

<div>SCOPE OF WORK</div> <div>PROPOSED NEW 8.16 KW (DC) ROOF MOUNTED PHOTOVOLTAIC (PV) SYSTEM WITH FOLLOWING EQUIPMENT:</div> <div><div>(24) HANWHA Q CELLS Q.PEAK DUO BLK-G8+ 340 SOLAR MODULES</div><div>(1) SOLAREEDGE SE7600H-US INVERTER</div><div>UNIRAC SOLARMOUNT FLUSH RACKING SYSTEM</div></div>
--

<div>SITE SPECIFICATIONS</div> <div>ELECTRIC UTILITY PROVIDER: PUGET SOUND ENERGY ELECTRIC SERVICE RATING: 200A</div> <div>ROOF MATERIAL: COMPOSITE SHINGLE SEISMIC CATEGORY: D ASCE 7-10 WIND EXPOSURE CATEGORY: B ASCE 7-10 GROUND SNOW LOAD: 25 PSF ASCE 7-10 WINDSPEEDS (3 SEC GUST IN MPH) -RISK CATEGORY I: 125 -RISK CATEGORY II: 135 <i>Vult</i> -RISK CATEGORY III-IV: 140 ASCE 7-05 WINDSPEED: 85 (3-SEC PEAK GUST IN MPH) ASCE 7-93 WINDSPEED: 71 (FASTEST MILE IN MPH)</div>
--

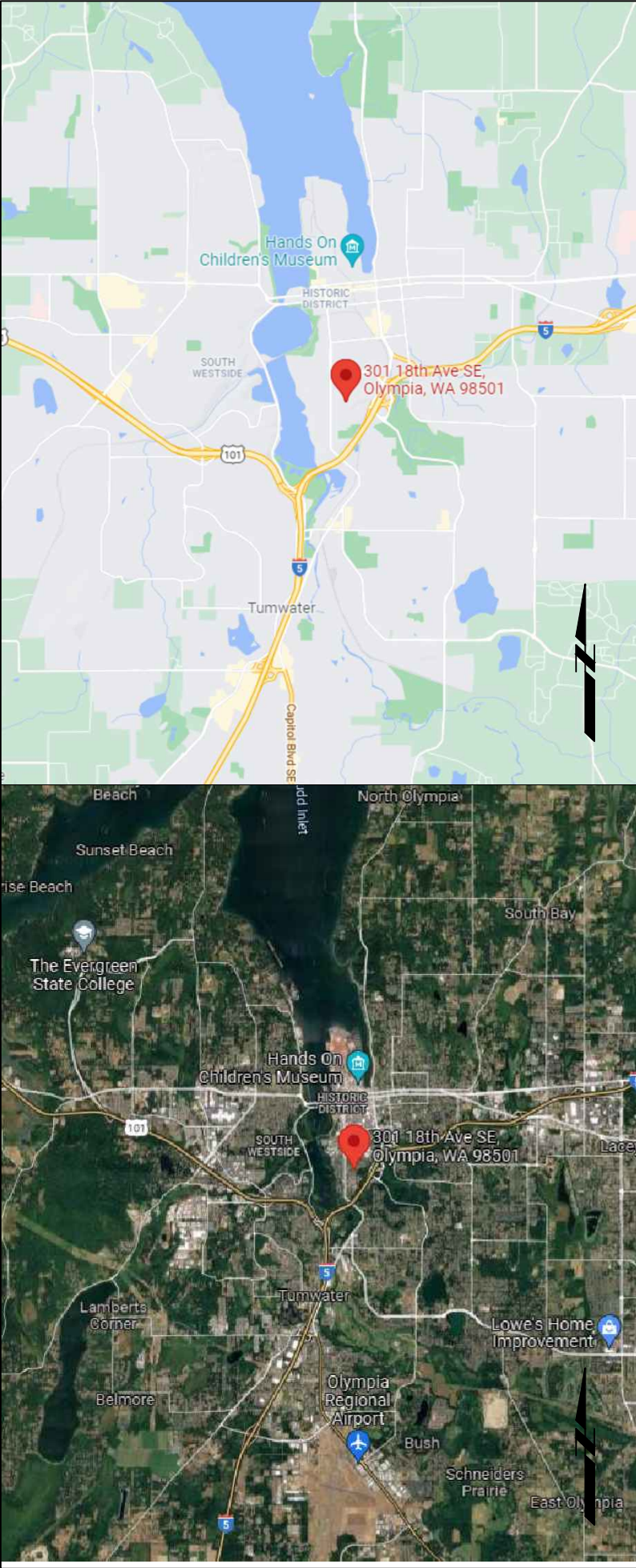
<div>CODE AUTHORITY</div> <div>2018 WASHINGTON STATE FIRE CODE (2018 IFC) 2020 WAC 296-46B (2020 NEC, WITH WAC AMENDMENTS) 2018 WASHINGTON STATE ENERGY CODE (2018 IECC) 2018 WASHINGTON STATE BUILDING CODE (2018 IBC) 2018 WASHINGTON STATE RESIDENTIAL CODE - (2018 INTERNATIONAL RESIDENTIAL CODE, WASHINGTON AMENDMENTS 2018 WAC51-51-2300 SECTION M2301) 2018 WASHINGTON STATE PLUMBING CODE (2018 UPC) 2018 WASHINGTON STATE MECHANICAL CODE (2018 UMC)</div>
--

SHEET INDEX	
A-1	NOTES, INDEX, SITE INFO, PROJECT DATA, CODE
A-2	SITE PLAN
A-3	PV LAYOUT AND COMPONENT LOCATION
E-1	ELECTRICAL LINE DIAGRAM
E-2	LABELING INFORMATION
E-3	EQUIPMENT: PV MODULE SPECIFICATION SHEETS
E-4	EQUIPMENT: INVERTER SPECIFICATION SHEETS
E-5	EQUIPMENT: DC/DC POWER OPTIMIZER SPECIFICATION SHEETS
S-1, S-2	EQUIPMENT: RACKING SYSTEM, ROOF ATTACHMENT
S-3, S-4	EQUIPMENT: RACKING SYSTEM, ROOF ATTACHMENT ENGINEERING
S-5	EQUIPMENT: RACKING SYSTEM, CLAMPS
S-6	EQUIPMENT: RACKING SYSTEM, RAIL
S-7	EQUIPMENT: RACKING SYSTEM, ENGINEERING
S-8	EQUIPMENT: RACKING SYSTEM, SITE SPECIFIC ENGINEERING
S-9	EQUIPMENT: RACKING SYSTEM, BILL OF MATERIALS



