RB ENGINEERING
LEADING THE WAY
Structural Engineering Firm
NC License No. C-2499

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Cary, North Carolina 27513
www.rbengineering.com

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E-mail: rbittler@rbengineering.com

Mr. Rob Smith, PV Project Manager
Yes! Solar Solutions of the Triangle
E-mail: rsmith@yessolarsolutions.com

February 7, 2019

Subject: Proposed roof solar panels – Braden Residence
295 Cedar Rock Trail
Fuquay Varina, North Carolina 27526

File No.: RB-195631

Dear Rob:

RB Engineering, Inc. is pleased to provide the following summary engineering letter concerning the subject project. The existing roof system is constructed with (2) 11 7/8-inch TJI 210 I-joists at 19.2 inches on center, an insulated OSB roof deck and a composition asphalt shingle roof. We have reviewed the proposed solar layout and have structurally evaluated the additional proposed roof loading with the following conclusions:

- The total surface area of the proposed solar array (24 PV modules) is approximately 430 SF. The solar panel installation has been evaluated for a maximum design wind loading of 115 mph.
- The subject roof mounted PV system attachment method is structurally adequate to transfer the design uplift loads in accordance with the current 2018 North Carolina residential building code.
- The existing roof system is structurally adequate to transfer the applicable design loads - including the additional design loading (dead load and wind load) due to the proposed solar panel installation - in accordance with the current 2018 North Carolina residential building code.

Our services were provided in accordance with the standard of practice for structural engineering and within the limits imposed by scope, schedule, and budget. If you have any questions or if I can be of further assistance to you on this project, please contact me at (919) 677-9662.

Respectfully submitted,

Ron Bittler, PE
President / Structural Engineer
RB Engineering, Inc.

2.07.2019

Harnett COUNTY NORTH CAROLINA

Approved

brutton 03/01/2019

NEW PV SYSTEM: 7.680 kWp

BRADEN RESIDENCE

295 CEDAR ROCK TRAIL
FUQUAY VARINA, NC 27526
ASSESSOR'S #: 050633011213

GENERAL NOTES

1.1.1 **PROJECT NOTES:**

1.1.2 THIS PHOTOVOLTAIC (PV) SYSTEM SHALL COMPLY WITH THE NATIONAL ELECTRIC CODE (NEC) ARTICLE 690, ALL MANUFACTURER'S LISTING AND INSTALLATION INSTRUCTIONS, AND THE RELEVANT CODES AS SPECIFIED BY THE AUTHORITY HAVING JURISDICTION'S (AHJ) APPLICABLE CODES.

1.1.3 THE UTILITY INTERCONNECTION APPLICATION MUST BE APPROVED AND PV SYSTEM INSPECTED PRIOR TO PARALLEL OPERATION

1.1.4 ALL PV SYSTEM COMPONENTS; MODULES, UTILITY-INTERACTIVE INVERTERS, AND SOURCE CIRCUIT COMBINER BOXES ARE IDENTIFIED AND LISTED FOR USE IN PHOTOVOLTAIC SYSTEMS AS REQUIRED BY NEC 690.4 & NEC 690.60: **PV MODULES:** UL1703, IEC61730, AND IEC61215, AND NFPA 70 CLASS C FIRE **INVERTERS:** UL 1741 CERTIFIED, IEEE 1547, 929, 519 **COMBINER BOX(ES):** UL 1703 OR UL 1741 ACCESSORY

1.1.5 NEC 690.35 REFERS SPECIFICALLY TO "UNGROUNDED" PV SYSTEMS. ALSO DESIGNATED AS "TRANSFORMERLESS" BY INVERTER MANUFACTURERS AND "NON-ISOLATED" BY UNDERWRITERS LABORATORY.

1.1.6 INVERTER(S) USED IN UNGROUNDED SYSTEM SHALL BE LISTED FOR THIS USE [NEC 690.35 (G)].

1.1.7 AS SPECIFIED BY THE AHJ, EQUIPMENT USED IN UNGROUNDED SYSTEMS LABELED ACCORDING TO NEC 690.35 (F).

1.1.8 MAX DC VOLTAGE CALCULATED USING MANUFACTURER PROVIDED TEMP COEFFICIENT FOR VOC. IF UNAVAILABLE, MAX DC VOLTAGE CALCULATED ACCORDING TO NEC 690.7.

1.1.9 ALL INVERTERS, PHOTOVOLTAIC MODULES, PHOTOVOLTAIC PANELS, AND SOURCE CIRCUIT COMBINERS INTENDED FOR USE IN A PHOTOVOLTAIC POWER SYSTEM WILL BE IDENTIFIED AND LISTED FOR THE APPLICATION PER 690.4 (D), SHALL BE INSTALLED ACCORDING TO ANY INSTRUCTIONS FROM LISTING OR LABELING [NEC 110.3].

1.1.10 ALL SIGNAGE TO BE PLACED IN ACCORDANCE WITH LOCAL BUILDING CODE. IF EXPOSED TO SUNLIGHT, IT SHALL BE UV RESISTANT. ALL PLAQUES AND SIGNAGE WILL BE INSTALLED AS REQUIRED BY THE NEC AND AHJ.

1.2.1 **SCOPE OF WORK:**

1.2.2 PRIME CONTRACTOR IS RESPONSIBLE FOR THE DESIGN AND SPECIFICATIONS OF THE GRID-TIED PHOTOVOLTAIC SYSTEM RETROFIT. PRIME CONTRACTOR WILL BE RESPONSIBLE FOR COLLECTING EXISTING ONSITE REQUIREMENTS TO DESIGN, SPECIFY, AND INSTALL THE EXTERIOR ROOF-MOUNTED PORTION OF THE PHOTOVOLTAIC SYSTEMS DETAILED IN THIS DOCUMENT.

1.3.1 **WORK INCLUDES:**

1.3.2 PV ROOF ATTACHMENTS - ZILLA DOUBLE STUD XL

1.3.3 PV RACKING SYSTEM INSTALLATION - SNAP N RACK UR-40 RAIL

1.3.4 PV MODULE AND INVERTER INSTALLATION - REC SOLAR REC320NP / SOLAR EDGE SE71000H-US (240V)

1.3.5 PV EQUIPMENT GROUNDING

1.3.6 PV SYSTEM WIRING TO A ROOF-MOUNTED JUNCTION BOX

1.3.7 PV LOAD CENTERS (IF INCLUDED)

1.3.8 PV METERING/MONITORING (IF INCLUDED)

1.3.9 PV DISCONNECTS

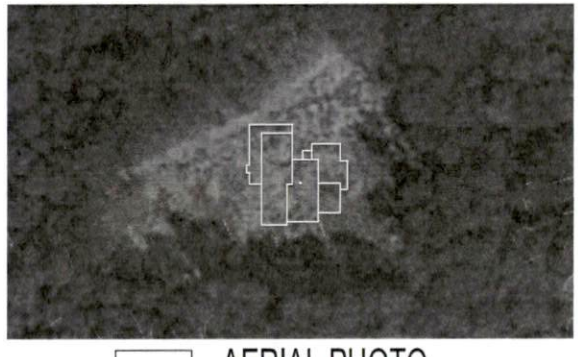
1.3.10 PV FINAL COMMISSIONING

1.3.11 (E) ELECTRICAL EQUIPMENT RETROFIT FOR PV

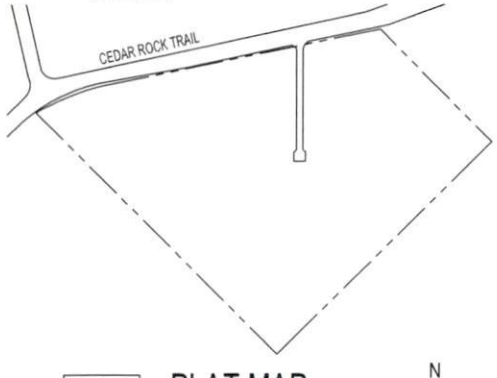
1.3.12 SIGNAGE PLACED IN ACCORDANCE WITH LOCAL BUILDING CODE

SCOPE OF WORK

SYSTEM SIZE:	STC: 24 x 320W = 7.680kW PTC: 24 x 299.2W = 7.181kW DC (24) REC SOLAR REC320NP (1) SOLAR EDGE SE10000H-US (240V)
ATTACHMENT TYPE:	ZILLA DOUBLE STUD XL
MSP UPGRADE:	NO



01 AERIAL PHOTO
NOT TO SCALE



02 PLAT MAP
NOT TO SCALE

N
W E
S

SHEET LIST TABLE

SHEET NUMBER	SHEET TITLE
T-001	COVER PAGE
G-001	NOTES
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A-103	SOLAR ATTACHMENT PLAN
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E-602	DESIGN TABLES
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R-001	RESOURCE DOCUMENT
R-002	RESOURCE DOCUMENT
R-003	RESOURCE DOCUMENT
R-004	RESOURCE DOCUMENT
R-005	RESOURCE DOCUMENT

PROJECT INFORMATION

OWNER
NAME: KAREN BRADEN

PROJECT MANAGER
NAME: DARREN QUELETTE
PHONE: 919-459-2846

CONTRACTOR
NAME: YES SOLAR SOLUTIONS
PHONE: 919-459-2846

AUTHORITIES HAVING JURISDICTION
BUILDING: HARNETT COUNTY
ZONING: HARNETT COUNTY
UTILITY: DUKE

DESIGN SPECIFICATIONS
OCCUPANCY: II
CONSTRUCTION: SINGLE-FAMILY
ZONING: RESIDENTIAL
GROUND SNOW LOAD: 15 PSF
WIND EXPOSURE: C
WIND SPEED: 116 MPH

APPLICABLE CODES & STANDARDS
BUILDING: IBC 2018 IRC 2018
ELECTRICAL: NEC 2017
FIRE: IFC 2018

YES SOLAR SOLUTIONS

CONTRACTOR

YES SOLAR SOLUTIONS

PHONE: (919) 459-2846
ADDRESS: 202 NORTH DIXON AVENUE CARY, NC 27513

LIC. NO.: 67356
HIC. NO.:
ELE. NO.: 31227-U

NEW PV SYSTEM: 7.680 kWp

BRADEN RESIDENCE

295 CEDAR ROCK TRAIL
FUQUAY VARINA, NC 27526
APN: 050633011213

ENGINEER OF RECORD

PAPER SIZE: 11" x 17" (ANSI B)

COVER PAGE

DATE: 01.31.2018
DESIGN BY: A.L.
CHECKED BY: M.M.

