVIDED WITH UNIQUE AND PERMANENTLY AFFIXED TAGS

2. INVERTERS -
(A) INSPECT THAT INVERTERS ARE INSTALLED IN ACCORDANCE WITH THE DESIGN

(B) DRAWINGS, SPECIFICATIONS AND EQUIPMENT INSTRUCTION MANUALS WITH PARTICULAR ATTENTION TO FIELD CABLES, CONDUIT MOUNTING ATTACHMENTS, VENTILATION AND LABELING.

(C) VERIFY ALL WIRE AND CABLE CONNECTIONS ARE PROPERLY TORQUED.

(D) MEGGER AND CONTINUITY CHECKS ARE TO BE PERFORMED FOR ALL CABLES.

3. SWITCHGEAR -
(A) INSPECT THAT ALL SWITCHGEAR IS INSTALLED IN ACCORDANCE WITH ENGINEERING DRAWINGS, SPECIFICATIONS AND SUPPLIER INSTRUCTION MANUALS.

(B) ALL SWITCHES, CIRCUIT BREAKERS AND METERS ARE LABELED FOR OPERATION.

(C) VERIFY ALL WIRE AND CABLE CONNECTIONS ARE PROPERLY TORQUED.

(D) MEGGER AND CONTINUITY CHECKS ARE TO BE PERFORMED FOR ALL CABLES.

4. MEDIUM VOLTAGE CABLE -
(A) PERFORM HIGH POTENTIAL TESTS ON ALL CABLES OVER 600V AFTER

(B) INSTALLATION. VISUALLY INSPECT JACKET AND INSULATION CONDITION OF CABLES. INSPECT SHIELD GROUNDING, CABLE SUPPORT AND TERMINATION.

(C) PERFORM FIELD CONTINUITY TEST ON EACH CONDUCTOR. RECORD OHMIC VALUE.

5. GROUND GRID -
(A) CHECK AND INSPECT THE GROUND GRID INTEGRITY FROM THE MODULE ARRAY, THROUGH COMBINER BOXES, CABLE TRAYS AND RACEWAYS, FUSE BOXES, INVERTERS, SWITCHGEAR, TRANSFORMERS AND ALL OTHER ELECTRICAL PANELS, TO THE GROUND GRID AND GROUND RODS.

(B) PROVIDE GROUND RESISTANCE TESTS WITH A GROUND RESISTANCE MEGGER AT EACH FACILITY, TRANSFORMER, SWITCHGEAR AND INVERTER. USE APPROPRIATE METHOD (FALL OF POTENTIAL, THREE TERMINAL METHOD) TO MEASURE OHMIC VALUE OF GROUND SYSTEM TO EARTH (MAXIMUM 5 OHMS). VERIFY ALL EQUIPMENT GROUND TERMINATIONS WITH RESPECT TO PRIME POINT USED TO ESTABLISH OHMIC VALUE STATED ABOVE. VDC POS + BLACK BLACK VDC NEG - WHITE WHITE

COMMISSIONING

1. PV ARRAY -
BEFORE CLOSING DISCONNECTS OR ATTEMPTING TO ENERGIZE THE INVERTERS, THE FOLLOWING COMMISSIONING PROCEDURE SHALL BE COMPLETED:

(A) MEASURE AND RECORD THE OPEN CIRCUIT VOLTAGE (Vac), POLARITY (+/-), AND SOLAR INCIDENCE OF EACH SOURCE CIRCUIT. RECORD THESES VALUES ON THE COMMISSIONING RECORD DOCUMENTS PROVIDED IN ADDITION TO DATE AND TIME.

(B) COMPLETE A VISUAL INSPECTION OF ALL THE MODULES TO CHECK FOR BROKEN GLASS, FRAYED WIRES, EXPOSED CONDUCTORS AND ANY OTHER PROBLEMS THAT MAY CAUSE A FAULT.

2. INVERTERS -
BEFORE TURNING THE INVERTER ON, OR CLOSING ANY OF THE INVERTER DISCONNECTS, THE FOLLOWING COMMISSIONING PROCEDURE SHALL 1BE COMPLETED:

(A) FOLLOW START-UP SEQUENCE IN MANUFACTURER'S OPERATION AND MAINTENANCE MANUAL.

(B) INSPECT AND TEST UNDER THE DIRECTION OF A MANUFACTURER'S REPRESENTATIVE AND IN ACCORDANCE WITH THE INSTRUCTION MANUALS.

(C) ENSURE PROPER SOFTWARE IS INSTALLED AND PROTECTION FEATURES ARE SET PROPERLY, FUNCTIONAL AND OPERATIONAL. RECORD ALL SET POINTS, ADJUSTABLE CONSTANTS AND FEATURES.

(D) RECORD ALL SET POINTS, ADJUSTABLE CONSTANTS AND FEATURES.

(E) CHECK THAT THE INVERTER IS PROPERLY GROUNDED, AS DESCRIBED BY THE MANUFACTURER

(F) CHECK DC INPUT VOLTAGE (Voc) IS WITHIN THE PROPER RANGE IN THE INVERTER CABINET AS DEFINED BY THE INVERTER RATING LABEL AND ACCOMPANIED MANUAL.

(G) CHECK THAT THE AC GRID VOLTAGE, AT THE INVERTER AC TERMINALS, IS WITHIN THE PROPER RANGE AS DEFINED BY THE INVERTER RATING LABEL AND ACCOMPANIED MANUAL

3. SWITCHGEAR -
(A) SET AND TEST T1-1E PROTECTION DEVICES FOR EACH CIRCUIT BREAKER.

(B) MEGGER EACH PHASE OF THE SWITCHGEAR.

(C) CHECK EACH CIRCUIT 'BREAKER.

(D) CHECK PHASING OF ALL CIRCUITS.

ABBREVIATIONS

(E)	DENOTES EXISTING SYSTEM
(N)	NEW
(R)	RELOCATED
RGS	RIGID GALVANIZED STEEL
UON.	UNLESS OTHERWISE NOTED
WP	WEATHER PROOF
IG	ISOLATED GROUND
GND	GROUND
PNL	PANEL BOARD OR PANEL
C-BOX	COMBINER BOX
J-BOX / JB	JUNCTION BOX
TVSS	TRANSIENT VOLTAGE SURGE SUPPRESSION
DAS	DATA ACQUISITION SYSTEM
MSB	MAIN SWITCHBOARD
XFMR	TRANSFORMER
COM BOX	COMMUNICATION BOX
MET STATION	METEOROLOGICAL STATION (A N ENCLOSURE WHICH HOLDS SENSORS TO MEASURE TEMPERATURE, IRRADIANCE, WIND MPH)
PVC	POLYVINYL CHLORIDE
EMT	ELECTRICAL METAL TUBING
FMC	FLEXIBLE METAL CONDUIT
TYP	TYPICAL OR COMMON ELEMENTS OF A SELECTION
SF	SQUARE FEET
NEMA	NATIONAL ELECTRIC MANUFACTURES ASSOCIATION
NEC	NATIONAL ELECTRIC CODE
W	WATTS
KW	1,000 WATTS
MW	1,000,000 WATTS
A	AMPS
V	VOLTAGE
AC	ALTERNATING CURRENT
DC	DIRECT CURRENT
VA	VOLT-AMP (AC)
AIC	AMPERE INTERRUPTING CAPACITY
M	METER
VOC	OPEN CIRCUIT VOLTAGE
ISC	SHORT CIRCUIT CURRENT