PHOTOVOLTAIC NOTES

1. AN INVERTER OR AN AC MODULE IN AN INTERACTIVE PHOTOVOLTAIC SYSTEM SHALL AUTOMATICALLY DE-ENERGIZE ITS OUTPUT TO THE CONNECTED ELECTRICAL PRODUCTION AND DISTRIBUTION NETWORK UPON LOSS OF VOLTAGE IN THAT SYSTEM AND SHALL REMAIN IN THAT STATE UNTIL THE ELECTRICAL PRODUCTION AND DISTRIBUTION NETWORK VOLTAGE HAS BEEN RESTORED. (NEC 690.361)
2. ALL EXTERIOR ELECTRICAL METALLIC TUBING(EMT) CONDUIT FITTING SHALL BE RAIN TIGHT THREAD-LESS COMPRESSION TYPE.
3. MODULES AND SUPPORT STRUCTURES SHALL BE GROUNDED
4. NAMEPLATES SHALL BE PROVIDED FOR ALL CIRCUITS IN THE SERVICE DISTRIBUTION AND POWER DISTRIBUTION SWITCH BOARDS, PANEL BOARDS, DISCONNECTING SWITCHES, TERMINAL CABINETS, ETC. ALL NAMEPLATES SHALL BE PERMANENTLY ATTACHED AND BE OF SUFFICIENT CAPACITY TO WITHSTAND THE WEATHER.
5. JUNCTION BOX/COMBINER BOX HAVE TO USE COMPRESSION TYPE STRAIN RELIEF POSITIONED FOR APPROPRIATE WATER RUN OFF.
6. CONDUIT RUNS SHALL BE PROVIDED WITH SUFFICIENT WEATHERPROOF PULL BOXES OF JUNCTION BOX/COMBINER BOXES PER APPROPRIATE NEC REQUIREMENTS.
7. SEE PROVIDED CUT SHEETS FOR ADDITIONAL EQUIPMENT SPECIFICATIONS
8. WIRING MATERIALS SHALL BE SUITABLE FOR THE SUN EXPOSURE AND WET LOCATIONS. FIELD APPLIED PROTECTIVE COATINGS ARE NOT ACCEPTABLE.
9. JUNCTION, PULL AND OUTLET BOXES LOCATED BEHIND MODULES SHALL BE SO INSTALLED THAT THE WIRING CONTAINED IN THEM CAN BE RENDERED ACCESSIBLE DIRECTLY OR BY DISPLACEMENT OF MODULE(S) SECURED BY REMOVABLE FASTENERS AND CONNECTED BY A FLEXIBLE WIRING SYSTEM. (NEC 690.34)
10. IN AN UNDERGROUND PHOTOVOLTAIC SYSTEM, THE POWER SOURCE SHALL BE LABELED WITH THE FOLLOWING WARNING AT EACH JUNCTION BOX, COMBINER BOX, DISCONNECT AND DEVICE WHERE THE UNGROUNDED CIRCUITS MAY BE EXPOSED DURING SERVICE : " WARNING - ELECTRIC SHOCK HAZARD. THE CURRENT CIRCUIT CONDUCTORS OF THIS PHOTOVOLTAIC POWER SYSTEM ARE UNGROUNDED BUT MAY BE ENERGIZED WITH THE RESPECT TO GROUND DUE TO LEAKAGE PATHS AND/OR GROUND FAULTS." (NECE 690.35(F))
11. ALL PHOTOVOLTAIC MODULES AND ASSOCIATED EQUIPMENT AND WIRING MATERIAL SHALL BE PROTECTED FROM ANY PHYSICAL DAMAGE.
12. ALL ELECTRICAL DEVICES AND UTILIZATION EQUIPMENT SHALL BE LISTED BY AN APPROVED TESTING AGENCY.
13. OUTDOOR EQUIPMENT SHALL BE AT LEAST NEMA 3R RATED.
14. ALL SPECIFIED WIRING IS BASED ON THE USE OF COPPER
15. CONTRACTOR SHALL OBTAIN ELECTRICAL PERMITS AND SHALL COORDINATE ALL INSPECTION, COMMISSIONING AND ACCEPTANCE WITH THE CLIENT, UTILITY CO. AND CITY INSPECTORS AS NEEDED
16. DRAWINGS ARE DIAGRAMMATIC ONLY, ROUTING OF RACEWAYS SHALL BE AT THE OPTION OF THE CONTRACTOR UNLESS OTHERWISE NOTED AND SHALL BE COORDINATED WITH OTHER TRADES.
17. IF DISTANCES OF CABLE RUNS ARE DIFFERENT THAN SHOWN, THE CONTRACTOR SHALL NOTIFY ELECTRICAL ENGINEER TO VALIDATE THE WIRE SIZE. FINAL DRAWINGS WILL BE RED-LINED AND UPDATED AS APPROPRIATE.
18. WHENEVER A DISCREPANCY IN QUANTITY OF EQUIPMENT, ARISES ON THE DRAWINGS OR SPECIFICATIONS, THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING AND INSTALLING ALL MATERIAL AND SERVICES REQUIRED BY THE STRICTEST CONDITIONS NOTED ON THE DRAWINGS OR IN THE SPECIFICATIONS TO ENDURE COMPLETE COMPLIANCE AND LONGEVITY OF THE OPERABLE SYSTEM REQUIRED BY THE ARCHITECT/ENGINEER.
19. ALL BROCHURES, OPERATION MANUALS, CATALOGS, SHOP DRAWINGS, ETC. SHALL BE HANDED OVER TO THE OWNER'S REPRESENTATIVE AT THE COMPLETION OF WORK.
20. ALL WIRING CONCEALED IN WALL AND CEILING SPACES SHALL BE IN METAL CONDUIT.
21. THE SEISMIC BRACING AND ANCHORAGE OF ELECTRICAL CONDUITS SHALL BE IN ACCORDANCE WITH THE "SMACNA"-GUIDLINES FOR SEISMIC RESTRAINS OF MECHANICAL SYSTEMS AND PLUMBING PIPING SYSTEMS.
22. ALL OF THE LISTED SYSTEMS REQUIRED THAT THE SEISMIC LATERAL FORCE F INCLUDING CONSIDERATION OF r_p AND r_p BE DETERMINED AT EACH LEVEL OF THE BUILDING SO THAT BRACE SPACING CAN BE CALCULATED. THE DISTRICT STRUCTURAL ENGINEER CAN APPROVE THE SEISMIC LATERAL FORCE DETERMINATION.
23. A COPY OF THE CHOSEN BRACING SYSTEM(S) INSTALLATION GUIDE/MANUAL SHALL BE ON THE JOB SITE PRIOR TO STARTING THE INSTALLING OF HANGERS AND/OR BRACES.
24. WHEN INSTALLING DRILLED-IN ANCHORS AND/OR POWDER DRIVEN PINS IN EXISTING NON-PRESTRESSED REINFORCED CONCRETE, USE CARE AND CAUTION TO AVOID CUTTING OR DAMAGING THE REINFORCED BARS. WHEN INSTALLING THEM INTO EXISTING PRE-STRESSED CONCRETE TENDONS BY USING A NON-DESTRUCTIVE METHOD PRIOR TO INSTALLATION. EXERCISE EXTREME CARE AND CAUTION TO AVOID CUTTING OR DAMAGING THE TENDONS DURING INSTALLATION. MAINTAIN A MINIMUM CLEARANCE OF ONE INCH BETWEEN THE REINFORCEMENT AND THE DRILLED-IN ANCHOR.
25. THE WORKING CLEARANCES AROUND THE EXISTING ELECTRICAL EQUIPMENT AS WELL AS THE NEW ELECTRICAL EQUIPMENT WILL BE MAINTAINED IN ACCORDANCE WITH NEC 110.26.
26. CONDUCTORS EXPOSED TO SUNLIGHT SHALL BE LISTED AS SUNLIGHT RESISTANT. (NEC 300.6 O1, 310B D)
27. GROUNDING BUSHINGS ARE REQUIRED AROUND PRE-PUNCHED CONCENTRIC KNOCKOUTS ON THE DC SIDE OF THE SYSTEM. (NEC 250.97)
28. THE GROUNDING ELECTRODE CONDUCTOR MUST BE PROTECTED FROM PHYSICAL DAMAGE IF SMALLER THAN #6 COPPER WIRE. (NEC 250.64 D)
29. GROUNDING ELECTRODE CONDUCTOR WILL BE CONTINUOUS, EXCEPT FOR SPLICES OR JOINTS AT BUSBARS WITHIN LISTED EQUIPMENT. (NEC 250.64 C)
30. RACEWAY FOR GROUNDING ELECTRODE CONDUCTOR SHALL BE BONDED AT EACH END. (CEC 250.64 (E)
31. WHERE ALL TERMINALS OF THE DISCONNECTING MEANS MAY BE ENERGIZED IN THE OPEN POSITION, A SIGN WILL BE PROVIDED WARNING OF THE HAZARD PER NEC 690.11. 34. EACH UNGROUNDED CONDUCTOR OF THE MULT-WIRE BRANCH CIRCUIT WILL BE IDENTIFIED PER PHASE AND SYSTEM PER NEC210.5.
32. CIRCUITS OVER 250V TO GROUND SHALL COMPLY WITH NEC250.97 & 250.92 (D) & LAMC 93.250.97.
33. DC CONDUCTORS EITHER DO NOT ENTER THE BUILDING OR ARE RUN IN METALLIC RACEWAYS OR ENCLOSURES TO THE FIRST ACCESSIBLE DC DISCONNECTING MEANS PER NEC 690.31 (E), LAMC 93.690.31 (E)
34. ALL METALLIC FRAME RAILS AND OTHER CURRENT CARRYING METALLIC COMPONENTS (CONDUIT, JUNCTION & PULL BOXES, RACEWAY, ETC) SHALL BE SOLIDLY GROUNDED PER THE MANUFACTURER'S INSTALLATION INSTRUCTIONS LAMC 93.690.110.3 & 93.110.3(D).
35. SCREWS, NUTS, BOLTS & WASHERS THAT ATTACH EQUIPMENT GROUNDING LUGS SHALL BE STAINLESS STEEL LAMC 93.110.3(D).
36. NO PIPING, DUCTS OR EQUIPMENT FOREIGN TO ELECTRICAL EQUIPMENT SHALL BE PERMITTED TO BE LOCATED WITHIN THE DEDICATED SPACE ABOVE THE ELECTRICAL EQUIPMENT.
37. ALL FIELD INSTALLED JUNCTION, PULL AND OUTLET BOXED LOCATED BEHIND MODULES OR PANELS SHALL BE ACCESSIBLE DIRECTLY OR BY DISPLACEMENT OF A MODULE (S) OR PANEL (S) SECURED BY REMOVABLE FASTENERS.
38. REMOVAL OF A DWP-INTERACTIVE INVERTER OR OTHER EQUIPMENT SHALL NOT DISCONNECT THE BONDING CONNECTION BETWEEN THE GROUNDING ELECTRODE CONDUCTOR AND THE PHOTOVOLTAIC SOURCE AND/OR OUTPUT CIRCUIT GROUNDED CONDUCTOR.
39. THE ROOF MOUNTED PHOTOVOLTAIC MODULES, PANELS, OR SOLAR VOLTAC ROLL ROOFING MATERIAL SHALL HAVE THE SAME OR BETTER LISTED FIRE-RESISTANCE RATING THAN THE BUILDING ROOF-COVERING MATERIAL.
40. ALL ROOF MOUNTED CONDUIT WILL BE A MINIMUM 1" OFF THE ROOF SURFACE.



PLOT PLAN WITH ROOF PLAN

1

SCALE: 1" = 16' / (1/16" = 1')

A-2

2"x2"
AHJ APPROVAL
STAMP

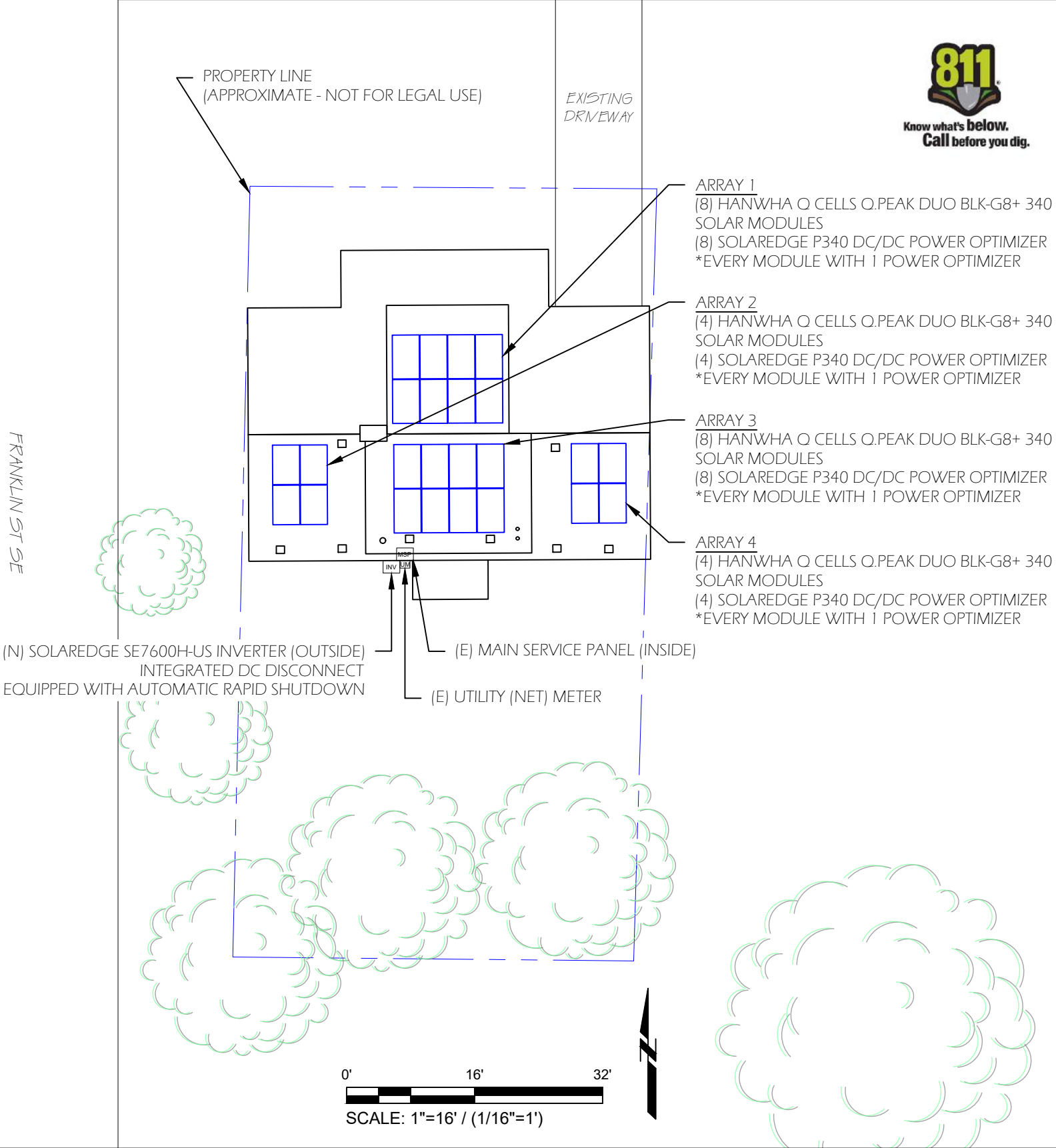


DESCRIPTION	DATE	REVISION
INITIAL	2021. SEPT. 7	1

Solar Specialist
EVIE ABERCROMBIE
System Engineer
TIM WACHTMAN
System Designer
JOHN CANFIELD
Customer Info
JOHN SAUNDERS & KATHRYN CHOLAKIAN 301 SE 18TH AVE, OLYMPIA, WA 98501 PARCEL # 39400200500

Project Details
8.16 kW ROOFTOP PV SYSTEM
TILT
16° / 4:12 PITCH & 30° / 7:12 PITCH
AZIMUTH
0° / 180°
DC SYSTEM RATING
8.16 kW
AC SYSTEM RATING
7.6 kW
ESTIMATED ANNUAL PRODUCTION
7,177 kWh/Yr
Drawing
SITE PLAN
Sheet