REVISIONS

T-001.00
(SHEET 1)

2.1.1 **SITE NOTES:**

2.1.2 A LADDER WILL BE IN PLACE FOR INSPECTION IN COMPLIANCE WITH OSHA REGULATIONS.

2.1.3 THE PV MODULES ARE CONSIDERED NON-COMBUSTIBLE AND THIS SYSTEM IS A UTILITY INTERACTIVE SYSTEM WITH NO STORAGE BATTERIES.

2.1.4 THE SOLAR PV INSTALLATION WILL NOT OBSTRUCT ANY PLUMBING, MECHANICAL, OR BUILDING ROOF VENTS.

2.1.5 PROPER ACCESS AND WORKING CLEARANCE AROUND EXISTING AND PROPOSED ELECTRICAL EQUIPMENT WILL BE PROVIDED AS PER SECTION NEC 110.26.

2.1.6 ROOF COVERINGS SHALL BE DESIGNED, INSTALLED, AND MAINTAINED IN ACCORDANCE WITH THIS CODE AND THE APPROVED MANUFACTURER'S INSTRUCTIONS SUCH THAT THE ROOF COVERING SERVES TO PROTECT THE BUILDING OR STRUCTURE.

2.2.1 **EQUIPMENT LOCATIONS**

2.2.2 ALL EQUIPMENT SHALL MEET MINIMUM SETBACKS AS REQUIRED BY NEC 110.26.

2.2.3 WIRING SYSTEMS INSTALLED IN DIRECT SUNLIGHT MUST BE RATED FOR EXPECTED OPERATING TEMPERATURE AS SPECIFIED BY NEC 690.31 (A),(C) AND NEC TABLES 310.15 (B)(2)(A) AND 310.15 (B)(3)(C).

2.2.3 JUNCTION AND PULL BOXES PERMITTED INSTALLED UNDER PV MODULES ACCORDING TO NEC 690.34.

2.2.4 ADDITIONAL AC DISCONNECT(S) SHALL BE PROVIDED WHERE THE INVERTER IS NOT WITHIN SIGHT OF THE AC SERVICING DISCONNECT.

2.2.5 ALL EQUIPMENT SHALL BE INSTALLED ACCESSIBLE TO QUALIFIED PERSONNEL ACCORDING TO NEC APPLICABLE CODES.

2.2.6 ALL COMPONENTS ARE LISTED FOR THEIR PURPOSE AND RATED FOR OUTDOOR USAGE WHEN APPROPRIATE.

2.3.1 **STRUCTURAL NOTES:**

2.3.2 RACKING SYSTEM & PV ARRAY WILL BE INSTALLED ACCORDING TO CODE-COMPLIANT INSTALLATION MANUAL. TOP CLAMPS REQUIRE A DESIGNATED SPACE BETWEEN MODULES, AND RAILS MUST ALSO EXTEND A MINIMUM DISTANCE BEYOND EITHER EDGE OF THE ARRAY/SUBARRAY, ACCORDING TO RAIL MANUFACTURER'S INSTRUCTIONS.

2.3.3 JUNCTION BOX WILL BE INSTALLED PER MANUFACTURERS' SPECIFICATIONS. IF ROOF-PENETRATING TYPE, IT SHALL BE FLASHED & SEALED PER LOCAL REQUIREMENTS.

2.3.4 ROOFTOP PENETRATIONS FOR PV RACEWAY WILL BE COMPLETED AND SEALED W/ APPROVED CHEMICAL SEALANT PER CODE BY A LICENSED CONTRACTOR.

2.3.5 ALL PV RELATED ROOF ATTACHMENTS TO BE SPACED NO GREATER THAN THE SPAN DISTANCE SPECIFIED BY THE RACKING MANUFACTURER.

2.3.6 WHEN POSSIBLE, ALL PV RELATED RACKING ATTACHMENTS WILL BE STAGGERED AMONGST THE ROOF FRAMING MEMBERS.

2.4.1 **GROUNDING NOTES:**

2.4.2 GROUNDING SYSTEM COMPONENTS SHALL BE LISTED FOR THEIR PURPOSE, AND GROUNDING DEVISES EXPOSED TO THE ELEMENTS SHALL BE RATED FOR SUCH USE.

2.4.3 AS IN CONVENTIONAL PV SYSTEMS, UNGROUNDED PV SYSTEMS REQUIRE AN EQUIPMENT GROUNDING CONDUCTOR. ALL METAL ELECTRICAL EQUIPMENT AND STRUCTURAL COMPONENTS BONDED TO GROUND, IN ACCORDANCE WITH 250.134 OR 250.136(A), ONLY THE DC CONDUCTORS ARE UNGROUNDED.

2.4.4 PV EQUIPMENT SHALL BE GROUNDED ACCORDING TO NEC 690.43 AND MINIMUM NEC TABLE 250.122.

2.4.5 METAL PARTS OF MODULE FRAMES, MODULE RACKING, AND ENCLOSURE CONSIDERED GROUNDED IN ACCORD WITH 250.134 AND 250.136(A).

2.4.6 EACH MODULE WILL BE GROUNDED USING WEEB GROUNDING CLIPS AS SHOWN IN MANUFACTURER DOCUMENTATION AND APPROVED BY THE AHJ. IF WEEBS ARE NOT USED, MODULE GROUNDING LUGS MUST BE INSTALLED AT THE SPECIFIED GROUNDING LUG HOLES PER THE MANUFACTURERS' INSTALLATION REQUIREMENTS.

2.4.7 THE GROUNDING CONNECTION TO A MODULE SHALL BE ARRANGED SUCH THAT THE REMOVAL OF A MODULE DOES NOT INTERRUPT A GROUNDING CONDUCTOR TO ANOTHER MODULE.

2.4.8 GROUNDING AND BONDING CONDUCTORS, IF INSULATED, SHALL BE COLORED GREEN OR MARKED GREEN IF #4 AWG OR LARGER [NEC 250.119]

2.4.9 THE GROUNDING ELECTRODE SYSTEM COMPLIES WITH NEC 690.47 AND NEC 250.50 THROUGH 250.106. IF EXISTING SYSTEM IS INACCESSIBLE, OR INADEQUATE, A GROUNDING ELECTRODE SYSTEM PROVIDED ACCORDING TO NEC 250, NEC 690.47 AND AHJ.

2.4.10 ACCORDING TO NEC 690.47 (C)(3), UNGROUNDED SYSTEMS INVERTER MAY SIZE DC GEC ACCORDING TO EGC REQUIREMENTS OF NEC 250.122. HOWEVER, DC GEC TO BE UNSPLICED OR IRREVERSIBLY SPLICED.

2.4.11 IN UNGROUNDED INVERTERS, GROUND FAULT PROTECTION IS PROVIDED BY "ISOLATION MONITOR INTERRUPTOR," AND GROUND FAULT DETECTION PERFORMED BY "RESIDUAL-CURRENT DETECTOR."

2.5.1 **INTERCONNECTION NOTES:**

2.5.2 LOAD-SIDE INTERCONNECTION SHALL BE IN ACCORDANCE WITH [NEC 690.64 (B)]

2.5.3 THE SUM OF THE UTILITY OCPD AND INVERTER CONTINUOUS INPUT MAY NOT EXCEED 120% OF BUSBAR RATING [NEC 705.12(D)(2)(3)].

2.5.4 WHEN SUM OF THE PV SOURCES EQUALS >100% OF BUSBAR RATING, PV DEDICATED BACKFFED BREAKERS MUST BE LOCATED OPPOSITE END OF THE BUS FROM THE UTILITY SOURCE OCPD [NEC 705.12(D)(2)(3)].

2.5.5 AT MULTIPLE INVERTERS OUTPUT COMBINER PANEL, TOTAL RATING OF ALL OVERCURRENT DEVICES SHALL NOT EXCEED AMPACITY OF BUSBAR. HOWEVER, THE COMBINED OVERCURRENT DEVICE MAY BE EXCLUDED ACCORDING TO NEC 705.12 (D)(2)(3)(C).

2.5.6 FEEDER TAP INTERCONECTION (LOAD SIDE) ACCORDING TO NEC 705.12 (D)(2)(1)

2.5.7 SUPPLY SIDE TAP INTERCONNECTION ACCORDING TO NEC 705.12 (A) WITH SERVICE ENTRANCE CONDUCTORS IN ACCORDANCE WITH NEC 230.42

2.5.8 BACKFEEDING BREAKER FOR UTILITY-INTERACTIVE INVERTER OUTPUT IS EXEMPT FROM ADDITIONAL FASTENING [NEC 705.12 (D)(5)].

2.6.1 **DISCONNECTION AND OVER-CURRENT PROTECTION NOTES:**

2.6.2 DISCONNECTING SWITCHES SHALL BE WIRED SUCH THAT WHEN THE SWITCH IS OPENED THE CONDUCTORS REMAINING ENERGIZED ARE CONNECTED TO THE TERMINALS MARKED "LINE SIDE" (TYPICALLY THE UPPER TERMINALS).

2.6.3 DISCONNECTS TO BE ACCESSIBLE TO QUALIFIED UTILITY PERSONNEL, BE LOCKABLE, AND BE A VISIBLE-BREAK SWITCH.

2.6.4 BOTH POSITIVE AND NEGATIVE PV CONDUCTORS ARE UNGROUNDED. THEREFORE BOTH MUST OPEN WHERE A DISCONNECT IS REQUIRED. ACCORDING TO NEC 690.13.

2.6.5 DC DISCONNECT INTEGRATED INTO ROOFTOP DC COMBINER OR INSTALLED WITHIN 6 FT. ACCORDING TO NEC 690.15 (C).

2.6.6 RAPID SHUTDOWN OF ENERGIZED CONDUCTORS BEYOND 10 FT OF PV ARRAY OR 5 FT INSIDE A BUILDING WITHIN 10 SECONDS. CONTROLLED CONDUCTORS ≤30V AND ≤240VA [NEC 690.12]. LOCATION OF LABEL ACCORDING TO AHJ.