SYMBOLS

- (2) NUMBERED NOTE
- 1 / 101 ELEVATION CALL OUT
- 1 / 101 SECTION CALL OUT
- 1 / 101 DETAIL CALL OUT
- BRANCH CIRCUIT PANEL
- DISTRIBUTION PANEL OR SWITCHBOARD
- MC MOTOR CONTROLLER OR STARTER
- BC BATTERY CHARGER
- J J J JUNCTION BOX
- J JUNCTION BOX - FLEX CONNECTION
- PB PULL BOX
- M MOTOR
- BREAKER
- FUSE
- DISCONNECT SWITCH (UNFUSED)
- DISCONNECT SWITCH (FUSED)
- AUTOMATIC TRANSFER SWITCH
- T DRY TYPE TRANSFORMER.
- WP GFI 120 VOLT, GFI, 20 AMP, DUPLEX, WEATHERPROOF BOX & COVER 18" AFF UON
- INVERTER FOR PHOTOVOLTAIC (PV) CIRCUITS
- PHOTOVOLTAIC (PV) MODULE
- CONDUIT RUN, EXPOSED ON ROOF OR WALL
- CONDUIT RUN, UNDERGROUND

CONDUCTOR COLOR SCHEDULE

DESCRIPTION	PHASE	COLOR
120/208V/3PHS/4W	A	BLACK
	B	RED
	C	BLUE
	N	WHITE
277/480V/3PHS/4W	A	BROWN
	B	ORANGE
	C	YELLOW
	N	GRAY
120/240V/1PHS/3W	A	BLACK
	B	RED
	N	WHITE
GROUNDING CONDUCTOR	G	GREEN
UN-GROUNDED ARRAY	POSITIVE (+)	RED
	NEGATIVE (-)	BLACK

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PROJECT NUMBER: 00-000-0000

SHEET SIZE: ARCH "D" 24" X 36" (610 x 914)

REV #	DESCRIPTION	DATE
REV-A	30% IFR	00/00/00

DATE:	00/00/00
DRAWN BY:	CAD
CHECKED BY:	PM
APPROVED BY:	EOR

SHEET NAME: NOTES AND SYMBOLS

SHEET NUMBER: E-001

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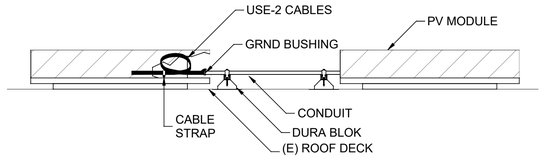
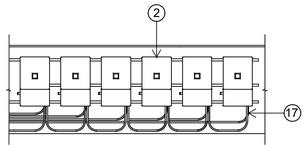
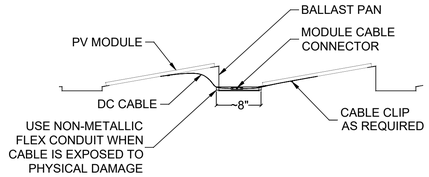


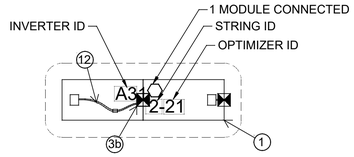
1 E-100 PATHWAY CONDUIT CROSSING (TYP.)
1/2" = 1'