A-2



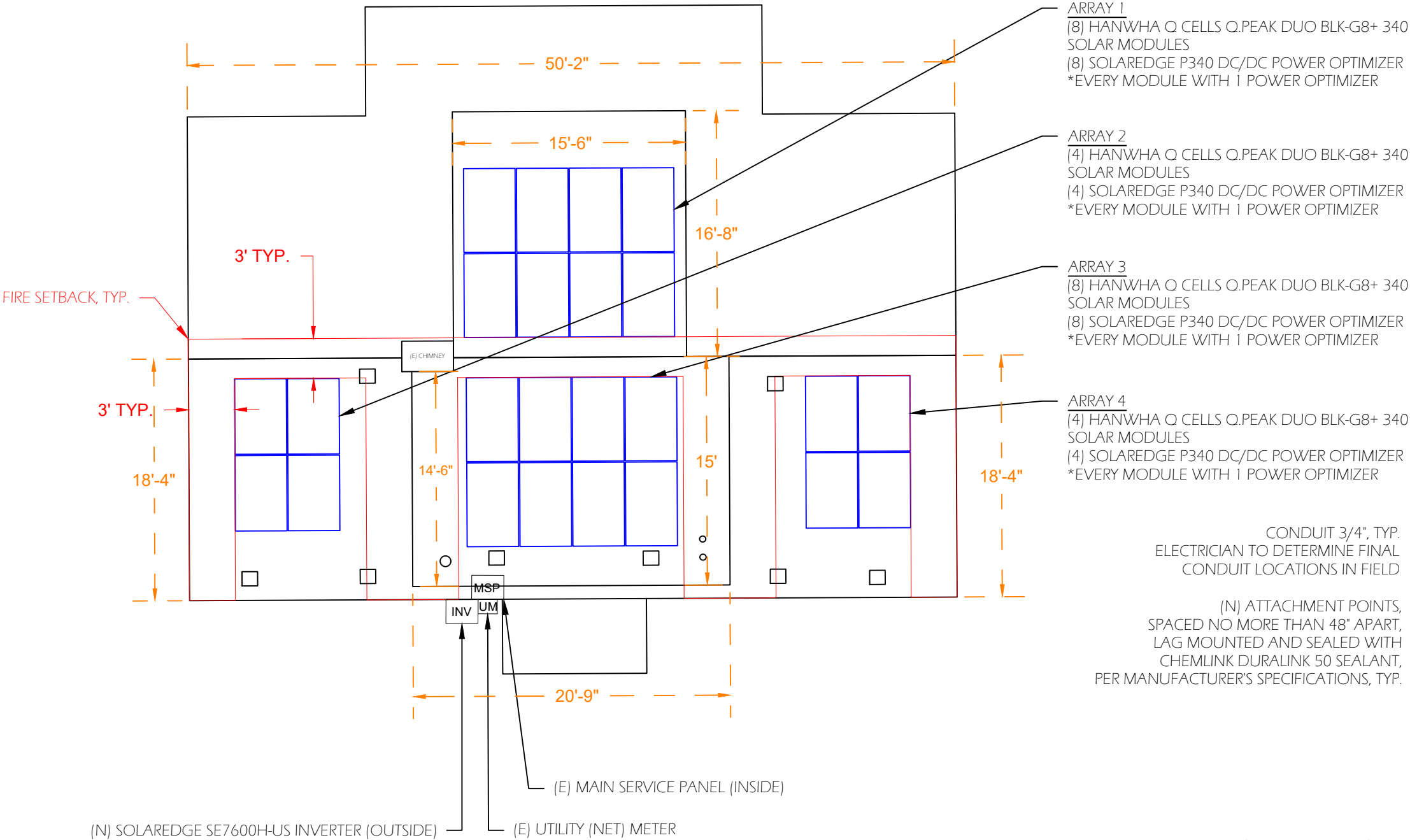
NOTE TO PV INSTALLERS:

- 1. ATTACHMENTS MUST BE INSTALLED PER MANUFACTURER'S SPECIFICATIONS, REFER TO INSTALLATION GUIDE ON S-1.
- 2. LOCATE RAFTERS/TRUSSES LOCATIONS.
- 3. BACKFILL ALL PILOT HOLES WITH SEALANT.
- 4. ATTACHMENTS MUST BE LAG MOUNTED INTO RAFTERS/TRUSSES.
- 5. DRIVE LAG BOLT UNTIL ATTACHMENT IS FIRMLY IN PLACE. WHEN THE PROPER TORQUE IS REACHED, THE EPDM RUBBER BACKING ON THE SEALING WASHER SHOULD EXPAND BEYOND THE EDGE OF THE METAL WASHER. DO NOT OVERTIGHTEN.
- 6. INJECT CHEMLINK DURALINK 50 SEALANT INTO PORT UNTIL SEALANT EXITS BOTH VENTS.

MOUNTING CALCULATIONS

A	MOUNTING SYSTEM AND MANUFACTURER	UNIRAC SOLARMOUNT FLUSH		
B	TOTAL WEIGHT OF MODULES, RAILS, ATTACHMENTS, & OPTIMIZERS		1235.3	LBS
	MODULE WEIGHT (43.9) X NUMBER OF MODULES	24	1053.6	LBS
	OPTIMIZER WEIGHT (1.4) X NUMBER OF OPTIMIZERS	24	33.6	LBS
	RACKING COMPONENTS		181.7	LBS
C	ATTACHMENTS WEIGHT (1.8) X NUMBER OF ATTACHMENTS	56	100.8	LBS
D	WEIGHT PER ATTACHMENT POINT (B/C) (POINT LOAD)	NOT TO EXCEED 45 LBS	22.1	LBS
E	MAXIMUM RAIL CANTILEVER		16	IN
F	TOTAL SURFACE AREA OF PV MODULES	19.31 SQ FT X MODULES	463.4	SQ FT
G	DISTRIBUTED WEIGHT OF PV MODULE ON ROOF (B/F) (DEAD LOAD)	1235.28 LBS / 463.4 SQ FT	2.7	PSF

RAFTERS 2" X 6" @ 24" O.C., V.I.F.



2"x2"
AHJ APPROVAL
STAMP



DESCRIPTION	DATE	REVISION
INITIAL	2021.SEPT.7	1

Solar Specialist

EVIE ABERCROMBIE

System Engineer

TIM WACHTMAN

System Designer

JOHN CANFIELD

Customer Info

JOHN SAUNDERS & KATHRYN CHOLAKIAN
301 SE 18TH AVE,
OLYMPIA, WA 98501
PARCEL # 39400200500

Project Details

8.16 kW
ROOFTOP PV
SYSTEM

TILT

16° / 4:12 PITCH & 30° / 7:12 PITCH

AZIMUTH

0° / 180°

DC SYSTEM RATING

8.16 kW

AC SYSTEM RATING

7.6 kW

ESTIMATED ANNUAL PRODUCTION

7,177 kWh/Yr

Drawing

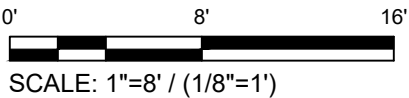
PV LAYOUT AND
COMPONENT LOCATION

Sheet

A-3



Know what's below.
Call before you dig.

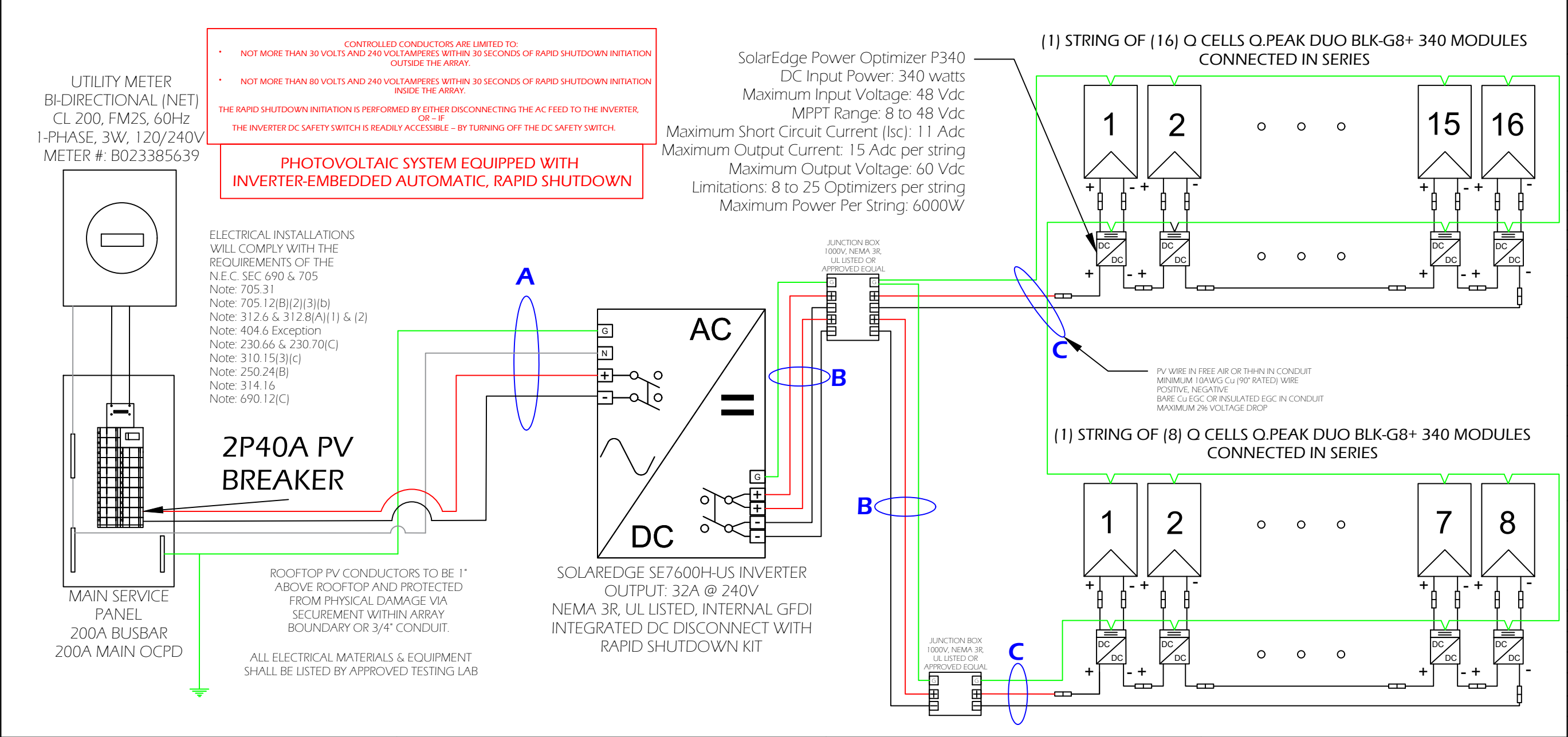



SCALE: 1"=8' / (1/8"=1')



