

INSTALLATION PLAN - STANDING SEAM METAL ROOF PHOTOVOLTAIC ARRAY

GOLDEN, CO

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| Sheet List Table | |
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CODE COMPLIANCE

ALL WORK SHALL CONFORM TO ALL PERTINENT CODES, REGULATIONS, LAWS AND ORDINANCES AS REQUIRED BY THE STATE OF COLORADO AS WELL AS 2008 NATIONAL ELECTRIC CODE

SCOPE OF WORK

THIS PROJECT CONSISTS OF THE INSTALLATION OF A SOLAR ELECTRIC SYSTEM ON THE METAL ROOFTOP OF AN EXISTING BUILDING. THE SOLAR ELECTRIC SYSTEM INCLUDES A ROOFTOP SOLAR ARRAY AND ASSOCIATED ELECTRICAL EQUIPMENT.

THE SOLAR ELECTRIC SYSTEM WILL BE BUILT ON THE EXISTING ROOF. SUNPOWER SOLAR ELECTRIC SYSTEMS ARE DESIGNED TO WITHSTAND WIND AND SEISMIC LOADS ON THE EXISTING METAL ROOF, USING PRE-ENGINEERED ATTACHMENT METHODS.

THE ROOFTOP SYSTEM WILL BE BUILT ON THE EXISTING BUILDING FOOTPRINT AND WILL NOT ENCROACH ON ANY EXISTING SITE BOUNDARIES.

THE SOLAR ELECTRIC SYSTEM IS DESIGNED SO THAT IT WILL NOT IMPACT ROOFTOP ACCESS, ADA COMPLIANCE, FIRE DEPARTMENT CONNECTIONS, LANDSCAPING, VEHICULAR SITE ACCESS, OR PARKING & LOADING AREAS.

VICINITY MAP



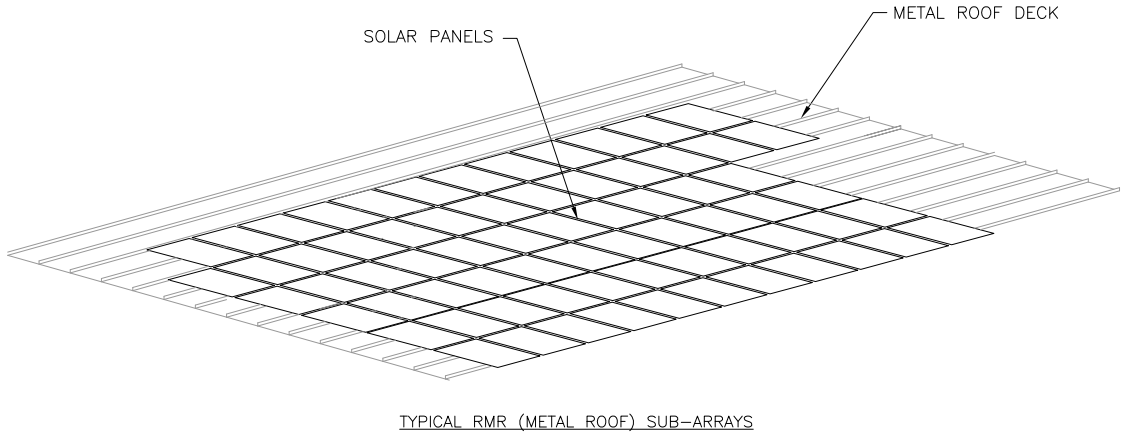
SITE MAP



APPROVALS - FOR OFFICIAL USE ONLY

ELECTRICAL SYSTEM SUMMARY

408.24 KWP
(1,296) SPWR 315W MODULES
8 MODULES/STRING
162 STRINGS TOTAL



ABBREVIATIONS

| | |
|------------------|-----------------------------|
| ADJ | ADJACENT |
| APPROX | APPROXIMATE |
| ARCH | ARCHITECT, ARCHITECTURAL |
| ASSY | ASSEMBLY |
| B.U.R. | BUILT UP ROOF |
| BLDG | BUILDING |
| C | CONDUIT |
| CAT | CATEGORY |
| CB | COMBINER BOX |
| CBC | CALIFORNIA BUILDING CODE |
| COL | COLUMN |
| CONC | CONCRETE |
| CONT | CONTINUOUS |
| DAS | DATA ACQUISITION SYSTEM |
| DISC | DISCONNECT |
| DN | DOWN |
| DWG | DRAWING |
| (E) OR EXIST | EXISTING |
| E.J. | EXPANSION JOINT |
| EL OR ELEV | ELEVATION |
| ELEC | ELECTRICAL |
| EMT | ELECTRICAL METALLIC CONDUIT |
| EQUIV | EQUIVALENT |
| FLA | FULL LOAD AMPS |
| FLASH'G | FLASHING |
| FLEX | FLEXIBLE |
| FT | FEET |
| GCR | GROUND COVER RATIO |
| GEN. | GENERAL |
| GND | GROUND |
| HT | HEIGHT |
| KW | KILOWATT |
| L.F. OR LIN. FT. | LINEAR FEET |

| | |
|--------|----------------------------|
| MAX | MAXIMUM |
| MFR | MANUFACTURER |
| MIN | MINIMUM |
| MISC | MISCELLANEOUS |
| MLO | MAIN LUGS ONLY |
| (N) | NEW |
| N.I.C. | NOT IN CONTRACT |
| N.T.S. | NOT TO SCALE |
| NOM | NOMINAL |
| O.C. | ON CENTER |
| P.L.F. | POUNDS PER LINEAR FOOT |
| P.S.F. | POUNDS PER SQUARE FOOT |
| PNL | PANEL |
| PV | PHOTOVOLTAIC |
| PVC | POLYVINYL CHLORIDE DUCT |
| RAD. | RADIUS |
| REF | REFERENCE |
| RGS | RIGID GALVANIZED STEEL |
| S.A.D. | SEE ARCHITECTURAL DRAWINGS |
| S.E.D. | SEE ELECTRICAL DRAWINGS |
| SECT | SECTION |
| SHT | SHEET |
| SYM | SYMMETRICAL |
| SYS | SYSTEM |
| TX | TRANSFORMER |
| TYP | TYPICAL |
| U.O.N. | UNLESS OTHERWISE NOTED |
| V.I.F. | VERIFY IN FIELD |
| VERT | VERTICAL |
| W/ | WITH |
| W/O | WITHOUT |
| WT | WEIGHT |

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NREL RSF II
BUILDING

GOLDEN, CO

TITLE
SHEET

REVISIONS

REV QUOTE #

OPPORTUNITY

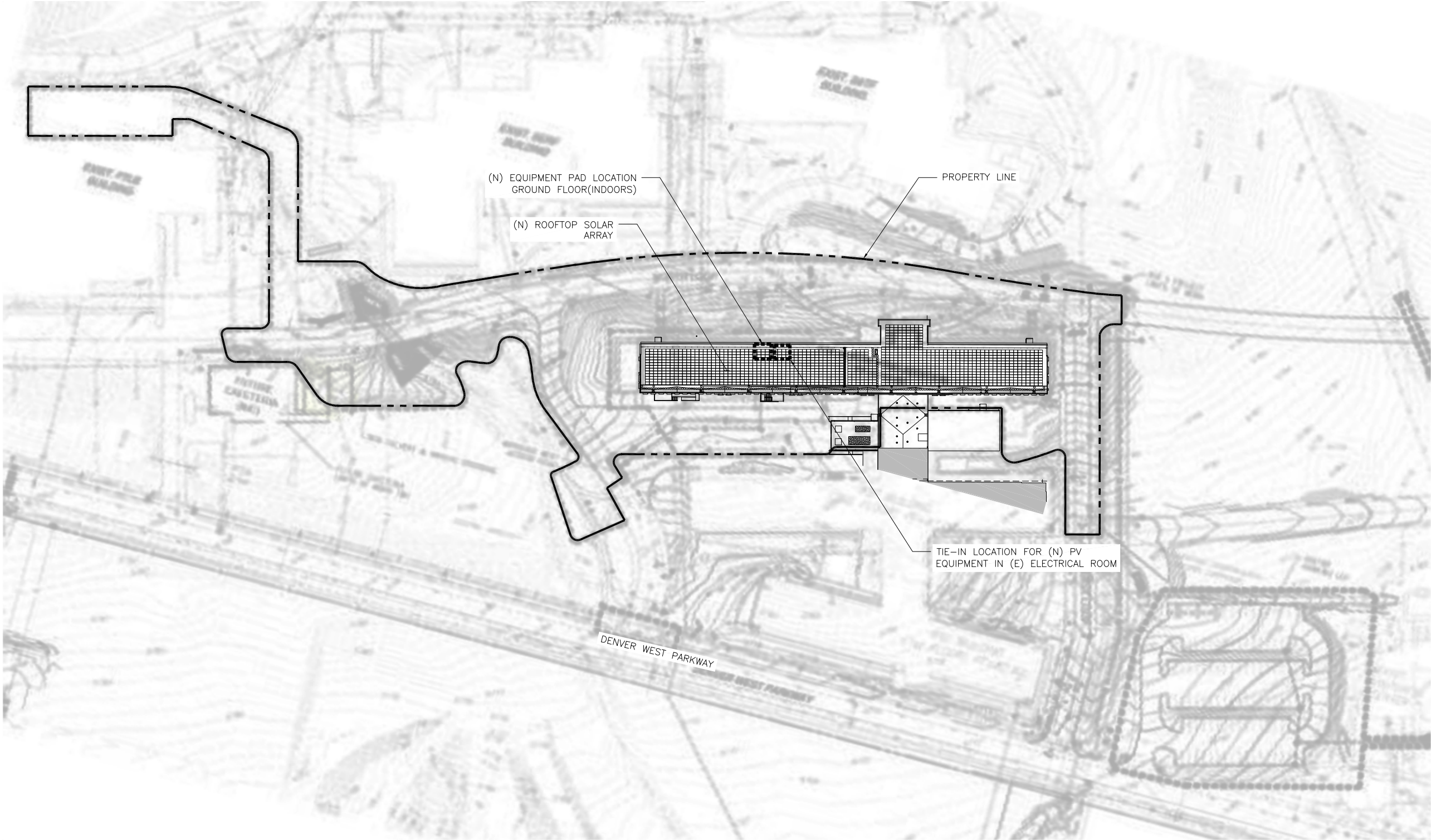
PROJECT

DATE DRAWN

DRAWN BY

0 1/2" 1"
IF BAR IS NOT ONE INCH, DRAWING IS NOT TO SCALE
SHEET

T1.1



1 SITE PLAN
SCALE: 1/64" = 1'-0"



MODULES ROTATED 90°

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SITE PLAN

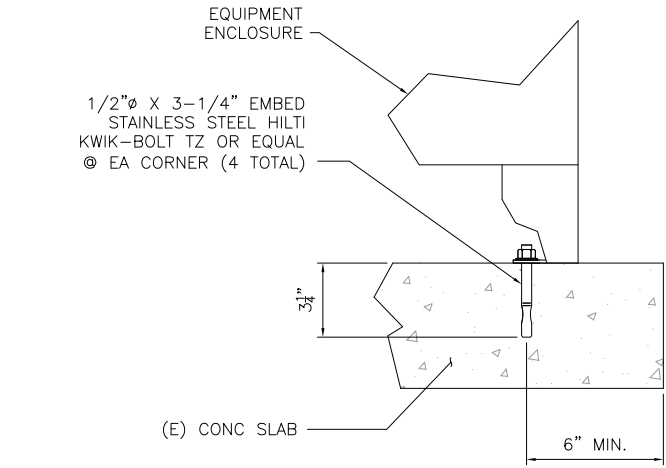
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| | | | 1/12/11 | MM | MM | RH |
| 1 | | ISSUE FOR CUSTOMER APPROVAL | 1/12/11 | MM | | |
| 2 | | ISSUE FOR CONSTRUCTION | 5/26/11 | MM | RH | |
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| OPPORTUNITY | |
| PROJECT | 10861 |
| DATE DRAWN | 10-19-10 |
| DRAWN BY | RC |