2.6.7 ALL OCPD RATINGS AND TYPES SPECIFIED ACCORDING TO NEC 690.8, 690.9, AND 240.

2.6.8 BOTH POSITIVE AND NEGATIVE PV CONDUCTORS ARE UNGROUNDED, THEREFORE BOTH REQUIRE OVER-CURRENT PROTECTION, ACCORDING TO NEC 240.21. (SEE EXCEPTION IN NEC 690.9)

2.6.9 IF REQUIRED BY AHJ, SYSTEM WILL INCLUDE ARC-FAULT CIRCUIT PROTECTION ACCORDING TO NEC 690.11 AND UL1699B.

2.7.1 **WIRING & CONDUIT NOTES:**

2.7.2 ALL CONDUIT AND WIRE WILL BE LISTED AND APPROVED FOR THEIR PURPOSE. CONDUIT AND WIRE SPECIFICATIONS ARE BASED ON MINIMUM CODE REQUIREMENTS AND ARE NOT MEANT TO LIMIT UP-SIZING.

2.7.3 ALL CONDUCTORS SIZED ACCORDING TO NEC 690.8, NEC 690.7.

2.7.4 EXPOSED UNGROUNDED PV SOURCE AND OUTPUT CIRCUITS SHALL USE WIRE LISTED AND IDENTIFIED AS PHOTOVOLTAIC (PV) WIRE [690.35 (D)]. PV MODULES WIRE LEADS SHALL BE LISTED FOR USE WITH UNGROUNDED SYSTEMS, ACCORDING TO NEC 690.35 (D)(3).

2.7.5 PV WIRE BLACK WIRE MAY BE FIELD-MARKED WHITE [NEC 200.6 (A)(6)].

2.7.6 MODULE WIRING SHALL BE LOCATED AND SECURED UNDER THE ARRAY.

2.7.7 ACCORDING TO NEC 200.7, UNGROUNDED SYSTEMS DC CONDUCTORS COLORED OR MARKED AS FOLLOWS:

DC POSITIVE- RED, OR OTHER COLOR EXCLUDING WHITE, GREY AND GREEN

DC NEGATIVE- BLACK, OR OTHER COLOR EXCLUDING WHITE, GREY AND GREEN

2.7.8 AC CONDUCTORS COLORED OR MARKED AS FOLLOWS:

PHASE A OR L1- BLACK

PHASE B OR L2- RED, OR OTHER CONVENTION IF THREE PHASE

PHASE C OR L3- BLUE, YELLOW, ORANGE*, OR OTHER CONVENTION

NEUTRAL- WHITE OR GREY

* IN 4-WIRE DELTA CONNECTED SYSTEMS THE PHASE WITH HIGHER VOLTAGE TO BE MARKED ORANGE [NEC 110.15].

YES SOLAR SOLUTIONS

CONTRACTOR

YES SOLAR SOLUTIONS

PHONE: (919) 459-2846

ADDRESS: 202 NORTH DIXON AVENUE
CARY, NC 27513

LIC. NO.: 67356

HIC. NO.:

ELE. NO.: 31227-U

NEW PV SYSTEM: 7.680 kWp

BRADEN RESIDENCE

295 CEDAR ROCK TRAIL
FUQUAY VARINA, NC 27526
APN: 050633011213

ENGINEER OF RECORD

PAPER SIZE: 11" x 17" (ANSI B)

NOTES

DATE: 01.31.2018

DESIGN BY: A.L.

CHECKED BY: M.M.

REVISIONS

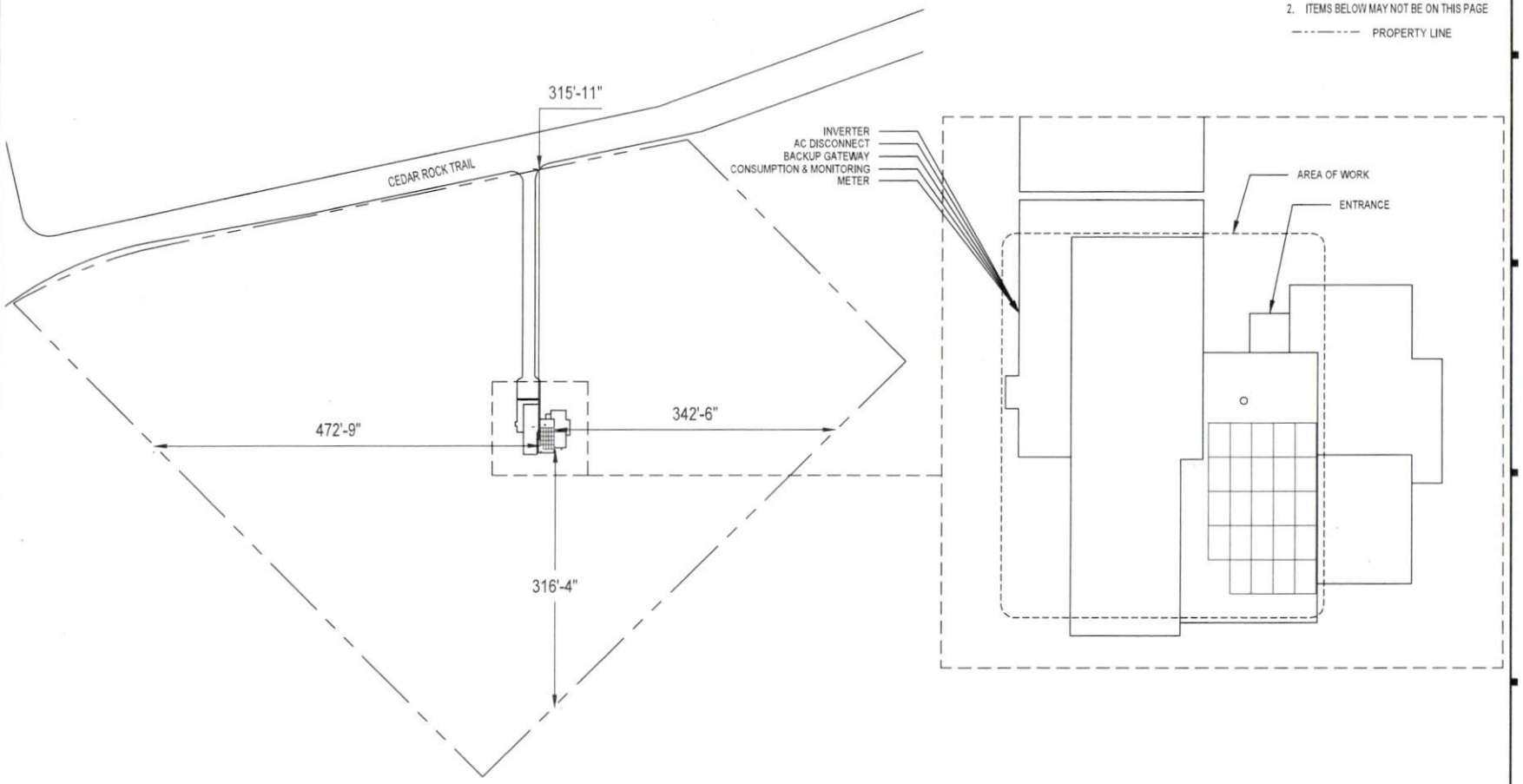
G-001.00

(SHEET 2)

GENERAL NOTES

1. FIELD VERIFY ALL MEASUREMENTS
2. ITEMS BELOW MAY NOT BE ON THIS PAGE

PROPERTY LINE



01 SITE PLAN

1/128" = 1'-0"

0 64' 128'

N W E S

YES SOLAR SOLUTIONS

CONTRACTOR

YES SOLAR SOLUTIONS

PHONE: (919) 459-2846

ADDRESS: 202 NORTH DIXON AVENUE CARY, NC 27513

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FUQUAY VARINA, NC 27526
APN: 050633011213

ENGINEER OF RECORD

PAPER SIZE: 11" x 17" (ANSI B)

SITE PLAN

DATE: 01.31.2018

DESIGN BY: A.L.

CHECKED BY: M.M.

REVISIONS

A-101.00

(SHEET 3)

