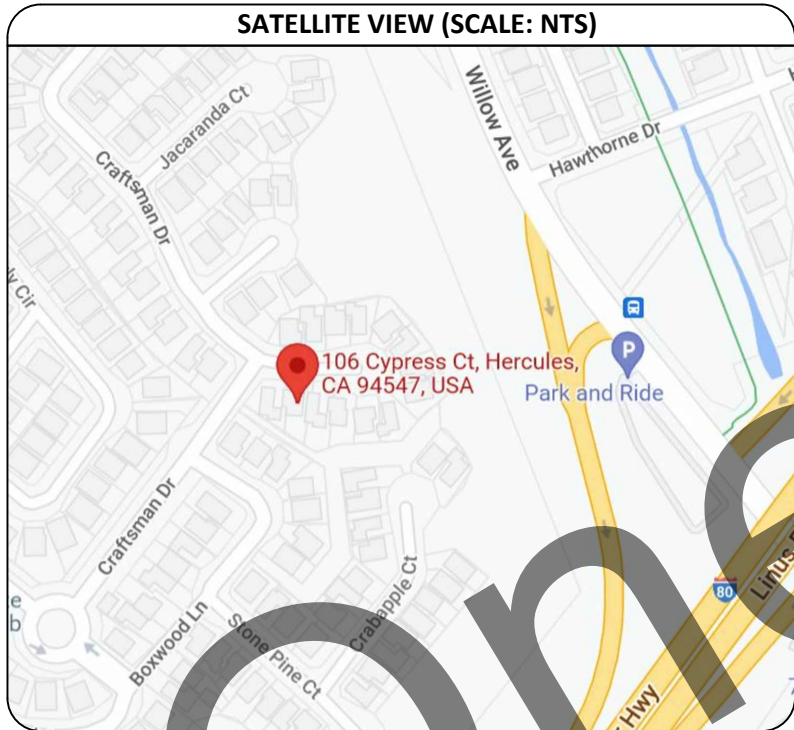


PROJECT: PV SYSTEM DETAILS	
[DC] SYSTEM SIZE	[AC] SYSTEM SIZE
20 MODULES x 400W	20 MICRO-INVERTER x 290W
8.0 kW	5.80 kW



SCOPE OF WORK

- PROPOSED PROJECT TO INSTALL GRID- TIED PV ONLY SYSTEM ON AN EXISTING ROOFTOP STRUCTURE AT A RESIDENTIAL LOCATION : HOUSE NO STREET NAME, CITY, STATE ZIP CODE. COORDINATES: 38°01'23.8"N 122°15'55.8"W
- THE PV MODULES WILL BE SECURED ON ROOF USING PRE-ENGINEERED ROOF RACKING SYSTEM.
- INSTALLED PV SYSTEM WILL BE THEN CONNECTED TO HOMEOWNER'S SERVICE EQUIPMENT USING APPLICABLE INTERCONNECTION METHOD (AS PER AHJ).
- THE ENERGY PRODUCED BY PV SYSTEM WILL BE USED TO POWER THE HOME APPLIANCES. EXCESS POWER IS SENT BACK TO THE UTILITY GRID.

APPLICABLE GOVERNING CODES & NOTES

THIS PROJECT SHALL COMPLY WITH THE FOLLOWING CODES:

- 2019 CALIFORNIA BUILDING CODE
- 2019 CALIFORNIA ELECTRICAL CODE
- 2019 CALIFORNIA FIRE CODE
- 2019 CALIFORNIA RESIDENTIAL CODE

ALL OTHER RELATED STATE & AHJ BY-LAWS & ORDINANCES

DESIGN CRITERIA

- OCCUPANCY GROUP: R1/SINGLE FAMILY DWELLING (SFD)
- NO. OF STORIES: SINGLE STORY
- EXPOSURE CATEGORY : B, RISK CATEGORY : II
- WIND SPEED (ASCE 7-16) : 115 MPH
- GROUND SNOW LOAD (ASCE 7-16) : 0 lb/sqft
- ASHRAE EXTREME LOW: -4°C
- ASHRAE HIGH TEMP (2% AVG.) : 31°C
- ASHRAE DISTANCE ABOVE ROOF (7/8") : 53°C

SHEET INDEX

PV-0	PROJECT SUMMARY
PV-1	SITE PLAN
PV-2	ROOF ATTACHMENT DETAILS
PV-3	BOM & STRING LAYOUT
S-1	STRUCTURAL DETAILED DIAGRAM
E-1	ELECTRICAL DIAGRAM & CALCULATIONS
E-2	PLACARDS
E.S	EQUIPMENT SPECIFICATIONS

EQUIPMENT DETAILS

(#) PV MODULES	(20) REC400AA PURE BLACK
(#) MICROINVERTER	(20) ENPHASE IQ8PLUS-72-2-US
(#) COMBINER BOX	(01) ENPHASE IQ COMBINER 4C (X-IQ-AM1-240-4C)
OUTPUT CURRENT	24.2A
ROOF RACKING SYSTEM	UNIRAC FLASHLOC COMP W/ UNIRAC SOLARMOUNT LIGHT RAIL (168")
STRING / BRANCH CIRCUIT	2 STRING OF 10 MODULES
POINT OF INTERCONNECTION UTILITY	LOAD BREAKER IN THE MAIN SERVICE PANEL MLO W/200A BUSBAR, 120/240V, 3W, 1φ
AHJ	XXXX

GENERAL NOTES

- ALL COMPONENTS ARE UL LISTED & CEC CERTIFIED, WHERE WARRANTED
- A DISCONNECTING MEANS SHALL BE INSTALLED AT A READILY ACCESSIBLE LOCATION EITHER OUTSIDE OF THE BUILDING OR STRUCTURE OR INSIDE NEAREST POINT OF ENTRANCE OF THE SYSTEM CONDUCTORS.
- HEIGHT OF THE INTEGRATED AC/DC DISCONNECT SHALL NOT EXCEED 6'-7" PER CEC CODE 240.24.
- A GROUNDING ELECTRODE SYSTEM IN ACCORDANCE WITH CEC 690.47 AND 250.50 THROUGH 60 AND 250-166 SHALL BE PROVIDED. PER CEC
- GROUNDING ELECTRODE SYSTEM OF EXISTING BUILDING MAY BE USED AND BONDED TO THE SERVICE ENTRANCE. IF EXISTING SYSTEM IS INACCESSIBLE OR INADEQUATE A SUPPLEMENTAL GROUNDING ELECTRODE WILL BE USED AT THE INVERTER LOCATION CONSISTING OF A UL LISTED 8 FT. GROUND ROD WITH ACORN CLAMP. GROUNDING ELECTRODE CONDUCTORS SHALL BE NO LESS THAN #8 AWG AND NO LARGER THAN #6 AWG COPPER AND BONDED TO THE EXISTING GROUNDING ELECTRODE TO PROVIDE FOR A COMPLETE SYSTEM.
- PHOTOVOLTAIC MODULES ARE TO BE CONSIDERED NON-COMBUSTIBLE.
- PHOTOVOLTAIC INSTALLATION WILL NOT OBSTRUCT ANY PLUMBING, MECHANICAL, OR BUILDING ROOF VENTS.
- WATER PROOF CONNECTORS AND HUBS SHALL BE USED WHERE APPLICABLE PER CEC 312.2 AND 314.15.
- GROUNDING/BONDING BUSHINGS SHALL BE INSTALLED WHERE APPLICABLE PER CEC 250.92.
- ALL EXTERIOR RACEWAYS ON WALLS SHOULD BE EMT UNLESS NOTED OTHERWISE.
- CONTRACTOR SHALL INSTALL EQUIPMENT IN ACCORDANCE WITH MANUFACTURER INSTRUCTIONS & NOTHING IN THIS DOCUMENT SHALL BE INTERPRETED IN A WAY THAT OVERRIDES THEM.
- CONTRACTOR IS RESPONSIBLE FOR VERIFICATION OF ALL CONDITIONS, DIMENSIONS & DETAILS IN THIS DOCUMENT. ALL DIMENSIONS SHALL BE VERIFIED BY SUBCONTRACTOR BEFORE INSTALLATION.

PHOTOVOLTAIC SYSTEM FIRE CLASSIFICATION LISTING IN ACCORDANCE WITH UL1703 STANDARD.

ELECTRICAL NOTES

- THE EQUIPMENT AND ALL ASSOCIATED WIRING AND INTERCONNECTION SHALL BE INSTALLED ONLY BY QUALIFIED PEOPLE. A QUALIFIED PERSON IS ONE WHO HAS SKILLS AND KNOWLEDGE RELATED TO THE CONSTRUCTION AND OPERATION OF THE ELECTRICAL EQUIPMENT AND INSTALLATIONS AND HAS RECEIVED SAFETY TRAINING TO RECOGNIZE AND AVOID THE HAZARDS INVOLVED. (CEC690.4(E) AND 705.6)
- LOCAL UTILITY PROVIDER SHALL BE NOTIFIED PRIOR TO USE AND ACTIVATION OF ANY SOLAR PHOTOVOLTAIC INSTALLATION. FOR A LINE SIDE TAP CONNECTION, UTILITY NEEDS TO BE NOTIFIED WELL IN ADVANCE TO COORDINATE BUILDING ELECTRICAL SHUT OFF.
- NEW CONDUIT ROUTING SHOWN IS ESSENTIALLY SCHEMATIC. SUBCONTRACTOR SHALL LAY OUT RUNS TO SUIT FIELD CONDITIONS AND THE COORDINATION REQUIREMENTS OF OTHER TRADES.
- ARRAY WIRING SHOULD NOT BE READILY ACCESSIBLE EXCEPT TO QUALIFIED PERSONNEL.
- ALL EXTERIOR CONDUIT, FITTINGS, AND BOXES SHALL BE WATERTIGHT AND APPROVED FOR USE IN WET LOCATIONS .
- WIRING METHODS FOR PV SYSTEM CONDUCTORS AREN'T PERMITTED WITHIN 10 IN. OF THE ROOF DECKING OR SHEATHING EXCEPT WHERE LOCATED DIRECTLY BELOW THE ROOF SURFACE THAT'S COVERED BY PV MODULES AND ASSOCIATED EQUIPMENT WIRING
- BACK-FED BREAKER MUST BE AT THE OPPOSITE END OF BUS BAR FROM THE MAIN BREAKER OR MAIN LUG SUPPLYING CURRENT FROM THE UTILITIES.
- ALL CONDUCTORS AND WIRE TIES EXPOSED TO SUNLIGHT ARE LISTED AS UV RESISTANT.
- CONTRACTOR SHALL FOLLOW ALL ELECTRICAL EQUIPMENT LABELING REQUIREMENTS ACCORDING TO CEC.
- MEASURE THE LINE-TO-LINE AND LINE-TO-NEUTRAL VOLTAGE OF ALL SERVICE ENTRANCE CONDUCTORS PRIOR TO INSTALLING ANY SOLAR EQUIPMENT. THE VOLTAGES FOR THE 240VAC RATED.
- ALL EXTERIOR CONDUIT TO BE PAINT MATCHED TO THE HOMES COLORS