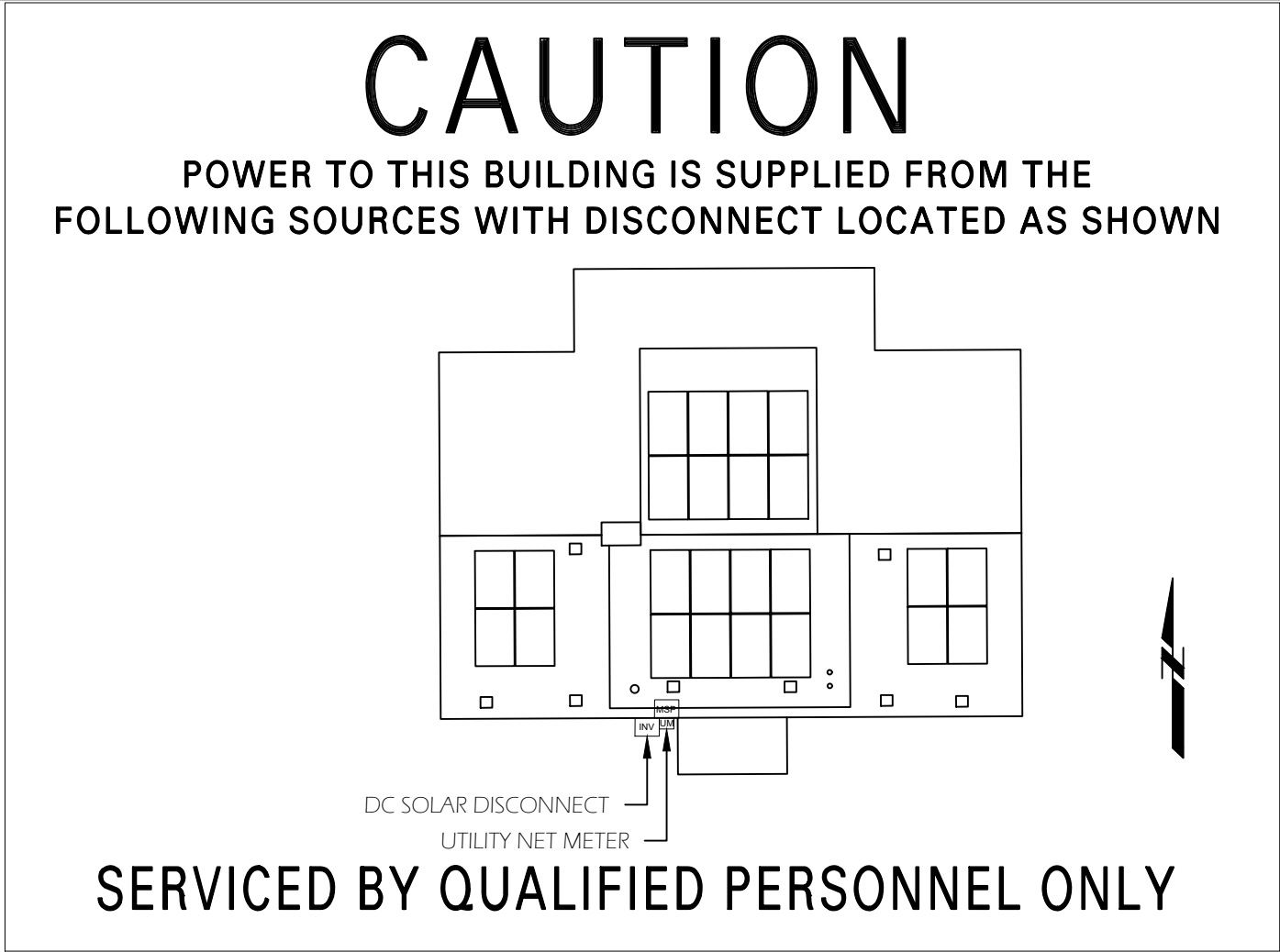
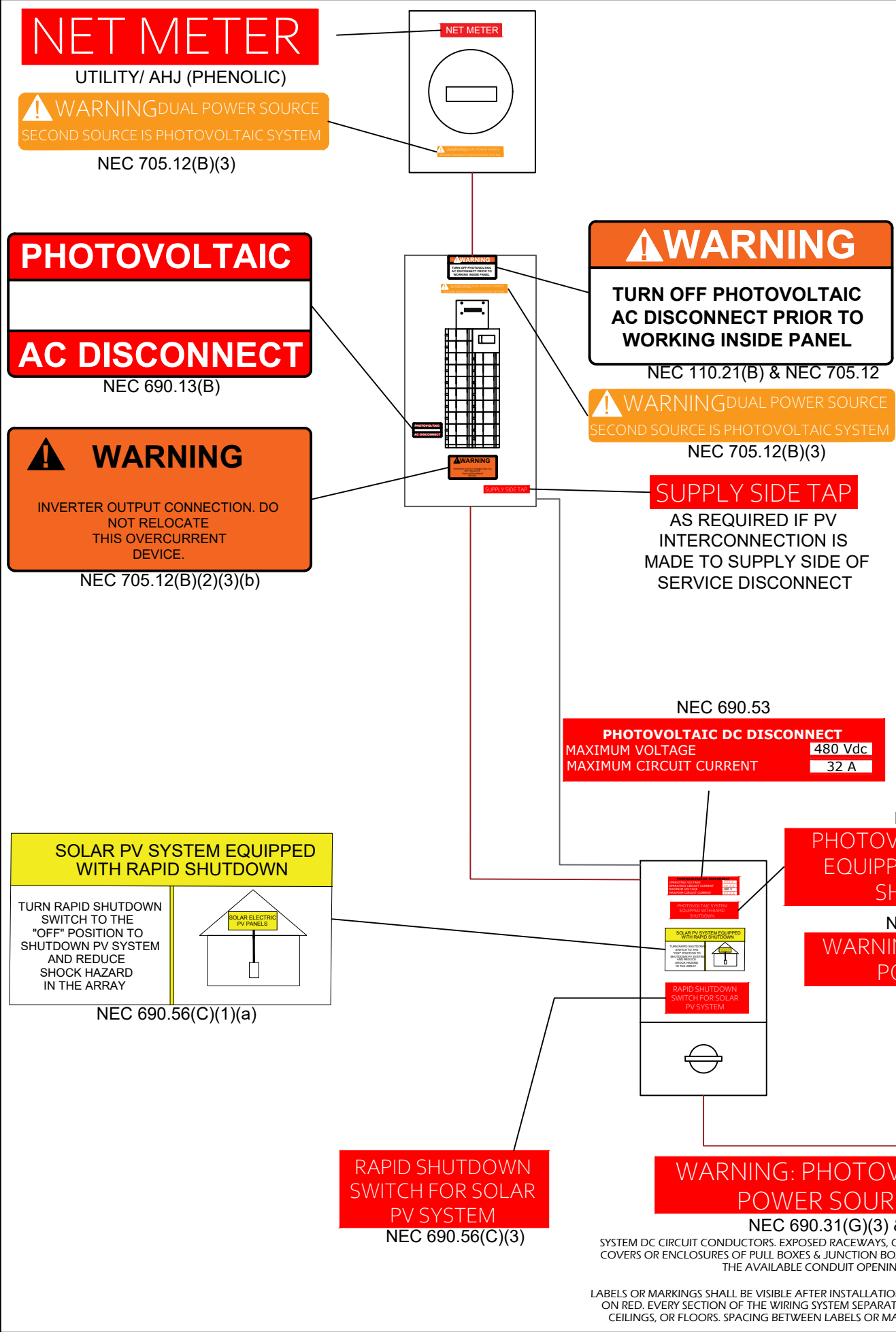
	CONDUIT	WIRE		RATING	DERATE FOR TEMPERATURE		ISC	WIRE	VOLTAGE DROP CALCULATIONS	RUN LENGTH	AMPS	VOLTAGE DROP	VOLTAGE DROP %	VOLTAGE AT LOAD
A	¾" PVC SCHEDULE 40 CONDUIT	(3) 8 AWG THHN (Black, Red, White)	(1) 8 AWG Cu Bond Conductor (Green or bare)	8 AWG RATE 90°C = 55A	TEMPERATURE DE-RATING @ 104°F = 0.91	55A x 0.91 = 50.05A	ISC x 1.25 x 1.25 = 15.52A	8 AWG OK IAW NEC 690.8 (B)(1)	$V_d = \frac{2 \times 12.9 \times 50'}{16510} = 1290 \times 32A = 2.50 \text{ volts}$	50	32	2.50	1.04	237.50
B	¾" EMT CONDUIT	(2) 10 AWG THHN (Positive, Negative)	(1) 8 AWG Cu Bond Conductor (Green or bare)	10 AWG RATE 90°C = 30A	TEMPERATURE DE-RATING @ 104°F = 0.91	30A x 0.91 = 27.3A	ISC x 1.25 x 1.25 = 15.52A	10 AWG OK IAW NEC 690.8 (B)(1)	$V_d = \frac{2 \times 12.9 \times 50'}{10380} = 1290 \times 15A = 1.86 \text{ volts}$	50	15	1.86	0.78	238.14
C	PV WIRE IN FREE AIR OR THHN IN CONDUIT	MINIMUM 10AWG Cu (90° RATED) WIRE	POSITIVE, NEGATIVE	BARE Cu EGC OR INSULATED EGC IN CONDUIT										

2"X2"
AHJ APPROVAL
STAMP



		
DESCRIPTION	DATE	REVISION
INITIAL	2021.SEPT.7	1
Solar Specialist		
EVIE ABERCROMBIE		
System Engineer		
TIM WACHTMAN		
System Designer		
JOHN CANFIELD		
Customer Info		
JOHN SAUNDERS & KATHRYN CHOLAKIAN 301 SE 18TH AVE, OLYMPIA, WA 98501 PARCEL # 39400200500		
Project Details		
8.16 kW ROOFTOP PV SYSTEM		
TILT		
16° / 4:12 PITCH & 30° / 7:12 PITCH		
AZIMUTH		
0° / 180°		
DC SYSTEM RATING		
8.16 kW		
AC SYSTEM RATING		
7.6 kW		
ESTIMATED ANNUAL PRODUCTION		
7,177 kWh/Yr		
Drawing		
ELECTRICAL LINE DIAGRAM		
Sheet		
E-1		

Module Information	Inverter Specifications	Conductor Calculation	Interconnection Method
PV MODULE: Q CELLS Q.PEAK DUO BLK-G8+ 340 ELECTRICAL DATA PER MODULE (STC): MAXIMUM POWER - Pmax (Wp): 340 MAXIMUM POWER VOLTAGE - Vmpp (V): 34.34 MAXIMUM POWER CURRENT - Impp (A): 9.9 OPEN CIRCUIT VOLTAGE - Voc (V): 40.7 SHORT CIRCUIT CURRENT Isc (A): 10.4 MODULE EFFICIENCY: 19.8%	SOLAREGE SE7600H-US RATED/MAXIMUM AC POWER OUTPUT: 7600W MAX. CONTINUOUS OUTPUT CURRENT: 32A MAX.DC INPUT POWER: 11800@240V MAX. INPUT VOLTAGE: 480V NOMINAL DC INPUT VOLTAGE: 400V MAX. INPUT CURRENT: 20A@240V CEC WEIGHTED EFFICIENCY: 99% MAX. EFFICIENCY: 99.2%	MAX BRANCH DC CONDUCTOR AMPACITY: 340W x 16 = 5440W / 400V = 13.6A x 125% = 17A P340 MAXIMUM OUTPUT CURRENT = 15A 10 AWG Cu 90° RATED=40A(.91)=36.4A(1)=36.4A 36.4A ≥ 17A OK TO INSTALL IAW NEC 690.8(B)(1-2) MAX BRANCH AC CONDUCTOR AMPACITY: 32A MAXIMUM CONT. OUTPUT CURRENT 32A x 125%=40A 8 AWG Cu 90°=55A x .91=50.05A x 1=50.05A 50.05A ≥ 40A OK TO INSTALL IAW NEC 690.8(B)(1-2)	SOLAR CIRCUIT CONNECTED INTO EXISTING 200A MAIN SERVICE PANEL WITH NEW 2P40A SOLAR BREAKER (OCPD) TO BE INSTALLED AT OPPOSITE END OF BUSBAR FROM OCPD PROTECTING THE BUSBAR NEC 705.12(B)(3)(2) 200A RATED BUSS x 120% = 240A - 200A MAIN OCPD = 40A 2P40A BREAKER OK INSTALL PERMANENT LABEL ADJACENT TO THE BACK-FED BREAKER WITH FOLLOWING OR EQUIVALENT WORDING: WARNING: POWER SOURCE OUTPUT CONNECTION. DO NOT RELOCATE THIS OVERCURRENT DEVICE.