GENERAL NOTES

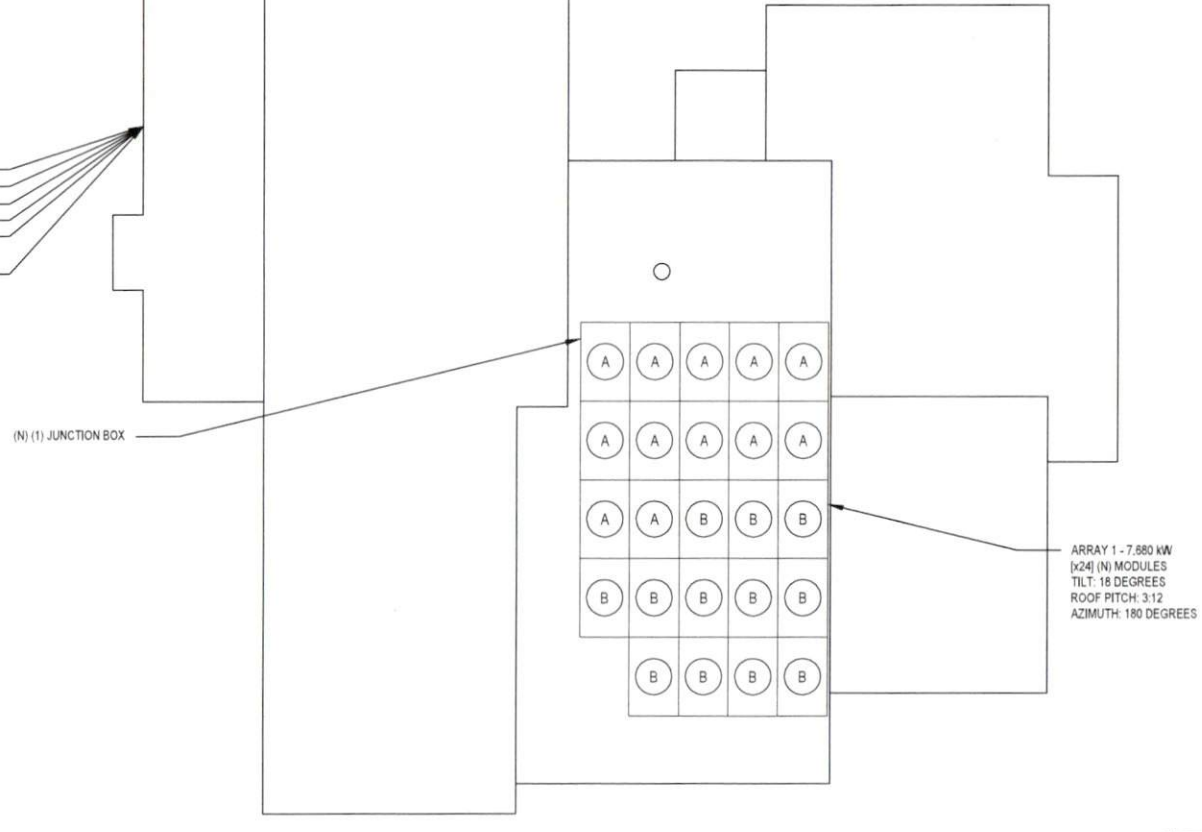
1. FIELD VERIFY ALL MEASUREMENTS
2. ITEMS BELOW MAY NOT BE ON THIS PAGE

(A) MODULE STRINGING

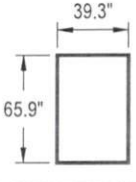
(B) MODULE STRINGING

EXTERIOR PV EQUIPMENT
(N) (1) INVERTER
(N) (1) AC DISCONNECT
(N) (1) BACKUP GATEWAY
(N) (1) CONSUMPTION & MONITORING
(E) (1) METER
INTERIOR PV EQUIPMENT
(E) (1) MAIN ELECTRICAL PANEL

(N) (1) JUNCTION BOX



ARRAY 1 - 7.680 kW
(x24) (N) MODULES
TILT: 18 DEGREES
ROOF PITCH: 3:12
AZIMUTH: 180 DEGREES



MODULE:
REC SOLAR REC320NP
320 WATTS

01 ELECTRICAL PLAN

1/8" = 1'

YES SOLAR SOLUTIONS

CONTRACTOR

YES SOLAR SOLUTIONS

PHONE: (919) 459-2846
ADDRESS: 202 NORTH DIXON AVENUE
CARY, NC 27513

LIC. NO.: 67356
HIC. NO.:
ELE. NO.: 31227-U

NEW PV SYSTEM: 7.680 kWp

BRADEN RESIDENCE

295 CEDAR ROCK TRAIL
FUQUAY VARINA, NC 27526
APN: 050633011213

ENGINEER OF RECORD

PAPER SIZE: 11" x 17" (ANSI B)

ELECTRICAL PLAN

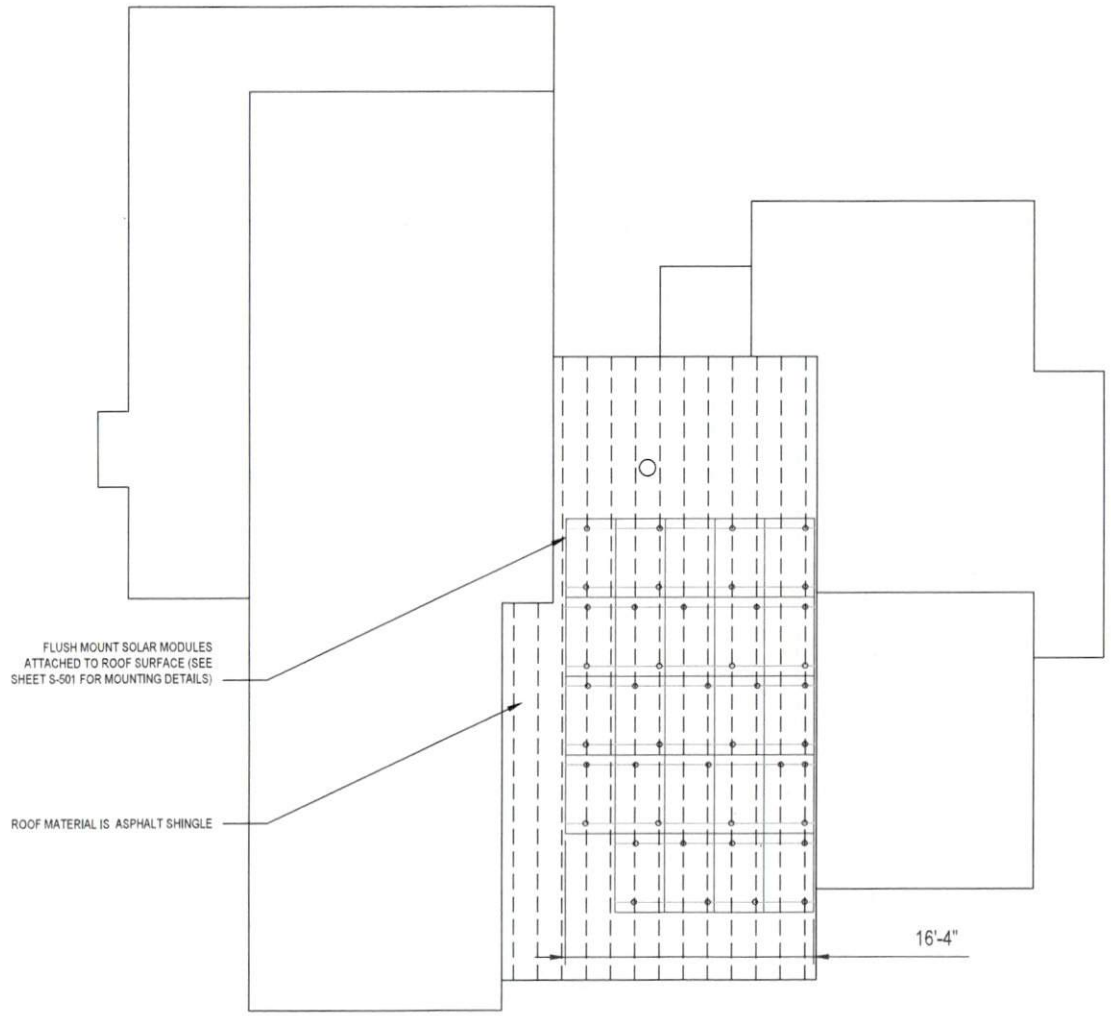
DATE: 01.31.2018
DESIGN BY: A.L.
CHECKED BY: M.M.
REVISIONS

A-102.00
(SHEET 4)

GENERAL NOTES

1. FIELD VERIFY ALL MEASUREMENTS
2. ITEMS BELOW MAY NOT BE ON THIS PAGE

_ _ _ _ ROOF RAFTERS

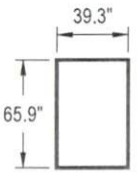


01 SOLAR ATTACHMENT PLAN

1/8" = 1'

0 4' 8'

N W E S



MODULE:
REC SOLAR REC320NP
320 WATTS

YES SOLAR SOLUTIONS

CONTRACTOR

YES SOLAR SOLUTIONS

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ADDRESS: 202 NORTH DIXON AVENUE
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ENGINEER OF RECORD

PAPER SIZE: 11" x 17" (ANSI B)

SOLAR ATTACHMENT PLAN

DATE: 01.31.2018
DESIGN BY: A.L.
CHECKED BY: M.M.
REVISIONS: DQ 2.8.19 YES SOLAR

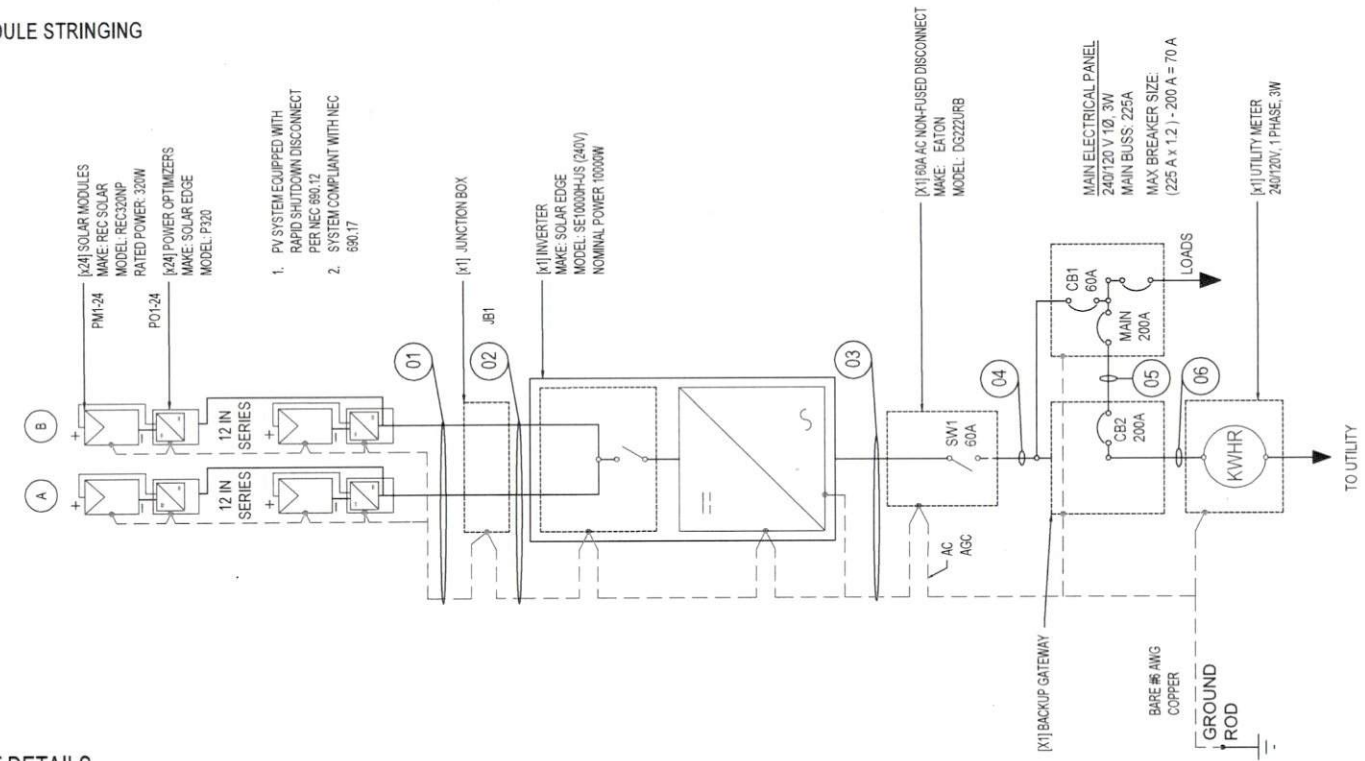
A-103.00
(SHEET 5)