CONTRACTOR LOGO
CONTRACTOR-NAME

DATE	MM/DD/YYYY
PROJECT ID	XXXX-XX-XX
CREATED BY	XX
CHECKED BY	XX
SCALE	NTS
SHEET SIZE	11"X 17"
	ANSI B

CUSTOMER NAME RESIDENCE
HOUSE NO STREET NAME CITY, STATE ZIP CODE
PHONE: (XXX) XXX-XXXX
APN: XXXXXXXX

HOMEOWNER INFO

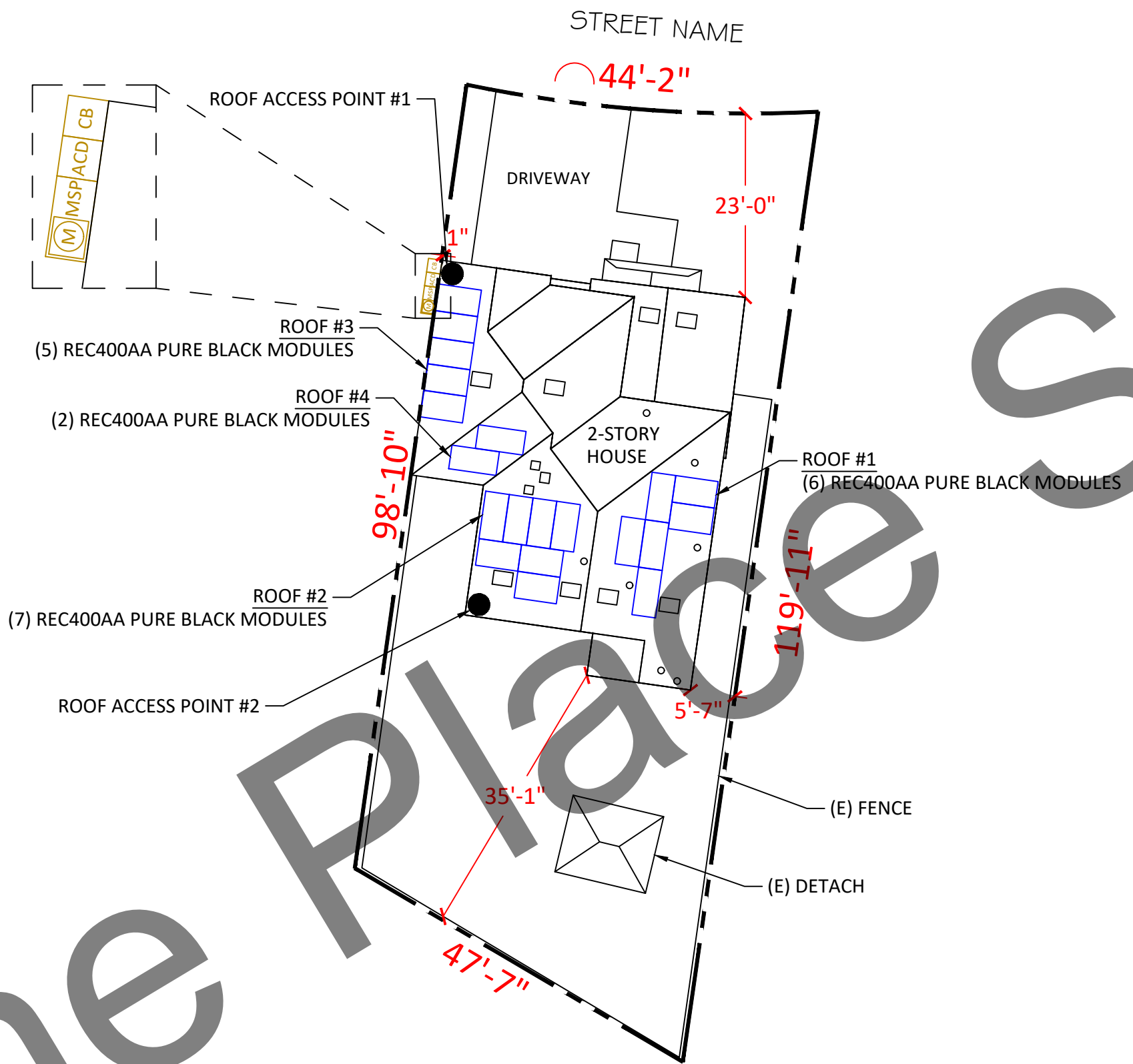
#	REVISION/UPDATE	DATE

SIGNED & STAMP BY

PV-0
SHEET NO.
PROJECT SUMMARY
SHEET INFORMATION

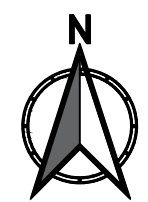
LEGEND

- M UTILITY METER
- CB ENPHASE IQ COMBINER 4C (X-IQ-AM1-240-4C)
- ACD NON FUSED AC DISCONNECT
- MSP MAIN SERVICE PANEL
- JB JUNCTION BOX
- ENPHASE IQ8PLUS-72-2-US MICROINVERTERS
- ROOF ACCESS POINT
- PROPERTY LINE
- VENT, ATTIC FAN (ROOF OBSTRUCTIONS)
- CHIMNEY
- FENCE



PROTECTION OF EMERGENCY RESPONDERS
 ALL SHARP EDGES AND FASTENER TIPS SHALL BE COVERED OR CRIMPED OVER TO ELIMINATE SHARP EDGES, TO MINIMIZE RISK OF INJURY TO EMERGENCY RESPONDERS.
 ALL ROOF MOUNTED CONDUITS, BOXES, AND EQUIPMENT CROSSING PATHWAYS ARE TO BE CLEARLY IDENTIFIED BY A RED/WHITE REFLECTIVE TAPE OR OTHER APPROVED MATERIAL.

- ROOF ACCESS POINT:**
- ROOF ACCESS POINT SHALL BE LOCATED IN AREAS THAT DO NOT REQUIRE THE PLACEMENT OF GROUND LADDERS OVER OPENINGS SUCH AS WINDOWS OR DOORS, AND LOCATED AT STRONG POINTS OF BUILDING CONSTRUCTION IN LOCATIONS WHERE THE ACCESS POINT DOES NOT CONFLICT WITH OVERHEAD OBSTRUCTIONS SUCH AS TREE LIMBS, WIRES OR SIGNS.
 - NO ENCROACHMENT INTO EASEMENTS BY NEW SCOPE OF WORK (SOLAR PANELS, RACK/RAIL SYSTEM & EQUIPMENT)



PROPOSED SITE DIAGRAM SHOWING THE RELATIVE LOCATION OF MAJOR COMPONENTS.