4 E-100 PARAPET WALL - INVERTER ELEVATION
1/4" = 1'

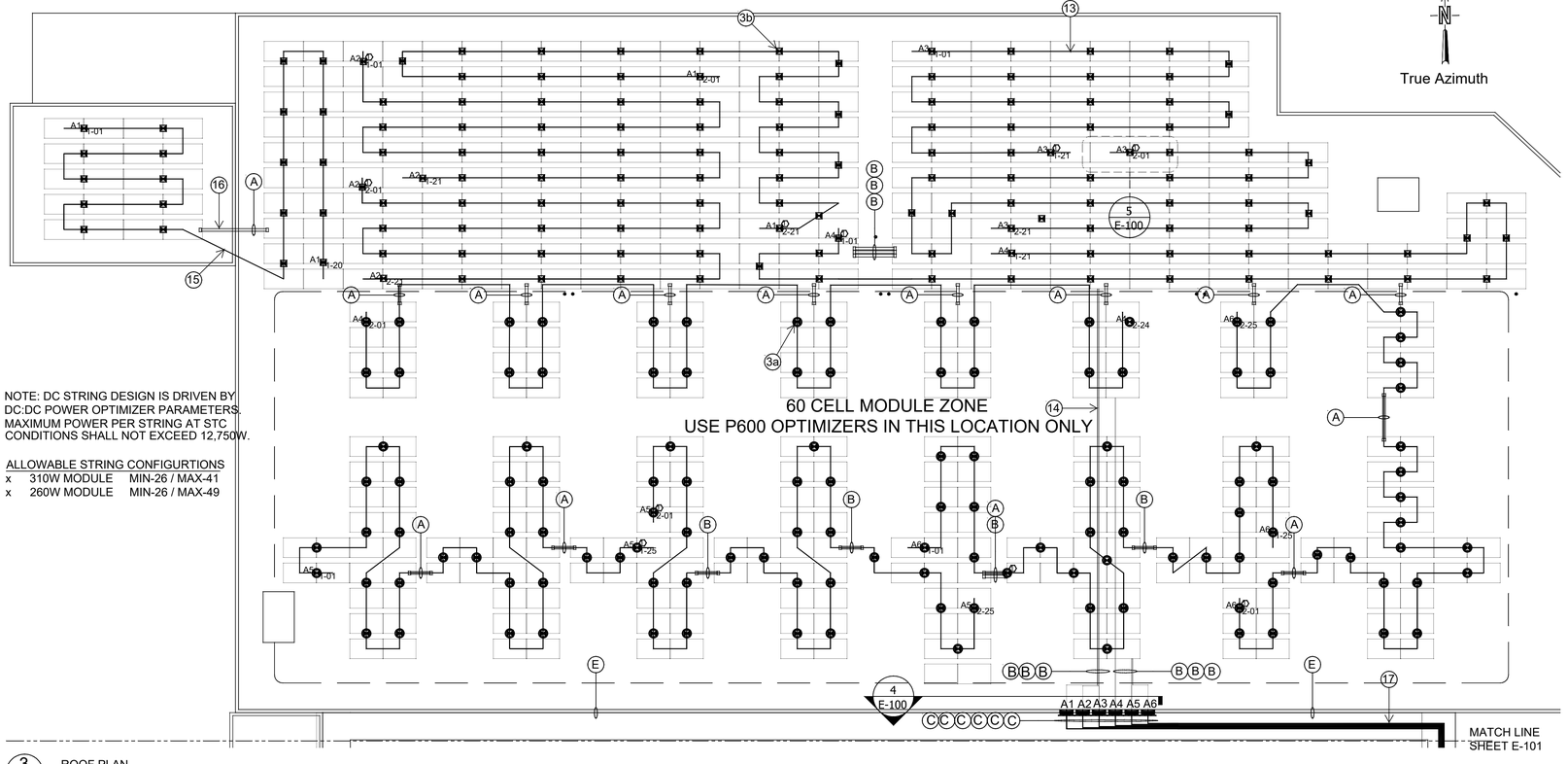


2 E-100 PV MODULE INTERCONNECTION DETAIL (TYP.)
1/2" = 1'



5 E-100 2-MODULE STRING
3/16" = 1'

CONDUIT SCHEDULE		
ID	DESCRIPTION	CONDUIT
A	SINGLE DC-DC OUTPUT CIRCUIT: 2 X 10-AWG PV1000 CABLE + 1 X10-AWG GND	3/4"
B	TWO DC-DC OUTPUT CIRCUITS: 4 X10-AWG PV1000 CABLE + 1 X 10-AWG GND	1"
C	20 KW INVERTER 480V AC OUTPUT CIRCUIT: 4 X 6-AWG THWN-2 + 1 X 8-AWG THWN-2 GND	1"
D	PANEL S1 FEEDER 2 X 4 X 400 XHHW-2 + 2 X 2 AWG THWN-2 GND	2 X 3"
E	NETWORK CAT-5 OR RS-485 CABLE	3/4"



NOTE: DC STRING DESIGN IS DRIVEN BY DC:DC POWER OPTIMIZER PARAMETERS. MAXIMUM POWER PER STRING AT STC CONDITIONS SHALL NOT EXCEED 12,750W.

ALLOWABLE STRING CONFIGURTIONS
x 310W MODULE MIN-26 / MAX-41
x 260W MODULE MIN-26 / MAX-49

3 E-100 ROOF PLAN
3/32" = 1'

PLAN NOTES

1. ROOF MOUNTED PHOTOVOLTAIC MODULE PROVIDE EQUIPMENT GROUND CONNECTION PER MODULE MANUFACTURES INSTRUCTIONS & NEC 2011 690.43 (TYP.)
2. 1000Vdc STRING INVERTER. MOUNT TO PARAPET WALL VIA 1-5/8" GALVANIZED STRUT . INSTALL MIN. (2) HILTI 3/8" WEDGE ANCHORS PER HORIZONTAL STRUT ATTACHMENT. VERIFY FINAL WORKING CLEARANCES ARE IN COMPLIANCE WITH NEC 2011 110.26(A)(1) & 110.34(A). INVERTER IS UNGROUNDED PER NEC 2011 690.35 (TYP.)
3a. P-600 DC-DC POWER OPTIMIZER MOUNTED TO PV MODULE SUPPORT RACK. FOR 60 CELL MODULES (TYP.)
3b. P-700 DC-DC POWER OPTIMIZER MOUNTED TO PV MODULE SUPPORT RACK. FOR 72 CELL MODULES (TYP.)
4. 480V INVERTER BREAKER PANEL "PNL-S1"
5. DATA ACQUISITION SYSTEM
6. 480V VISIBLE BLADE AC PHOTOVOLTAIC DISCONNECT LOCATED NEXT TO (E) MSB
7. SOLAR PRODUCTION METER CABINET
8. (E) MAIN SWITCH BOARD
9. (E) DATA BACKBOARD (INTERNET ROUTER CONNECTION) FIELD VERIFY
10. METEOROLOGICAL STATION, MOUNTED TO PARAPET WALL, INSTALL HIGHER THAN NEAR-BY OBSTRUCTIONS
11. CELL TEMPERATURE SENSOR
12. SOURCE CIRCUIT "TWO MODULE STRING" CONNECT FACTORY INSTALLED MODULE WHIPS IN SERIES CONFIGURATION TO DC-DC CONVERTER / OPTIMIZER (TYP.)
13. DC-DC OUTPUT CIRCUIT. CONNECT FACTORY SUPPLIED OPTIMIZER WHIPS IN SERIES STRINGS (TYP.)
14. DC-DC OUTPUT CIRCUIT HOME RUN. PROVIDE AND INSTALL LISTED PV-1000 CONDUCTORS WITH MATCHING CONNECTORS. ROUTE SOURCE CIRCUITS TOGETHER WHERE POSSIBLE. HOME RUN CABLE SHALL BE INSTALLED IN CONDUIT WHERE EXPOSED TO PHYSICAL DAMAGE AND WHEN LEAVING SOLAR ARRAY PER NEC 2011 690.31. SECURE CABLE IN FREE AIR TO RACKING SYSTEM WITH AHJ APPROVED CABLE STRAP (TYP.)
15. STRING JUMPER: PROVIDE AND INSTALL CONDUCTOR AND MATCHING CONNECTORS TO EXTEND STRINGING AS NEEDED. (TYP.)
16. JUMPER CONDUIT: INSTALL EMT CONDUIT ON DURA BLOK OR EQUAL TO PROTECT STRING CONDUCTORS FROM PHYSICAL DAMAGE. CONNECT CONDUIT TO EQUIPMENT GROUNDING CONDUCTOR PER NEC 2011 690.43 (TYP.)
17. SURFACE MOUNTED CONDUIT (TYP.)