- 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 Z39.4 (NEC 110.21(B) FIELD MARKING).
 - ADHESIVE FASTENED SIGNS MAY BE ACCEPTABLE IF PROPERLY ADHERED. VINYL SIGNS SHALL BE WEATHER RESISTANT (IFC 605.11.1.3)
1. ALL EQUIPMENT TO BE LISTED BY UL OR OTHER NRTL, AND LABELED FOR ITS APPLICATION.
 2. ALL CONDUCTORS SHALL BE COPPER, RATED FOR 600 V AND 90 DEGREE C WET ENVIRONMENT.
 3. WIRING, CONDUIT, AND RACEWAYS MOUNTED ON ROOFTOPS SHALL BE ROUTED DIRECTLY TO, AND LOCATED AS CLOSE AS POSSIBLE TO THE NEAREST RIDGE, HIP, OR VALLEY.
 4. WORKING CLEARANCES AROUND ALL NEW AND EXISTING ELECTRICAL EQUIPMENT SHALL COMPLY WITH NEC 110.26.
 5. DRAWINGS INDICATE THE GENERAL ARRANGEMENT OF SYSTEMS. CONTRACTOR SHALL FURNISH ALL NECESSARY OUTLETS, SUPPORTS, FITTINGS AND ACCESSORIES TO FULFILL APPLICABLE CODES AND STANDARDS.
 6. WHERE SIZES OF JUNCTION BOXES, RACEWAYS, AND CONDUITS ARE NOT SPECIFIED, THE CONTRACTOR SHALL SIZE THEM ACCORDINGLY.
 7. ALL WIRE TERMINATIONS SHALL BE APPROPRIATELY LABELED AND READILY VISIBLE.
 8. MODULE GROUNDING CLIPS TO BE INSTALLED BETWEEN MODULE FRAME AND MODULE SUPPORT RAIL, PER THE GROUNDING CLIP MANUFACTURER'S INSTRUCTION.
 9. MODULE SUPPORT RAIL TO BE BONDED TO CONTINUOUS COPPER G.E.C. VIA WEED LUG OR ILSCO GPL-4DBT LAY-IN LUG.
 10. THE POLARITY OF THE GROUNDED CONDUCTORS IS NEGATIVE

2"X2" AHJ APPROVAL STAMP		
DESCRIPTION	DATE	REVISION
INITIAL	2021.SEPT.7	1
Solar Specialist		
EVIE ABERCROMBIE		
System Engineer		
TIM WACHTMAN		
System Designer		
JOHN CANFIELD		
Customer Info		
JOHN SAUNDERS & KATHRYN CHOLAKIAN 301 SE 18TH AVE, OLYMPIA, WA 98501 PARCEL # 39400200500		
Project Details		
8.16 kW ROOFTOP PV SYSTEM		
TILT		
16° / 4:12 PITCH & 30° / 7:12 PITCH		
AZIMUTH		
0° / 180°		
DC SYSTEM RATING		
8.16 kW		
AC SYSTEM RATING		
7.6 kW		
ESTIMATED ANNUAL PRODUCTION		
7,177 kWh/yr		
Drawing		
LABELING INFORMATION		
Sheet		
E-2		



Q.peak DUO BLK-G8+
335-350

ENDURING HIGH
PERFORMANCE



Q.ANTUM TECHNOLOGY: LOW LEVELIZED COST OF ELECTRICITY

Higher yield per surface area, lower BOS costs, higher power classes, and an efficiency rate of up to 19.8%.



INNOVATIVE ALL-WEATHER TECHNOLOGY

Optimal yields, whatever the weather with excellent low-light and temperature behavior.



ENDURING HIGH PERFORMANCE

Long-term yield security with Anti-LID and Anti-PID Technology¹, Hot-Spot Protect and Traceable Quality Tra.Q™.



EXTREME WEATHER RATING

High-tech aluminum alloy frame, certified for high snow (5400Pa) and wind loads (4000Pa).



A RELIABLE INVESTMENT

Inclusive 25-year product warranty and 25-year linear performance warranty².

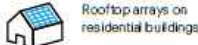


STATE OF THE ART MODULE TECHNOLOGY

Q.ANTUM DUO combines cutting edge cell separation and innovative 12-busbar design with Q.ANTUM Technology.

¹ APT test conditions according to IEC/TS 62804-1:2015, method B (-1500V, 188h)
² See data sheet on rear for further information

THE IDEAL SOLUTION FOR:

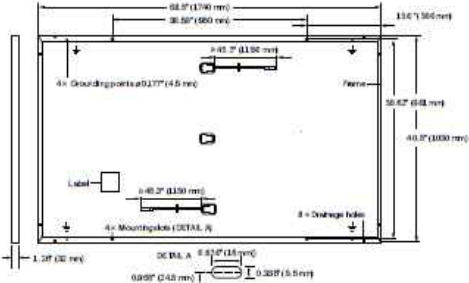


Engineered in Germany

Q CELLS

MECHANICAL SPECIFICATION

Format	68.6 × 40.6 × 1.26 in (including frame) (1740 × 1030 × 32 mm)
Weight	43.9 lbs (19.9 kg)
Front Cover	0.13 in (3.2 mm) thermally pre-stressed glass with anti-reflection technology
Back Cover	Composite film
Frame	Black anodized aluminum
Cell	6 × 20 monocrystalline Q.ANTUM solar half cells
Junction Box	2.09-3.98 × 1.26-2.36 × 0.59-0.71 in (53-101 × 32-60 × 15-18 mm), Protection class IP67, with bypass diodes
Cable	4 mm ² Solar cable; (+) ≥ 45.3 in (1150 mm), (-) ≥ 45.3 in (1150 mm)
Connector	Stäubli MC4; IP68

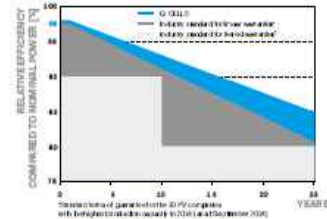


ELECTRICAL CHARACTERISTICS

POWERCLASS		335	340	345	350
MINIMUM PERFORMANCE AT STANDARD TEST CONDITIONS, STC ¹ (POWER TOLERANCE +5W / -0 W)					
Minimum	Power at MPP ²	P _{MPP} [W]	335	340	345
	Short Circuit Current ²	I _{SC} [A]	10.34	10.40	10.51
	Open Circuit Voltage ²	V _{OC} [V]	40.44	40.70	40.95
	Current at MPP	I _{MPP} [A]	9.86	9.90	9.96
	Voltage at MPP	V _{MPP} [V]	34.01	34.34	34.66
	Efficiency ¹	η [%]	≥ 18.7	≥ 19.0	≥ 19.3
MINIMUM PERFORMANCE AT NORMAL OPERATING CONDITIONS, NMOT ²					
Minimum	Power at MPP	P _{MPP} [W]	250.9	254.6	258.4
	Short Circuit Current	I _{SC} [A]	8.33	8.38	8.42
	Open Circuit Voltage	V _{OC} [V]	38.13	38.38	38.62
	Current at MPP	I _{MPP} [A]	7.75	7.79	7.84
	Voltage at MPP	V _{MPP} [V]	32.36	32.67	32.97

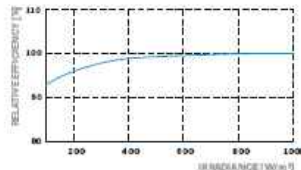
¹ Measurement tolerances P_{MPP} ± 3%; I_{SC}/V_{OC} ± 5% at STC: 1000 W/m², 25 ± 2 °C, AM 1.5 according to IEC 60904-3 • ² 800 W/m², NMOT, spectrum AM 1.5

Q CELLS PERFORMANCE WARRANTY



At least 98% of nominal power during first year. Thereafter max. 0.54% degradation per year. At least 93.1% of nominal power up to 10 years. At least 86% of nominal power up to 25 years.

All data within measurement tolerances. Full warranties in accordance with the warranty terms of the Q CELLS sales organization of your respective country.



Typical module performance under low irradiance conditions in comparison to STC conditions (25 °C, 1000 W/m²)

TEMPERATURE COEFFICIENTS

Temperature Coefficient of I _{SC}	α [%/K]	+0.04	Temperature Coefficient of V _{OC}	β [%/K]	-0.27
Temperature Coefficient of P _{MPP}	γ [%/K]	-0.35	Nominal Module Operating Temperature	NMOT [°F]	109 ± 5.4 (43 ± 3 °C)

PROPERTIES FOR SYSTEM DESIGN

Maximum System Voltage V _{sys}	[V]	1000 (IEC) / 1000 (UL)	PV module classification	Class II
Maximum Series Fuse Rating	[ADC]	20	Fire Rating based on ANSI/UL 61730	TYPE 2
Max. Design Load, Push / Pull ²	[lbs/ft ²]	75 (3600 Pa) / 55 (2667 Pa)	Permitted Module Temperature on Continuous Duty	-40 °F up to +185 °F (-40 °C up to +85 °C)
Max. Test Load, Push / Pull ²	[lbs/ft ²]	113 (5400 Pa) / 84 (4000 Pa)		

² See Installation Manual

QUALIFICATIONS AND CERTIFICATES

UL 61730, CE-compliant,
IEC 61215:2016,
IEC 61730:2016,
U.S. Patent No. 9,863,215
(solar cell)



PACKAGING AND TRANSPORT INFORMATION

Horizontal packaging	70.1 in 1780 mm	42.5 in 1080 mm	47.6 in 1208 mm	1485 lbs 674 kg	26 pallets	26 modules	32
Vertical packaging	70.9 in 1800 mm	45.3 in 1150 mm	47.2 in 1200 mm	1505 lbs 682 kg	28 pallets	26 modules	32

Note: Installation instructions must be followed. See the installation and operating manual or contact our technical service department for further information on approved installation and use of this product. Q CELLS supplies solar modules in two different packaging methods, depending on the location of manufacture (modules are packed horizontally or vertically). You can find more detailed information in the document "Packaging and Transport Information", available from Q CELLS.

Hanwha Q CELLS America Inc.

400 Spectrum Center Drive, Suite 1400, Irvine, CA 92618, USA | TEL: +1 949 748 59 96 | EMAIL: inquiry@us.q-cells.com | WEB: www.q-cells.us

2"x2"
AHJ APPROVAL
STAMP



DESCRIPTION	DATE	REVISION
INITIAL	2021.SEPT.7	1

Solar Specialist
EVIE ABERCROMBIE
System Engineer
TIM WACHTMAN
System Designer
JOHN CANFIELD

Customer Info
JOHN SAUNDERS & KATHRYN CHOLAKIAN
301 SE 18TH AVE,
OLYMPIA, WA 98501
PARCEL # 39400200500

Project Details
8.16 kW ROOFTOP PV SYSTEM
TILT
16° / 4:12 PITCH & 30° / 7:12 PITCH
AZIMUTH
0° / 180°
DC SYSTEM RATING
8.16 kW
AC SYSTEM RATING
7.6 kW

ESTIMATED ANNUAL PRODUCTION
7,177 kWh/yr
Drawing
EQUIPMENT:
PV MODULE SPECIFICATION SHEETS
Sheet

E-3

Single Phase Inverter with HD-Wave Technology for North America

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



INVERTERS

Optimized installation with HD-Wave technology

- Specifically designed to work with power optimizers
- Record-breaking 99% weighted efficiency
- Quick and easy inverter commissioning directly from a smartphone using the SolarEdge SetApp
- Fixed voltage inverter for longer strings
- Integrated arc fault protection and rapid shutdown for NEC 2014, NEC 2017 and NEC 2020 per article 690.11 and 690.12
- UL1741 SA certified, for CPUC Rule 21 grid compliance
- Small, lightweight, and easy to install both outdoors or indoors
- Built-in module-level monitoring
- Optional: Faster installations with built-in consumption metering (1% accuracy) and production revenue grade metering (0.5% accuracy, ANSI C12.20)

solaredge.com



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 @ 240V 10000 @ 208V	VA						
Maximum AC Power Output	3000	3800 @ 240V 3300 @ 208V	5000	6000 @ 240V 5000 @ 208V	7600	10000	11400 @ 240V 10000 @ 208V	VA						
AC Output Voltage Min.-Nom.-Max. (211 - 240 - 264)	✓	✓	✓	✓	✓	✓	✓	Vac						
AC Output Voltage Min.-Nom.-Max. (183 - 208 - 229)	-	✓	-	✓	-	-	✓	Vac						
AC Frequency (Nominal)	59.3 - 60 - 60.5 ⁽¹⁾							Hz						
Maximum Continuous Output Current @240V	12.5	16	21	25	32	42	47.5	A						
Maximum Continuous Output Current @208V	-	16	-	24	-	-	48.5	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	-	-	15500	W						
Transformer-less, Ungrounded	Yes													
Maximum Input Voltage	480							Vdc						
Nominal DC Input Voltage	380				400			Vdc						
Maximum Input Current @240V ⁽²⁾	8.5	10.5	13.5	16.5	20	27	30.5	Adc						
Maximum Input Current @208V ⁽²⁾	-	9	-	13.5	-	-	27	Adc						
Max. Input Short Circuit Current	45							Adc						
Reverse-Polarity Protection	Yes													
Ground-Fault Isolation Detection	600ka Sensitivity													
Maximum Inverter Efficiency	99	99.2					%							
CEC Weighted Efficiency	99						99 @ 240V 98.5 @ 208V	%						
Nighttime Power Consumption	< 2.5							W						
ADDITIONAL FEATURES														
Supported Communication Interfaces	RS485, Ethernet, ZigBee (optional), Cellular (optional)													
Revenue Grade Data, ANSI C12.20	Optional ⁽³⁾													
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 AFCEI 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	1" Maximum / 14-6 AWG					1" Maximum /14-4 AWG								
DC Input Conduit Size / # of Strings / AWG Range	1" Maximum / 1-2 strings / 14-6 AWG					1" Maximum / 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													
Operating Temperature Range	-13 to +140 / -25 to +60 ⁽⁴⁾ (-40°F / -40°C option) ⁽⁵⁾							°F / °C						
Protection Rating	NEMA 4X (Inverter with Safety Switch)													

⁽¹⁾ For other regional settings please contact SolarEdge support.
⁽²⁾ A higher current source may be used; the inverter will limit its input current to the values stated.
⁽³⁾ Revenue grade inverter P/N: SExxxxH-US000NNC2
⁽⁴⁾ For power de-rating information refer to: <https://www.solaredge.com/sites/default/files/se-temperature-derating-note-na.pdf>
⁽⁵⁾ -40 version P/N: SExxxxH-US000NNU4

© SolarEdge Technologies, Inc. All rights reserved. SOLAREEDGE, the SolarEdge logo, OPTIMIZED BY SOLAREEDGE are trademarks or registered trademarks of SolarEdge Technologies, Inc. All other trademarks mentioned herein are trademarks of their respective owners. Date: 03/2019/V01/ENG NAM. Subject to change without notice.