CONTRACTOR LOGO
 CONTRACTOR-NAME

DATE	MM/DD/YYYY
PROJECT ID	XXXX-XX-XX
CREATED BY	XX
CHECKED BY	XX
SCALE	1/16" = 1'-0"
SHEET SIZE	11"X 17"
	ANSI B

CUSTOMER NAME RESIDENCE
 HOUSE NO STREET NAME CITY, STATE ZIP CODE
 PHONE: (XXX) XXX-XXXX
 APN: XXXXXXXX

HOMEOWNER INFO

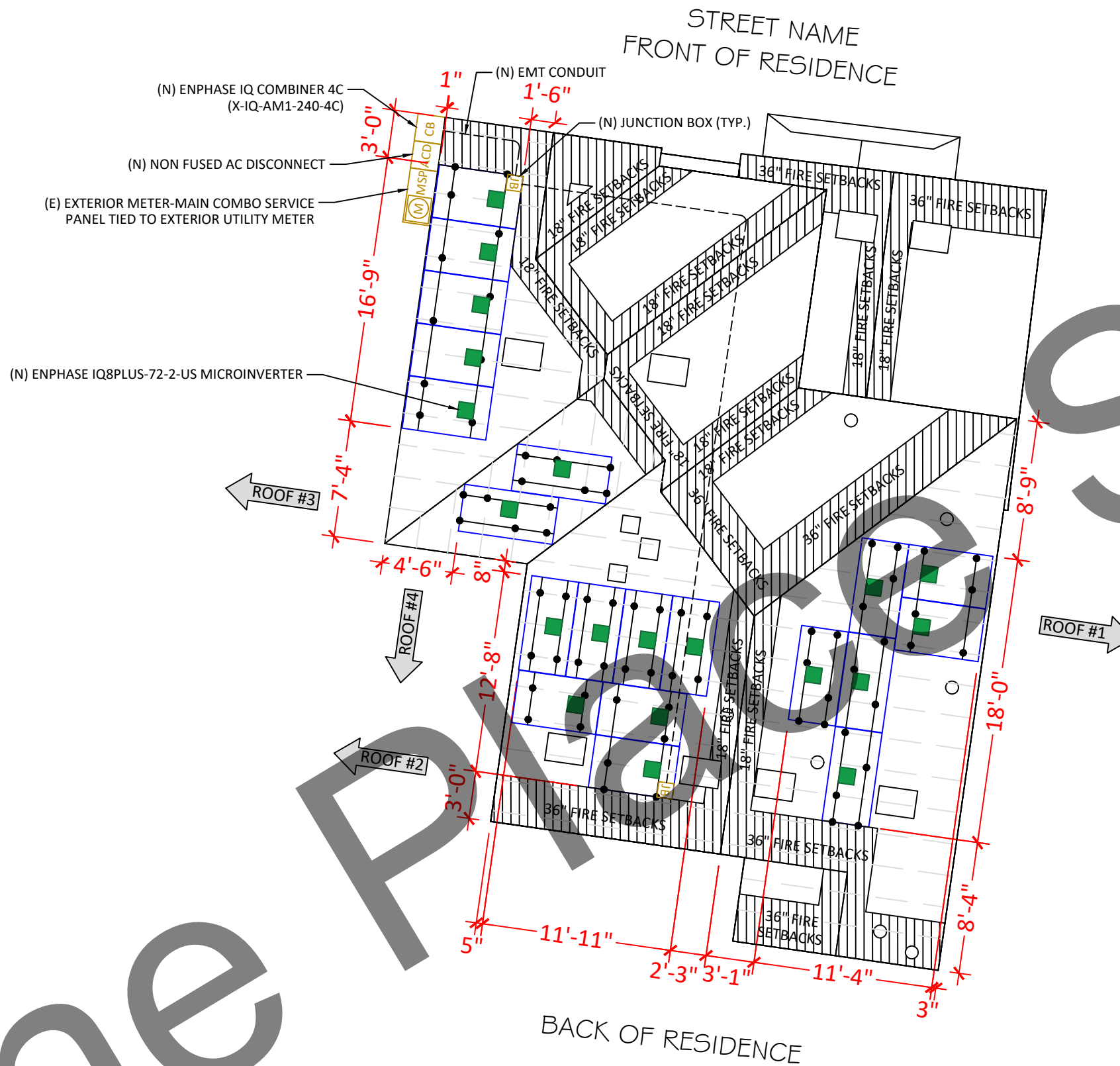
#	REVISION/UPDATE	DATE

SIGNED & STAMP BY

PV-1
 SHEET NO.
SITE PLAN
 SHEET INFORMATION

LEGEND

- M UTILITY METER
- CB ENPHASE IQ COMBINER 4C (X-IQ-AM1-240-4C)
- ACD NON FUSED AC DISCONNECT
- MSP MAIN SERVICE PANEL
- JB JUNCTION BOX
- ENPHASE IQ8PLUS-72-2-US MICROINVERTERS
- CONDUIT
- □ VENT, ATTIC FAN (ROOF OBSTRUCTIONS)
- ⊠ CHIMNEY
- FENCE
- UNIRAC FLASHLOC COMP
- UNIRAC SOLARMOUNT LIGHT RAIL (168")



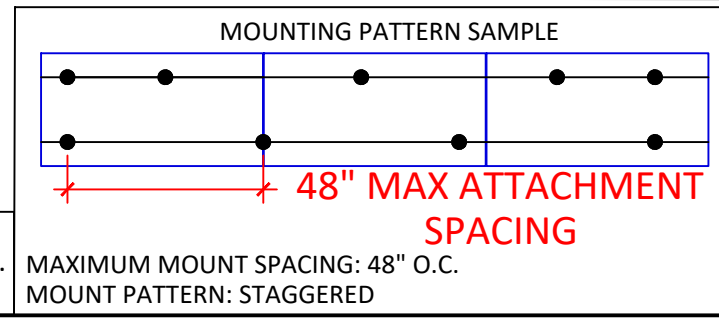
ROOF DETAILS				
MOUNTING PLANE	ROOF #1	ROOF #2	ROOF #3	ROOF #4
NO. OF MODULES	6	7	5	2
AZIMUTH	98°	278°	277°	187°
ROOF TILT	27°	27°	27°	27°
ROOF TYPE	COMP SHINGLE	COMP SHINGLE	COMP SHINGLE	COMP SHINGLE
RAFTER SIZE	2"X4" O.C	2"X4" O.C	2"X4" O.C	2"X4" O.C
RAFTER SPACING	24"	24"	24"	24"
ARRAY AREA	119.50	139.42	99.58	39.83
(TOTAL ARRAY AREA/ TOTAL ROOF AREA) X 100% = (394.42/1627.79) X 100% = 14.62%				

NOTE: ALL EXTERIOR CONDUIT TO BE PAINT MATCHED TO THE HOMES COLORS

PLUMBING VENTS, SKYLIGHTS AND MECHANICAL VENTS SHALL NOT BE COVERED, MOVED, RE-ROUTED OR RE-LOCATED.

THE WORKING CLEARANCES AROUND THE EXISTING ELECTRICAL EQUIPMENT AS WELL BE MAINTAINED IN ACCORDANCE WITH CEC 110.26

NOTES:
 CALIFORNIA FIRE CODE SECTION 605.11.1.2 FOR RESIDENTIAL R-1 OCCUPANCIES AT LEAST THREE (3) FEET OF CLEARANCE ALONG THE EDGE OF THE ROOF TO A PANEL AND AT LEAST THREE (3) FEET FROM THE RIDGE SHALL BE AT LEAST ONE AND ONE-HALF (1-1/2) FEET FROM A VALLEY OR HIP. NO CLEARANCE IS REQUIRED AT THE EAVE.
 CALIFORNIA FIRE CODE SECTION 605.11.1.2.4 ROOF WITH HIPS AND VALLEYS - WHERE PANELS ARE TO BE LOCATED ON ONLY ONE SIDE OF EQUAL LENGTH, THE PANEL SHALL BE PERMITTED TO BE PLACED DIRECTLY ADJACENT TO THE HIP OR VALLEY.



NOTES: ATTACHMENT POINTS ARE NOT EXACT. CONTRACTOR MAY NEED TO ADJUST MOUNT LOCATION. EXISTING ROOF CONDITION & RAFTER LOCATIONS ARE SUBJECT TO FIELD VERIFICATION. ACTUAL LOCATION MAY DIFFER. INSTALL PER MANUFACTURER SPECIFICATIONS. SEE SUPPLEMENTAL DOCUMENTS FOR ATTACHMENT & STRUCTURAL DOCUMENTATION.



CONTRACTOR LOGO

CONTRACTOR-NAME

DATE	MM/DD/YYYY
PROJECT ID	XXXX-XX-XX
CREATED BY	XX
CHECKED BY	XX
SCALE	1/8" = 1'-0"
SHEET SIZE	11"X 17"
	ANSI B

CUSTOMER NAME RESIDENCE
 HOUSE NO STREET NAME CITY, STATE ZIP CODE
 PHONE: (XXX) XXX-XXXX
 APN: XXXXXXXX

HOMEOWNER INFO

#	REVISION/UPDATE	DATE

SIGNED & STAMP BY

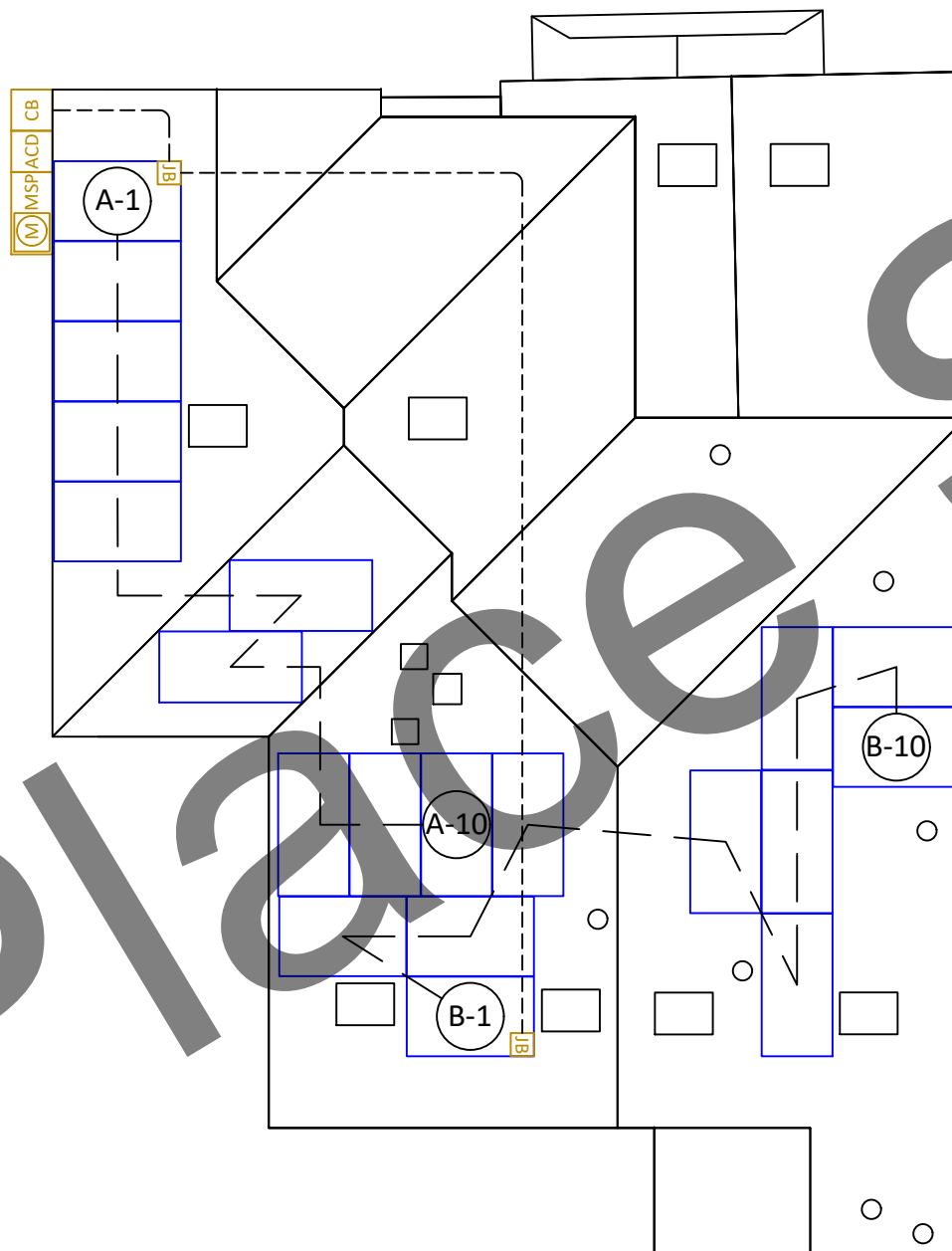
PV-2
 SHEET NO.
 ROOF ATTACHMENT DETAILS
 SHEET INFORMATION

BILL OF MATERIALS		
EQUIPMENT	QTY	DESCRIPTION
SOLAR PV MODULE	20	REC400AA PURE BLACK
MICRO-INVERTER	20	ENPHASE IQ8PLUS-72-2-US
JUNCTION BOX	1	JUNCTION BOX, 600V, NEMA 3R, UL LISTED
AC DISCONNECT	1	60A NON FUSED AC DISCONNECT, 2P, NEMA 3R, 240V
COMBINER BOX	1	ENPHASE IQ COMBINER 4C W/ IQ GATEWAY (X-IQ-AM1-240-4C)
ENPHASE Q CABLE	30	ENPHASE Q CABLE 240V, (PER CONNECTOR)
BRANCH TERMINATOR	2	BRANCH TERMINATOR
WATER TIGHT CAPS	10	WATER TIGHT CAPS
ATTACHMENT	73	5/16" x 4" SS LAG BOLT W/ SS EPDM BONDED WASHER
ATTACHMENT	73	SS SERRATED T-BOLT W/ SS SERRATED FLANGE NUT
ATTACHMENT	73	FLASHLOC BASE
RAIL	15	UNIRAC SOLARMOUNT LIGHT RAIL (168")
BONDED SPLICE	4	UNIRAC SPLICE PRO SERIES MILL
CLAMPS	18	UNIRAC UNIVERSAL AF MID CLAMP
CLAMPS	48	UNIRAC UNIVERSAL AF END CLAMP
GROUNDING LUG	12	GROUNDING LUG