GENERAL NOTES

1. ELECTRICAL DRAWINGS ARE DIAGRAMMATIC. NOT EVERY DETAIL OR EXACT LOCATION OF EQUIPMENT IS SHOWN. CONTRACTOR SHALL FIELD VERIFY ALL CONDITIONS AND DIMENSIONS PRIOR TO ORDERING EQUIPMENT OR PERFORMING ANY WORK. NOTIFY ENGINEER OF ANY CONDITIONS WHICH MAY AFFECT THE PERFORMANCE OF THE WORK IN ACCORDANCE WITH CONTRACT DRAWINGS AND SPECIFICATIONS.
2. SEAL CONDUIT PENETRATIONS THROUGH SHEET ROCK WITH LISTED FIRE CAULKING.
3. SEE SHEET E-200 FOR ROOF CONDUIT CLEARANCE PER NEC 2011 310.15(3)(5)(C)
4. POWER OPTIMIZERS HAVE FIXED LENGTH OUTPUT CABLE. LOCATE OPTIMIZERS PER MANUFACTURERS INSTRUCTIONS TO ACCOMMODATE CABLE LENGTH. USE COMPATIBLE JUMPER CABLE WHERE NEEDED TO EXTEND OUTPUT CABLES
5. MAINTAIN WORKING SPACES ABOUT ELECTRICAL EQUIPMENT AS REQUIRED BY EQUIPMENT MANUFACTURER AND PER NEC 2011 110.26 & 110.34

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PROJECT NUMBER:
00-000-0000

SHEET SIZE:
ARCH "D"
24" X 36" (610 x 914)

REV #	DESCRIPTION	DATE
REV-A	30% IFR	00/00/00

DATE:	00/00/00
DRAWN BY:	CAD
CHECKED BY:	PM
APPROVED BY:	EOR

SHEET NAME:
ELECTRICAL PLAN ROOF - A

SHEET NUMBER:
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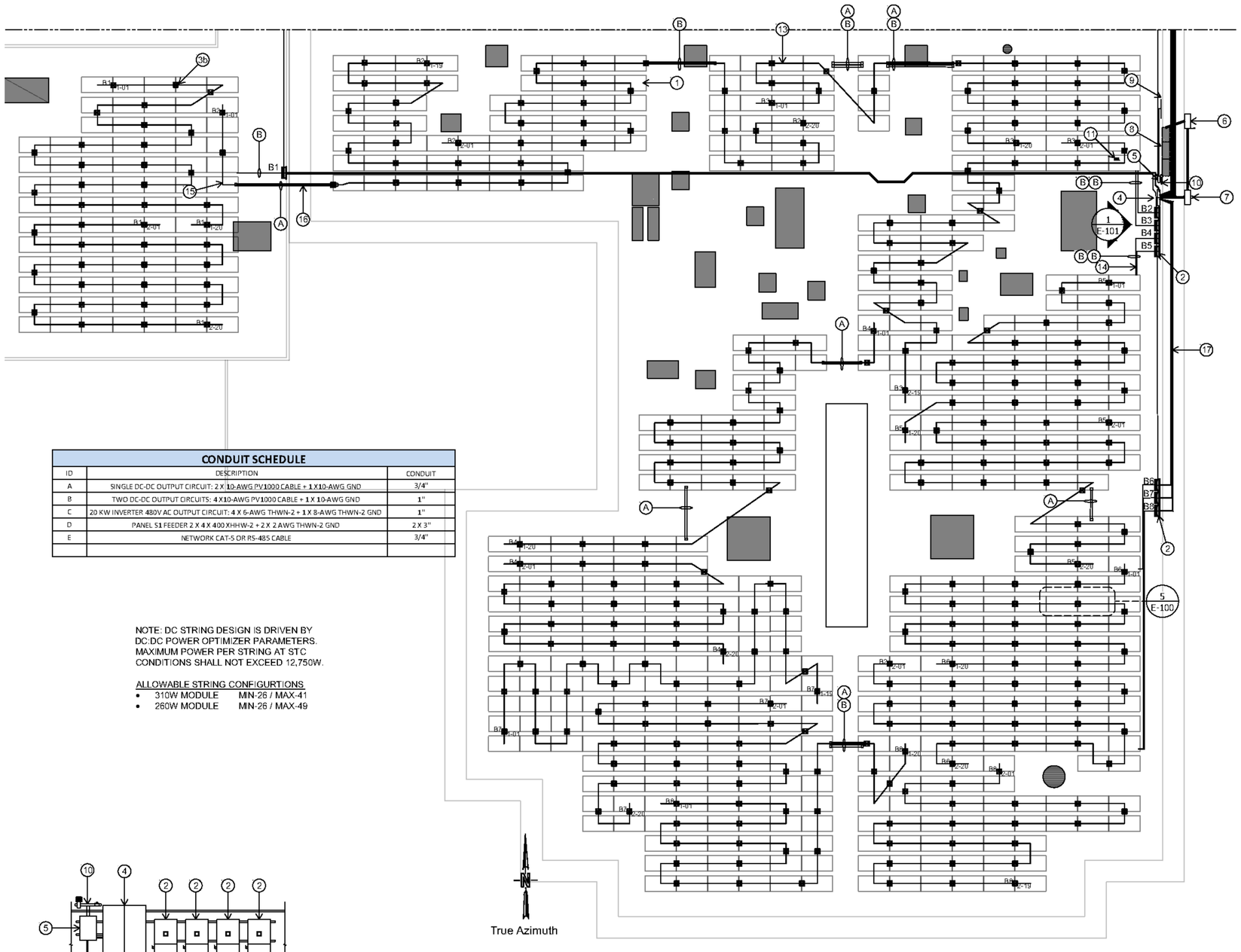
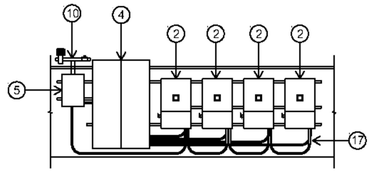


CONDUIT SCHEDULE		
ID	DESCRIPTION	CONDUIT
A	SINGLE DC-DC OUTPUT CIRCUIT: 2 X 10-AWG PV1000 CABLE + 1 X 10-AWG GND	3/4"
B	TWO DC-DC OUTPUT CIRCUITS: 4 X 10-AWG PV1000 CABLE + 1 X 10-AWG GND	1"
C	20 KW INVERTER 480V AC OUTPUT CIRCUIT: 4 X 6-AWG THWN-2 + 1 X 8-AWG THWN-2 GND	1"
D	PANEL S1 FEEDER 2 X 4 X 400 XHHW-2 + 2 X 2 AWG THWN-2 GND	2 X 3"
E	NETWORK CAT-5 OR RS-485 CABLE	3/4"

NOTE: DC STRING DESIGN IS DRIVEN BY DC:DC POWER OPTIMIZER PARAMETERS. MAXIMUM POWER PER STRING AT STC CONDITIONS SHALL NOT EXCEED 12,750W.