CONDUCTOR AND CONDUIT SCHEDULE W/ELECTRICAL CALCULATIONS

ID	TYPICAL	CONDUCTOR	CONDUIT	CURRENT-CARRYING CONDUCTORS IN CONDUIT	OCPD	EGC	TEMP. CORR. FACTOR	CONDUIT FILL FACTOR	CONT. CURRENT	MAX. CURRENT (125%)	BASE AMP.	DERATED AMP.	TERM. TEMP. RATING	AMP. @ TERMINAL
01	2	10 AWG PV WIRE, COPPER	FREE AIR	2	N/A	6 AWG BARE, COPPER	0.71 (59.1°C)	1	15A	18.75A	55A	39.05A	75°C	50A
02	1	10 AWG THWN-2, COPPER	0.75" DIA EMT	4	N/A	10 AWG THWN-2, COPPER	0.71 (59.1°C)	0.8	15A	18.75A	40A	22.72A	75°C	35A
03	1	6 AWG THWN-2, COPPER	0.75" DIA EMT	2	N/A	10 AWG THWN-2, COPPER	0.91 (37.1°C)	1	42A	52.5A	75A	68.25A	75°C	65A
04	1	6 AWG THWN-2, COPPER	0.75" DIA EMT	2	60A	10 AWG THWN-2, COPPER	0.91 (37.1°C)	1	42A	52.5A	75A	68.25A	75°C	65A
05	1	4 AWG THWN-2, ALUMINIUM	1.5" DIA EMT	2	N/A	4 AWG THWN-2, COPPER	0.91 (37.1°C)	1	160A	200A	25A	68.25A	75°C	180A
06	1	4 AWG THWN-2, ALUMINIUM	1.5" DIA EMT	2	200A	4 AWG THWN-2, COPPER	0.91 (37.1°C)	1	160A	200A	25A	68.25A	75°C	180A

(A) MODULE STRINGING

(B) MODULE STRINGING



PROJECT DETAILS

PROJECT OWNER: KAREN BRADEN
PROJECT NAME: BRADEN RESIDENCE
PROJECT ADDRESS: 295 CEDAR ROCK TRAIL, FUQUAY VARINA, NC 27526
METERING ARRAGEMENT: NET METERING/BILLING

YES SOLAR SOLUTIONS

CONTRACTOR

YES SOLAR SOLUTIONS

PHONE: (919) 459-2846
ADDRESS: 202 NORTH DIXON AVENUE
CARY, NC 27513

LIC. NO.: 67356
HIC. NO.:
ELE. NO.: 31227-U

NEW PV SYSTEM: 7.680 kWp

BRADEN RESIDENCE

295 CEDAR ROCK TRAIL
FUQUAY VARINA, NC 27526
APN: 050633011213

ENGINEER OF RECORD

PAPER SIZE: 11" x 17" (ANSI B)

LINE DIAGRAM

DATE: 01.31.2018
DESIGN BY: A.L.
CHECKED BY: M.M.

REVISIONS

E-601.00
(SHEET 6)

SYSTEM SUMMARY

	STRING #1	STRING #2
POWERBOX MAX OUTPUT CURRENT	15A	15A
OPTIMIZERS IN SERIES	12	12
NOMINAL STRING VOLTAGE	400V	400V
ARRAY OPERATING CURRENT	9.6A	9.6A
ARRAY STC POWER	7,680W	
ARRAY PTC POWER	7,181W	
MAX AC CURRENT	42A	
MAX AC POWER	10,000W	
DERATED (CEC) AC POWER	7,024W	

DESIGN TEMPERATURES

ASHRAE EXTREME LOW	-11.1°C (12.0°F), SOURCE: HARTNETT COUNTY (35.38°; -78.73°)
ASHRAE 2% HIGH	37.1°C (98.8°F), SOURCE: HARTNETT COUNTY (35.38°; -78.73°)

MODULES

REF.	QTY.	MAKE AND MODEL	PMAX	PTC	ISC	IMP	VOC	VMP	TEMP. COEFF. OF VOC	FUSE RATING
P1-24	24	REC SOLAR REC320NP	320W	299.2W	10.18A	9.37A	40.8V	34.2V	-0.143V/°C (-0.35%/°C)	25A

POWER OPTIMIZERS

REF.	QTY.	MODEL	RATED INPUT POWER	MAX OUTPUT CURRENT	MAX INPUT ISC	MAX DC VOLTAGE	WEIGHTED EFFICIENCY
PO1-24	24	SOLAR EDGE P320	320W	15A	11A	48V	98.8%

INVERTERS

REF.	QTY.	MAKE AND MODEL	AC VOLTAGE	GROUND	OCPD RATING	RATED POWER	MAX OUTPUT CURRENT	MAX INPUT CURRENT	MAX INPUT VOLTAGE	CEC WEIGHTED EFFICIENCY
I1	1	SOLAR EDGE SE10000H-US (240V)	240V	FLOATING	60A	10000W	42A	27A	480V	99.0%

DISCONNECTS

REF.	QTY.	MAKE AND MODEL	RATED CURRENT	MAX RATED VOLTAGE
SW1	1	EATON DG222URB OR EQUIV.	60A	240VAC

OCPDS

REF.	QTY.	RATED CURRENT	MAX VOLTAGE
CB1	1	60A	240VAC
CB2	1	200A	240VAC

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DESIGN TABLES

DATE: 01.31.2018

DESIGN BY: A.L.

CHECKED BY: M.M.

REVISIONS

E-602.00

(SHEET 7)

SOLAR PV SYSTEM EQUIPPED WITH RAPID SHUTDOWN

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

LABEL 1
AT SYSTEM'S RAPID SHUTDOWN
[NEC 690.56(C)].

! WARNING !
ELECTRIC SHOCK HAZARD
TERMINALS ON THE LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION.
DC VOLTAGE IS ALWAYS PRESENT WHEN SOLAR MODULES ARE EXPLOSED TO SUNLIGHT

LABEL 2
AT EACH DISCONNECTING MEANS FOR PHOTOVOLTAIC EQUIPMENT
[NEC 690.15]

OPERATING CURRENT:	19.2 A DC
OPERATING VOLTAGE:	400 V DC
MAX SHORT CURRENT:	30 A DC
MAX VOLTAGE:	480 V DC

LABEL 3
AT EACH APPLICABLE DC DISCONNECTING MEANS [NEC 690.53]

PHOTOVOLTAIC AC DISCONNECT

OPERATING CURRENT:	42 A AC
OPERATING VOLTAGE:	240 V AC

LABEL 4
AT POINT OF INTERCONNECTION, MARKED AT DISCONNECTING MEANS [NEC 690.54]

! WARNING !
DUAL POWER SOURCES.
SECOND SOURCE IS PV SYSTEM

LABEL 5

! CAUTION !
PHOTOVOLTAIC SYSTEM CIRCUIT IS BACKFED

LABEL 6

INTERACTIVE PHOTOVOLTAIC SYSTEM CONNECTED
PHOTOVOLTAIC SYSTEM DISCONNECT LOCATED WEST SIDE OF THE HOUSE

PLAQUE

AT POINT OF INTERCONNECTION; LABEL, SUCH AS LABEL 5 OR LABEL 6 MUST IDENTIFY PHOTOVOLTAIC SYSTEM
[NEC 705.12(B)(4)]

DIRECTORY
PERMANENT PLAQUE OR DIRECTORY PROVIDING THE LOCATION OF THE SERVICE DISCONNECTING MEANS AND THE PHOTOVOLTAIC SYSTEM DISCONNECTING MEANS IF NOT IN THE SAME LOCATION
[NEC 690.56(B)]
WHERE THE PV SYSTEMS ARE REMOTELY LOCATED FROM EACH OTHER, A DIRECTORY IN ACCORDANCE WITH 705.10 SHALL BE PROVIDED AT EACH PV SYSTEM DISCONNECTING MEANS.
[NEC 690.4(D)]
PV SYSTEM EQUIPMENT AND DISCONNECTING MEANS SHALL NOT BE INSTALLED IN BATHROOMS.
[NEC 690.4(E)]

INTERACTIVE PHOTOVOLTAIC SYSTEM CONNECTED

LABEL 7
AT UTILITY METER
[NEC 690.56(B)]

PHOTOVOLTAIC DC DISCONNECT

LABEL 8
AT EACH DC DISCONNECTING MEANS
[NEC 690.13(B)]

RAPID SHUTDOWN SWITCH FOR SOLAR PV SYSTEM

LABEL 9
AT RAPID SHUTDOWN SWITCH [NEC 690.56(C)].
LETTERS AT LEAST 3/8 INCH; WHITE ON RED BACKGROUND; REFLECTIVE [IFC 605.11.1.1].
LABEL LOCATEDON OR NO MORE THAN 1 METER (3.3 FT.) FROM THE SWITCH.