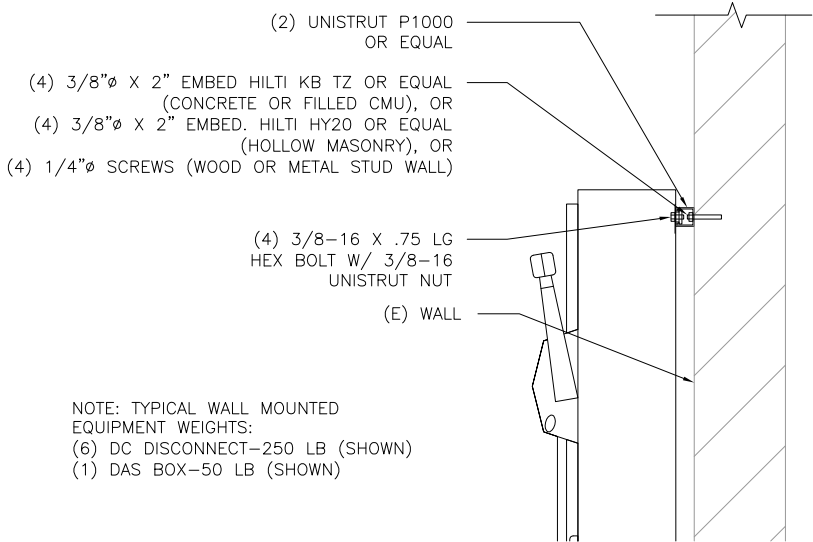
0 1/2" 1"
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SHEET

G2.1



3 EQUIPMENT ANCHOR DETAIL
SCALE: 3" = 1'-0"



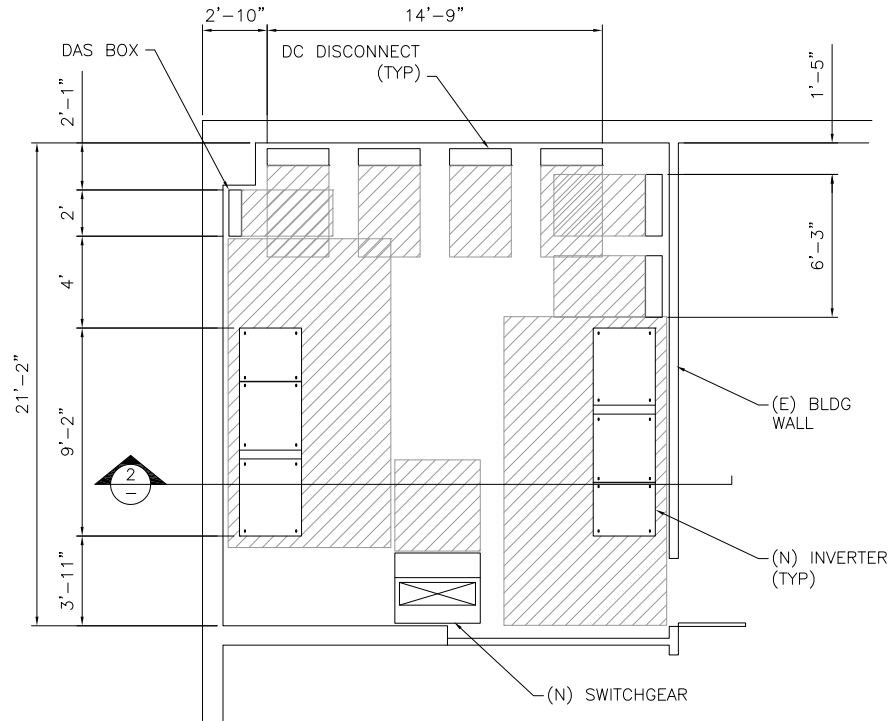
4 WALL MOUNTED DETAIL
SCALE: 1'-1/2"=1'-0"

NOTES:

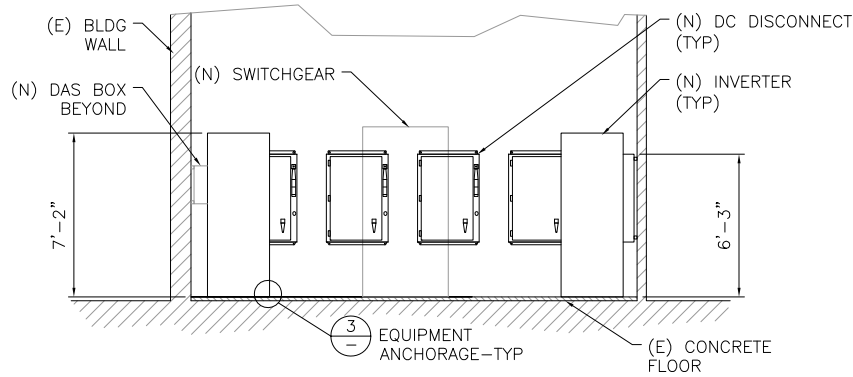
1. COORDINATE W/ ELECTRICAL SUBCONTRACTOR FOR REQUIRED LOCATIONS OF ELECTRICAL CONDUIT STUB-UPS PRIOR TO POURING CONCRETE PAD.

2. CONCRETE: CONSTRUCTION SHALL BE IN ACCORDANCE WITH LATEST EDITION OF ACI 318. ALL REINFORCING STEEL SHALL BE DEFORMED BARS CONFORMING TO A.S.T.M. A-615 GRADE 60. ALL CONCRETE SHALL BE ROCK CONCRETE CONFORMING TO A.S.T.M. C-33. CONCRETE SHALL DEVELOP A 2500 P.S.I. COMPRESSIVE STRENGTH AT 28 DAYS.

3. MASONRY: MASONRY CONSTRUCTION AND MATERIALS SHALL CONFORM TO ALL REQUIREMENTS OF "SPECIFICATIONS FOR MASONRY STRUCTURES ACI530/ASCE6/TMS602." BLOCK SHALL BE NORMAL WEIGHT UNITS CONFORMING TO ASTM C-90 TYPE I, f'm=1,500psi MINIMUM. GROUT SHALL CONFORM TO THE PROPORTION REQUIREMENTS OF ASTM C476. MORTAR SHALL BE TYPE S AND SHALL CONFORM TO ASTM270. HORIZONTAL JOINT REINFORCEMENT SHALL BE PER ASTM A-82. HORIZONTAL JOINT REINFORCEMENT SHALL BE PROVIDED @ 16" O.C. ALL MASONRY SHALL BE LAID RUNNING BOND UNLESS NOTED OTHERWISE. VERTICAL BARS SHALL BE IN FULLY GROUTED CORES AND BE CONTINUOUS TO THE FOUNDATION.



1 EQUIPMENT PAD - PLAN
SCALE: 1/4"=1'-0"



NOTE:
ALL EQUIPMENT OTHER THAN INVERTER TO BE WALL MOUNTED

2 EQUIPMENT PAD ELEVATION - FRONT VIEW
SCALE: 1/4"=1'-0"

Colorado Springs: (Main Office)
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Colo. Spgs., CO 80918
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EQUIPMENT PAD
DETAILS

GOLDEN, CO

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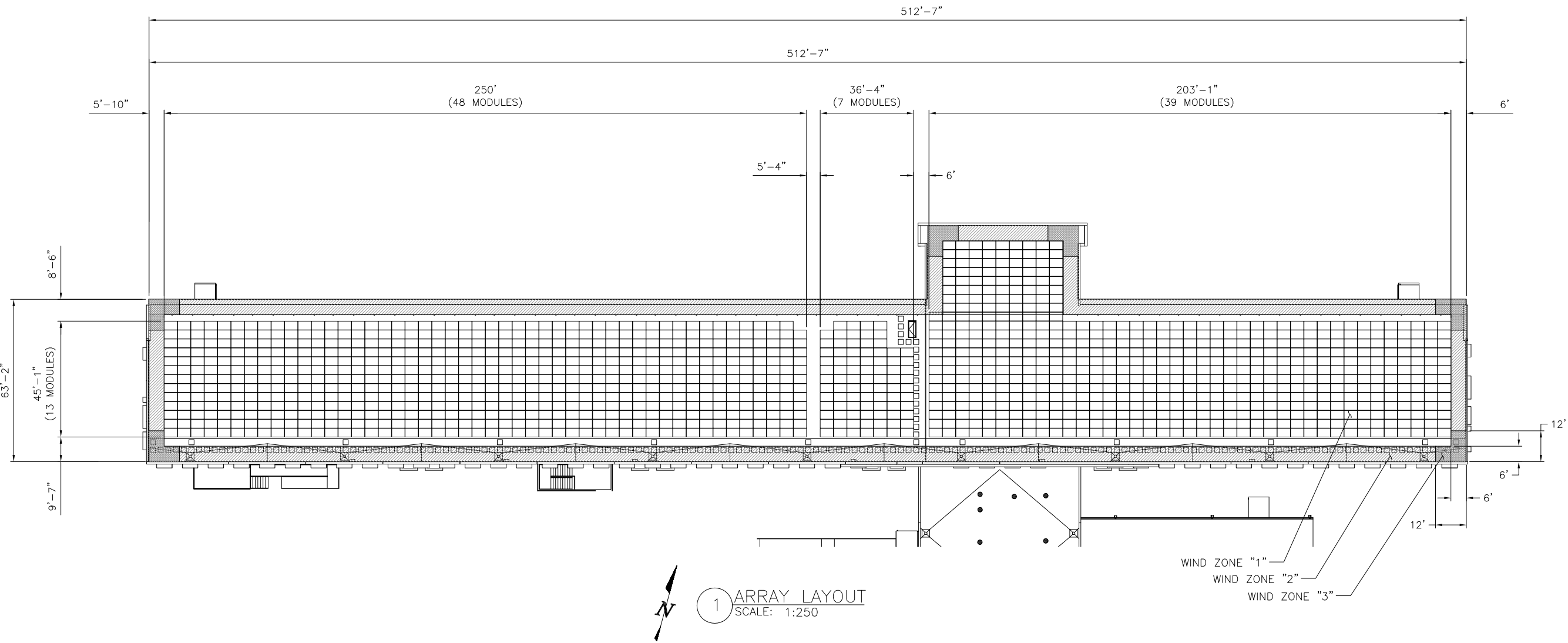
PROJECT 10861

DATE DRAWN 10-19-10

DRAWN BY RC

0 1/2" 1"
IF BAR IS NOT ONE INCH, DRAWING IS NOT TO SCALE
SHEET

S1.1

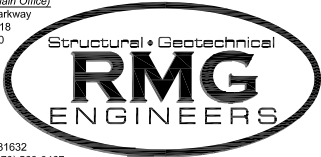


1
ARRAY LAYOUT
SCALE: 1:250

| S-5-U AND S-5-U MINI ATTACHMENT SCHEDULE | |
|------------------------------------------|----------------------------------|
| WIND ZONE | QTY. ATTACHMENTS PER MODULE SIDE |
| ZONE "1" | 2 PER SIDE |
| ZONE "2" | 2 PER SIDE |
| ZONE "3" | 3 PER SIDE |

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ARRAY WEIGHTS:
(1296) MODULES @ 53 LBS = 68,688 LBS.
TOTAL ARRAY AREA = 22,407 SQ. FT.
TOTAL ROOF AREA = 34,079 SQ. FT.