ALLOWABLE STRING CONFIGURTIONS
- 310W MODULE MIN-26 / MAX-41
- 260W MODULE MIN-26 / MAX-49



1 E-101 PARAPET WALL - DAS, PANEL S1 & INVERTER ELEVATION
1/4" = 1'

2 E-101 ROOF PLAN
3/32" = 1'

PLAN NOTES

1. ROOF MOUNTED PHOTOVOLTAIC MODULE PROVIDE EQUIPMENT GROUND CONNECTION PER MODULE MANUFACTURES INSTRUCTIONS & NEC 2011 690.43 (TYP.)
2. 1000Vdc STRING INVERTER. MOUNT TO PARAPET WALL VIA 1-5/8" GALVANIZED STRUT . INSTALL MIN. (2) HILTI 3/8" WEDGE ANCHORS PER HORIZONTAL STRUT ATTACHMENT. VERIFY FINAL WORKING CLEARANCES ARE IN COMPLIANCE WITH NEC 2011 110.26(A)(1) & 110.34(A). INVERTER IS UNGROUNDED PER NEC 2011 690.35 (TYP.)
3. P-600 DC-DC POWER OPTIMIZER MOUNTED TO PV MODULE SUPPORT RACK. FOR 60 CELL MODULES (TYP.)
4. P-700 DC-DC POWER OPTIMIZER MOUNTED TO PV MODULE SUPPORT RACK. FOR 72 CELL MODULES (TYP.)
5. 480V INVERTER BREAKER PANEL "PNL-S1"
6. DATA ACQUISITION SYSTEM
7. 480V VISIBLE BLADE AC PHOTOVOLTAIC DISCONNECT LOCATED NEXT TO (E) MSB
8. SOLAR PRODUCTION METER CABINET
9. (E) MAIN SWITCH BOARD
10. (E) DATA BACKBOARD (INTERNET ROUTER CONNECTION) FIELD VERIFY
11. METEOROLOGICAL STATION, MOUNTED TO PARAPET WALL, INSTALL HIGHER THAN NEAR-BY OBSTRUCTIONS
12. CELL TEMPERATURE SENSOR
13. SOURCE CIRCUIT "TWO MODULE STRING" CONNECT FACTORY INSTALLED MODULE WHIPS IN SERIES CONFIGURATION TO DC-DC CONVERTER / OPTIMIZER (TYP.)
14. DC-DC OUTPUT CIRCUIT. CONNECT FACTORY SUPPLIED OPTIMIZER WHIPS IN SERIES STRINGS (TYP.)
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16. STRING JUMPER: PROVIDE AND INSTALL CONDUCTOR AND MATCHING CONNECTORS TO EXTEND STRINGING AS NEEDED. (TYP.)
17. JUMPER CONDUIT: INSTALL EMT CONDUIT ON DURA BLOK OR EQUAL TO PROTECT STRING CONDUCTORS FROM PHYSICAL DAMAGE, CONNECT CONDUIT TO EQUIPMENT GROUNDING CONDUCTOR PER NEC 2011 690.43 (TYP.)
18. SURFACE MOUNTED CONDUIT (TYP.)

GENERAL NOTES

1. ELECTRICAL DRAWINGS ARE DIAGRAMMATIC. NOT EVERY DETAIL OR EXACT LOCATION OF EQUIPMENT IS SHOWN. CONTRACTOR SHALL FIELD VERIFY ALL CONDITIONS AND DIMENSIONS PRIOR TO ORDERING EQUIPMENT OR PERFORMING ANY WORK. NOTIFY ENGINEER OF ANY CONDITIONS WHICH MAY AFFECT THE PERFORMANCE OF THE WORK IN ACCORDANCE WITH CONTRACT DRAWINGS AND SPECIFICATIONS.
2. SEAL CONDUIT PENETRATIONS THROUGH SHEET ROCK WITH LISTED FIRE CAULKING.
3. SEE SHEET E-200 FOR ROOF CONDUIT CLEARANCE PER NEC 2011 310.15(3)(5)(C)
4. POWER OPTIMIZERS HAVE FIXED LENGTH OUTPUT CABLE. LOCATE OPTIMIZERS PER MANUFACTURERS INSTRUCTIONS TO ACCOMMODATE CABLE LENGTH. USE COMPATIBLE JUMPER CABLE WHERE NEEDED TO EXTEND OUTPUT CABLES
5. MAINTAIN WORKING SPACES ABOUT ELECTRICAL EQUIPMENT AS REQUIRED BY EQUIPMENT MANUFACTURER AND PER NEC 2011 110.26 & 110.34

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PROJECT NUMBER: 00-000-0000

SHEET SIZE: ARCH "D" 24" X 36" (610 x 914)

REV #	DESCRIPTION	DATE
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APPROVED BY:	EOR

SHEET NAME: ELECTRICAL PLAN ROOF - B

SHEET NUMBER: E-101

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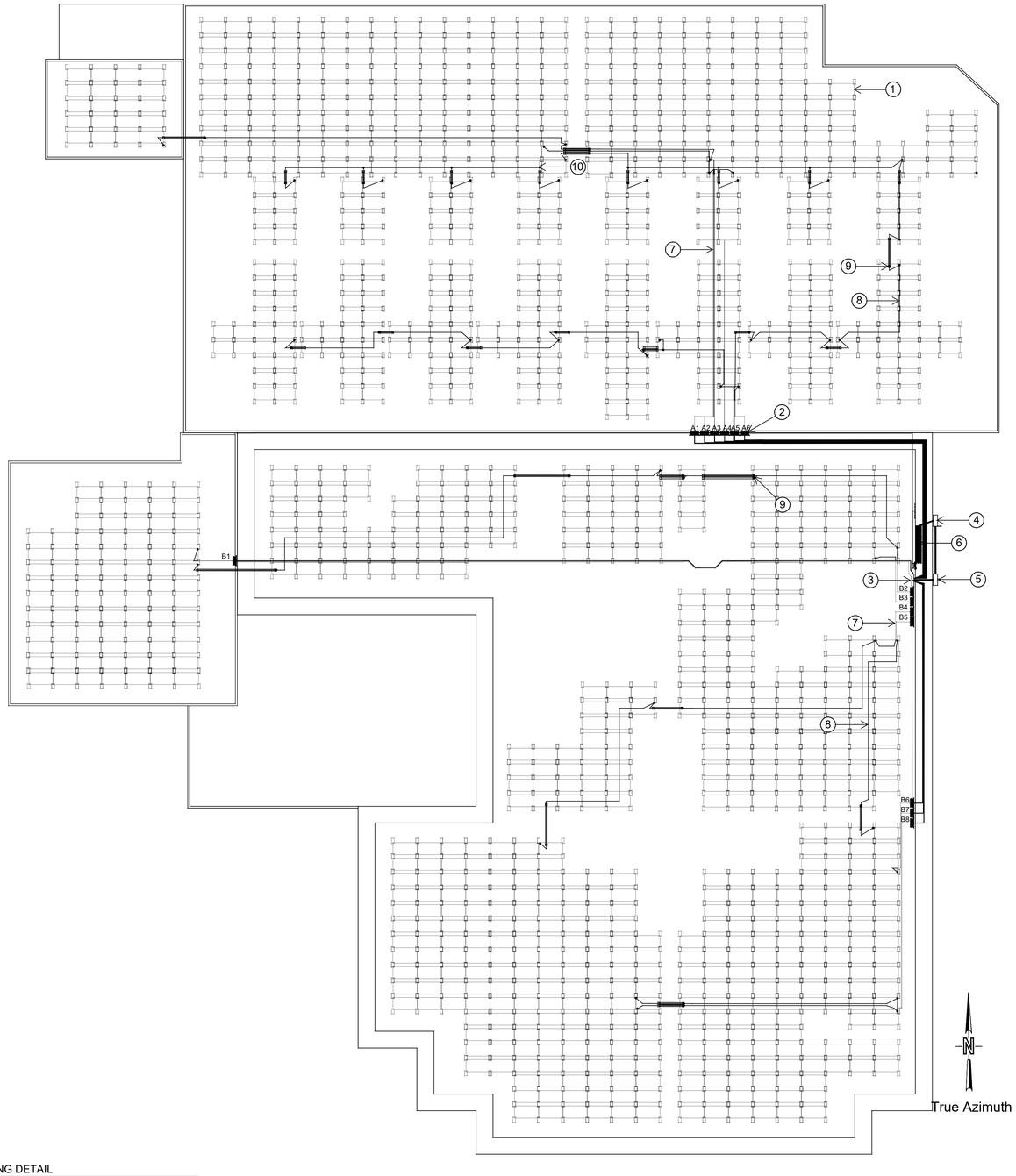
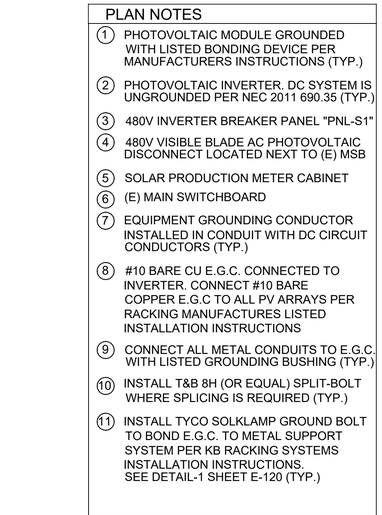