WARNING: PHOTOVOLTAIC POWER SOURCE

LABEL 10
AT EXPOSED RACEWAYS, CABLE TRAYS, AND OTHER WIRING METHODS; SPACED AT MAXIMUM 10 FT SECTION OR WHERE SEPARATED BY ENCLOSURES, WALLS, PARTITIONS, CEILINGS, OR FLOORS.
[NEC 690.31(G)]
LETTERS AT LEAST 3/8 INCH; WHITE ON RED BACKGROUND; REFLECTIVE
[IFC 605.11.1.1]

PHOTOVOLTAIC AC DISCONNECT

LABEL 11
AT EACH AC DISCONNECTING MEANS
[NEC 690.13(B)]

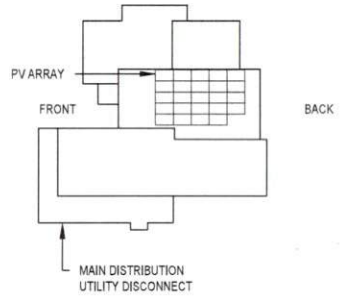
! WARNING !
POWER SOURCE OUTPUT CONNECTION. DO NOT RELOCATE THIS OVERCURRENT DEVICE

LABEL 12
AT POINT OF INTERCONNECTION
OVERCURRENT DEVICE
[NEC 705.12(D)(10)(3)(B)]

LABELING NOTES
1.1 LABELING REQUIREMENTS BASED ON THE 2017 NATIONAL ELECTRICAL CODE, INTERNATIONAL FIRE CODE 605.11, OSHA STANDARD 1910.145, ANSI Z535
1.2 MATERIAL BASED ON THE REQUIREMENTS OF THE AUTHORITY HAVING JURISDICTION.
1.3 LABELS TO BE OF SUFFICIENT DURABILITY TO WITHSTAND THE ENVIRONMENT INVOLVED.
1.4 LABELS TO BE A MINIMUM LETTER HEIGHT OF 3/8" AND PERMANENTLY AFFIXED.
1.5 ALERTING WORDS TO BE COLOR CODED. "DANGER" WILL HAVE RED BACKGROUND; "WARNING" WILL HAVE ORANGE BACKGROUND; "CAUTION" WILL HAVE YELLOW BACKGROUND. [ANSI Z535]

!CAUTION!

POWER TO THIS BUILDING IS ALSO SUPPLIED FROM ROOF MOUNTED SOLAR ARRAYS WITH SAFETY DISCONNECTS AS SHOWN:



YES SOLAR SOLUTIONS

CONTRACTOR

YES SOLAR SOLUTIONS

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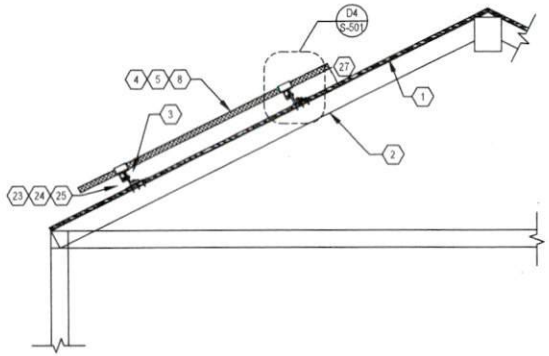
PLACARDS

DATE: 01.31.2018
DESIGN BY: A.L.
CHECKED BY: M.M.

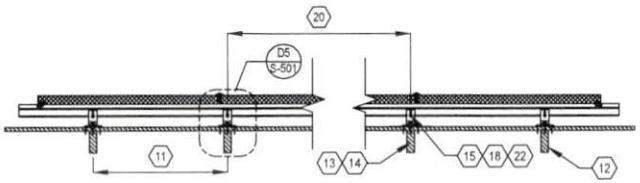
REVISIONS

E-603.00
(SHEET 8)



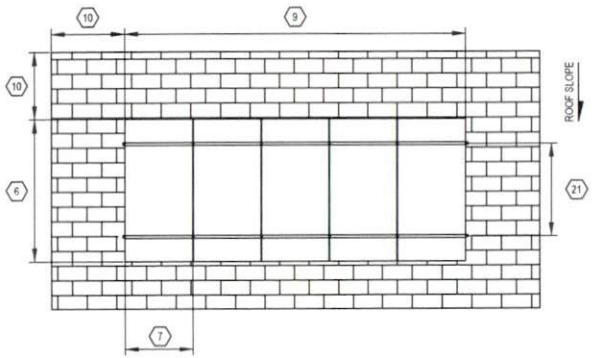
D1 RACKING DETAIL (TRANSVERSE)

NOT TO SCALE



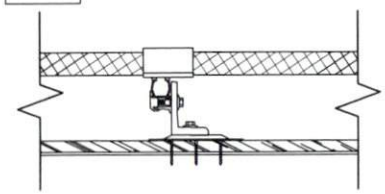
D2 RACKING DETAIL (LONGITUDINAL)

NOT TO SCALE



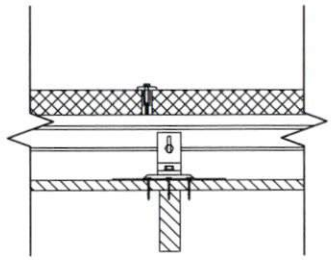
D3 RACKING DETAIL (TOP)

NOT TO SCALE



D4 DETAIL (TRANSVERSE)

NOT TO SCALE



D5 DETAIL (LONGITUDINAL)

NOT TO SCALE

GENERAL NOTES

1. FIELD VERIFY ALL MEASUREMENTS

SHEET KEYNOTES

1. ROOF MATERIAL: ASPHALT SHINGLE
2. ROOF STRUCTURE: SINGLE SPAN RAFTER
3. ATTACHMENT TYPE: ZILLA DOUBLE STUD XL
4. MODULE MANUFACTURER: REC SOLAR
5. MODULE MODEL: REC320NP
6. MODULE LENGTH: 65.9 IN.
7. MODULE WIDTH: 39.3 IN.
8. MODULE WEIGHT: 39.7 LBS.
9. SEE SHEET A-103 FOR DIMENSION(S)
10. MIN. FIRE OFFSET: NO FIRE CODE ENFORCED
11. RAFTER SPACING: 19.2 IN. O.C.
12. RAFTER SIZE: 11 7/8" TJI 210 SERIES I-JOIST
13. LAG BOLT DIAMETER: BOLT/SCREW SUPPLIED WITH RACKING
14. LAG BOLT EMBEDMENT: 1 IN.
15. TOTAL # OF ATTACHMENTS: 44
16. TOTAL AREA: 431.36 SQ. FT.
17. TOTAL WEIGHT: 1097.18 LBS.
18. WEIGHT PER ATTACHMENT: 24.94 LBS.
19. DISTRIBUTED LOAD: 2.54 PSF
20. MAX. HORIZONTAL STANDOFF: 57.5 IN.
21. MAX. VERTICAL STANDOFF: LANDSCAPE: 26 IN., PORTRAIT: 33 IN.
22. STANDOFF STAGGERING: YES
23. RAIL MANUFACTURER (OR EQUIV.): SNAP N RACK
24. RAIL MODEL (OR EQUIVALENT): UR-40 RAIL
25. RAIL WEIGHT: 0.42 PLF.
26. MAX. RAFTER SPAN: 10 FT.
27. MODULE CLEARANCE: 3 IN. MIN., 6 IN. MAX.

2.08.2019

STRUCTURAL REVIEW PROVIDED BY:
RONALD P. BITTLER, PE
RB ENGINEERING, INC. (C-2499)
168 QUADE DRIVE
CARY, NC 27513
919-677-9662
PROJECT #RB-195631

YES SOLAR SOLUTIONS

CONTRACTOR

YES SOLAR SOLUTIONS

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295 CEDAR ROCK TRAIL
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APN: 050633011213

ENGINEER OF RECORD

PAPER SIZE: 11" x 17" (ANSI B)

ASSEMBLY DETAILS

DATE: 01.31.2018
DESIGN BY: A.L.
CHECKED BY: M.M.

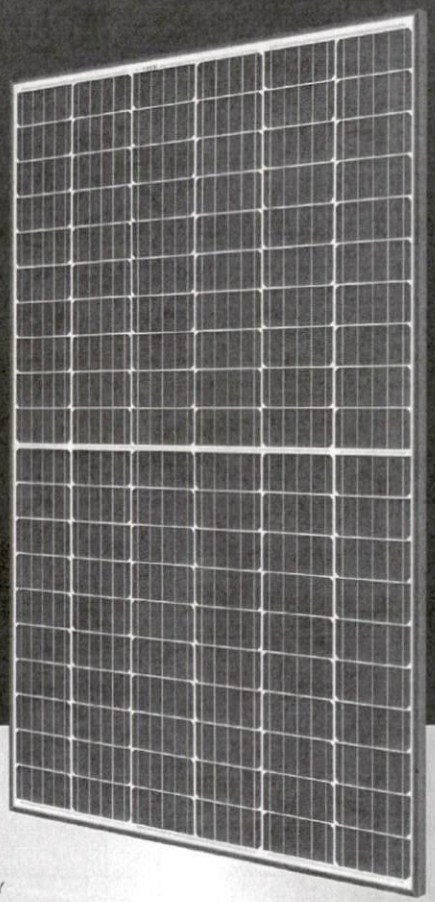
REVISIONS: DQ 2.8.19 YES SOLAR (ATTACHMENT COUNT 48 TO 44, LOAD CALC CHANGE)

S-501.00
(SHEET 9)

SOLAR'S MOST TRUSTED REC

REC N-PEAK SERIES

PREMIUM MONO N-TYPE SOLAR PANELS WITH SUPERIOR PERFORMANCE



MONO N-TYPE: THE MOST EFFICIENT C-SI TECHNOLOGY

NO LIGHT INDUCED DEGRADATION

SUPER-STRONG FRAME UP TO 7000 PA SNOW LOAD

FLEXIBLE INSTALLATION OPTIONS

IMPROVED PERFORMANCE IN SHADED CONDITIONS

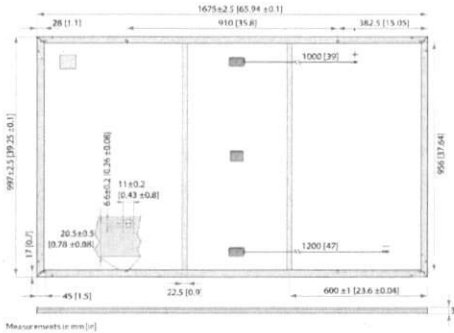
GUARANTEED HIGH POWER OVER LIFETIME

330 Wp POWER

12 YEAR PRODUCT WARRANTY

0.5% ANNUAL DEGRADATION OVER 25-YEAR POWER WARRANTY

REC N-PEAK SERIES



Measurements in mm [in]