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ARRAY LAYOUT

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OPPORTUNITY

PROJECT 10861

DATE DRAWN 10-19-10

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0 1/2" 1"
IF BAR IS NOT ONE INCH, DRAWING IS NOT TO SCALE

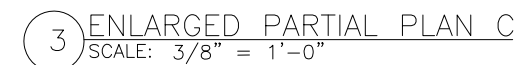
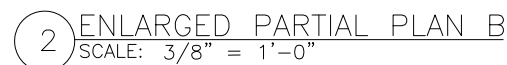
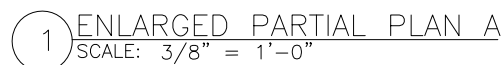
SHEET

S2.1



| WEST SEAM ATTACHMENT SCHEDULE | | | | |
|-------------------------------|-----|-----|-----|-----|
| 6 | 56 | 107 | 158 | 215 |
| 8 | 59 | 110 | 161 | 217 |
| 10 | 60 | 111 | 162 | 219 |
| 12 | 63 | 114 | 164 | 221 |
| 14 | 64 | 115 | 166 | 223 |
| 16 | 67 | 118 | 168 | |
| 17 | 68 | 119 | 170 | |
| 20 | 71 | 121 | 172 | |
| 21 | 72 | 123 | 174 | |
| 24 | 75 | 125 | 176 | |
| 25 | 76 | 127 | 180 | |
| 28 | 78 | 129 | 182 | |
| 29 | 80 | 131 | 184 | |
| 32 | 82 | 133 | 185 | |
| 33 | 84 | 135 | 188 | |
| 35 | 86 | 137 | 189 | |
| 37 | 88 | 139 | 192 | |
| 39 | 90 | 141 | 197 | |
| 41 | 92 | 142 | 200 | |
| 43 | 94 | 145 | 201 | |
| 45 | 96 | 146 | 204 | |
| 47 | 98 | 149 | 205 | |
| 49 | 100 | 150 | 207 | |
| 51 | 102 | 153 | 209 | |
| 53 | 103 | 154 | 211 | |
| 55 | 106 | 157 | 213 | |

| EAST SEAM ATTACHMENT SCHEDULE | |
|-------------------------------|-----|
| 2 | 103 |
| 4 | 106 |
| 6 | 107 |
| 8 | 110 |
| 10 | 111 |
| 12 | 114 |
| 14 | 115 |
| 16 | 118 |
| 18 | 119 |
| 20 | 122 |
| 21 | 123 |
| 24 | 125 |
| 25 | 127 |
| 28 | 129 |
| 29 | 131 |
| 32 | 133 |
| 33 | 135 |
| 36 | 137 |
| 37 | 139 |
| 40 | 141 |
| 41 | 143 |
| 43 | 145 |
| 45 | 146 |
| 47 | 149 |
| 49 | 150 |
| 51 | 153 |



(Main Office)
 s Parkway
 80918
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S-5 ATTACHMENT
DETAILS

| REVISIONS | | | | |
|-----------|---------|-----------------------------|---------|-------|
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| PROJECT | 10861 |
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| DATE DRAWN | 10-19-10 |
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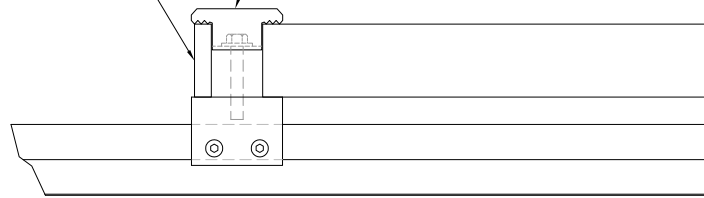
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SHEET

S2.2

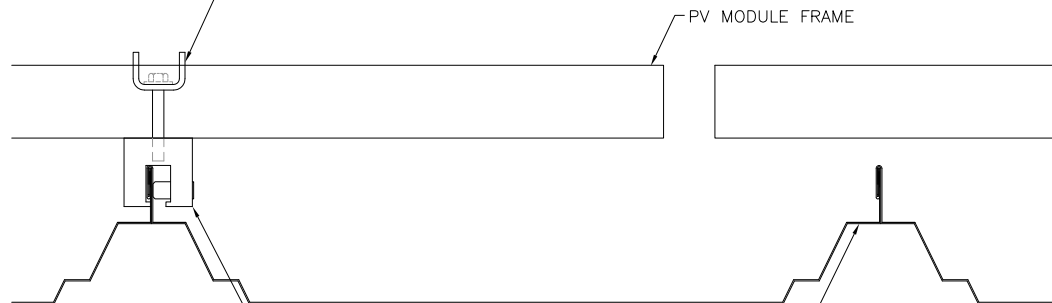
EXTERIOR SPACER CLIP -
ROTATE SPACER SO THE HEIGHT
IS THE SAME AS THE MODULE
(SP PART # 106477)

(N) INTERNAL FLANGE FRAME (IFF) CLIP (SP
PART # 106004) W/ 1/4 X 2" LG STAINLESS
STEEL BOLT (SP PART # 106095)



5 S-5/IFF MODULE MOUNTING CLIP
SCALE: 6" = 1'-0"

(N) INTERNAL FLANGE FRAME (IFF) CLIP (SP
PART # 106004) W/ 1/4 X 2" LG STAINLESS
STEEL BOLT (SP PART # 106095)



(N) S5 CLAMP ATTACHED
TO STANDING SEAM ROOF
(SP PART # 105469) OR
S5U MINI AS APPROVED BY
STRUCTURAL ENGINEER

(E) STANDING SEAM

6 S-5/IFF MODULE END CLIP
SCALE: 6" = 1'-0"

PV MODULE FRAME

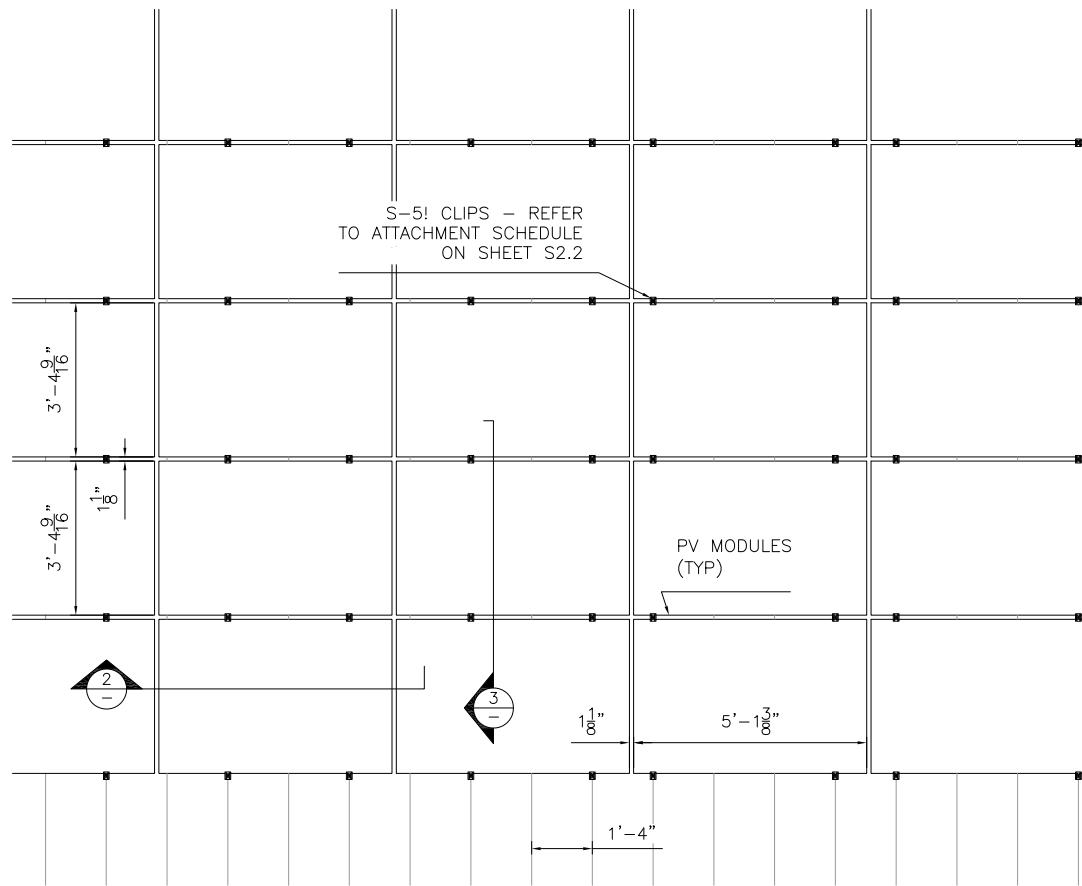
(N) INTERNAL FLANGE FRAME (IFF) CLIP
(SP PART # 106004) W/ 1/4 X 2" LG
STAINLESS STEEL BOLT (SP PART #
106095)

(N) S5U CLAMP
ATTACHED TO STANDING
SEAM ROOF (SP PART #
105469) OR S5U MINI
AS APPROVED BY
STRUCTURAL ENGINEER

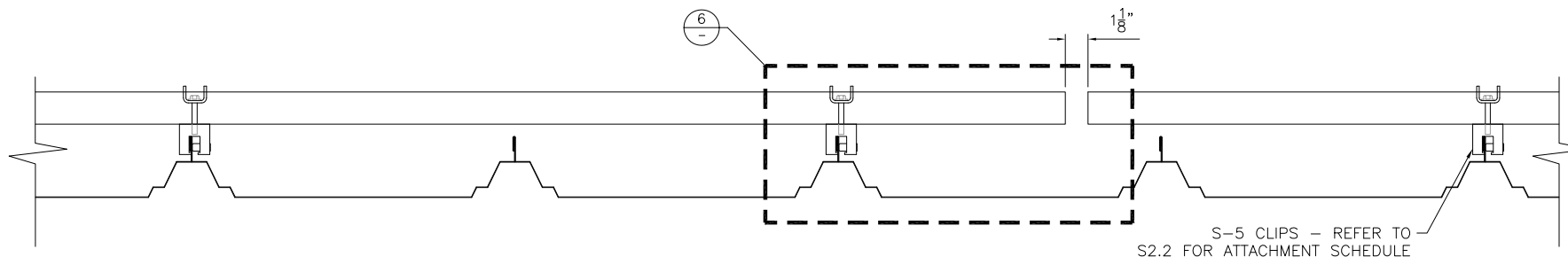
SET SCREW

(E) STANDING
SEAM

4 S-5/STANDING SEAM SECTION
SCALE: 6" = 1'-0"

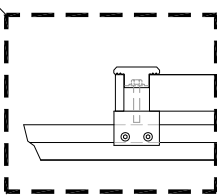


1 ENLARGED PARTIAL PLAN
SCALE: 1/2" = 1'-0"



2 MODULE MOUNT/S-5 CLAMP FRONT VIEW
SCALE: 3" = 1'-0"

5

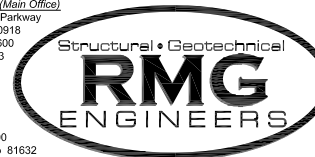


S-5 CLIPS - REFER TO
S2.2 FOR ATTACHMENT SCHEDULE

3 MODULE MOUNT/S-5 CLAMP SIDE VIEW
SCALE: 3" = 1'-0"

Colorado Springs: (Main Office)
2910 Austin Bluffs Parkway
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ATTACHMENT DETAILS
SHEET 1

REVISIONS

| REV | QUOTE # | DESCRIPTION | DATE | DB | CB |
|-----|---------|-----------------------------|---------|----|----|
| 1 | | ISSUE FOR CUSTOMER APPROVAL | 1/12/11 | MM | |
| 2 | | ISSUE FOR CONSTRUCTION | 5/26/11 | MM | RH |
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OPPORTUNITY