1 E-120 MODULE GROUNDING DETAIL
NTS

2 E-120 TYPICAL ARRAY GROUNDING PLAN
3/32" = 1'



3 E-120 GROUNDING ELECTRODE SYSTEM
NTS

PLAN NOTES

1. PHOTOVOLTAIC MODULE GROUNDED WITH LISTED BONDING DEVICE PER MANUFACTURERS INSTRUCTIONS (TYP.)
2. PHOTOVOLTAIC INVERTER. DC SYSTEM IS UNGROUNDED PER NEC 2011 690.35 (TYP.)
3. 480V INVERTER BREAKER PANEL "PNL-S1"
4. 480V VISIBLE BLADE AC PHOTOVOLTAIC DISCONNECT LOCATED NEXT TO (E) MSB
5. SOLAR PRODUCTION METER CABINET
6. (E) MAIN SWITCHBOARD
7. EQUIPMENT GROUNDING CONDUCTOR INSTALLED IN CONDUIT WITH DC CIRCUIT CONDUCTORS (TYP.)
8. #10 BARE CU E.G.C. CONNECTED TO INVERTER. CONNECT #10 BARE COPPER E.G.C TO ALL PV ARRAYS PER RACKING MANUFACTURES LISTED INSTALLATION INSTRUCTIONS
9. CONNECT ALL METAL CONDUITS TO E.G.C. WITH LISTED GROUNDING BUSHING (TYP.)
10. INSTALL T&B 8H (OR EQUAL) SPLIT-BOLT WHERE SPLICING IS REQUIRED (TYP.)
11. INSTALL TYCO SOLKLAMP GROUND BOLT TO BOND E.G.C. TO METAL SUPPORT SYSTEM PER KB RACKING SYSTEMS INSTALLATION INSTRUCTIONS. SEE DETAIL-1 SHEET E-120 (TYP.)

GENERAL NOTES

1. REFER TO SINGLE LINE DIAGRAMS FOR CONDUCTOR TYPES AND SIZES
2. PHOTOVOLTAIC EQUIPMENT GROUNDING CONDUCTORS AND DEVICES SHALL COMPLY WITH NEC 2011 690.43
3. PHOTOVOLTAIC SYSTEM IS UNGROUNDED AS PERMITTED BY NEC 690-35. EQUIPMENT GROUNDING SYSTEM SHALL COMPLY WITH NEC 690.43

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SHEET NAME: GROUNDING PLAN

SHEET NUMBER: E-120

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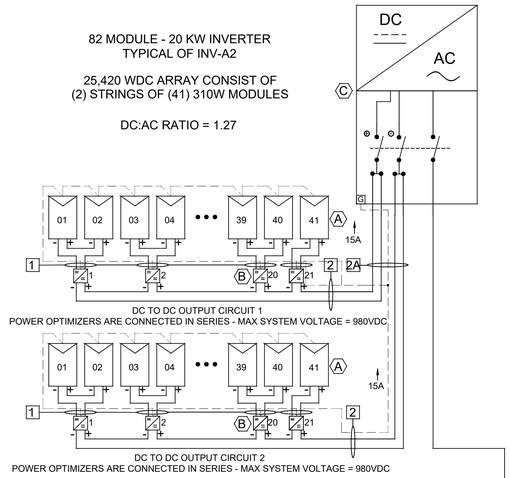
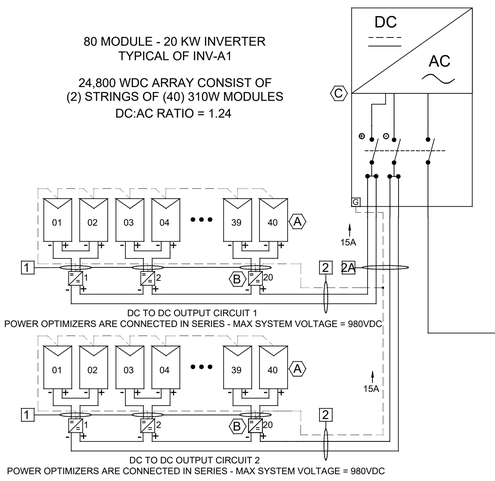
PANEL S1 LOAD CALC

MANUFACTURER:		SQD	TYPE:	NF-NEMA 3R			
BUS RATING:		400 AMP	MAIN:	450A/3P			
VOLTAGE:		277/480 VOLT	AIC:	65K AIC			
PHASE:		3PHS / 4W					
ID	AMP	DESCRIPTION	C/B	C/B	DESCRIPTION	AMP	ID
3	0	SPACE	A/3P	15A/3P	DAS (REF-VOLT)	0	4
9	24	INVERTER-A1	30A/3P	30A/3P	INVERTER-A4	24	10
15	24	INVERTER-A2	30A/3P	30A/3P	INVERTER-A5	24	16
21	24	INVERTER-A3	30A/3P	30A/3P	INVERTER-A6	24	22
27	24	INVERTER-B1	30A/3P	30A/3P	INVERTER-B5	24	28
33	24	INVERTER-B2	30A/3P	30A/3P	INVERTER-B6	24	34
39	24	INVERTER-B3	30A/3P	30A/3P	INVERTER-B7	24	40
45	24	INVERTER-B4	30A/3P	30A/3P	INVERTER-B8	24	46
					CONNECTED LOAD:	336	AMP
					25% CONTINUOUS LOAD:	84	AMP
					DESIGN LOAD:	420	AMP