ARRAY WEIGHT (LOAD CALC'S)		
Number of Modules	20	
Module Weight	45	LBS
Total Module (Array) Weight	900.00	LBS
Number of Attachment point	77	
Mounting System Weight <small>(Per Module)</small>	0.55	LBS
Mounting System Weight	92.40	LBS
Total System Weight <small>(Module Weight + Mounting System Weight)</small>	4104.00	LBS
Weight at Each Attachment Point <small>(Array Weight / Number of Attachment Point)</small>	19.87	LBS
Module Area (71.7"x40.0")	19.92	SqFt
Total Array Area	398.33	SqFt
Distributed Load <small>(Total System Weight / Total Array Area)</small>	2.26	Per SqFt
Total Roof Area	1627.79	SqFt
Total Percentage of Roof Covered <small>(Total Array Area / Total Roof Area)*100</small>	24.47%	



STREET NAME
FRONT OF RESIDENCE



BACK OF RESIDENCE

STRING LEGEND	
(A)	STRING #1
(B)	STRING #2

LEGEND	
(M)	UTILITY METER
CB	ENPHASE IQ COMBINER 4C (X-IQ-AM1-240-4C)
ACD	NON FUSED AC DISCONNECT
MSP	MAIN SERVICE PANEL
JB	JUNCTION BOX
■	ENPHASE IQ8PLUS-72-2-US MICROINVERTERS
---	CONDUIT
○ □	VENT, ATTIC FAN (ROOF OBSTRUCTIONS)
⊠	CHIMNEY
—	FENCE
●	UNIRAC FLASHLOC COMP
—	UNIRAC SOLARMOUNT LIGHT RAIL (168")

CONTRACTOR LOGO

CONTRACTOR NAME

DATE	MM/DD/YYYY
PROJECT ID	XXXX-XX-XX
CREATED BY	XX
CHECKED BY	XX
SCALE	1/8" = 1'-0"
SHEET SIZE	11"X 17"
	ANSI B

HOMEOWNER INFO

CUSTOMER NAME RESIDENCE

HOUSE NO STREET NAME CITY, STATE ZIP CODE

PHONE: (XXX) XXX-XXXX

APN: XXXXXXXX

#	REVISION/UPDATE	DATE

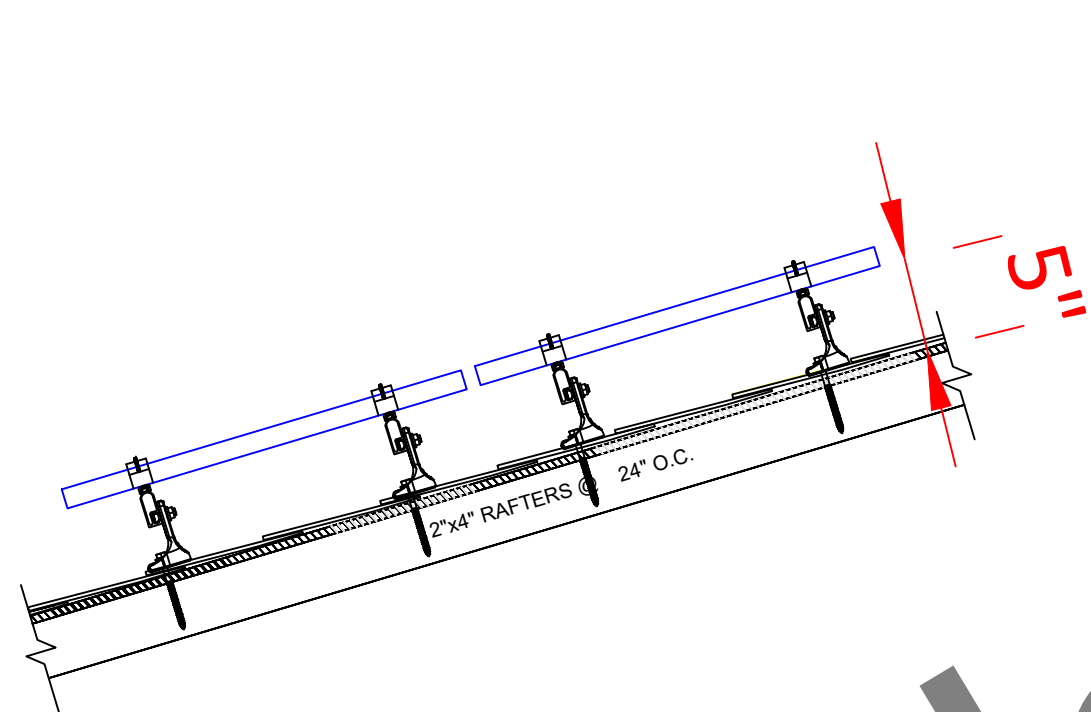
SIGNED & STAMP BY

PV-3

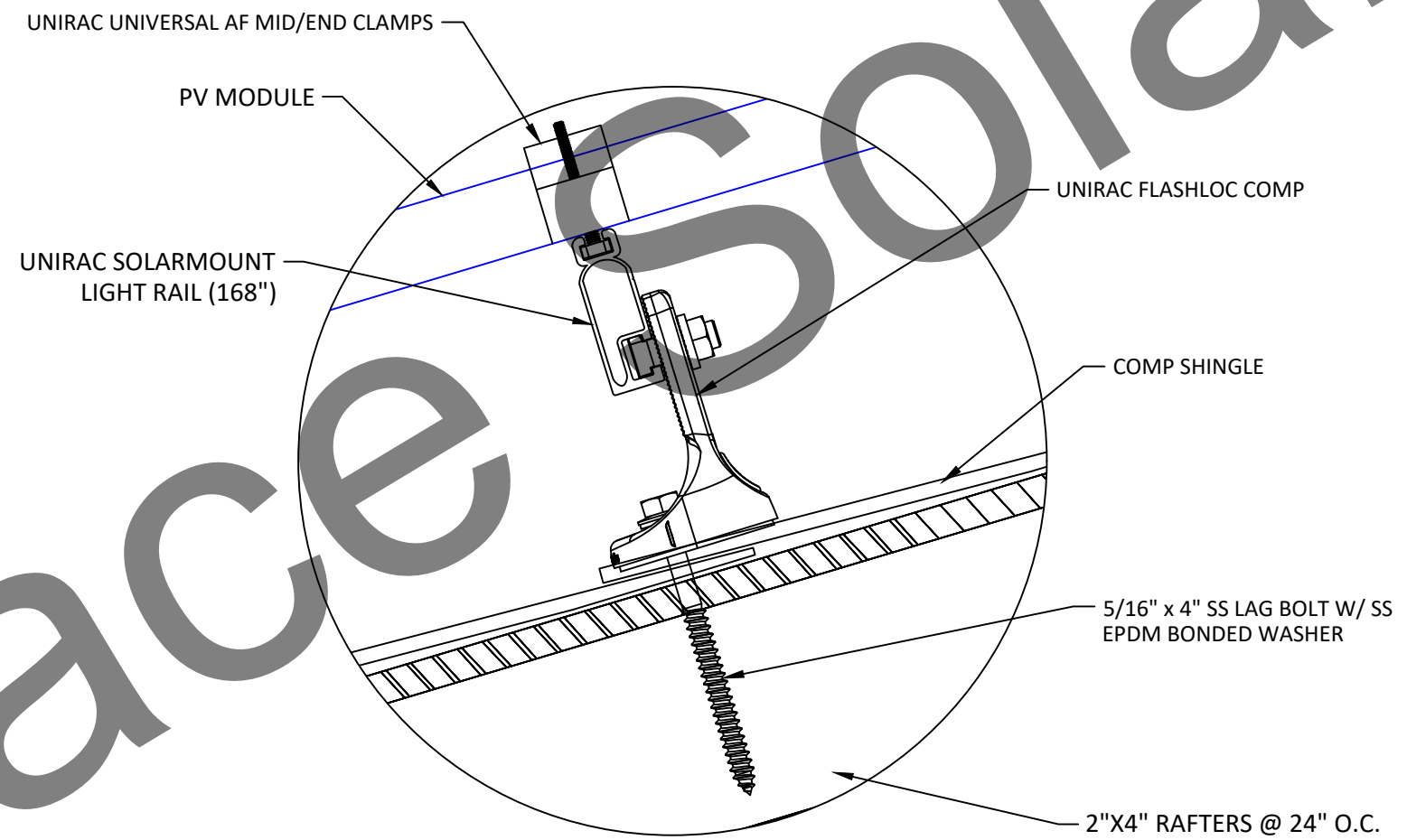
SHEET NO.

BOM &
STRING
LAYOUT

SHEET INFORMATION



STRUCTURAL ELEVATION DIAGRAM



ATTACHMENT DETAILED DIAGRAM

NOTES: FLASHING SHALL BE APPLIED IN ACCORDANCE WITH MANUFACTURERS PRINTED INSTRUCTIONS. IF THERE IS ANY CONFLICT BETWEEN WHAT IS DEPICTED & INSTRUCTION AS PER MANUFACTURER, MANUFACTURERS INSTRUCTIONS SHALL SUPERSEDE.