RoHS

2"X2"
AHJ APPROVAL
STAMP



DESCRIPTION	DATE	REVISION
INITIAL	2021.SEPT.7	1

Solar Specialist
EVIE ABERCROMBIE
System Engineer
TIM WACHTMAN
System Designer
JOHN CANFIELD
Customer Info
JOHN SAUNDERS & KATHRYN CHOLAKIAN 301 SE 18TH AVE, OLYMPIA, WA 98501 PARCEL # 39400200500

Project Details
8.16 kW ROOFTOP PV SYSTEM
TILT
16° / 4:12 PITCH & 30° / 7:12 PITCH
AZIMUTH
0° / 180°
DC SYSTEM RATING
8.16 kW
AC SYSTEM RATING
7.6 kW
ESTIMATED ANNUAL PRODUCTION
7,177 kWh/Yr
Drawing
EQUIPMENT: INVERTER SPECIFICATION SHEETS
Sheet

E-4

Power Optimizer

For North America

P320 / P340 / P370 / P400 / P405 / P485 / P505



POWEROPTIMIZER

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
- Meets NEC requirements for arc fault protection (AFCI) and Photovoltaic Rapid Shutdown System (PVRSS)
- Module-level voltage shutdown for installer and firefighter safety

solaredge.com



Power Optimizer For North America

P320 / P340 / P370 / P400 / P405 / P485 / P505

Optimizer model (typical module compatibility)	P320 (for 60-cell modules)	P340 (for high-power 60-cell modules)	P370 (for higher-power 60 and 72-cell modules)	P400 (for 72 & 96-cell modules)	P405 (for high-voltage modules)	P485 (for high-voltage modules)	P505 (for higher current modules)	
INPUT								
Rated Input DC Power ⁽¹⁾	320	340	370	400	405	485	505	W
Absolute Maximum Input Voltage (Voc at lowest temperature)	48		60	80	125 ⁽²⁾		83 ⁽²⁾	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			12.5			17.5	Adc
Maximum Efficiency	99.5							%
Weighted Efficiency	98.8						98.6	%
Overvoltage Category	II							
OUTPUT DURING OPERATION (POWER OPTIMIZER CONNECTED TO OPERATING SOLAREEDGE INVERTER)								
Maximum Output Current	15							Adc
Maximum Output Voltage	60				85			Vdc
OUTPUT DURING STANDBY (POWER OPTIMIZER DISCONNECTED FROM SOLAREEDGE INVERTER OR SOLAREEDGE 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							
Material	UL94 V-0 , UV Resistant							
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)	129 x 153 x 27.5 / 5.1 x 6 x 1.1			129 x 153 x 33.5 / 5.1 x 6 x 1.3	129 x 159 x 49.5 / 5.1 x 6.3 x 1.9		129 x 162 x 59 / 5.1 x 6.4 x 2.3	mm / in
Weight (including cables)	630 / 1.4			750 / 1.7	845 / 1.9		1064 / 2.3	gr / lb
Input Connector	MC4 ⁽³⁾					Single or dual MC4 ⁽³⁾⁽⁴⁾	MC4 ⁽³⁾	
Input Wire Length	0.16 / 0.52							m / ft
Output Wire Type / Connector	Double Insulated / MC4							
Output Wire Length	0.9 / 2.95		1.2 / 3.9	1.2 / 3.9	1.2 / 3.9		1.2 / 3.9	m / ft
Operating Temperature Range ⁽⁵⁾	-40 - +85 / -40 - +185							°C / °F
Protection Rating	IP68 / NEMA6P							
Relative Humidity	0 - 100							%

⁽¹⁾ Rated power of the module at STC will not exceed the optimizer "Rated Input DC Power". Modules with up to +5% power tolerance are allowed

⁽²⁾ NEC 2017 requires max input voltage be not more than 80V

⁽³⁾ For other connector types please contact SolarEdge

⁽⁴⁾ For dual version for parallel connection of two modules use the P485. In the case of an odd number of PV modules in one string, installing one P485 dual version power optimizer

⁽⁵⁾ For ambient temperature above +85°C / +185°F power de-rating is applied. Refer to Power Optimizers Temperature De-Rating Technical Note for more details.

PV System Design Using a SolarEdge Inverter ⁽¹⁾⁽²⁾		Single Phase HD-Wave	Single phase	Three Phase for 208V grid	Three Phase for 277/480V grid	
Minimum String Length (Power Optimizers)	P320, P340, P370, P400	8		10	18	
	P405, P485, P505	6		8	14	
Maximum String Length (Power Optimizers)		25		25	50 ⁽³⁾	
Maximum Power per String		5700 (6000 with SE7600-US - SE11400-US)	5250	6000 ⁽³⁾	12750 ⁽³⁾	W
Parallel Strings of Different Lengths or Orientations		Yes				

⁽¹⁾ For detailed string sizing information refer to: http://www.solaredge.com/sites/default/files/string_sizing_na.pdf

⁽²⁾ It is not allowed to mix P405/P485/P505 with P320/P340/P370/P400 in one string

⁽³⁾ A string with more than 30 optimizers does not meet NEC rapid shutdown requirements; safety voltage will be above the 30V requirement

⁽⁴⁾ For 208V grid: it is allowed to install up to 6,500W per string when the maximum power difference between each string is 1,000W

⁽⁵⁾ For 277/480V grid: it is allowed to install up to 17,550W per string when the maximum power difference between each string is 2,000W

© SolarEdge Technologies Ltd. All rights reserved. SOLAREEDGE, the SolarEdge logo, OPTIMIZED BY SOLAREEDGE are trademarks or registered trademarks of SolarEdge Technologies, Inc. All other trademarks mentioned herein are trademarks of their respective owners. Date: 12/2019/V02/ENG NAM. Subject to change without notice.



RoHS

2"x2"
AHJ APPROVAL
STAMP



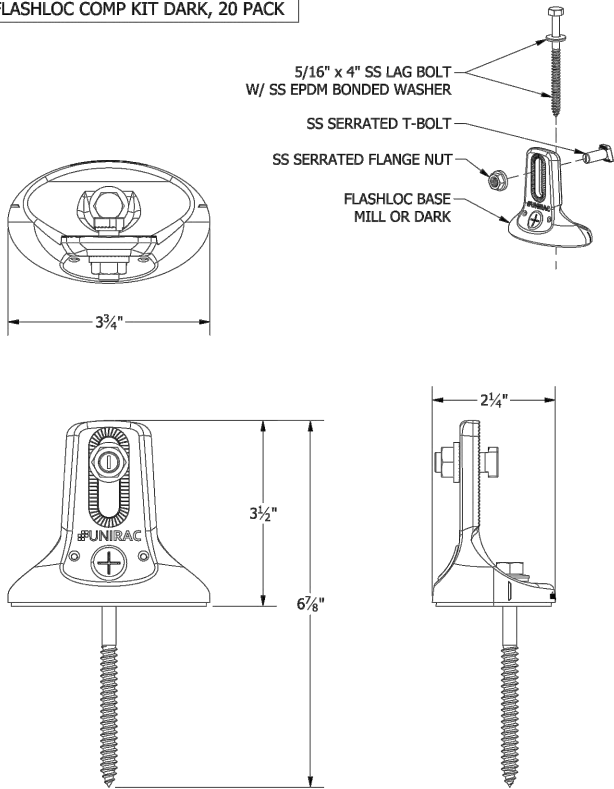
DESCRIPTION	DATE	REVISION
INITIAL	2021.SEPT.7	1

Solar Specialist
EVIE ABERCROMBIE
System Engineer
TIM WACHTMAN
System Designer
JOHN CANFIELD
Customer Info
JOHN SAUNDERS & KATHRYN CHOLAKIAN 301 SE 18TH AVE, OLYMPIA, WA 98501 PARCEL # 39400200500

Project Details
8.16 kW ROOFTOP PV SYSTEM
TILT
16° / 4:12 PITCH & 30° / 7:12 PITCH
AZIMUTH
0° / 180°
DC SYSTEM RATING
8.16 kW
AC SYSTEM RATING
7.6 kW
ESTIMATED ANNUAL PRODUCTION
7,177 kWh/Yr
Drawing
EQUIPMENT: DC/DC POWER OPTIMIZER SPECIFICATION SHEETS
Sheet

E-5

PART TABLE	
P/N	DESCRIPTION
004085M	FLASHLOC COMP KIT MILL, 20 PACK
004085D	FLASHLOC COMP KIT DARK, 20 PACK



UNIRAC
1411 BROADWAY BLVD. NE
ALBUQUERQUE, NM 87102 USA
PHONE: 505.242.6411
WWW.UNIRAC.COM

PRODUCT LINE:	SOLARMOUNT
DRAWING TYPE:	PART DRAWING
DESCRIPTION:	FLASHLOC COMP KIT
REVISION DATE:	4/28/2020

DRAWING NOT TO SCALE ALL DIMENSIONS ARE NOMINAL
PRODUCT PROTECTED BY ONE OR MORE US PATENTS LEGAL NOTICE

FL-A01

SHEET

FLASH LOC

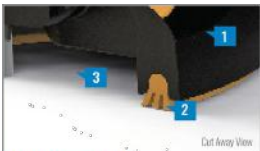


FLASHLOC is the ultimate attachment for composition shingle and rolled comp roofs. The all-in-one mount installs fast — no kneeling on hot roofs to install flashing, no prying or cutting shingles, no pulling nails. Simply drive the lag bolt and inject sealant into the base. **FLASHLOC's** patented **TRIPLE 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!**



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-L, Geocol 4500, or Geocol 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

2"x2"
AHJ APPROVAL
STAMP



DESCRIPTION	DATE	REVISION
INITIAL	2021.SEPT.7	1

Solar Specialist

EVIE ABERCROMBIE

System Engineer

TIM WACHTMAN

System Designer

JOHN CANFIELD

Customer Info

JOHN SAUNDERS & KATHRYN CHOLAKIAN
301 SE 18TH AVE,
OLYMPIA, WA 98501
PARCEL # 39400200500

Project Details

8.16 kW
ROOFTOP PV
SYSTEM

TILT

16° / 4:12 PITCH & 30° / 7:12 PITCH

AZIMUTH

0° / 180°

DC SYSTEM RATING

8.16 kW

AC SYSTEM RATING

7.6 kW

ESTIMATED ANNUAL PRODUCTION

7,177 kWh/Yr

Drawing

EQUIPMENT:
RACKING SYSTEM, ROOF
ATTACHMENT

Sheet

S-1

FLASHLOC™ DUO

THE MOST VERSATILE DIRECT TO DECK ATTACHMENT



FLASHLOC™ DUO is the most versatile direct to deck and rafter 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 required number of screws to secure the mount 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 two rafter screws, sealant and hardware for maximum convenience (deck screws sold separately). Don't just divert water, **LOC it out!**



PROTECT THE ROOF

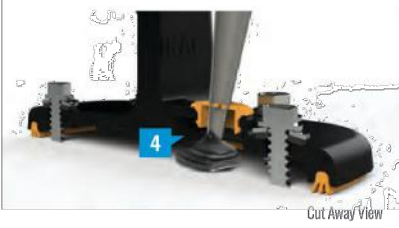
Install a high-strength waterproof attachment without lifting, prying or damaging shingles.