CONDUIT & CABLE CALCS

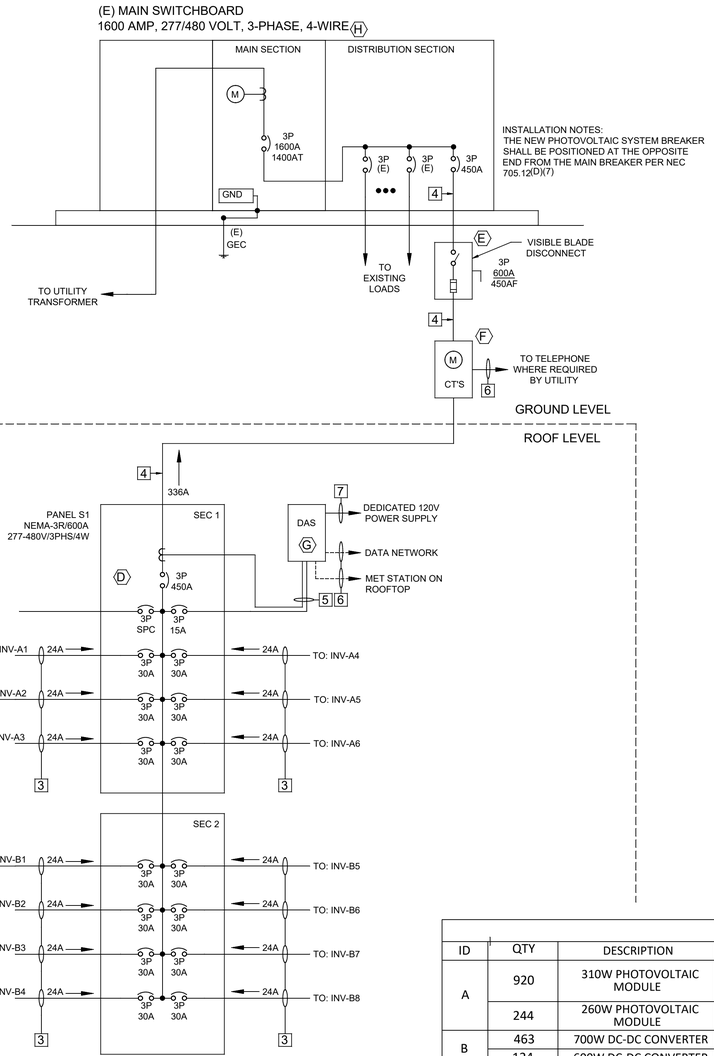
CONDITIONS OF USE					MINIMUM AMPACITIES					DERATED AMPACITIES							VOLTAGE DROP CALCS			
ID	DESCRIPTION	LOCATION	MAX CURRENT (Imax)	CONTINUOUS CURRENT (Icont = Imax x 1.25)	OCPD	CONDUCTOR	E.G.C.	CABLE TYPE	75C AMP	90C AMP	CONDUCTORS PER PHASE (>1 = PARALLEL)	CONDUIT	CONDUIT TYPE	DESIGN TEMP AMB=41C	TEMP DERATE FACTOR	CONDUIT DERATE FACTOR	DERATED CONDUCTOR AMPACITY	APPROX LENGTH	VOLTS AT MAX POWER	AMPS AT MAX POWER	% VOLT DROP
1	SOURCE CIRCUIT 2 MODULE STRING	ARRAY	11.3	14.1	NA	2 X 10-AWG CU	10-AWG BARE CU	MODULE WHIP	25	30	1	NA	FREE AIR	63	0.65	1	20	3	73	8.6	0.1%
2	ONE DC-DC CONVERTER OUTPUT CIRCUIT (12750 W-STC MAX OPTIMIZER STRING)	ROOF >1/2"	15.0	18.8	NA	2 X 10-AWG CU		PV-1000V	35	40	1	3/4"	EMT & FREE AIR		0.65	1	26	150	850	15.0	0.7%
2A	TWO DC-DC CONVERTER OUTPUT CIRCUITS (12750 W-STC MAX OPTIMIZER STRING)				NA	4 X 10-AWG CU						1"			0.65	0.8	21				
3	INVERTER 480V OUTPUT CIRCUIT		24.0	30.0	30A	4 X 6-AWG CU	8-AWG CU	THWN-2	50	55	1	1"	EMT		0.65	0.8	29	150	480	24	0.7%
4	PANEL S1 FEEDER	OUTDOOR	336	420	450A	2 X 4 X 400-AWG AL	2-AWG CU	XHHW-2	540	610	2	2 X 3"		41	0.87	0.8	425	40	480	336	0.2%
5	SOLAR CT'S & REFERENCE VOLT		NA			10 X 12-AWG CU	12-AWG CU	THWN-2	NA			1"		REFER TO MONITORING EQUIPMENT INSTALLATION INSTRUCTIONS FOR WIRING REQUIREMENTS							
6	NETWORK CONNECTION	VARIES				CAT-5 OR RS-485	NA	OUTDOOR				3/4"									
7	120V POWER CONTROL POWER	ROOF >1/2"	1	1.25	15A	2 X 14-AWG CU	14-AWG CU	THWN-2	20	25	1	1/2"		41	0.65	1	16	TBD	120		TBD





NOTE: DC STRING DESIGN IS DRIVEN BY DC:DC POWER OPTIMIZER PARAMETERS. MAXIMUM POWER PER STRING AT STC CONDITIONS SHALL NOT EXCEED 12,750W.