CONTRACTOR LOGO

CONTRACTOR-NAME

DATE	MM/DD/YYYY
PROJECT ID	XXXX-XX-XX
CREATED BY	XX
CHECKED BY	XX
SCALE	NTS
SHEET SIZE	11"X 17"
	ANSI B

HOMEOWNER INFO

CUSTOMER NAME RESIDENCE
 HOUSE NO STREET NAME CITY, STATE ZIP CODE
 PHONE: (XXX) XXX-XXXX
 APN: XXXXXXXX

#	REVISION/UPDATE	DATE

SIGNED & STAMP BY

S-1

SHEET NO.

STRUCTURAL
 DETAILED
 DIAGRAM

SHEET INFORMATION

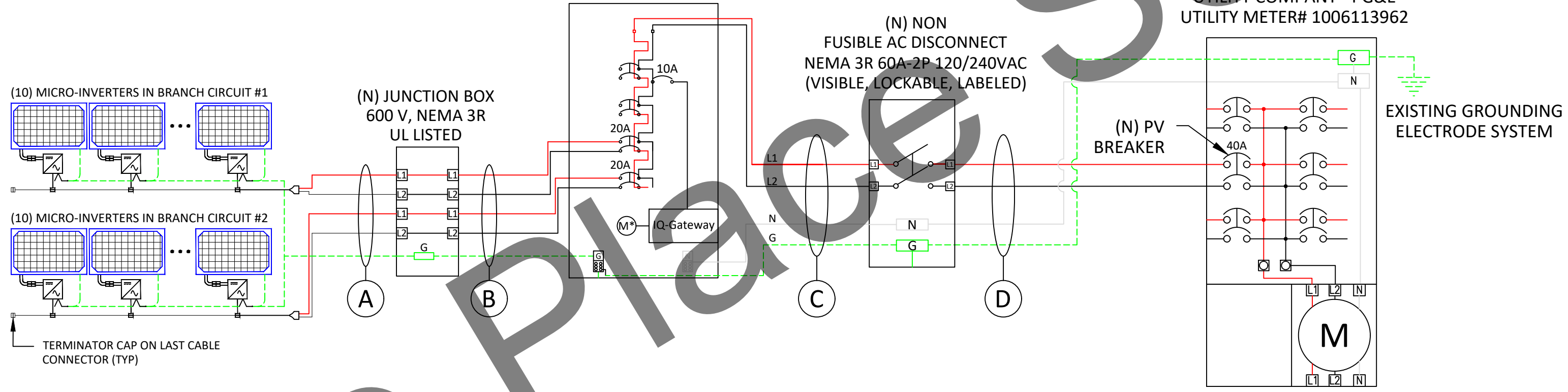
EQUIPMENT DETAILS	
(#) PV MODULES	(20) REC400AA PURE BLACK
(#) MICROINVERTERS	(20) ENPHASE IQ8PLUS-72-2-US
OUTPUT CURRENT	24.2A
BRANCH CIRCUIT	2 STRINGS OF 10 MODULES
POINT OF INTERCONNECTION	LOAD BREAKER IN THE MAIN SERVICE PANEL MLO W/200A BUSBAR, 120/240V, 3W, 1φ
UTILITY	XXXX
AHJ	XXXX

MICROINVERTER SPECIFICATIONS	
MANUFACTURER / MODEL	ENPHASE IQ8PLUS-72-2-US
NOMINAL OUTPUT VOLTAGE	240VAC
CONTINUOUS OUTPUT CURRENT	1.21A
[DC] SYSTEM SIZE	[AC] SYSTEM SIZE
20 MODULES x 400W	20 MICROINVERTER x 290W
8.0 kW	5.8 kW

SOLAR MODULE SPECIFICATIONS	
MANUFACTURER / MODEL	REC400AA PURE BLACK
VMP	42.1V
IMP	9.51A
VOC	48.8V
ISC	10.10A
TEMP. COEFF. VOC	-0.24 %/°C
MODULE DIMENSION	71.7" (L) x 40.0" (W)
PANEL WATTAGE	400W

(N) ENPHASE IQ COMBINER 4,
X-IQ- AM1-240-4C 64A/240V
CONTINUOUS, PROTECTION MAX
80A BREAKER ON SOLAR OUTPUT;
WITH
10 KAIC CIRCUIT BREAKERS

POINT OF INTERCONNECT, LOAD BREAKER
(E) EXTERIOR 240V/200A BUS
BAR RATING, MAIN SERVICE
PANEL, SINGLE PHASE, MLO
UTILITY COMPANY - PG&E
UTILITY METER# 1006113962



ID	CONDUCTOR		CONDUIT	# OF PARALLEL CIRCUITS	CURRENT-CARRYING CONDUCTORS IN CONDUIT	CONDUIT FILL PERCENT	OCPD	EGC		TEMP. CORR. FACTOR	CONDUIT FILL FACTOR	CONT. CURRENT x 125%			MAX CURRENT	BASE AMP.	DERATED AMP.	LENGTH	VOLTAGE DROP		
A	12 AWG	QCABLE	-	1	2	N/A	N/A	6 AWG	BARE COPPER	0.76	(53°C)	N/A	12.1A	x	1.25	=	15.12A	N/A	N/A	50FT	0.71%
B	10 AWG	THWN-2 COPPER	MIN 0.75" Dia EMT	2	4	19.09%	20A	8 AWG	THWN-2, COPPER	0.96	(31°C)	0.8	12.1A	x	1.25	=	15.12A	40A	40A x 0.8 x 0.96 = 30.72A	30FT	0.49%
C	10 AWG	THWN-2 COPPER	MIN 0.75" Dia EMT	1	3	15.27%	N/A	8 AWG	THWN-2, COPPER	0.96	(31°C)	1	24.2A	x	1.25	=	30.25A	40A	40A x 1 x 0.96 = 38.4A	5FT	0.16%
D	10 AWG	THWN-2 COPPER	MIN 0.75" Dia EMT	1	3	15.27%	40A	8 AWG	THWN-2, COPPER	0.96	(31°C)	1	24.2A	x	1.25	=	30.25A	40A	40A x 1 x 0.96 = 38.4A	5FT	0.16%

CONTRACTOR LOGO
CONTRACTOR-NAME

DATE	MM/DD/YYYY
PROJECT ID	XXXX-XX-XX
CREATED BY	XX
CHECKED BY	XX
SCALE	NTS
SHEET SIZE	11"X 17"
	ANSI B

CUSTOMER NAME RESIDENCE
HOUSE NO STREET NAME CITY, STATE ZIP CODE
PHONE: (XXX) XXX-XXXX
APN: XXXXXXXX

HOMEOWNER INFO

#	REVISION/UPDATE	DATE

SIGNED & STAMP BY

E-1
SHEET NO.
ELECTRICAL
DIAGRAM &
CALCULATIONS
SHEET INFORMATION

1

! WARNING

ELECTRIC SHOCK HAZARD

TERMINALS ON BOTH LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION

LABEL LOCATION:
 MAIN SERVICE PANEL/AC DISCONNECT/INVERTER/
 AC COMBINER
 2019 CEC 690.13(B)

2

WARNING PHOTOVOLTAIC POWER SOURCE

LABEL LOCATION:
 DC CONDUIT
 EVERY 10' AND ON CONDUIT BODIES WHEN EXPOSED
 2019 CEC 690.31(G)(D)(3)

3

PHOTOVOLTAIC AC DISCONNECT

RATED AC OUTPUT CURRENT **24.2A**

NOMINAL OPERATING AC VOLTAGE **240 VAC**

LABEL LOCATION:
 MAIN SERVICE PANEL/AC DISCONNECT
 2019 CEC 690.13(B)

4

RAPID SHUTDOWN SWITCH FOR SOLAR PV SYSTEM

LABEL LOCATION:
 INVERTER
 AT OR WITHIN 3' OF THE DC COMBINER SWITCH
 2019 CEC 690.56(C)(3)

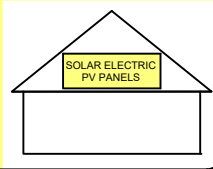
ADHESIVE FASTENED SIGNS:

- THE LABEL SHALL BE SUITABLE FOR THE ENVIRONMENT WHERE IT IS INSTALLED.
- WHERE REQUIRED ELSEWHERE IN THIS CODE, ALL FIELD APPLIED LABELS, WARNINGS, AND MARKINGS SHOULD COMPLY WITH ANSI Z395.4 [CEC 110.21(B) FIELD MARKING].
- ADHESIVE FASTENED SIGNS MAY BE ACCEPTABLE IF PROPERLY ADHERED. VINYL SIGNS SHALL BE WEATHER RESISTANT [CFC 605.11.1.3]

5

SOLAR PV SYSTEM EQUIPPED WITH RAPID SHUTDOWN

TURN RAPID SHUTDOWN SWITCH TO THE "OFF" POSITION TO SHUT DOWN PV SYSTEM AND REDUCE SHOCK HAZARD IN THE ARRAY



LABEL LOCATION:
 MAIN SERVICE PANEL
 IF MSD IS OUTSIDE PLACE IT THERE / IF MSD IS INSIDE PLACE ON THE AC DISCONNECT
 2019 CEC 690.56(C)(1)(a)

6

PHOTOVOLTAIC SYSTEM UTILITY DISCONNECT SWITCH

LABEL LOCATION:
 AC DISCONNECT
 2019 CEC 690.56(C)(3)

7

PV SOLAR BREAKER

DO NOT RELOCATE THIS OVERCURRENT DEVICE

LABEL LOCATION:
 MAIN SERVICE PANEL
 2019 CEC 705.12(B)(2)(3)(b)

8

! CAUTION

DUAL POWER SOURCE SECOND SOURCE US PHOTOVOLTAIC

LABEL LOCATION:
 MAIN SERVICE PANEL/AC DISCONNECT/AC COMBINER/
 REVENUE METER
 2019 CEC 705.12(B)(3)

Solar



LABEL LOCATION:
 EACH SERVICE EQUIPMENT LOCATION AND AT THE LOCATION(S) OF THE SYSTEM DISCONNECT(S) FOR ALL ELECTRIC POWER PRODUCTION SOURCES CAPABLE OF BEING INTERCONNECTED

CONTRACTOR LOGO

CONTRACTOR NAME

DATE	MM/DD/YYYY
PROJECT ID	XXXX-XX-XX
CREATED BY	XX
CHECKED BY	XX
SCALE	NTS
SHEET SIZE	11"X 17"
	ANSI B

HOMEOWNER INFO

CUSTOMER NAME RESIDENCE

HOUSE NO STREET NAME CITY, STATE ZIP CODE

PHONE: (XXX) XXX-XXXX

APN: XXXXXXXX

#	REVISION/UPDATE	DATE

SIGNED & STAMP BY

E-2

SHEET NO.