JUNE2021_FLASHLOCDUO_V2



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 the required number of screws and inject sealant into the port 4 to create a permanent pressure seal.

FLASHLOC™ DUO

INSTALLATION GUIDE



PRE-INSTALL: CLEAN SURFACE AND MARK LOCATION

Ensure existing roof structure is capable of supporting loads prescribed in Flashloc Duo D&E Guide. Clean roof surface of dirt, debris, snow and ice.

Snap chalk lines for attachment rows. On shingle roofs, snap lines 1/4" below upslope edge of shingle course. This line will be used to align the upper edge of the mount.

NOTE: Space mounts per span charts found in FLASHLOC DUO state certification letters.

STEP ONE: SECURE



ATTACHING TO A RAFTER: Place FLASHLOC DUO over rafter location and align upper edge of mount with horizontal chalk line. Secure mount with the two (2) provided rafter screws. BACKFILL ALL PILOT HOLES WITH SEALANT.

ATTACHING TO SHEATHING: Place FLASHLOC DUO over desired location and align upper edge of mount with horizontal chalk line. Secure mount with the two (2) provided rafter screws. Next, secure mount with four (4) deck screws by drilling through the FLASHLOC DUO deck mount hole locations. Unirac recommends using a drill as opposed to an impact gun to prevent over-tightening or stripping roof sheathing.

IMPORTANT: SECURELY ATTACH MOUNT BUT DO NOT OVERTIGHTEN SCREWS.



STEP TWO: SEAL

Insert tip of UNIRAC approved sealant into port and inject until sealant exits vent. Continue array installation, attaching rails to mounts with provided T-bolts. Follow sealant manufacturer's instructions. Follow sealant manufacturer's cold weather application guidelines, if applicable.

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

CUT SHINGLES AS REQUIRED: DO NOT INSTALL THE FLASHLOC SLIDER ACCROSS THICKNESS VARIATIONS GREATER THAN 1/8" SUCH AS THOSE FOUND IN HIGH DEFINITION SHINGLES.



NOTE: When installing included rail attachment hardware, torque T-bolt nut to 30 ft-lbs.
NOTE: If an exploratory hole falls outside of the area covered by the sealant, flash hole accordingly.
NOTE: Read and comply with the Flashloc Duo Design & Engineering Guide prior to design and installation of the system.

USE ONLY UNIRAC APPROVED SEALANTS. PLEASE CONTACT UNIRAC FOR FULL LIST OF COMPATIBLE SEALANTS.

2"x2"
AHJ APPROVAL
STAMP



DESCRIPTION	DATE	REVISION
INITIAL	2021.SEPT.7	1

Solar Specialist
EVIE ABERCROMBIE
System Engineer
TIM WACHTMAN
System Designer
JOHN CANFIELD
Customer Info
JOHN SAUNDERS & KATHRYN CHOLAKIAN 301 SE 18TH AVE, OLYMPIA, WA 98501 PARCEL # 39400200500

Project Details
8.16 kW ROOFTOP PV SYSTEM
TILT
16° / 4:12 PITCH & 30° / 7:12 PITCH
AZIMUTH
0° / 180°
DC SYSTEM RATING
8.16 kW
AC SYSTEM RATING
7.6 kW
ESTIMATED ANNUAL PRODUCTION
7,177 kWh/Yr
Drawing
EQUIPMENT: RACKING SYSTEM, ROOF ATTACHMENT
Sheet

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

S-2



UNIRAC, INC. MIAMI-DADE TEST REPORT

SCOPE OF WORK
TAS 100(A) TESTING ON FLASHLOC, ROOF MOUNTS.

REPORT NUMBER
K1187.01-109-18

TEST DATE(S)
09/09/19

ISSUE DATE
09/24/19

REVISED DATE
09/24/19

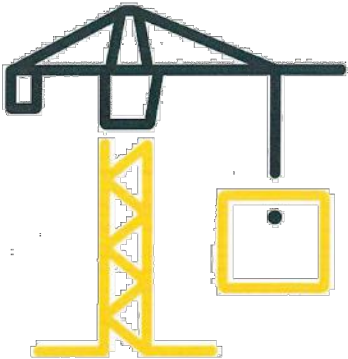
RECORD RETENTION END DATE
09/09/29

MIAMI-DADE COUNTY NOTIFICATION NO.
ATI 19048

LABORATORY CERTIFICATION NO.
18-0524.13

PAGES
18

DOCUMENT CONTROL NUMBER
ATI 00651 (08/21/17)
RT-R-AMER-Test-2816
© 2017 INTERTEK



TEST REPORT FOR UNIRAC, INC.
Report No.: K1187.01-109-18
Revision 1: 09/24/19
Date: 09/24/19

REPORT ISSUED TO
UNIRAC, INC.
3411 Broadway Blvd. NE
Albuquerque, New Mexico 87102-1545

SECTION 1

SCOPE

Intertek Building & Construction (B&C) was contracted by Unirac, Inc. to perform TAS 100(A) testing in accordance with Miami-Dade County requirements on their FLASHLOC, Roof Mounts. Results obtained are tested values and were secured by using the designated test method(s). Testing was conducted at the Intertek B&C test facility in York, Pennsylvania. This report does not constitute certification of this product nor an opinion or endorsement by this laboratory.



For INTERTEK B&C:

COMPLETED BY: Robert J. Beatty
Technician
TITLE: Product Testing
SIGNATURE: [Signature]
DATE: 09/24/19

RJB:wnl

REVIEWED BY: Daniel C. Culbert, P.E.
TITLE: Senior Project Engineer
SIGNATURE: [Signature]
DATE: 09/24/19

2019.09.25 09:59:46 -04'00'

This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and thereby in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample(s) tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.

Version: 08/21/17

Page 2 of 18

RT-R-AMER-Test-2816



TEST REPORT FOR UNIRAC, INC.
Report No.: K1187.01-109-18
Revision 1: 09/24/19
Date: 09/24/19

Test Specimens #3 and #4 with M-1® sealant

Test Procedure: The wind speed intervals were conducted as follows:

Interval No.	Wind Speed (mph)	Time (min)	Water Spray
1	35	15	On
2	0	5	Off
3	70	15	On
4	0	5	Off
5	90	15	On
6	0	5	Off
7	110	5	On
8	0	5	Off

Test Results: The TAS 100(A) test results are as follows:

Wind Speed	Results	Allowed
35 mph	0 oz.	N/A
70 mph	0 oz.	N/A
90 mph	0 oz.	N/A
110 mph	0 oz.	N/A
Total	0 oz.	13.6 oz.

Results: Pass.

General Note: Each configuration was evaluated separately with no leakage at the mount locations during or after the test.

Version: 08/21/17

Page 8 of 18

RT-R-AMER-Test-2816

2"X2"
AHJ APPROVAL
STAMP



DESCRIPTION	DATE	REVISION
INITIAL	2021. SEPT. 7	1

Solar Specialist

EVIE ABERCROMBIE

System Engineer

TIM WACHTMAN

System Designer

JOHN CANFIELD

Customer Info

JOHN SAUNDERS & KATHRYN CHOLAKIAN
301 SE 18TH AVE,
OLYMPIA, WA 98501
PARCEL # 39400200500

Project Details

8.16 kW
ROOFTOP PV
SYSTEM

TILT

16° / 4:12 PITCH & 30° / 7:12 PITCH

AZIMUTH

0° / 180°

DC SYSTEM RATING

8.16 kW

AC SYSTEM RATING

7.6 kW

ESTIMATED ANNUAL PRODUCTION

7,177 kWh/Yr

Drawing

EQUIPMENT:
RACKING SYSTEM,
ENGINEERING

Sheet

S-3

FLASHLOC DUO

GETTING STARTED | 1
DESIGN & ENGINEERING GUIDE | PAGE

Getting Started

This manual is for professional engineers, designers, installers, and permitting authorities. For assistance with your array's engineering and a Bill of Materials, see our U-builder at <https://design.unirac.com/>

The Flashloc Duo attachment is designed to be used with the Unirac SOLARMOUNT Flush-to-Roof system.

Some of the features of this product include:

- Designed per the ASCE 7-10 and ASCE 7-16 Building Code
- Component testing
- Rigorous Engineering Analysis
- Ability to be attached both to a rafter or directly to roof sheathing that meets the requirements outlined in this document
- Flashloc triple seal technology which saves time, preserves the roof, and protects the penetration
- Kitted with two rafter screws, sealant, and rail attachment hardware for maximum convenience
- Compatible with comp shingle and rolled comp roofs

FLASHLOC DUO

TOOLS AND SPECIFICATIONS | 3
DESIGN & ENGINEERING GUIDE | PAGE

TECHNICAL SPECIFICATIONS:

Material Types: A380 diecast aluminum

Seals: Injection molded EPDM

Hardware: 300 series stainless steel

Bonding and Grounding: See SOLARMOUNT D&E GUIDE

TOOLS REQUIRED OR RECOMMEND FOR LAYOUT, ATTACHMENTS, AND INSTALLATION:

- Drill (**Do Not Use an Impact Driver**)
- 5/16" Socket
- Torque Wrench
- Tape Measure
- Chalk Reel

GENERAL HARDWARE:

- #12-14 x 2.5" Hex Head, Self-drilling, Screws

SAFETY:

All applicable OSHA safety guidelines should be observed when working on a PV installation job site. The installation and handling of PV solar modules, electrical installation and PV racking systems involves handling components with potentially sharp metal edges. Rules regarding the use of gloves and other personal protective equipment should be observed.

Detail drawings available for basic geometry at Unirac.com



FLASHLOC DUO

INSTALLER RESPONSIBILITY | 2
DESIGN & ENGINEERING GUIDE | PAGE

Installer Responsibility & Disclaimer

Please review this guide and the SOLARMOUNT Installation Guide thoroughly before installing your SOLARMOUNT system. These guides provide supporting documentation for building permit applications, planning, and assembling the SOLARMOUNT system.

The installer is solely responsible for:

- Complying with all applicable local or national building codes, including code requirements that can be more stringent than the guidelines set forth in this manual;
- Maintaining and enforcing all aspects of a safe working environment;
- Ensuring that Unirac and other products are appropriate for the particular installation and the installation environment;
- Ensuring that the roof, its rafters, connections, and any other structural support members can support the array under all code level loading conditions (this total building assembly is referred to as the building structure);
- Using only Unirac parts and installer-supplied parts as specified by Unirac (substitution of parts may void the warranty and invalidate the letters of certification in all Unirac publications);
- Ensuring that attachment strength is adequate to support loads in your installation location
- Ensuring the attachment of the roof deck to the rafters is adequate to support all loads when attaching to sheathing (See [Expedited Permit Process](#) at https://www.dvrpc.org/solar/pdf/Structural_Commentary_for_the_National_Simplified_Residential_Roof_Photovoltaic_Array_Permitt_Guidelines_2017-06-03.pdf;
- Maintaining the waterproof integrity of the roof, including selection and proper installation of appropriate flashing techniques, if required;
- Ensuring safe installation of all electrical aspects of the PV array, including proper grounding/bonding;
- Array shading and output analysis;
- Ensuring correct and appropriate design parameters are used in determining the design loading used for design of the specific installation. Parameters, such as snow loading, wind speed, exposure and topographic factor should be confirmed with the local building official or a licensed professional engineer;
- Comply with module manufacturer's specifications.