ALLOWABLE STRING CONFIGURTIONS
x 310W MODULE MIN-26 / MAX-41
x 260W MODULE MIN-26 / MAX-49



(E) SERVICE PANEL LOAD CALC

MANUFACTURER:		CHALLENGER	TYPE:	POW-R-LINE		
BUS RATING:		1600 AMP	MAIN:	1400AT		
VOLTAGE:		277 / 480V	AIC:	65K AIC		
PHASE:		3PHS / 4W / NEMA-1				
CALCULATION PER 2011 NEC 705.12(D)(2)						
			EXISTING MAIN SUPPLY BREAKER	1400	AMP	
			NEW PHOTOVOLTAIC SUPPLY BREAKER:	500	AMP	
			SUM OF SUPPLY BREAKERS:	1900	AMP	
			UTILIZED BUSS CAPACITY:	119	%	

PV MODULE SPECIFICATIONS

MODULE	TYPE-1	TYPE-2	
Manufacturer	CSUN		
Model #	CSUN 310-72P	CSUN 260-60P	
Maximum Series Fuse	20		A
Pmax (Nominal Output)	310	260	W
Vmp (Voltage at Pmax)	36.1	30.3	V
Imp (Current at Pmax)	8.58	8.58	A
Voc (Open Circuit Voltage)	44.8	37.7	V
Isc (Short Circuit Current)	9.04	8.95	A
NOCT (Nominal Operating Cell Temp.)	45		ƒ&
Temperature Coefficient of Pmax	-0.45%		%/C
Temperature Coefficient of Voc	-0.29%		%/C

OPTIMIZER SPECIFICATIONS

Manufacturer	SOLAREDGE		
Model #	P600	P700	
Rated Input Power	600	700	W
Max DC Input Voltage	125		V
Max Wdc/ STR@STC	12750		W
Max Output Curent	15		A

INVERTER SPECIFICATIONS

Manufacturer	SOLAREDGE	
Model #	SE20KUS	
Nominal AC Voltage	277/480	V
Maximum DC Voltage (LIMITED BY INVERTER)	980	V
Nominal DC Voltage	850	V
Continuous AC Power	20	KW
Continuous AC Current	24	A

MAXIMUM DC VOLTAGE CALCULATION

PHOTOVOLTAIC MODULE MODEL#	CSUN 310-72P	
VOC (at STC)	44.8	V
Tlow (TMY3 MATHER FIELD #724835)	-3	C
TEMP. CORRECTION FACTOR (NEC 2011 690.7)	1.12	
VOC_LO (at TLOW)	50.18	V
VOC MAX 2-MODULE STR (VOC_LO X 2)	100	V

EQUIPMENT SCHEDULE

ID	QTY	DESCRIPTION	MANUFACTURE - MODEL #
A	920	310W PHOTOVOLTAIC MODULE	CSUN , ROOF MOUNTED ON BALLASTED MOUNTING STRUCTURE. INSTALL MODULE PER MANUFACTURES INSTRUCTIONS. SOURCE CIRCUIT AND MODULE INTERCONNECTION CABLES INSTALLED IN FREE AIR SHALL BE SECURED BY AHJ APPROVED CABLE CLAMP
	244	260W PHOTOVOLTAIC MODULE	
B	463	700W DC-DC CONVERTER	SOLAREDGE POWER OPTIMIZER
	124	600W DC-DC CONVERTER	
C	14	20 KW INVERTER	SOLAREDGE SE20KUS, 277/480V TRANSFORMER LESS, 980VDC-UNGROUNDED
		AC-DC SAFETY SWITCH	PROVIDED BY INVERTER MANUFACTURER, INSTALL PER MANUFACTURERS INSTRUCTIONS
D	1	AC DISTRIBUTION PANEL	SQD NF 277/480V, 4W, NEMA 3R, DEDICATED INVERTER PANEL HAS NO SITE LOADS CONNECTED.
E	1	AC DISCONNECT	600A HEAVY DUTY, VISIBLE BLADE, 480V/3P/4W, 3 X 450A CLASS RK-5 FUSES , NEMA 3R

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PHONE NUMBER
WWW.WEBSITE.BIZ

STAMP:
NOT FOR CONSTRUCTION

YOUR PROJECT NAME HERE

SOMEWHERE IN THE USA

PROJECT NUMBER:
00-000-0000

SHEET SIZE:
ARCH "D"
24" X 36" (610 x 914)

REV #	DESCRIPTION	DATE
REV-A	30% IFR	00/00/00

DATE:	00/00/00
DRAWN BY:	CAD
CHECKED BY:	PM
APPROVED BY:	EOR

SHEET NAME:
SINGLE LINE DRAWING

SHEET NUMBER:
E-600

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Equipment Lables
Color: Black Background, White Text
Material: ABS UV
Front: Arial
Text Height: 3/8"

x Total: (11) Pcs
x INVERTER LABELS (TYP.)

INV-A1

1"

3"

x Total: (1) Pcs
x ELECTRONIC EQUIPMENT LABELS (TYP.)

DAS

1"

x Total: (1) Pcs
x AC PANEL LABELS
PNL S1

PANEL S1

1"

3"

Color: Red Background, White Text
Material: UV Tape
Front: Arial
Text Height: 3/8"
Tyco # SOL-CSC-159254-4-0.1

x Total: (200) Pcs

CAUTION SOLAR CIRCUIT

1"

6"

DC Wiring
All interior and exterior DC conduit, raceways, enclosures, and cable assemblies at turns above and/or below penetrations to be labeled every 10'.

Color: Red Background, White Text
Material: ABS UV
Front: Arial
Text Height: 3/16" UON

x On MSB & VISIBLE BLADE DISCONNECT (2 Pcs)
x 3/8" + 3/16" TEXT

PHOTOVOLTAIC SYSTEM
AC DISCONNECT
MAXIMUM OUTPUT
OPERATING AC CURRENT: 366 A
OPERATING AC VOLTAGE: 480 V

NEC 690.54

3"

5"

x On INVERTER DC Disconnect (16 Pcs)

PHOTOVOLTAIC ARRAY
DC DISCONNECT
OPERATING VOLTAGE: 850 V
MAX. SYSTEM VOLTAGE: 980 V

IMP 15 A ISC 15 A

NEC 690.53

2½"

5"

x Total: (3) Pcs
x AC LABELS
x PANEL MSB, PANEL S-1 & AC DISCONNECT

WARNING

PHOTOVOLTAIC SYSTEM
ELECTRIC SHOCK HAZARD.
DO NOT TOUCH TERMINALS.
TERMINALS ON BOTH THE LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION.

NEC 690.17 (4)

3"

5"

x ALL DC CIRCUIT JUNCTION BOXES AND TERMINATION POINTS

WARNING

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

A-03

NEC 690.35(F)

3"

5"

x On 20 KW Inverter (16 Pcs)

PHOTOVOLTAIC POWER SOURCE
INVERTER
MAXIMUM OUTPUT
OPERATING AC CURRENT: 24 A
OPERATING AC VOLTAGE: 480 V

NEC 690.54

2"

5"

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YOUR PROJECT NAME HERE

SOMEWHERE IN THE USA

PROJECT NUMBER:
00-000-0000

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ARCH "D"
24" X 36" (610 x 914)

REV #	DESCRIPTION	DATE
REV-A	30% IFR	00/00/00

DATE:	00/00/00
DRAWN BY:	CAD
CHECKED BY:	PM
APPROVED BY:	EOR

SHEET NAME:
WARNING LABELS

SHEET NUMBER:
E-700

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