PLACARDS

SHEET INFORMATION

REC ALPHA[®] PURE BLACK SERIES

PRODUCT SPECIFICATIONS

400 WP
20.3 W/FT²



ELIGIBLE

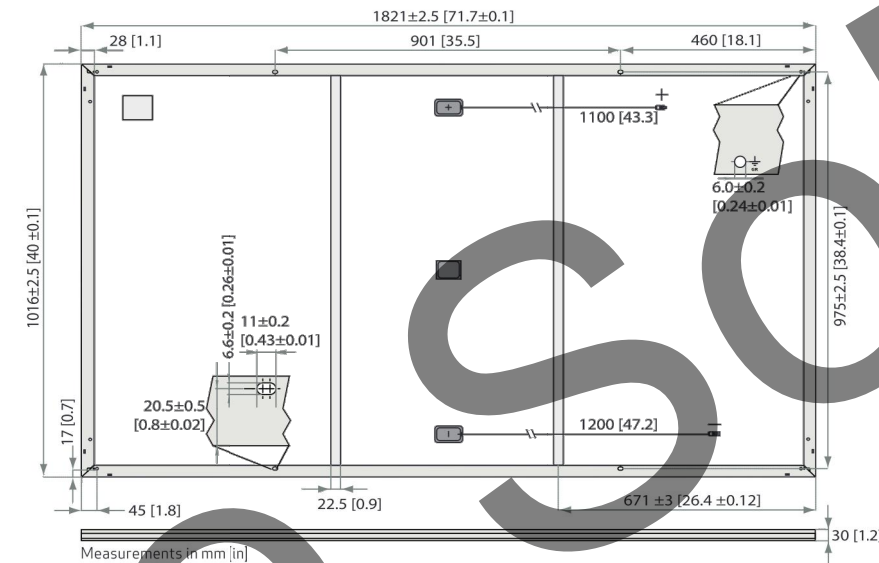


SOLAR'S MOST TRUSTED



REC ALPHA PURE BLACK SERIES > PRODUCT SPECIFICATIONS

PRODUCT SPECIFICATIONS



GENERAL DATA

Cell type:	132 half-cut REC heterojunction cells with lead-free, gapless technology 6 strings of 22 cells in series	Connectors:	Stäubli MC4 PV-KBT4/KST4, 12AWG (4mm ²) in accordance with IEC 62852 IP68 only when connected
Glass:	0.13 in (3.2 mm) solar glass with anti-reflection surface treatment	Cable:	12AWG (4mm ²) PV wire, 43+47 in (1.1+1.2m) in accordance with EN 50618
Backsheet:	Highly resistant polymer (black)	Dimensions:	71.7 x 40 x 1.2 in (1821 x 1016 x 30 mm)
Frame:	Anodized aluminum (black)	Weight:	45 lbs (20.5 kg)
Junction box:	3-part, 3 bypass diodes, IP67 rated in accordance with IEC 62790	Origin:	Made in Singapore

ELECTRICAL DATA

Product Code*: RECxxxAA Pure Black

	385	390	395	400	405
Power Output - P _{MAX} (Wp)	385	390	395	400	405
Watt Class Sorting - (W)	0/+5	0/+5	0/+5	0/+5	0/+5
Nominal Power Voltage - V _{MPP} (V)	41.2	41.5	41.8	42.1	42.4
Nominal Power Current - I _{MPP} (A)	9.35	9.40	9.45	9.51	9.56
Open Circuit Voltage - V _{OC} (V)	48.5	48.6	48.7	48.8	48.9
Short Circuit Current - I _{SC} (A)	9.99	10.03	10.07	10.10	10.14
Power Density (W/sq ft)	19.3	19.6	19.8	20.1	20.3
Panel Efficiency (%)	20.8	21.1	21.3	21.6	21.9
Power Output - P _{MAX} (Wp)	293	297	301	305	309
Nominal Power Voltage - V _{MPP} (V)	38.8	39.1	39.4	39.7	40.0
Nominal Power Current - I _{MPP} (A)	7.55	7.59	7.63	7.68	7.72
Open Circuit Voltage - V _{OC} (V)	45.7	45.8	45.9	46.0	46.1
Short Circuit Current - I _{SC} (A)	8.07	8.10	8.13	8.16	8.19

Values at standard test conditions (STC: air mass AM1.5, irradiance 10.75 W/sq ft (1000 W/m²), temperature 77°F (25°C), based on a production spread with a tolerance of P_{MAX}, V_{OC} & I_{SC} ±3% within one watt class. Nominal module operating temperature (NMOT: air mass AM1.5, irradiance 800 W/m², temperature 68°F (20°C), windspeed 3.3 ft/s (1 m/s). * Where xxx indicates the nominal power class (P_{MAX}) at STC above.

CERTIFICATIONS

IEC 61215:2016, IEC 61730:2016, UL 61730 (Pending)
ISO 14001:2004, ISO 9001:2015, OHSAS 18001:2007, IEC 62941



WARRANTY

	Standard	REC ProTrust	
Installed by an REC Certified Solar Professional	No	Yes	Yes
System Size	All	<25 kW	25-500 kW
Product Warranty (yrs)	20	25	25
Power Warranty (yrs)	25	25	25
Labor Warranty (yrs)	0	25	10
Power in Year 1	98%	98%	98%
Annual Degradation	0.25%	0.25%	0.25%
Power in Year 25	92%	92%	92%

See warranty documents for details. Conditions apply

MAXIMUM RATINGS

Operational temperature:	-40 ... +185°F (-40 ... +85°C)
Maximum system voltage:	1000 V
Maximum test load (front):	+7000 Pa (146 lbs/sq ft)
Maximum test load (rear):	-4000 Pa (83.5 lbs/sq ft)
Max series fuse rating:	25 A
Max reverse current:	25 A

* See installation manual for mounting instructions.
Design load = Test load / 1.5 (safety factor)

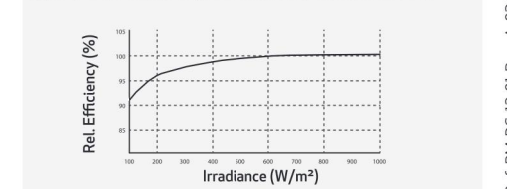
TEMPERATURE RATINGS*

Nominal Module Operating Temperature:	44°C (±2°C)
Temperature coefficient of P _{MAX} :	-0.26 %/°C
Temperature coefficient of V _{OC} :	-0.24 %/°C
Temperature coefficient of I _{SC} :	0.04 %/°C

* The temperature coefficients stated are linear values

LOW LIGHT BEHAVIOUR

Typical low irradiance performance of module at STC:



Founded in 1996, REC Group is an international pioneering solar energy company dedicated to empowering consumers with clean, affordable solar power. As Solar's Most Trusted, REC is committed to high quality, innovation, and a low carbon footprint in the solar materials and solar panels it manufactures. Headquartered in Norway with operational headquarters in Singapore, REC also has regional hubs in North America, Europe, and Asia-Pacific.



Specifications subject to change without notice.

Ref: PM-DS-12-01-Rev-A_03.21



IQ8 and IQ8+ Microinverters

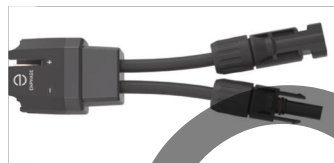
Our newest IQ8 Microinverters are the industry's first microgrid-forming, software-defined microinverters with split-phase power conversion capability to convert DC power to AC power efficiently. The brain of the semiconductor-based microinverter is our proprietary application-specific integrated circuit (ASIC) which enables the microinverter to operate in grid-tied or off-grid modes. This chip is built in advanced 55nm technology with high speed digital logic and has super-fast response times to changing loads and grid events, alleviating constraints on battery sizing for home energy systems.



Part of the Enphase Energy System, IQ8 Series Microinverters integrate with the Enphase IQ Battery, Enphase IQ Gateway, and the Enphase App monitoring and analysis software.



IQ8 Series Microinverters redefine reliability standards with more than one million cumulative hours of power-on testing, enabling an industry-leading limited warranty of up to 25 years.



Connect PV modules quickly and easily to IQ8 Series Microinverters using the included Q-DCC-2 adapter cable with plug-n-play MC4 connectors.



IQ8 Series Microinverters are UL Listed as PV Rapid Shut Down Equipment and conform with various regulations, when installed according to manufacturer's instructions.

Easy to install

- Lightweight and compact with plug-n-play connectors
- Power Line Communication (PLC) between components
- Faster installation with simple two-wire cabling

High productivity and reliability

- Produce power even when the grid is down*
- More than one million cumulative hours of testing
- Class II double-insulated enclosure
- Optimized for the latest high-powered PV modules

Microgrid-forming

- Complies with the latest advanced grid support**
- Remote automatic updates for the latest grid requirements
- Configurable to support a wide range of grid profiles
- Meets CA Rule 21 (UL 1741-SB) requirements

* Only when installed with IQ System Controller 2, meets UL 1741.