GENERAL DATA	
Cell type:	120 half-cut n-type mono c-Si cells 6 strings of 20 cells in series
Glass:	0.13" (3.2 mm) solar glass with anti-reflection surface treatment
Backsheet:	Highly resistant polymeric construction
Frame:	Anodized aluminum (black)
Junction box:	3-part, 3 bypass diodes, IP67 rated in accordance with IEC 62790
Cable:	12 AWG (4 mm²) PV wire, 39 + 47" (1 m + 1.2 m) in accordance with EN 50618
Connectors:	Staubli MC4 PV-KBT4/KST4, 12 AWG (4 mm²) in accordance with IEC 62852 IP68 only when connected
Origin:	Made in Singapore

MECHANICAL DATA	
Dimensions:	65.9 x 39.25 x 1.1" (1675 x 997 x 30 mm)
Area:	17.98 ft² (1.67 m²)
Weight:	39.7 lbs (18 kg)

ELECTRICAL DATA @ STC	Product code*: RECxxxNP				
Nominal Power - P_{nom} (Wp)	310	315	320	325	330
Watt Class Sorting - (W)	-0/+5	-0/+5	-0/+5	-0/+5	-0/+5
Nominal Power Voltage - V_{mpp} (V)	33.6	33.9	34.2	34.4	34.6
Nominal Power Current - I_{mpp} (A)	9.24	9.31	9.37	9.46	9.55
Open Circuit Voltage - V_{oc} (V)	40.2	40.5	40.8	41.0	41.3
Short Circuit Current - I_{sc} (A)	10.01	10.09	10.18	10.27	10.36
Panel Efficiency (%)	18.6	18.9	19.2	19.5	19.8

Values at standard test conditions (STC: air mass AM 1.5, irradiance 1000 W/m², temperature 25°C), based on a production spread with a tolerance of V_{oc} & I_{sc} ± 3% within one watt class. * Where xxx indicates the nominal power class (P_{nom}) at STC above.

ELECTRICAL DATA @ NOCT	Product code*: RECxxxNP				
Nominal Power - P_{nom} (Wp)	234	238	241	245	249
Nominal Power Voltage - V_{mpp} (V)	31.1	31.4	31.7	31.9	32.1
Nominal Power Current - I_{mpp} (A)	7.51	7.56	7.62	7.69	7.76
Open Circuit Voltage - V_{oc} (V)	37.3	37.5	37.8	38.0	38.3
Short Circuit Current - I_{sc} (A)	8.01	8.07	8.14	8.22	8.29

Nominal operating cell temperature (NOCT, air mass AM 1.5, irradiance 800 W/m², temperature 20°C, windspeed 1 m/s). * Where xxx indicates the nominal power class (P_{nom}) at STC above.

MAXIMUM RATINGS	
Operational temperature:	40...+85°C
Maximum system voltage:	1000 V
Design load (+) snow:	4666 Pa (97.5 lbs/ft²)*
Maximum test load (+):	7000 Pa (146 lbs/ft²)*
Design load (-) wind:	1600 Pa (33.4 lbs/ft²)*
Maximum test load (-):	2400 Pa (50 lbs/ft²)*
Max series fuse rating:	25 A
Max reverse current:	25 A

* Calculated using a safety factor of 1.5
* See installation manual for mounting instructions

TEMPERATURE RATINGS *	
Nominal Operating Cell Temperature:	44°C (±2°C)
Temperature coefficient of P_{mpp}:	-0.35 %/°C
Temperature coefficient of V_{oc}:	-0.27 %/°C
Temperature coefficient of I_{sc}:	0.04 %/°C

*The temperature coefficients stated are linear values

CERTIFICATIONS

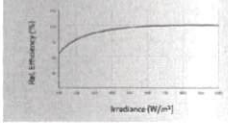
UL 1703 (Fire type 2), IEC 61215, IEC 61730
IEC 62804 (PID), IEC 61701 (Salt Mist), IEC 62716 (Ammonia)
ISO 9001:2015, ISO 14001:2004, OHSAS 18001:2007

WARRANTY

12 year product warranty
25 year linear power output warranty, maximum degression in performance of 0.5% p.a., giving 86% at end of year 25.
See warranty conditions for further details

LOW LIGHT BEHAVIOUR

Typical low irradiance performance of module at STC:



Specifications subject to change without notice

Ref: NE_05_H_Rev_A_2_GB

Founded in Norway in 1996, REC is a leading vertically integrated solar energy company. Through integrated manufacturing from silicon to wafers, cells, high-quality panels and extending to solar solutions, REC provides the world with a reliable source of clean energy. REC's renowned product quality is supported by the lowest warranty claims rate in the industry. REC is a Bluestar Elkem company with headquarters in Norway and operational headquarters in Singapore. REC employs more than 2,000 people worldwide, producing 1.5 GW of solar panels annually.

REC
www.recgroup.com

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CHECKED BY: M.M.

REVISIONS

R-001.00
(SHEET 10)

INVERTERS

solaredge

Single Phase Inverter
with HD-Wave Technology
for North America

SE3000H-US / SE3800H-US / SE5000H-US /
SE6000H-US / SE7600H-US / SE10000H-US / SE11400H-US

Optimized installation with HD-Wave technology

- Specifically designed to work with power optimizers
- Record-breaking efficiency
- Fixed voltage inverter for longer strings
- Integrated arc fault protection and rapid shutdown for NEC 2014 and 2017, per article 690.11 and 690.12
- UL1741 SA certified, for CPUC Rule 21 grid compliance
- Extremely small
- High reliability without any electrolytic capacitors
- Built-in module-level monitoring
- Outdoor and indoor installation
- Optional: Revenue grade data, ANSI C12.20 Class 0.5 (0.5% accuracy)

HD wave

www.solaredge.us

solaredge

Single Phase Inverter
with HD-Wave Technology for North America

SE3000H-US / SE3800H-US / SE5000H-US /
SE6000H-US/ SE7600H-US / SE10000H-US / SE11400H-US

	SE3000H-US	SE3800H-US	SE5000H-US	SE6000H-US	SE7600H-US	SE10000H-US	SE11400H-US	
OUTPUT								
Rated AC Power Output	3000	3800 @ 240V 3300 @ 208V	5000	6000 @ 240V 5000 @ 208V	7600	10000	11400	VA
Max. AC Power Output	3000	3800 @ 240V 3300 @ 208V	5000	6000 @ 240V 5000 @ 208V	7600	10000	11400	VA
AC Output Voltage Min.-Nom.-Max. (183 - 208 - 229)	-	✓	-	✓	-	-	-	Vac
AC Output Voltage Min.-Nom.-Max. (211 - 240 - 264)	✓	✓	✓	✓	✓	✓	✓	Vac
AC Frequency (Nominal)	59.3 - 60 - 60.5[1]							Hz
Maximum Continuous Output Current 208V	-	16	-	24	-	-	-	A
Maximum Continuous Output Current @240V	12.5	16	21	25	32	42	47.5	A
GFDI Threshold	1							A
Utility Monitoring, Islanding Protection, Country Configurable Thresholds	Yes							
INPUT								
Maximum DC Power @240V	4650	5900	7750	9300	11800	15500	17650	W
Maximum DC Power @208V	-	5100	-	7750	-	-	-	W
Transformer-less, Ungrounded	Yes							
Maximum Input Voltage	480							Vdc
Nominal DC Input Voltage	380					400		Vdc
Maximum Input Current 208V	-	9	-	13.5	-	-	-	Adc
Maximum Input Current @240V	8.5	10.5	13.5	16.5	20	27	30.5	Adc
Max. Input Short Circuit Current	45							Adc
Reverse-Polarity Protection	Yes							
Ground-Fault Isolation Detection	600kΩ Sensitivity							
Maximum Inverter Efficiency	99	99.2						%
CEC Weighted Efficiency	99							%
Nighttime Power Consumption	< 2.5							W
ADDITIONAL FEATURES								
Supported Communication Interfaces	RS485, Ethernet, ZigBee (optional), Cellular (optional)							
Revenue Grade Data, ANSI C12.20	Optional[2]							
Rapid Shutdown - NEC 2014 and 2017 690.12	Automatic Rapid Shutdown upon AC Grid Disconnect							
STANDARD COMPLIANCE								
Safety	UL1741, UL1741 SA, UL1699B, CSA C22.2, Canadian AFCI according to T.I.L. M-07							
Grid Connection Standards	IEEE1547, Rule 21, Rule 14 (HI)							
Emissions	FCC Part 15 Class B							
INSTALLATION SPECIFICATIONS								
AC Output Conduit Size / AWG Range	3/4" minimum / 14-6 AWG					3/4" minimum /14-4 AWG		
DC Input Conduit Size / # of Strings / AWG Range	3/4" minimum / 1-2 strings / 14-6 AWG					3/4" minimum / 1-3 strings / 14-6 AWG		
Dimensions with Safety Switch (HxWxD)	17.7 x 14.6 x 6.8 / 450 x 370 x 174					21.3 x 14.6 x 7.3 / 540 x 370 x 185		in / mm
Weight with Safety Switch	22 / 10		25.1 / 11.4	26.2 / 11.9		38.8 / 17.6		lb / kg
Noise	< 25					<50		dBA
Cooling	Natural Convection					Natural convection		
Operating Temperature Range	-13 to +140 / -25 to +60[3] (-40°F / -40°C option)[4]							°F / °C
Protection Rating	NEMA 3R (Inverter with Safety Switch)							

[1] For other regional settings please contact SolarEdge support
[2] Revenue grade inverter P/N: SExxxxH-US000NNC2
[3] For power de-rating information refer to: https://www.solaredge.com/sites/default/files/se-temperature-derating-note-na.pdf
[4] 40 version P/N: SExxxxH-US000NNU4

RoHS

YES SOLAR SOLUTIONS

CONTRACTOR

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RESOURCE DOCUMENT

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DESIGN BY: A.L.
CHECKED BY: M.M.