PROJECT 10861

DATE DRAWN 10-19-10

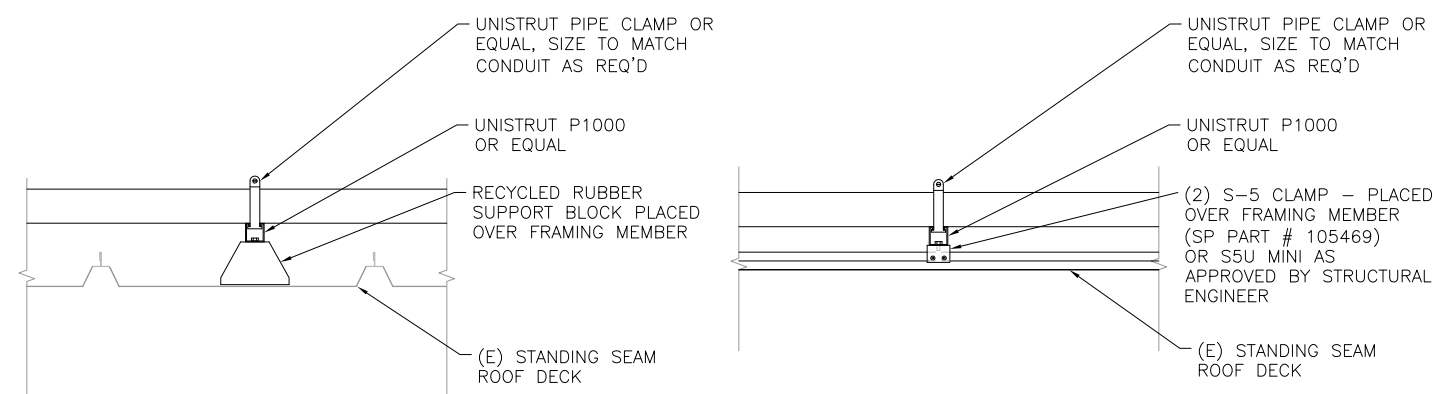
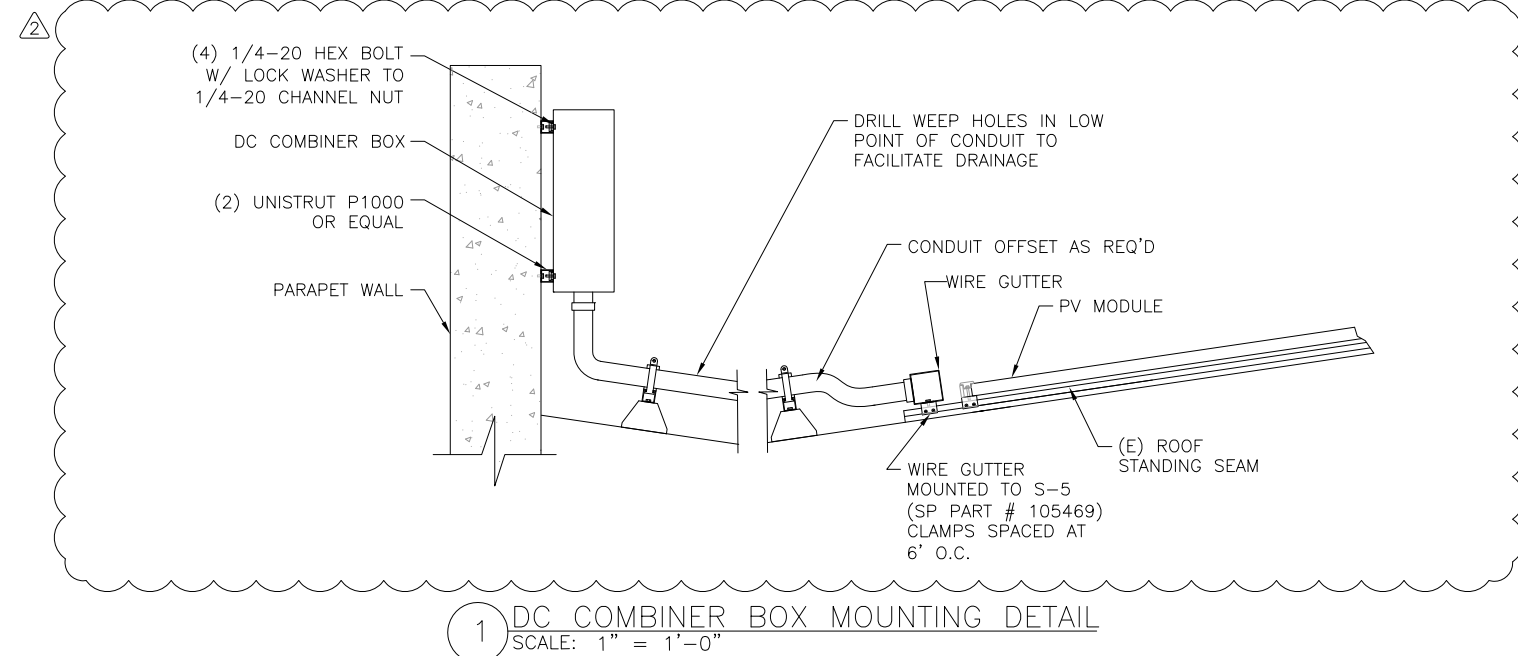
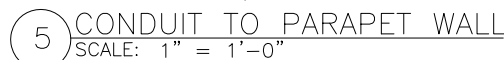
DRAWN BY RC

0 1/2" 1"

IF BAR IS NOT ONE INCH, DRAWING IS NOT TO SCALE

SHEET

S3.1



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ATTACHMENT DETAILS
SHEET 1

| | |
|-------------|----------|
| OPPORTUNITY | |
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| DRAWN BY | RC |

0 1/2" 1"

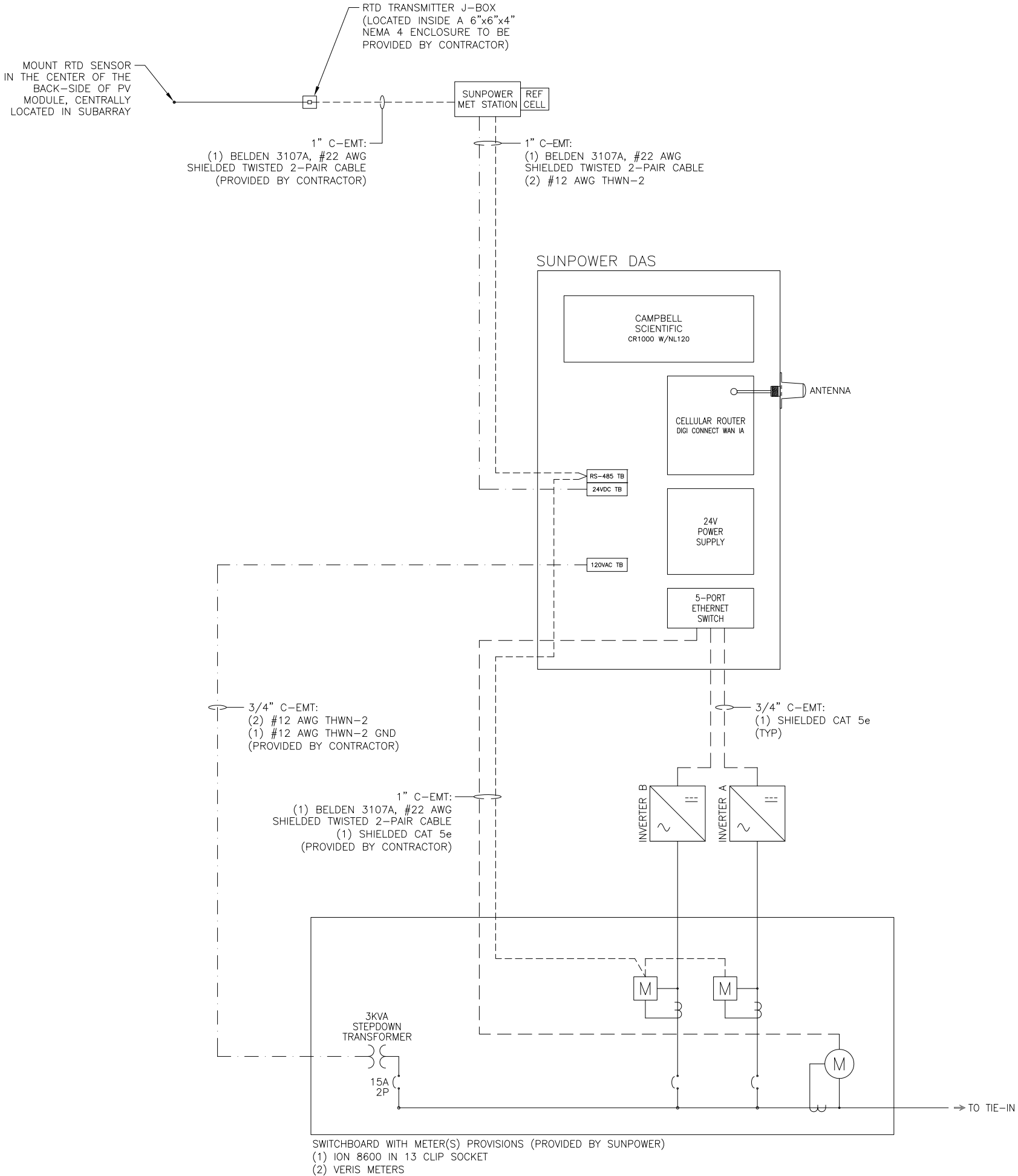
IF BAR IS NOT ONE INCH, DRAWING IS NOT TO SCALE

SHEET

S3.2

| ETHERNET & MODBUS DEVICE ADDRESSING | | |
|-------------------------------------|--------------|-----------|
| DEVICE | IP ADDRESS | MODBUS ID |
| SUNPOWER DAS CR1000 W/ NL120 | 192.168.1.91 | — |
| DIGI CONNECTWAN IA | 192.168.1.1 | — |
| ION 8600 | 192.168.1.3 | — |
| SUNPOWER MET STATION | — | 2 |
| INVERTER A VERIS METER | — | 10 |
| INVERTER B VERIS METER | — | 11 |
| INVERTER A | 192.168.1.50 | — |
| INVERTER B | 192.168.1.51 | — |

| LEGEND | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|
| ----- | RS-485: (1) BELDEN 3107A, #22 AWG SHIELDED TWISTED 2-PAIR CABLE |
| — — — — | ETHERNET: SHIELDED CAT 5e CABLE |
| ----- | REFERENCE CELL CABLE (ROOFTOP ONLY) |
| — · — · — | TWHN-2 CONDUCTORS |
| (M) | ION 8600 METER |
| [M] | VERIS METER |
| MODBUS WIRING INSIDE EQUIPMENT ENCLOSURES IS DIAGRAMMATIC. THE ORDER OF THE DEVICES ON THE MODBUS DAISY-CHAIN INSIDE EQUIPMENT ENCLOSURES IS LEFT TO THE DISCRETION OF THE CONTRACTOR. | |



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THE DRAWING USES STANDARD SYMBOLS AND NOTATION. CONSULT THE SUNPOWER CORPORATION IS AWARE OF THE