** IQ8 and IQ8Plus supports split phase, 240V installations only.

IQ8 and IQ8+ Microinverters

INPUT DATA (DC)		IQ8-60-2-US	IQ8PLUS-72-2-US
Commonly used module pairings ¹	W	235 – 350	235 – 440
Module compatibility		60-cell/120 half-cell	60-cell/120 half-cell, 66-cell/132 half-cell and 72-cell/144 half-cell
MPPT voltage range	V	27 – 37	29 – 45
Operating range	V	25 – 48	25 – 58
Min/max start voltage	V	30 / 48	30 / 58
Max input DC voltage	V	50	60
Max DC current ² [module Isc]	A	15	15
Overvoltage class DC port		II	II
DC port backfeed current	mA	0	0
PV array configuration		1x1 Ungrounded array; No additional DC side protection required; AC side protection requires max 20A per branch circuit	
OUTPUT DATA (AC)		IQ8-60-2-US	IQ8PLUS-72-2-US
Peak output power	VA	245	300
Max continuous output power	VA	240	290
Nominal (L-L) voltage/range ³	V	240 / 211 – 264	
Max continuous output current	A	1.0	1.21
Nominal frequency	Hz	60	
Extended frequency range	Hz	50 – 68	
AC short circuit fault current over 3 cycles	Arms	2	
Max units per 20 A (L-L) branch circuit ⁴		16	13
Total harmonic distortion		<5%	
Overvoltage class AC port		III	
AC port backfeed current	mA	30	
Power factor setting		1.0	
Grid-tied power factor (adjustable)		0.85 leading – 0.85 lagging	
Peak efficiency	%	97.5	97.6
CEC weighted efficiency	%	97	97
Night-time power consumption	mW	60	
MECHANICAL DATA			
Ambient temperature range		-40°C to +60°C (-40°F to +140°F)	
Relative humidity range		4% to 100% (condensing)	
DC Connector type		MC4	
Dimensions (HxWxD)		212 mm (8.3") x 175 mm (6.9") x 30.2 mm (1.2")	
Weight		1.08 kg (2.38 lbs)	
Cooling		Natural convection – no fans	
Approved for wet locations		Yes	
Pollution degree		PD3	
Enclosure		Class II double-insulated, corrosion resistant polymeric enclosure	
Environ. category / UV exposure rating		NEMA Type 6 / outdoor	
COMPLIANCE			
Certifications		CA Rule 21 (UL 1741-SB), UL 62109-1, UL1741/IEEE1547, FCC Part 15 Class B, ICES-0003 Class B, CAN/CSA-C22.2 NO. 107.1-01	

(1) No enforced DC/AC ratio. See the compatibility calculator at <https://link.enphase.com/module-compatibility>

(2) Maximum continuous input DC current is 10.6A (3) Nominal voltage range can be extended beyond nominal if required by the utility. (4) Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.

Enphase IQ Combiner 4/4C

X-IQ-AM1-240-4
X-IQ-AM1-240-4C



X-IQ-AM1-240-4C

X-IQ-AM1-240-4

The **Enphase IQ Combiner 4/4C** with Enphase IQ Gateway and integrated LTE-M1 cell modem (included only with IQ Combiner 4C) consolidates interconnection equipment into a single enclosure and streamlines IQ microinverters and storage installations by providing a consistent, pre-wired solution for residential applications. It offers up to four 2-pole input circuits and Eaton BR series busbar assembly.

Smart

- Includes IQ Gateway for communication and control
- Includes Enphase Mobile Connect cellular modem (CELLMODEM-M1-06-SP-05), included only with IQ Combiner 4C
- Includes solar shield to match Enphase IQ Battery aesthetics and deflect heat
- Flexible networking supports Wi-Fi, Ethernet, or cellular
- Optional AC receptacle available for PLC bridge
- Provides production metering and consumption monitoring

Simple

- Centered mounting brackets support single stud mounting
- Supports bottom, back and side conduit entry
- Up to four 2-pole branch circuits for 240 VAC plug-in breakers (not included)
- 80A total PV or storage branch circuits

Reliable

- Durable NRTL-certified NEMA type 3R enclosure
- Five-year limited warranty
- Two years labor reimbursement program coverage included for both the IQ Combiner SKU's
- UL listed



To learn more about Enphase offerings, visit enphase.com



Enphase IQ Combiner 4/4C

MODEL NUMBER

IQ Combiner 4 (X-IQ-AM1-240-4)	IQ Combiner 4 with Enphase IQ Gateway printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 +/- 0.5%) and consumption monitoring (+/- 2.5%). Includes a silver solar shield to match the IQ Battery system and IQ System Controller 2 and to deflect heat.
IQ Combiner 4C (X-IQ-AM1-240-4C)	IQ Combiner 4C with Enphase IQ Gateway printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 +/- 0.5%) and consumption monitoring (+/- 2.5%). Includes Enphase Mobile Connect cellular modem (CELLMODEM-M1-06-SP-05), a plug-and-play industrial-grade cell modem for systems up to 50 microinverters. (Available in the US, Canada, Mexico, Puerto Rico, and the US Virgin Islands, where there is adequate cellular service in the installation area.) Includes a silver solar shield to match the IQ Battery and IQ System Controller and to deflect heat.

ACCESSORIES AND REPLACEMENT PARTS

Ensemble Communications Kit COMMS-CELLMODEM-M1-06 CELLMODEM-M1-06-SP-05 CELLMODEM-M1-06-AT-05	(not included, order separately) - Includes COMMS-KIT-01 and CELLMODEM-M1-06-SP-05 with 5-year Sprint data plan for Ensemble sites - 4G based LTE-M1 cellular modem with 5-year Sprint data plan - 4G based LTE-M1 cellular modem with 5-year AT&T data plan
Circuit Breakers BRK-10A-2-240V BRK-15A-2-240V BRK-20A-2P-240V BRK-15A-2P-240V-B BRK-20A-2P-240V-B	Supports Eaton BR210, BR215, BR220, BR230, BR240, BR250, and BR260 circuit breakers. Circuit breaker, 2 pole, 10A, Eaton BR210 Circuit breaker, 2 pole, 15A, Eaton BR215 Circuit breaker, 2 pole, 20A, Eaton BR220 Circuit breaker, 2 pole, 15A, Eaton BR215B with hold down kit support Circuit breaker, 2 pole, 20A, Eaton BR220B with hold down kit support
EPLC-01	Power line carrier (communication bridge pair), quantity - one pair
XA-SOLARSHIELD-ES	Replacement solar shield for IQ Combiner 4/4C
XA-PLUG-120-3	Accessory receptacle for Power Line Carrier in IQ Combiner 4/4C (required for EPLC-01)
XA-ENV-PCBA-3	Replacement IQ Gateway printed circuit board (PCB) for Combiner 4/4C
X-IQ-NA-HD-125A	Hold down kit for Eaton circuit breaker with screws.

ELECTRICAL SPECIFICATIONS

Rating	Continuous duty
System voltage	120/240 VAC, 60 Hz
Eaton BR series busbar rating	125 A
Max. continuous current rating	65 A
Max. continuous current rating (input from PV/storage)	64 A
Max. fuse/circuit rating (output)	90 A
Branch circuits (solar and/or storage)	Up to four 2-pole Eaton BR series Distributed Generation (DG) breakers only (not included)
Max. total branch circuit breaker rating (input)	80A of distributed generation / 95A with IQ Gateway breaker included
Envoy breaker	10A or 15A rating GE/Siemens/Eaton included
Production metering CT	200 A solid core pre-installed and wired to IQ Gateway
Consumption monitoring CT (CT-200-SPLIT)	A pair of 200 A split core current transformers

MECHANICAL DATA

Dimensions (WxHxD)	37.5 x 49.5 x 16.8 cm (14.75" x 19.5" x 6.63"). Height is 21.06" (53.5 cm) with mounting brackets.
Weight	7.5 kg (16.5 lbs)
Ambient temperature range	-40° C to +46° C (-40° to 115° F)
Cooling	Natural convection, plus heat shield
Enclosure environmental rating	Outdoor, NRTL-certified, NEMA type 3R, polycarbonate construction
Wire sizes	• 20 A to 50 A breaker inputs: 14 to 4 AWG copper conductors • 60 A breaker branch input: 4 to 1/0 AWG copper conductors • Main lug combined output: 10 to 2/0 AWG copper conductors • Neutral and ground: 14 to 1/0 copper conductors Always follow local code requirements for conductor sizing.
Altitude	To 2000 meters (6,560 feet)

INTERNET CONNECTION OPTIONS

Integrated Wi-Fi	802.11b/g/n
Cellular	CELLMODEM-M1-06-SP-05, CELLMODEM-M1-06-AT-05 (4G based LTE-M1 cellular modem). Note that an Enphase Mobile Connect cellular modem is required for all Ensemble installations.
Ethernet	Optional, 802.3, Cat5E (or Cat 6) UTP Ethernet cable (not included)

COMPLIANCE

Compliance, IQ Combiner	UL 1741, CAN/CSA C22.2 No. 107.1, 47 CFR, Part 15, Class B, ICES 003 Production metering: ANSI C12.20 accuracy class 0.5 (PV production) Consumption metering: accuracy class 2.5
Compliance, IQ Gateway	UL 60601-1/CANCSA 22.2 No. 61010-1

To learn more about Enphase offerings, visit enphase.com

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FLASH LOC



FLASHLOC is the ultimate attachment for composition shingle and rolled comp roofs. The all-in-one mount installs fast — no kneeling on hot roofs to install flashing, no prying or cutting shingles, no pulling nails. Simply drive the lag bolt and inject sealant into the base. **FLASHLOC's** patented TRIPLE SEAL technology preserves the roof and protects the penetration with a permanent pressure seal. Kitted with lag bolts, sealant, and hardware for maximum convenience. Don't just divert water, **LOC it out!**

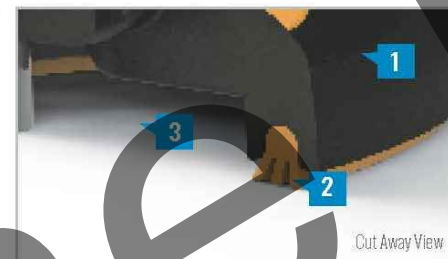


TESTED TO TAS-100
WIND DRIVEN RAIN TEST
AND UL441 RAIN TEST



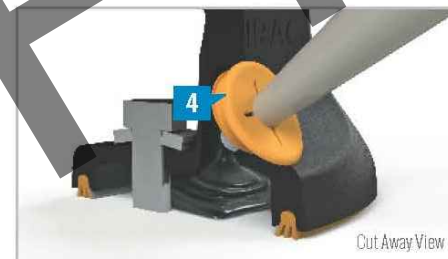
PROTECT THE ROOF

Install a high-strength waterproof attachment without lifting, prying or damaging shingles.



LOC OUT WATER

With an outer shield **1**, contour-conforming gasket **2** and pressurized sealant chamber **3**, the Triple Seal technology delivers a 100% waterproof connection.



HIGH-SPEED INSTALL

Simply drive lag bolt and inject sealant into the port **4** to create a permanent pressure seal.

FLASH LOC

INSTALLATION GUIDE



PRE-INSTALL

Snap chalk lines for attachment rows. On shingle roofs, snap lines 1-3/4" below upslope edge of shingle course. Locate rafters and mark attachment locations.

At each location, drill a 7/32" pilot hole. Clean roof surface of dirt, debris, snow, and ice. Next, **BACKFILL ALL PILOT HOLES WITH SEALANT.**

NOTE: Space mounts per racking system install specifications.



STEP 1: SECURE

Place **FLASHLOC** over pilot hole with lag on down-slope side. Align indicator marks on sides of mount with chalk line. Pass included lag bolt and sealing washer through **FLASHLOC** into pilot hole. Drive lag bolt until mount is held firmly in place.