REVISIONS

R-002.00
(SHEET 11)

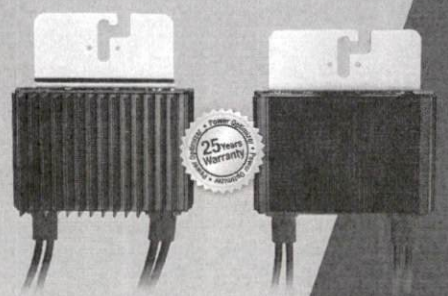
solaredge

SolarEdge Power Optimizer

Module Add-On For North America

P320 / P370 / P400 / P405 / P505

POWER OPTIMIZER



PV power optimization at the module-level

- Specifically designed to work with SolarEdge inverters
- Up to 25% more energy
- Superior efficiency (99.5%)
- Mitigates all types of module mismatch losses, from manufacturing tolerance to partial shading
- Flexible system design for maximum space utilization
- Fast installation with a single bolt
- Next generation maintenance with module-level monitoring
- Compliant with arc fault protection and rapid shutdown NEC requirements (when installed as part of the SolarEdge system)
- Module-level voltage shutdown for installer and firefighter safety

USA-CANADA-GERMANY-UK-ITALY-THE NETHERLANDS-JAPAN-CHINA-AUSTRALIA-ISRAEL-FRANCE-BELGIUM-TURKEY-INDIA-BULGARIA-ROMANIA-HUNGARY-SWEDEN-SOUTH AFRICA-POLAND-CZECH REPUBLIC

www.solaredge.us

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OPTIMIZER MODEL (typical module compatibility)	P320 (for high-power 60-cell modules)	P370 (for higher-power 60 and 72-cell modules)	P400 (for 72 & 96-cell modules)	P405 (for thin film modules)	P505 (for higher current modules)	
INPUT						
Rated Input DC Power[1]	320	370	400	405	505	W
Absolute Maximum Input Voltage (Voc at lowest temperature)	48	60	80	125	83	Vdc
MPPT Operating Range	8 - 48	8 - 60	8 - 80	12.5 - 105	12.5 - 83	Vdc
Maximum Short Circuit Current (Isc)	11	10.1			14	Adc
Maximum DC Input Current	13.75	12.63			17.5	Adc
Maximum Efficiency	99.5					%
Weighted Efficiency	98.8				98.6	%
Overvoltage Category	II					
OUTPUT DURING OPERATION (POWER OPTIMIZER CONNECTED TO OPERATING SOLAREDGE INVERTER)						
Maximum Output Current	15					Adc
Maximum Output Voltage	60		85			Vdc
OUTPUT DURING STANDBY (POWER OPTIMIZER DISCONNECTED FROM SOLAREDGE INVERTER OR SOLAREDGE INVERTER OFF)						
Safety Output Voltage per Power Optimizer	1 ± 0.1					Vdc
STANDARD COMPLIANCE						
EMC	FCC Part15 Class B, IEC61000-6-2, IEC61000-6-3					
Safety	IEC62109-1 (class II safety), UL1741					
RoHS	Yes					
INSTALLATION SPECIFICATIONS						
Maximum Allowed System Voltage	1000					Vdc
Compatible inverters	All SolarEdge Single Phase and Three Phase inverters					
Dimensions (W x L x H)	128 x 152 x 28 / 5 x 5.97 x 1.1		128 x 152 x 36 / 5 x 5.97 x 1.42	128 x 152 x 50 / 5 x 5.97 x 1.96	128 x 152 x 59 / 5 x 5.97 x 2.32	mm / in
Weight (including cables)	630 / 1.4		750 / 1.7	845 / 1.9	1064 / 2.3	gr / lb
Input Connector	MC4[2]					
Output Wire Type / Connector	Double Insulated; MC4					
Output Wire Length	0.95 / 3.0	1.2 / 3.9				m / ft
Operating Temperature Range	-40 - +85 / -40 - +185					°C / °F
Protection Rating	IP68 / NEMA6P					
Relative Humidity	0 - 100					%

[1] Rated STC power of the module. Module +/- up to +5% power tolerance allowed.
[2] For other connector types please contact SolarEdge

PV SYSTEM DESIGN USING A SOLAREDGE INVERTER[3][4]		SINGLE PHASE HD-WAVE	SINGLE PHASE	THREE PHASE 208V	THREE PHASE 480V	
Minimum String Length (Power Optimizers)	P320, P370, P400	8		10	18	
	P405 / P505	6		8	14	
Maximum String Length (Power Optimizers)		25		25	50[5]	
Maximum Power per String		5700 (6000 with SE7600H-US, SE10000H-US)	5250	6000	12750	W
Parallel Strings of Different Lengths or Orientations		Yes				

[3] For detailed string sizing information refer to: http://www.solaredge.com/sites/default/files/string_sizing_na.pdf
[4] It is not allowed to mix P405/P505 with P320/P370/P400/P405/P505 in one string.
[5] A string with more than 30 optimizers does not meet NEC rapid shutdown requirements; safety voltage will be above the 30V requirement

CE ETL

YES SOLAR SOLUTIONS

CONTRACTOR

YES SOLAR SOLUTIONS

PHONE: (919) 459-2846
ADDRESS: 202 NORTH DIXON AVENUE
CARY, NC 27513

LIC. NO.: 67356
HIC. NO.:
ELE. NO.: 31227-U

NEW PV SYSTEM: 7.680 kWp

BRADEN RESIDENCE

295 CEDAR ROCK TRAIL
FUQUAY VARINA, NC 27526
APN: 050633011213

ENGINEER OF RECORD

PAPER SIZE: 11" x 17" (ANSI B)

RESOURCE DOCUMENT

DATE: 01.31.2018

DESIGN BY: A.L.

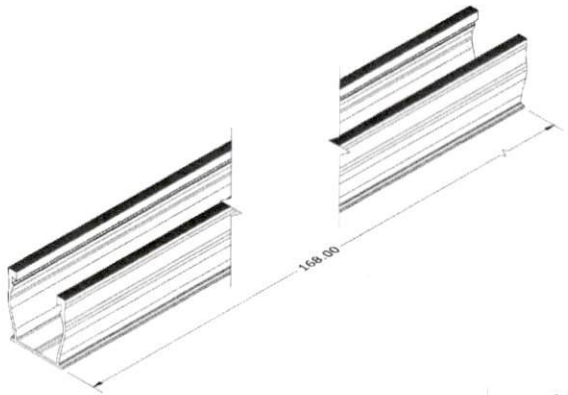
CHECKED BY: M.M.

REVISIONS

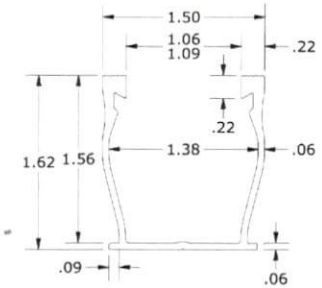
R-003.00

(SHEET 12)

DESCRIPTION:	DRAWN BY:	SnapNrack Solar Mounting Solutions
SNAPNRACK, UR-40 RAIL	mwatkins	
PART NUMBER(S):	REVISION:	
232-02449, 232-02450, 232-02451	A	555 MARKET STREET, 29TH FLOOR • SAN FRANCISCO, CA 94105, USA PHONE (415) 580-6900 • FAX (415) 580-6902 THE INFORMATION IN THIS DRAWING IS CONFIDENTIAL AND PROPRIETARY. ANY REPRODUCTION, DISCLOSURE, OR USE THEREOF IS PROHIBITED WITHOUT THE WRITTEN CONSENT OF SUNRUN SOUTH LLC.



UR-40 RAIL PROPERTIES	
SKU	FINISH
232-02449	MILL
232-02450	CLEAR
232-02451	BLACK



ALL DIMENSIONS IN INCHES

MATERIALS:	6000 SERIES ALUMINUM	OPTIONS:
DESIGN LOAD (LBS):	N/A	CLEAR / BLACK ANODIZED
ULTIMATE LOAD (LBS):	N/A	MILL FINISH
TORQUE SPECIFICATION:	N/A LB-FT	BUNDLES OF 144
CERTIFICATION:	UL 2703, FILE E359313	
WEIGHT (LBS):	5.85	

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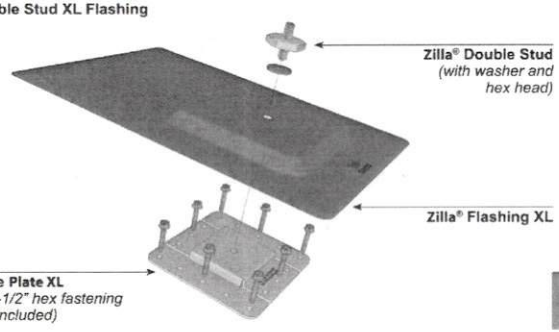
(SHEET 13)

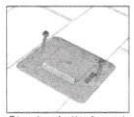
Zilla® Double Stud XL Flashing

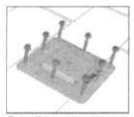
Technical Specifications

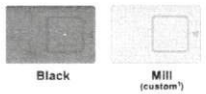
One or more patents apply to this product including without limitation: US Pat. 8,448,405; 8,707,654; 8,689,517; 8,707,655; and/or 8,752,338.
ZDSFA-AL XL / ZDSFA-AL BLK XL

Zilla® Double Stud XL Flashing




Structural attachment


Sheathing attachment



Zilla® Double Stud Flashing XL is available in Black (ZDSFA-AL BLK XL) or custom colors[1] and includes: Double Stud with Encapsulated Gland Washer, Flashing XL and Base Plate XL. **Zilla® Double Stud** is a 3/8"-16 x 1-1/2" stainless steel stud with 3/16" recessed hex and 1-3/8" hex aluminum nut.

PRODUCT	DESCRIPTION	MATERIALS	SIZE	COLOR
Double Stud	Provides mechanical connection between Flashing and Quad Combo XL. 3/8"-16 SS hardware and encapsulated gland washer included.	Aluminum / SS	1-3/8" Hex x 1.5"	Mill
Flashing XL	Sits on top of the Base Plate XL, and is captured by the Double Stud. 26 ga.	Aluminum	15" L x 9-7/8" W x 1/2" H	Black Mill[1]
Base Plate XL	Base Plate is attached to the roof with lags. Flashing is attached to the Base Plate using the Mini Standoff.	Galvanized Steel	6" L x 6" W x 1/2" H	Mill
Lags *(eight included)*	1/4" x 1-1/2" lags. Eight (8) included.	Zinc	3/8" hex drive	Zinc

[1] **Flashing available in Mill and custom colors, call for details and availability, minimum orders may apply.**

Zilla® So Simple It's Scary℠

77 Waneka Pkwy • Lafayette, CO 80026 • 720.880.6700 • fax 303.664.1268 • **zillarac.com**

v102016

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