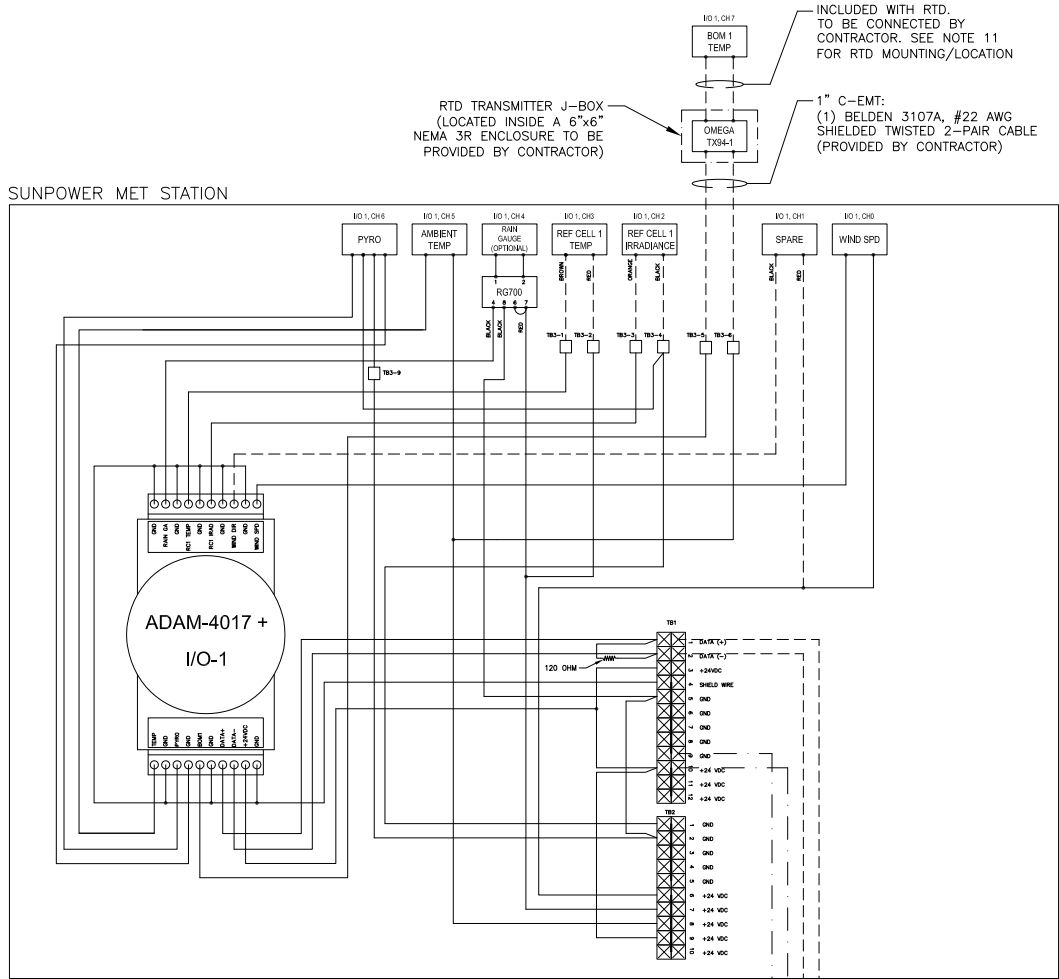
ENGINEER'S STAMP

NREL RSF II
BUILDING
GOLDEN, CO
MONITORING WIRING
SCHEMATIC

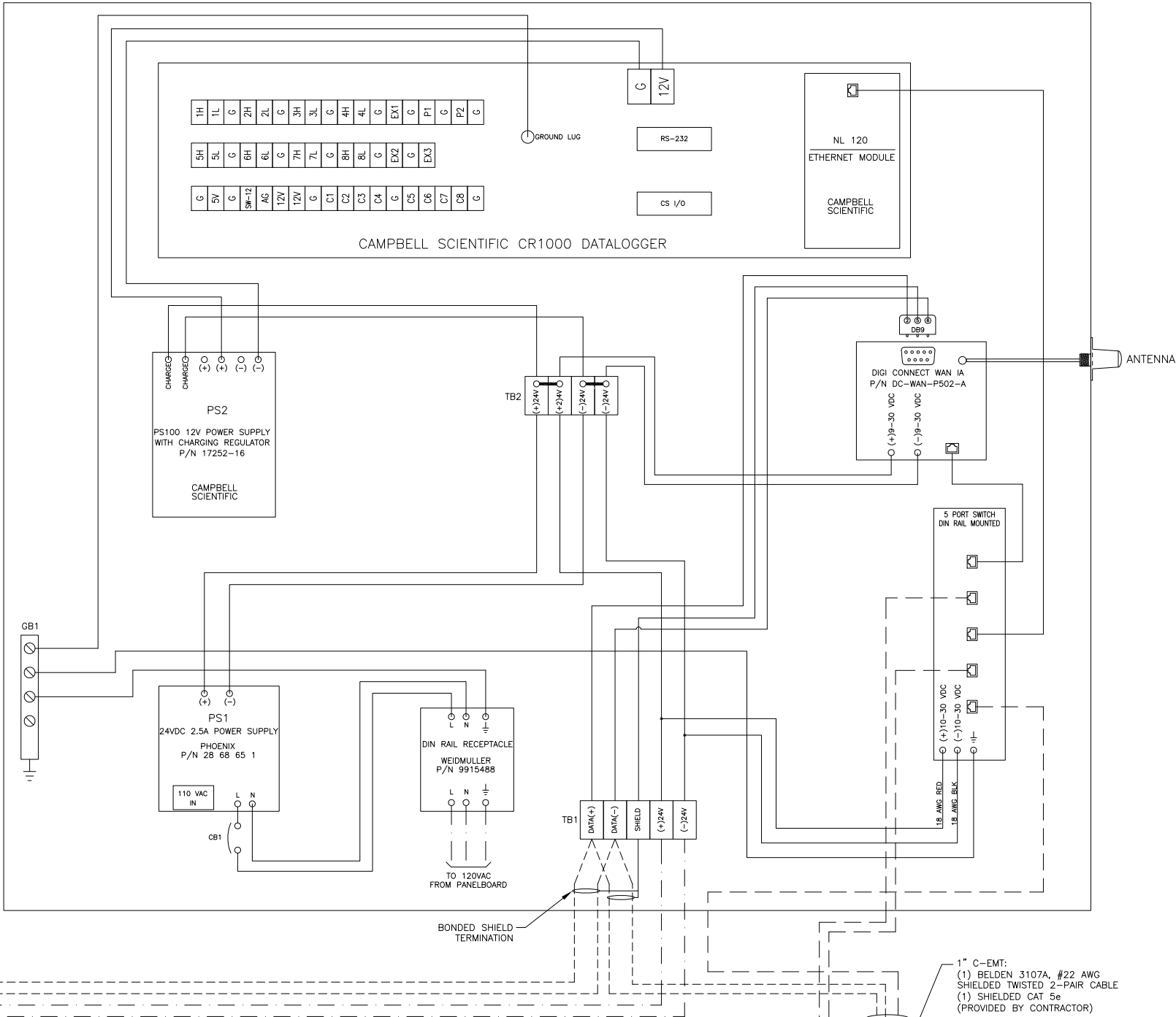
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| 1 | | | ISSUE FOR CUSTOMER APPROVAL | | 1/12/11 | MM | |
| 2 | | | ISSUE FOR CONSTRUCTION | | 5/26/11 | MM | RH |
| | | | | | | | |
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| | | | | | | | |
| OPPORTUNITY | | | | | | | |
| PROJECT | | | 10861 | | | | |
| DATE DRAWN | | | 10-19-10 | | | | |
| DRAWN BY | | | RC | | | | |
| <div>01/2"1"</div> <div>IF BAR IS NOT ONE INCH, DRAWING IS NOT TO SCALE</div> | | | | | | | |
| SHEET | | | | | | | |

E2.1

SUNPOWER MET STATION



SUNPOWER DAS

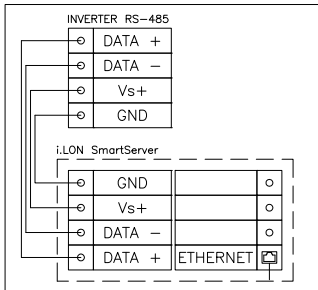


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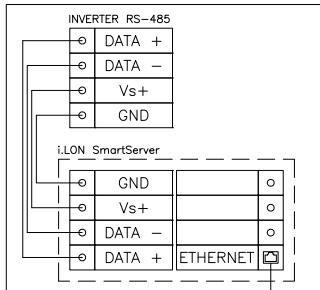
- EXAMINE INSTALLATION MANUAL OF EACH EQUIPMENT PRIOR TO INSTALLATION.
- CONDUIT TERMINATION TO MET STATION J-BOX MUST BE WEATHERPROOF.
- BOND SHIELDS OF BELDEN 3107A CABLE FOR RS-485 COMMUNICATION USING JUMPER WIRE TO GROUND TERMINAL BLOCK OF DAS ENCLOSURE. DO NOT GROUND SHIELDS OF BELDEN 3107A ELSEWHERE. ENSURE CONTINUOUS SHIELDS BETWEEN RS-485 CONNECTIONS.
- MAXIMUM REFERENCE CELL CABLE LENGTH IS 250'. FOR SYSTEMS WITH THE REFERENCE CELL NOT MOUNTED ON THE MET STATION, SUNPOWER TO PROVIDE P/N#105986/1506-673.
- INSTALL VERIS METER CTs AROUND EITHER BUSSING OR PHASE CONDUCTORS (ENSURING THAT ALL CONDUCTORS OF EACH PHASE ARE ENCLOSED) IN AGGREGATING SWITCHGEAR. CONNECT VOLTAGE TAPS TO BUSSING LUGS. SEE VERIS INSTALLATION MANUAL.
- ALL CONDUCTORS, CABLING, AND CONDUIT TO BE PROVIDED BY ELECTRICAL SUBCONTRACTOR UNLESS OTHERWISE NOTED.
- ALL ELECTRONICS AND EQUIPMENT TO BE PROVIDED BY SUNPOWER.
- SUBCONTRACTOR TO CONNECT AND WIRE THE FOLLOWING DEVICES: MET STATION, REFERENCE CELL, DAS ASSEMBLY AS DESCRIBED IN SCOPE OF WORK, MODBUS COMMUNICATION MODULE, VERIS CT METER, WAN IA ANTENNA IF EXTENSION IS REQUIRED.
- MODBUS WIRING INSIDE EQUIPMENT ENCLOSURES IS DIAGRAMMATIC. THE ORDER OF THE DEVICES ON THE MODBUS DAISY-CHAIN INSIDE EQUIPMENT ENCLOSURES IS LEFT TO THE DISCRETION OF THE CONTRACTOR.
- MOUNT RTD SENSOR ON BACKSIDE OF A PV MODULE IN THE CENTER OF A MODULE CELL ADJACENT TO THE MODULE JUNCTION BOX, CENTRALLY LOCATED IN SUBARRAY. FOR GROUND-MOUNT SYSTEMS, INSTALL A MINIMUM OF THREE ROWS FROM DRIVE MOTOR.

----- FIELD WIRING TWISTED PAIR
----- FIELD WIRING CAT 5e
----- FIELD WIRING THWN-2
100-1500 FIELD INSTALL TERMINATION RESISTOR

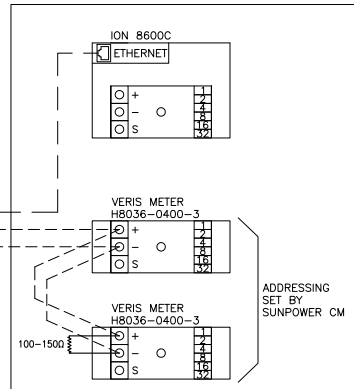
INVERTER B
SMA SC250U AC COMPARTMENT



INVERTER A
SMA SC250U AC COMPARTMENT



SWITCHBOARD
METERING COMPARTMENT



3/4" C-EMT:
(1) SHIELDED CAT 5e
(PROVIDED BY CONTRACTOR)(TYP.)

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DETAILED MONITORING
WIRING SCHEMATIC

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| 2 | | ISSUE FOR CONSTRUCTION | 5/26/11 | MM | RH |

OPPORTUNITY

PROJECT 10861

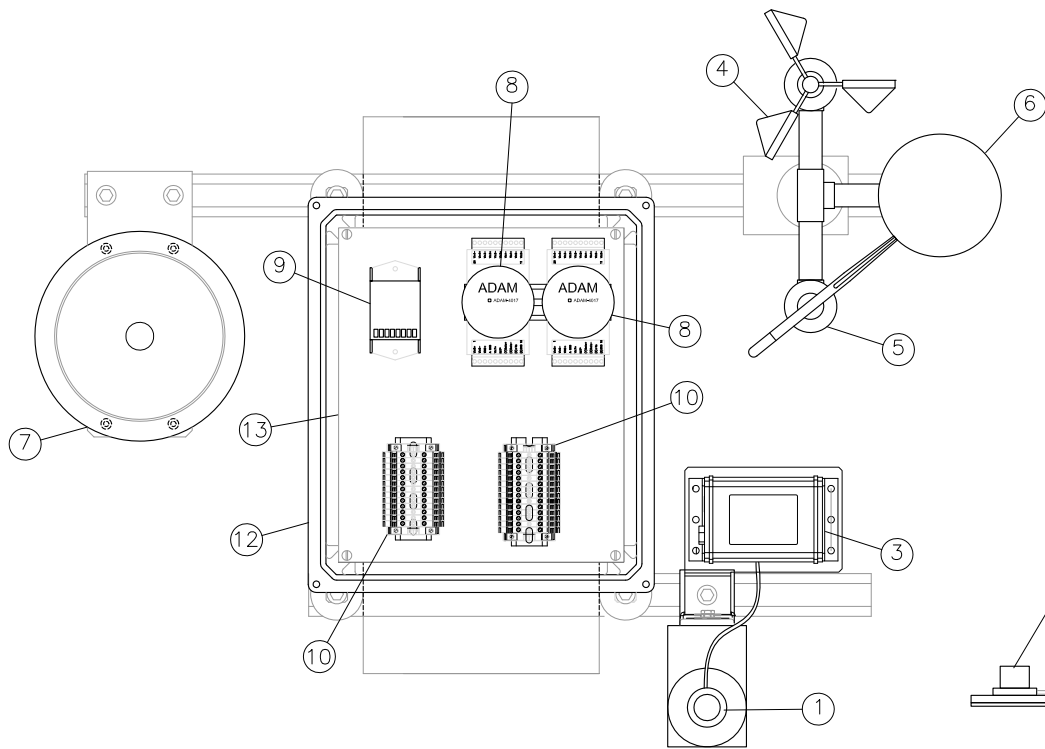
DATE DRAWN 10-19-10

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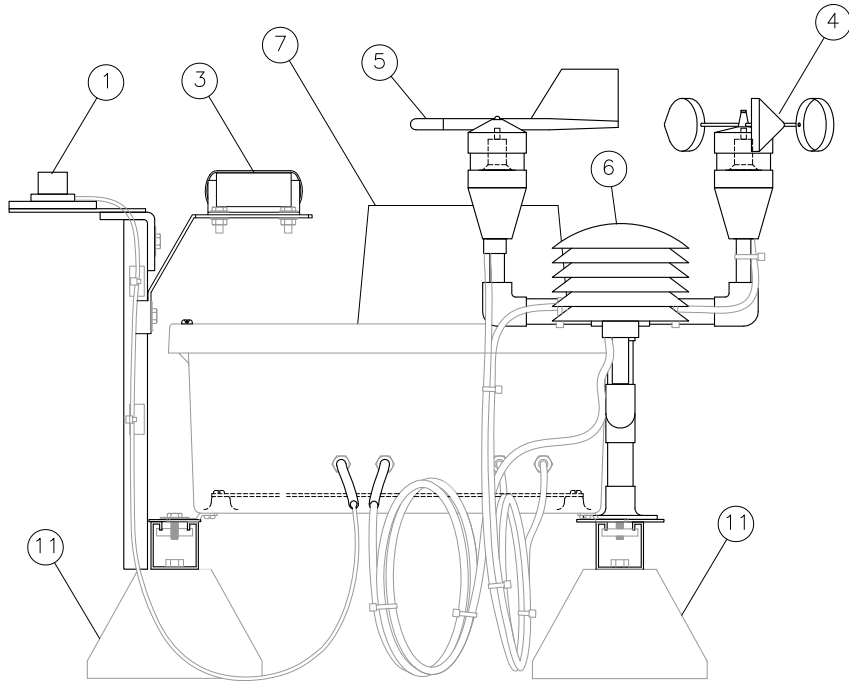
0 1/2" 1"
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SHEET