NOTE: The EPDM in the sealing washer will expand beyond the edge of the metal washer when proper torque is applied.



STEP 2: SEAL

Insert tip of UNIRAC provided sealant into port. Inject until sealant exits both vents.

Continue array installation, attaching rails to mounts with provided T-bolts.



NOTE: When **FLASHLOC** is installed over gap between shingle tabs or vertical joints, fill gap/joint with sealant between mount and upslope edge of shingle course.

USE ONLY UNIRAC APPROVED SEALANTS: Chemlink Duralink 50, Chemlink M-1, Geocel 4500, or Geocel S-4

FASTER INSTALLATION. 25-YEAR WARRANTY.

FOR QUESTIONS OR CUSTOMER SERVICE VISIT UNIRAC.COM OR CALL (505) 248-2702

FASTER INSTALLATION. 25-YEAR WARRANTY.

FOR QUESTIONS OR CUSTOMER SERVICE VISIT UNIRAC.COM OR CALL (505) 248-2702

SOLARMOUNT



SOLARMOUNT defined the standard in solar racking. Features are designed to get installers off the roof faster. Our grounding & bonding process eliminates copper wire and grounding straps to reduce costs. Systems can be configured with standard or light rail to meet your design requirements at the lowest cost possible. The superior aesthetics package provides a streamlined clean edge for enhanced curb appeal, with no special brackets required for installation.



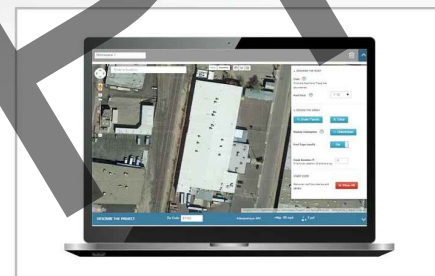
Now Featuring:
THE NEW FACE OF SOLAR RACKING
Superior Aesthetics Package



LOSE ALL OF THE COPPER & LUGS
System grounding through Enphase microinverters and trunk cables



SMALL IS THE NEXT NEW BIG THING
Light Rail is Fully Compatible with all SM Components



ENHANCED DESIGN & LAYOUT TOOLS
Featuring Google Map Capabilities within U-Builder

FAST INSTALLATION. SUPERIOR AESTHETICS

OPTIMIZED COMPONENTS • VERSATILITY • DESIGN TOOLS • QUALITY PROVIDER

SOLARMOUNT



OPTIMIZED COMPONENTS

INTEGRATED BONDING & PRE-ASSEMBLED PARTS

Components are pre-assembled and optimized to reduce installation steps and save labor time. Our new grounding & bonding process eliminates copper wire and grounding straps or bonding jumpers to reduce costs. Utilize the microinverter mount with a wire management clip for an easier installation.

VERSATILITY

ONE PRODUCT - MANY APPLICATIONS

Quickly set modules flush to the roof or at a desired tilt angle. Change module orientation to portrait or landscape while securing a large variety of framed modules on flat, low slope or steep pitched roofs. Available in mill, clear and dark anodized finishes to outperform your projects financial and aesthetic aspirations.

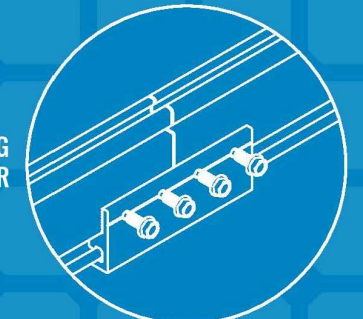
AUTOMATED DESIGN TOOL

DESIGN PLATFORM AT YOUR SERVICE

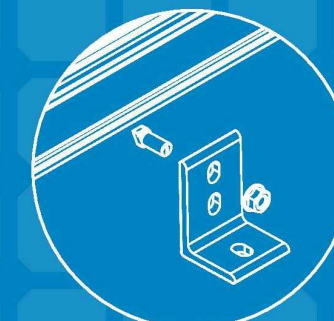
Creating a bill of materials is just a few clicks away with U-Builder, a powerful online tool that streamlines the process of designing a code compliant solar mounting system. Save time by creating a user profile, and recall preferences and projects automatically when you log in. You will enjoy the ability to share projects with customers: there's no need to print results and send to a distributor, just click and share.



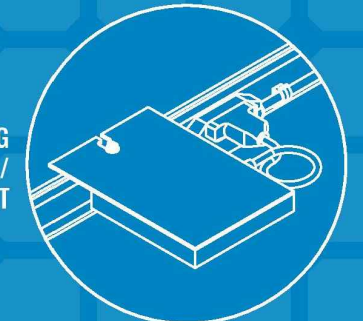
INTEGRATED BONDING MIDCLAMP



INTEGRATED BONDING SPLICE BAR



INTEGRATED BONDING L-FOOT w/ T-BOLT



INTEGRATED BONDING MICROINVERTER MOUNT w/ WIRE MANAGEMENT



UNIRAC CUSTOMER SERVICE MEANS THE HIGHEST LEVEL OF PRODUCT SUPPORT



TECHNICAL SUPPORT

Unirac's technical support team is dedicated to answering questions & addressing issues in real time. An online library of documents including engineering reports, stamped letters and technical data sheets greatly simplifies your permitting and project planning process.

CERTIFIED QUALITY PROVIDER

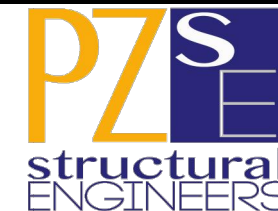
Unirac is the only PV mounting vendor with ISO certifications for 9001:2015, 14001:2015 and OHSAS 18001:2007, which means we deliver the highest standards for fit, form, and function. These certifications demonstrate our excellence and commitment to first class business practices.

BANKABLE WARRANTY

Don't leave your project to chance. Unirac has the financial strength to back our products and reduce your risk. Have peace of mind knowing you are receiving products of exceptional quality. SOLARMOUNT is covered by a twenty five (25) year limited product warranty and a five (5) year limited finish warranty.

PROTECT YOUR REPUTATION WITH QUALITY RACKING SOLUTIONS BACKED BY ENGINEERING EXCELLENCE AND A SUPERIOR SUPPLY CHAIN

PUB2017FEB28 - PRINTED



March 30, 2021

Unirac
1411 Broadway Blvd. NE
Albuquerque, NM 87102

Attn.: Unirac - Engineering Department

Re: Engineering Certification for the Unirac U-Builder 2.0 SOLARMOUNT Flush Rail Version

PZSE, Inc. - Structural Engineers has reviewed the Unirac SOLARMOUNT rails, proprietary mounting system constructed from modular parts which is intended for rooftop installation of solar photovoltaic (PV) panels; and has reviewed the U-builder Online tool. This U-Builder software includes analysis for the SOLARMOUNT LIGHT rail, SOLARMOUNT STANDARD rail, and SOLARMOUNT HEAVY DUTY rail with Standard and Pro Series hardware. All information, data and analysis contained within are based on, and comply with the following codes and typical specifications:

1. Minimum Design Loads for Buildings and other Structures, ASCE/SEI 7-16
2. 2019 California Building Code, by California Building Standards Commission.
3. 2018 International Building Code, by International Code Council, Inc. w/ Provisions from SEAOC PV-2 2017.
4. 2018 International Residential Code, by International Code Council, Inc. w/ Provisions from SEAOC PV-2 2017.
5. AC428, Acceptance Criteria for Modular Framing Systems Used to Support Photovoltaic (PV) Panels, November 1, 2012 by ICC-ES.
6. 2015 Aluminum Design Manual, by The Aluminum Association, 2015

Following are typical specifications to meet the above code requirements:

- Design Criteria:** Ground Snow Load = 0 - 100 (psf)
Basic Wind Speed = 85 - 190 (mph)
Roof Mean Height = 0 - 60 (ft)
Roof Pitch = 0 - 45 (degrees)
Exposure Category = B, C & D
- Attachment Spacing:** Per U-builder Engineering report.
- Cantilever:** Maximum cantilever length is L/3, where "L" is the span noted in the U-Builder online tool.
- Clearance:** 2" to 10" clear from top of roof to top of PV panel.
- Tolerance(s):** 1.0" tolerance for any specified dimension in this report is allowed for installation.
- Installation Orientation:** See SOLARMOUNT Rail Flush Installation Guide.
Landscape - PV Panel long dimension is parallel to ridge/eave line of roof and the PV panel is mounted on the long side.
Portrait - PV Panel short dimension is parallel to ridge/eave line of roof and the PV panel is mounted on the short side.

Components and Cladding Roof Zones:

The Components and Cladding Roof Zones shall be determined based on ASCE 7-05, ASCE 7-10 & 7-16 Component and Cladding design.

- Notes:
- 1) U-builder Online tool analysis is only for Unirac SM SOLARMOUNT Rail Flush systems only and do not include roof capacity check.
 - 2) Risk Category II per ASCE 7-16.
 - 3) Topographic factor, k_{zt} is 1.0.
 - 4) Array Edge Factor $Y_E = 1.5$
 - 5) Average parapet height is 0.0 ft.
 - 6) Wind speeds are LRFD values.
 - 7) Attachment spacing(s) apply to a seismic design category E or less.

Design Responsibility:

The U-Builder design software is intended to be used under the responsible charge of a registered design professional where required by the authority having jurisdiction. In all cases, this U-builder software should be used under the direction of a design professional with sufficient structural engineering knowledge and experience to be able to:

- Evaluate whether the U-Builder Software is applicable to the project, and
- Understand and determine the appropriate values for all input parameters of the U-Builder software.

This letter certifies that the Unirac SM SOLARMOUNT Rails Flush, when installed according to the U-Builder engineering report and the manufacture specifications, is in compliance with the above codes and loading criteria.

This certification excludes evaluation of the following components:

- 1) The structure to support the loads imposed on the building by the array; including, but not limited to: strength and deflection of structural framing members, fastening and/or strength of roofing materials, and/or the effects of snow accumulation on the structure.
- 2) The attachment of the SM SOLARMOUNT Rails to the existing structure.
- 3) The capacity of the solar module frame to resist the loads.

This requires additional knowledge of the building and is outside the scope of the certification of this racking system.

If you have any questions on the above, do not hesitate to call.

Prepared by:
PZSE, Inc. – Structural Engineers
Roseville, CA

DIGITAL SIGNATURE