E2.2

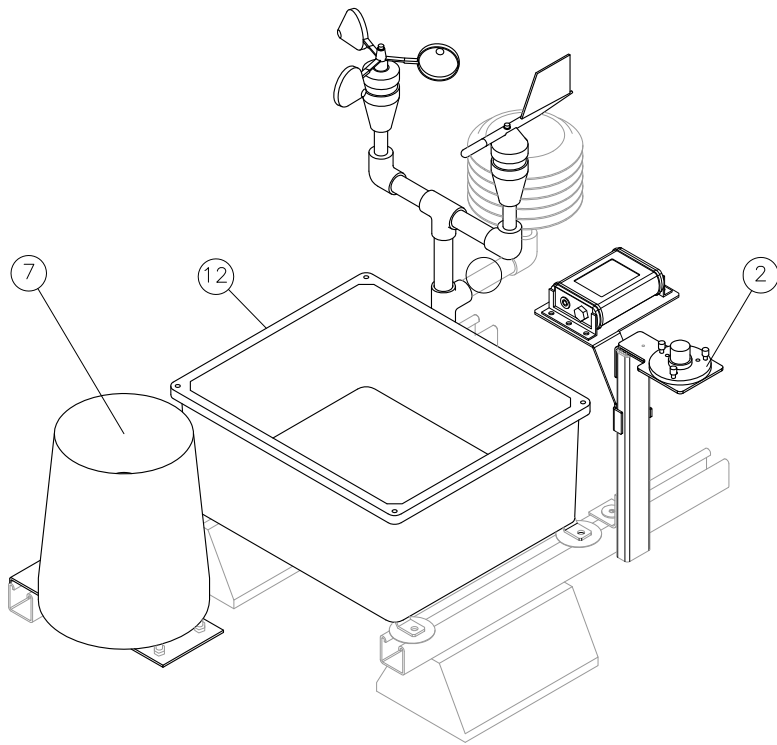
MET STATION DETAILS



TOP VIEW
WITHOUT ENCLOSURE COVER



PLAN VIEW



ISOMETRIC VIEW

NOTE: FOR TRACKER SYSTEMS REF CELL IS REMOVED AND PLACED ON TRACKER PER CONSTRUCTION DRAWING.

MET STATION COMPONENTS

| # | ITEM |
|----|------------------------|
| 1 | PYRANOMETER |
| 2 | LEVELING BASE |
| 3 | REFERENCE CELL |
| 4 | WIND SPEED |
| 5 | WIND DIRECTION |
| 6 | AMBIENT TEMP W/ SHIELD |
| 7 | RAIN GAUGE |
| 8 | ADAM ADC MODULE |
| 9 | 4-20MA MODULE |
| 10 | TERMINAL BLOCK |
| 11 | RUBBER FEET |
| 12 | ENCLOSURE |
| 13 | BACKPLATE |

MET STATION NOTES:

1. EXAMINE INSTALLATION MANUAL OF EACH EQUIPMENT PRIOR TO INSTALLATION.
2. CONDUIT TERMINATION TO MET STATION J-BOX MUST BE WEATHERPROOF.
3. LAND ALL BARE (SHIELD) WIRES FROM THE DAS CABLE TO THE TERMINAL LABELED "GND" IN THE DAS BOX. DO NOT LAND IN THE MET STATION.
4. MAXIMUM REFERENCE CELL CABLE LENGTH IS 250'. FOR SYSTEMS WITH THE REFERENCE CELL NOT MOUNTED ON THE MET STATION, SUNPOWER TO PROVIDE P/N#105986/1506-673.

5. BOND SHIELDS OF BELDEN 3107A CABLE FOR RS-485 COMMUNICATION USING JUMPER WIRE TO GROUND TERMINAL BLOCK OF DAS ENCLOSURE. DO NOT GROUND SHIELDS OF BELDEN 3107A ELSEWHERE. ENSURE CONTINUOUS SHIELDS BETWEEN RS-485 CONNECTIONS.
6. ALL CONDUCTORS, CABLING, AND CONDUIT TO BE PROVIDED BY ELECTRICAL SUBCONTRACTOR UNLESS OTHERWISE NOTED.
7. MOUNT MET STATION AS INDICATED IN SHEET SET. ENSURE STATION IS NOT SHADED.
8. LEVEL PYRANOMETER USING THE LEVELING BUBBLE IN THE LEVELING BASE.

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MET STATION
DETAILS

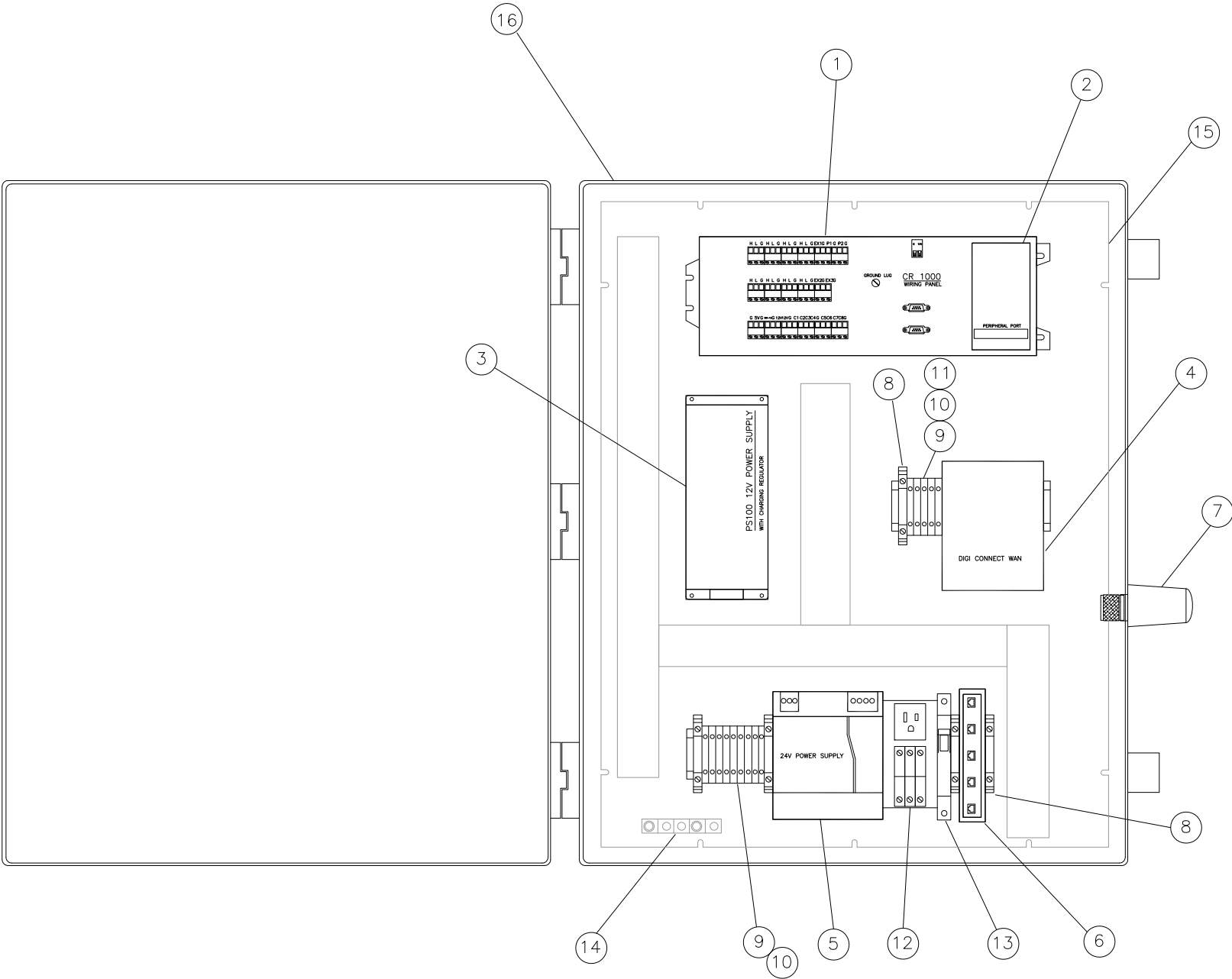
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|-------------|----------|
| OPPORTUNITY | |
| PROJECT | 10861 |
| DATE DRAWN | 10-19-10 |
| DRAWN BY | RC |

0 1/2" 1"
IF BAR IS NOT ONE INCH, DRAWING IS NOT TO SCALE
SHEET

E2.3

DAS DETAILS



PLAN VIEW

DAS COMPONENTS

| # | ITEM |
|----|---------------------------------|
| 1 | CR1000 DATA LOGGER |
| 2 | NL 120 ETHERNET INTERFACE |
| 3 | PS100 12V POWER SUPPLY |
| 4 | DIGICONNECT WAN IA ROUTER |
| 5 | 24V POWER SUPPLY |
| 6 | 5 PORT SWITCH DIN RAIL MOUNTED |
| 7 | ANTENNA |
| 8 | TERMINAL BLOCK CLAMP |
| 9 | TERMINAL BLOCK |
| 10 | TERMINAL BLOCK END COVER |
| 11 | 10 POS DIVISIBLE JUMPER |
| 12 | DIN RAIL RECEPTACLE |
| 13 | CIRCUIT BREAKER,1A |
| 14 | TAP BAR |
| 15 | BACK PLATE |
| 16 | ENCLOSURE NEMA 4X,POLYCARBONATE |

DAS ASSEMBLY NOTES:

1. SEE MONITORING WIRING DETAILS SHEET FOR DAS ASSEMBLY NOTES.

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DAS DETAILS

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OPPORTUNITY

PROJECT 10861

DATE DRAWN 10-19-10

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0 1/2" 1"
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SHEET

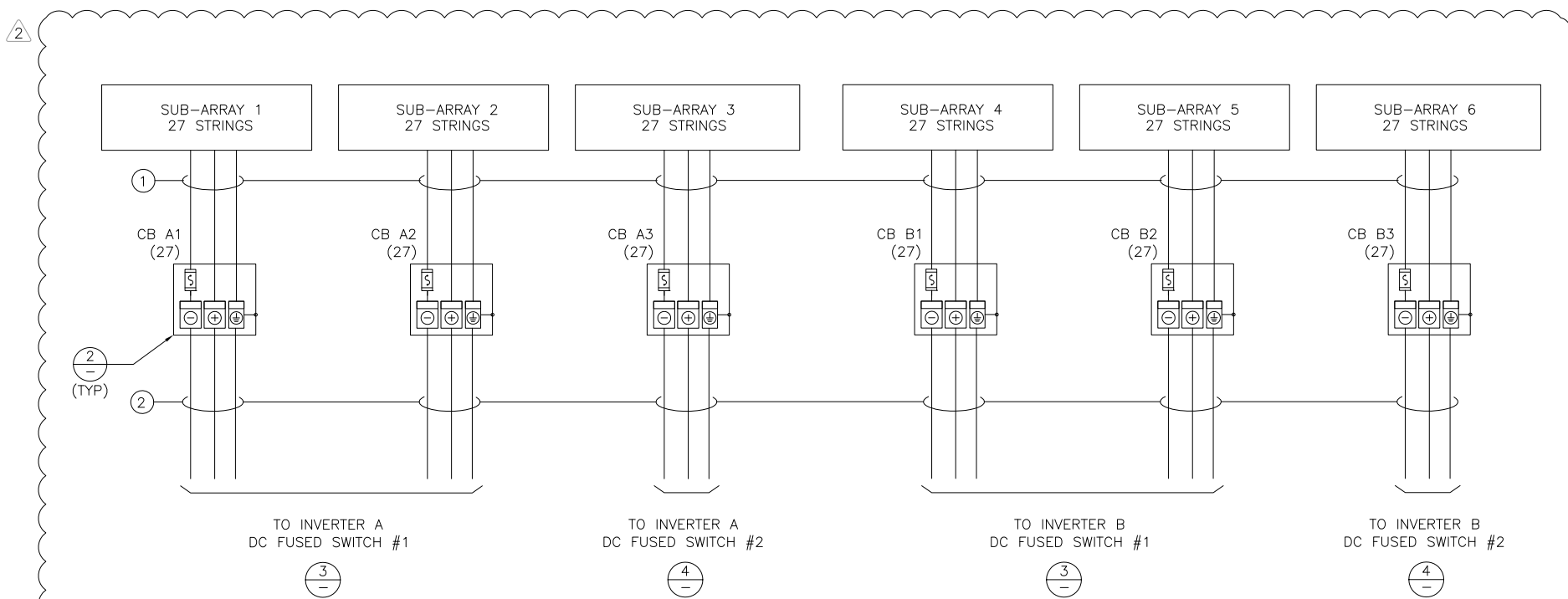
E2.4

| TOTAL SYSTEM RATING | |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| RMR PV ARRAY 408.24 KWP 1296 MODULES, SUNPOWER SPR-315E-WHT MODULE RATING: 290.00 WPTC 8 MODULES PER STRING, 162 STRINGS STRING AMPERAGE: 5.76A IMP, 6.14A ISC STRING VOLTAGE: 437.60V VMP, 516.80V VOC | |
| INVERTER SYSTEM | NUMBER OF STRINGS |
| A | 81 |
| B | 81 |

- NOTES:**
1. DETAIL NOMENCLATURE (TYP.):
CB A1 - COMBINER BOX #1, INVERTER SYSTEM A,
(XX) - NUMBER OF FUSES/STRINGS PER COMBINER BOX
EACH STRING CONSISTS OF (2) CONDUCTORS.
 2. FUSES IN SERIES SHALL BE OF CLASS RK1 OR RK5 AND HAVE SAME RATINGS AND BE LISTED FOR 600VDC.
 3. WHERE A FUSED SWITCH IS REQUIRED, DC FUSED SWITCH SHALL BE WITHIN 10' OF INVERTER.

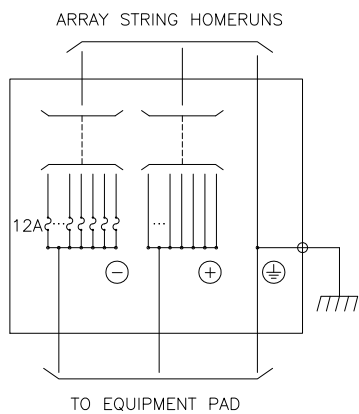
| Item # | CONDUIT | TABLE OF CONTENTS | FUSE |
|--------|--------------|-----------------------------------------------|------|
| ①* | 3/4" C-IMC | (6 MAX) #12 AWG USE-2, (1) #6 AWG THWN-2 GND | 12A |
| | 1" C-IMC | (10 MAX) #12 AWG USE-2, (1) #6 AWG THWN-2 GND | 12A |
| | 1-1/2" C-IMC | (28 MAX) #12 AWG USE-2, (1) #6 AWG THWN-2 GND | 12A |
| | 2" C-IMC | (30 MAX) #12 AWG USE-2, (1) #6 AWG THWN-2 GND | 12A |
| | 2-1/2" C-IMC | (30 MAX) #12 AWG USE-2, (1) #6 AWG THWN-2 GND | 12A |
| | 3" C-IMC | (30 MAX) #12 AWG USE-2, (1) #6 AWG THWN-2 GND | 12A |
| ② | (1) 2" C-IMC | (2) 300kCMIL THWN-2, (1) #4 AWG THWN-2 GND | 300A |

* WHERE NUMBER OF USE-2 CONDUCTORS EXCEEDS 30 CONDUCTORS, PARALLEL RUNS OF CONDUIT MUST BE USED. MAXIMUM OF 30 CURRENT CARRYING CONDUCTORS PERMITTED IN SINGLE CONDUIT.

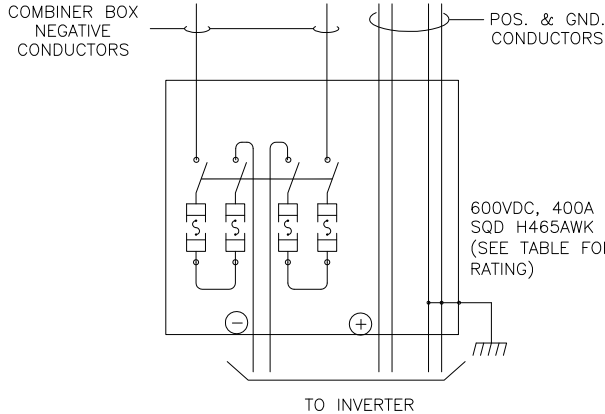


① ARRAY WIRING DETAILS
SCALE: NTS

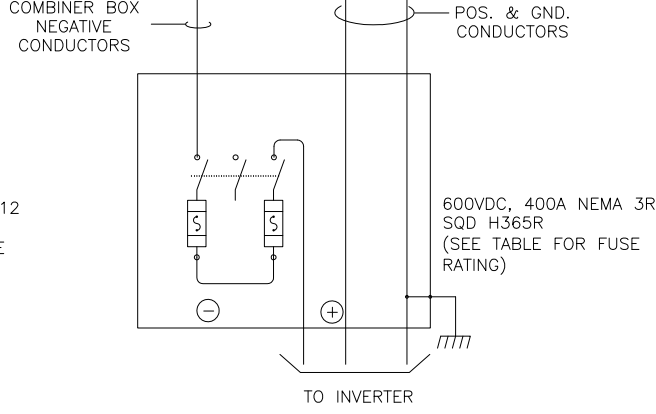
NOTE
(FOR SUNPOWER ARRAYS ONLY):
SUNPOWER MODULES ARE TO BE POSITIVELY GROUNDING. THIS REQUIRES THAT POSITIVE CONDUCTORS BE UN-FUSED AND UN-BROKEN FROM THE ARRAY TO THE INVERTER'S DC TERMINAL AND NEGATIVE CONDUCTORS BE FUSED AND/OR SWITCHED AS SPECIFIED IN THE DRAWINGS.



② COMBINER BOX WIRING
SCALE: NTS



③ DC 4 POLE FUSED SWITCH
SCALE: NTS



④ DC 3 POLE FUSED SWITCH
SCALE: NTS

| Combiner Box Sizing Data | |
|--------------------------------------|------------------|
| String Short Circuit Current (Isc) | 6.14 Amps |
| Nominal Current | 166 Amps |
| Current per conductor | 166 Amps |
| High Irradiance Factor (1.25) | 207 Amps |
| Continuous current (1.25) | 259 Amps |
| Conductors per conduit | 2 |
| Added Temperature Correction | 17 degs C |
| Conductor Fill Derating | 1.00 |
| Ambient Temp Derating (75 deg cond.) | 0.75 46-50 deg C |
| Ambient Temp Derating (90 deg cond.) | 0.82 46-50 deg C |

| Combiner Box Schedule | | | | | | | | | | |
|-----------------------------|-------------|-------------|-------------|-------------|-------------|-------------|---|---|---|----|
| Combiner Box # | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Strings | 27 | 27 | 27 | 27 | 27 | 27 | | | | |
| Power Conductors | (2) 300 | (2) 300 | (2) 300 | (2) 300 | (2) 300 | (2) 300 | | | | |
| Equipment Ground Conductors | (1) #4 | (1) #4 | (1) #4 | (1) #4 | (1) #4 | (1) #4 | | | | |
| Conduit Size | (1) 2" | (1) 2" | (1) 2" | (1) 2" | (1) 2" | (1) 2" | | | | |
| Fuse | 300Amp | 300Amp | 300Amp | 300Amp | 300Amp | 300Amp | | | | |
| Distance (ft.) | 200 | 200 | 200 | 200 | 290 | 400 | | | | |
| Voltage Drop | 2.503 | 2.503 | 2.503 | 2.503 | 3.629 | 5.005 | | | | |
| Percent Voltage Drop | 0.76% | 0.76% | 0.76% | 0.76% | 1.10% | 1.52% | | | | |
| Ambient Temp | 46-50 deg C | 46-50 deg C | 46-50 deg C | 46-50 deg C | 46-50 deg C | 46-50 deg C | | | | |
| Terminal Temp | 46-50 deg C | 46-50 deg C | 46-50 deg C | 46-50 deg C | 46-50 deg C | 46-50 deg C | | | | |
| Combiner Box Size (string) | 36 | 36 | 36 | 36 | 36 | 36 | | | | |
| System Configuration | 3 | 3 | 3 | 3 | 3 | 3 | | | | |
| Inverter System | A | A | A | B | B | B | | | | |

| References | |
|----------------------------|-----------------------------|
| Conductor Sizing | NEC Table 310-16 |
| Overcurrent Sizing | NEC 690-8(B)(1) |
| Equipment Ground Sizing | NEC 690-45 |
| Conduit Sizing | NEC Appendix C, Tables 1, 2 |
| Grounding Electrode Sizing | NEC Table 250-66 |

| Results from NEC Table 310-16 | |
|------------------------------------------------------------------|-----|
| Required Conductor Size | 300 |
| Conductor Ampacity (75 deg) | 285 |
| Conductor Ampacity (90 deg) | 320 |
| - Derated for Temperature | 262 |
| - Derated for Conduit Fill | 262 |
| Mn Fuse Rating (if needed) | 300 |
| Max Fuse Rating | 300 |
| Terminal Derating Check | 214 |
| NEC 690 Conditions to Satisfy | |
| Equal to or greater than 259 Amps (continuous current rating) | |
| Equal to or greater than 207 Amps (high irradiance current) | |
| (1) * 263 is equal to or greater than 300 Amps (min fuse rating) | |
| OR OK # (1) * 262 is between 250 and 300 (standard fuse sizes) | |
| Equal to or greater than 207 Amps (high irradiance current) | |

⑤ DC WIRING CALCULATIONS
SCALE: NTS

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DC WIRING DETAILS

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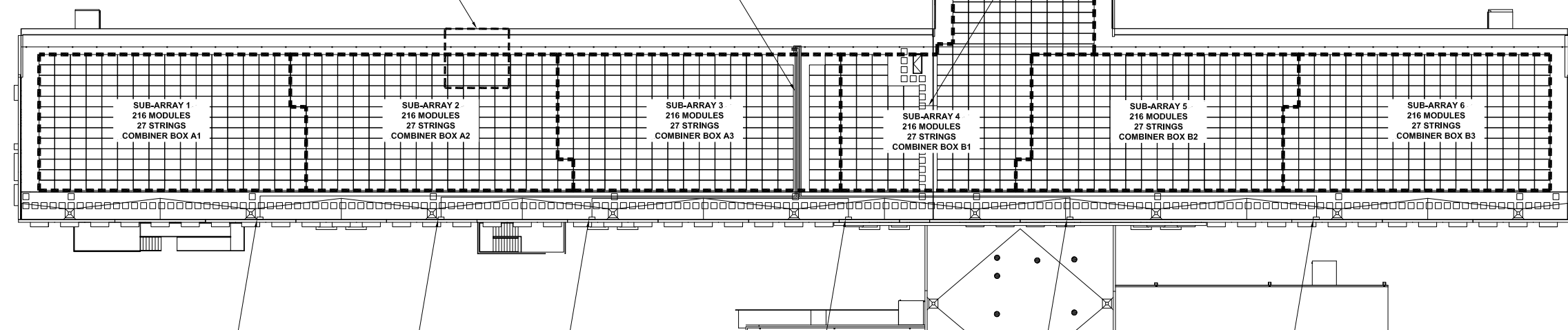
PROJECT 10861

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0 1/2" 1"
IF BAR IS NOT ONE INCH, DRAWING IS NOT TO SCALE
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E3.1






— (N) JUMPER CONDUIT
(TYP)

SUB-ARRAY 6
216 MODULES
27 STRINGS
COMBINER BOX B3

COMBINER BOX B3
27 STRINGS

1 DC WIRING PLAN
SCALE: 1:250

 - DC COMBINER BOX
 - DC GUTTER
 - DC CONDUIT

1. DC HOME-RUN WIRES ARE TO BE ATTACHED TO UNDERSIDE OF MODULE WITH ZIP-TIES THROUGH HOLES IN MODULE FRAME
2. CONDUIT EXPANSION FITTINGS REQUIRED, PLEASE REFER TO G.1.1 FOR CALCULATIONS.

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DC WIRING PLAN

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0 1/2" 1"

IF BAR IS NOT ONE INCH, DRAWING IS NOT TO SCALE

SHEET

E4.1

2

(N) #6 AWG BARE CU CONNECTED TO
END LINE OF MODULES WITH ILSCO
GBL-4DBT LAY-IN LUG. CONNECTION
TO MODULE SHALL BE AT MODULE'S
DESIGNATED GROUNDING POINT ON
UNDERSIDE OF MODULE FRAME.

(N) PV MODULE

CONTINUOUS #6 AWG BARE CU WITH
ONE LAY-IN LUG PER GUTTER SECTION
(ILSCO GBL-4DBT OR EQUIVALENT).

2

(N) 6x6 OR 4x4 ALUMINUM
ELECTRICAL WIREWAY

4

1

(N) COMBINER BOX

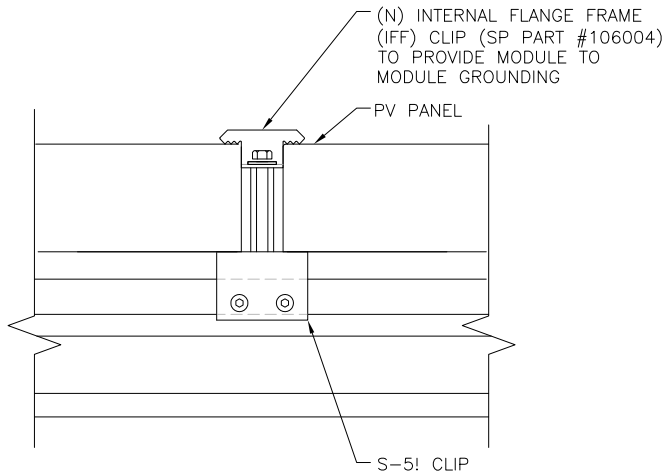
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2

(N) CONDUIT

(E) ROOF SEAM

1 TYPICAL ARRAY GROUNDING PLAN
SCALE: $\frac{3}{8}'' = 1'-0''$



2 INTERIOR MODULE TO MODULE GROUNDING
SCALE: $6'' = 1'-0''$

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ARRAY GROUNDING DETAILS

REVISIONS

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OPPORTUNITY

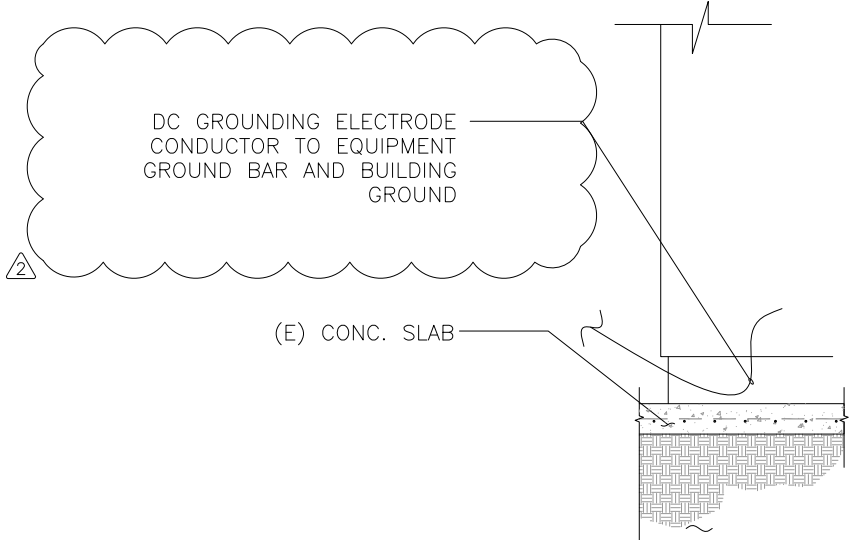
PROJECT 10861

DATE DRAWN 10-19-10

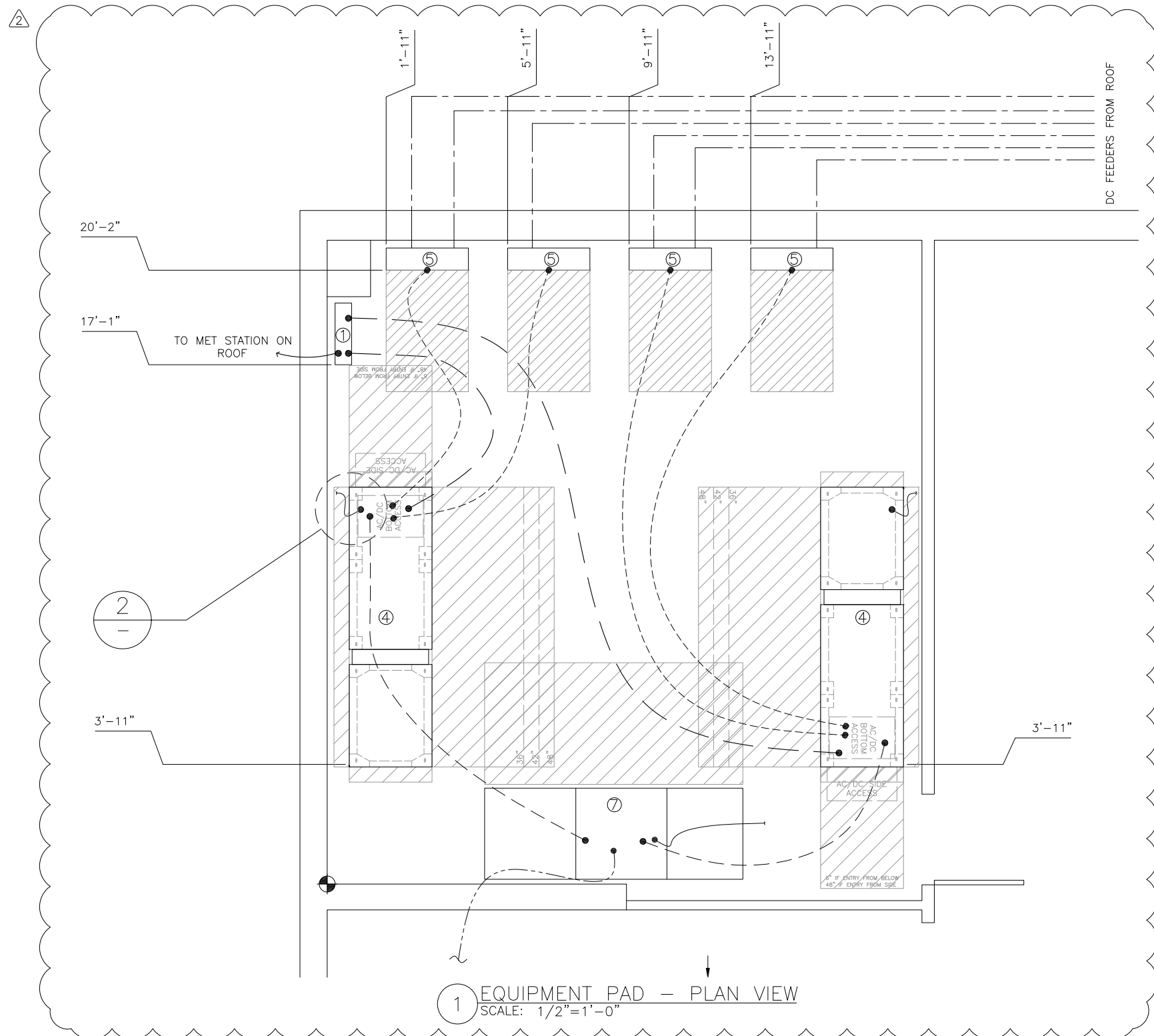
DRAWN BY RC

0 1/2" 1"
IF BAR IS NOT ONE INCH, DRAWING IS NOT TO SCALE
SHEET

E4.2



2 EQUIPMENT PAD GROUNDING ELECTRODE DETAILS—NEW PAD
SCALE: 1"=1'-0"



1 EQUIPMENT PAD — PLAN VIEW
SCALE: 1/2"=1'-0"

EQUIPMENT KEY:

| | |
|-------------------------|----------------------------|
| ① DAS | ⑦ SWITCHGEAR |
| ② ISOLATION TRANSFORMER | ⑧ MAIN PANEL |
| ③ AC DISCONNECT | ⑨ MINI-POWER ZONE |
| ④ INVERTER | ⑩ METER |
| ⑤ DC DISCONNECT | ⑪ HIGH VOLTAGE TRANSFORMER |
| ⑥ DC FUSE BOX | |

LEGEND

| | |
|-------|------------------------|
| | CLEARANCE AREA PER NEC |
| — | COMM CONDUIT |
| - - - | AC CONDUIT |
| - - - | DC CONDUIT FROM ROOF |
| - - - | DC CONDUIT |
| - - - | AC CONDUIT TO TIE-IN |

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EQUIPMENT PAD GROUNDING DETAILS

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|-----|---------|-----------------------------|---------|----|----|
| 1 | | ISSUE FOR CUSTOMER APPROVAL | 1/12/11 | MM | |
| 2 | | ISSUE FOR CONSTRUCTION | 5/26/11 | MM | RH |
| | | | | | |
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| | | | | | |

OPPORTUNITY

PROJECT 10861

DATE DRAWN 10-19-10

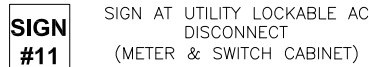
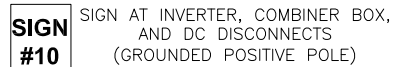
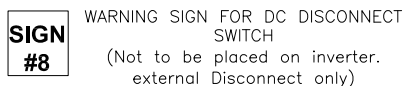
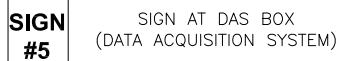
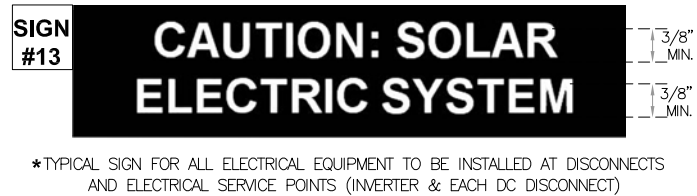
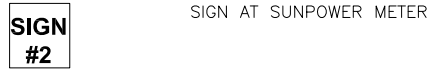
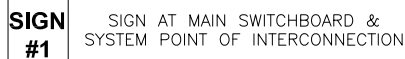
DRAWN BY RC

0 1/2" 1"

IF BAR IS NOT ONE INCH, DRAWING IS NOT TO SCALE

SHEET E5.1

10861_ES.1_EQUIPMENT PAD GROUNDING—STUB-UP PLAN.DWG



A } MODULES ROTATED 90°

5. COLOR FOR DAS WARNING SIGN, UTILITY LOCKABLE AC DISCONNECT, SOLAR GENERATOR ON PREMISES, POWER METER, INTERCONNECT PANEL SECONDARY POWER SIGN WILL BE BLACK TEXT ON ORANGE BACKGROUND. THE COLOR FOR DISCONNECT SIGNAGE WILL BE BLACK TEXT ON WHITE BACKGROUND, AND THE CAUTION SIGN WILL BE ON WHITE TEXT WITH RED BACKGROUND.

1 ELECTRICAL WARNING SIGNS
SCALE: NTS

SUNPOWER

1414 HARBOUR WAY SOUTH
RICHMOND, CA 94804
(510) 540-0550

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ENGINEER'S STAMP

NREL RSF II
BUILDING

GOLDEN, CO

SIGNAGE DETAILS & LOCATION

| | |
|--------------------|----------|
| OPPORTUNITY | |
| PROJECT | 10861 |
| DATE DRAWN | 10-19-10 |
| DRAWN BY | RC |

IF BAR IS NOT ONE INCH, DRAWING IS NOT TO SCALE

E7.1