Unirac shall not be liable for any losses, damages, or injuries that directly or indirectly result from any non-conformance with the above

FLASHLOC DUO

TEST DATA AND RESULTS | 4
DESIGN & ENGINEERING GUIDE | PAGE

TEST DATA:

Wood Types for sheathing attached systems:

- 24/16 APA rated 7/16" OSB,
- 32/24 APA rated 15/32" Plywood

Test Setup:

- Performed on sheathing thicknesses per IRC 2018.
- Performed with the farthest upslope screw in a 1/8" gap between sheathing panels.
- Included rail and clamp connections, meaning allowable loads cover entire racking system
- Applies only when rails are mounted parallel to eave and ridge
- Assume all installation requirements are followed correctly

TESTS RESULTS:

- OSB
 - Allowable load in Uplift = 135 lbs
 - Allowable load in Downforce = 124 lbs
 - Allowable load in Shear = 82 lbs
 - Allowable load in Lateral = 102 lbs
- Plywood
 - Allowable load in Uplift = 166 lbs
 - Allowable load in Downforce = 170 lbs
 - Allowable load in Shear = 127 lbs
 - Allowable load in Lateral = 140 lbs
- Rafter
 - Allowable load in Uplift = 495 lbs
 - Allowable load in Downforce = 907 lbs
 - Allowable load in Shear = 190 lbs
 - Allowable load in Lateral = 488 lbs

Spans are calculated such that the point loads on the roof will not exceed these allowable loads.

2"X2"
AHJ APPROVAL
STAMP



DESCRIPTION	DATE	REVISION
INITIAL	2021.SEPT.7	1

Solar Specialist

EVIE ABERCROMBIE

System Engineer

TIM WACHTMAN

System Designer

JOHN CANFIELD

Customer Info

JOHN SAUNDERS & KATHRYN CHOLAKIAN
301 SE 18TH AVE,
OLYMPIA, WA 98501
PARCEL # 39400200500

Project Details

8.16 kW
ROOFTOP PV
SYSTEM

TILT

16° / 4:12 PITCH & 30° / 7:12 PITCH

AZIMUTH

0° / 180°

DC SYSTEM RATING

8.16 kW

AC SYSTEM RATING

7.6 kW

ESTIMATED ANNUAL PRODUCTION

7,177 kWh/Yr

Drawing

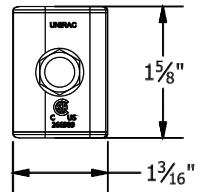
EQUIPMENT:
RACKING SYSTEM,
ENGINEERING

Sheet

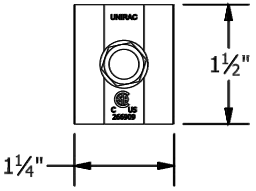
S-4

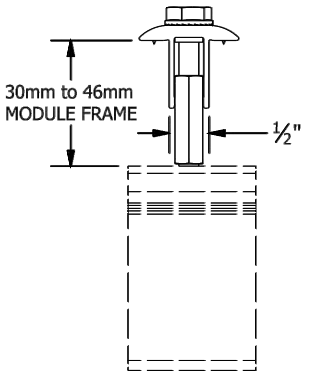
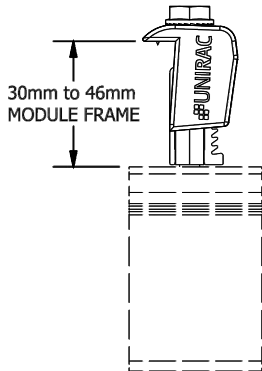
PART # TABLE	
P/N	DESCRIPTION
302045M	UNIVERSAL AF MID CLAMP - MILL
302045D	UNIVERSAL AF MID CLAMP - DRK
302050M	UNIVERSAL AF END CLAMP - MILL
302050D	UNIVERSAL AF END CLAMP - DRK

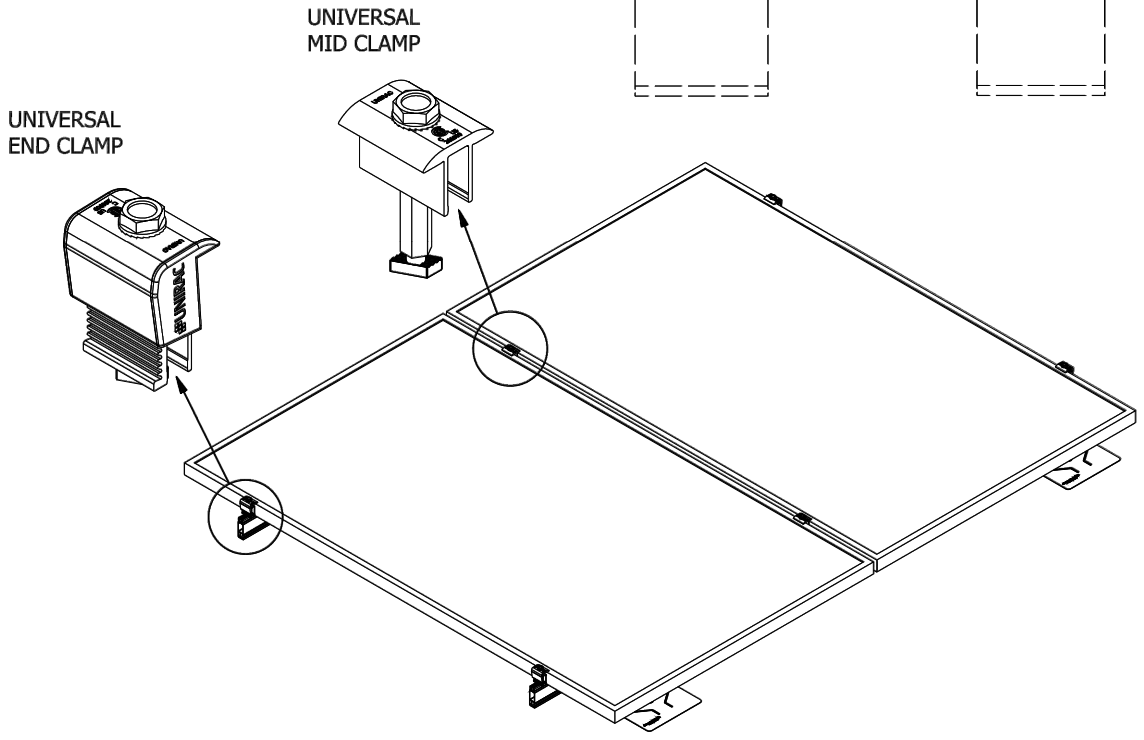
UNIVERSAL AF
END CLAMP




UNIVERSAL AF
MID CLAMP









1411 BROADWAY BLVD. NE
ALBUQUERQUE, NM 87102 USA
PHONE: 505.242.6411
WWW.UNIRAC.COM

PRODUCT LINE:	SOLARMOUNT
DRAWING TYPE:	PART & ASSEMBLY
DESCRIPTION:	UNIVERSAL AF CLAMPS
REVISION DATE:	9/28/2020

DRAWING NOT TO SCALE
ALL DIMENSIONS ARE
NOMINAL


PRODUCT PROTECTED BY
ONE OR MORE US PATENTS

LEGAL NOTICE

SM-A01B

SHEET

2"X2"
AHJ APPROVAL
STAMP



DESCRIPTION	DATE	REVISION
INITIAL	2021.SEPT.7	1

Solar Specialist

EVIE ABERCROMBIE

System Engineer

TIM WACHTMAN

System Designer

JOHN CANFIELD

Customer Info

JOHN SAUNDERS & KATHRYN CHOLAKIAN
301 SE 18TH AVE,
OLYMPIA, WA 98501
PARCEL # 39400200500

Project Details

8.16 kW/
ROOFTOP PV
SYSTEM

TILT

16° / 4:12 PITCH & 30° / 7:12 PITCH

AZIMUTH

0° / 180°

DC SYSTEM RATING

8.16 kW

AC SYSTEM RATING

7.6 kW

ESTIMATED ANNUAL PRODUCTION

7,177 kWh/Yr

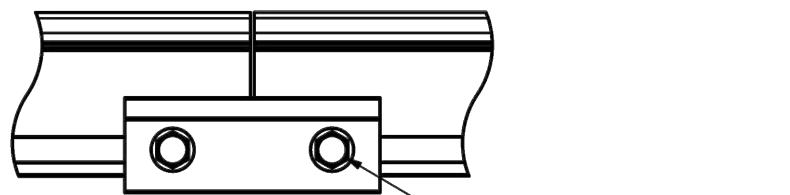
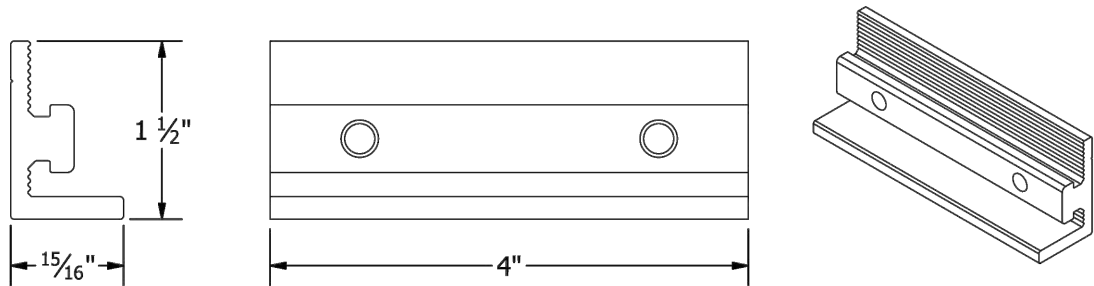
Drawing

EQUIPMENT:
RACKING SYSTEM, CLAMPS

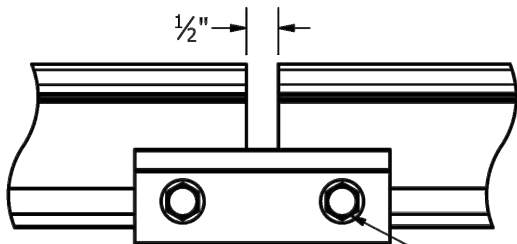
Sheet

S-5

BONDING SPLICE BAR



TYPICAL SPLICE BAR DETAIL



TYPICAL EXPANSION JOINT DETAIL

PART # TABLE	
P/N	DESCRIPTION
303019M	BND SPLICE BAR PRO SERIES MILL
303019D	BND SPLICE BAR PRO SERIES DRK



1411 BROADWAY BLVD. NE
ALBUQUERQUE, NM 87102 USA
PHONE: 505.242.6411
WWW.UNIRAC.COM

PRODUCT LINE:	SOLARMOUNT
DRAWING TYPE:	PART & ASSEMBLY
DESCRIPTION:	BONDING SPLICE BAR PRO SERIES
REVISION DATE:	8/23/2018

DRAWING NOT TO SCALE
ALL DIMENSIONS ARE
NOMINAL

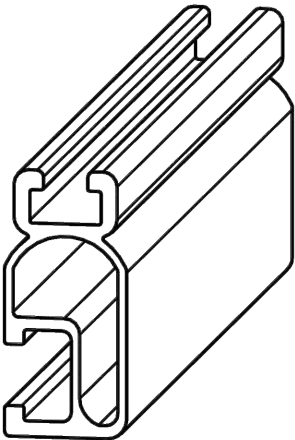
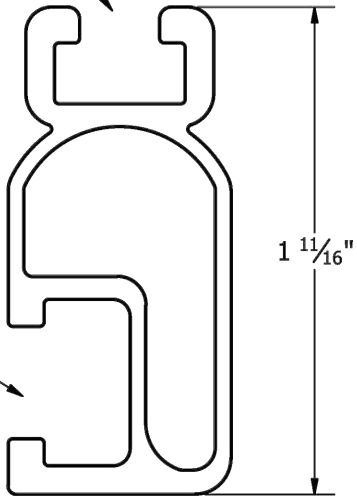
PRODUCT PROTECTED BY
ONE OR MORE US PATENTS
LEGAL NOTICE

SM-A05

SHEET

1/4" BOLT LOCATION

3/8" BOLT LOCATION



PART # TABLE		
P/N	DESCRIPTION	LENGTH
315168M	SM LIGHT RAIL 168" MILL	168"
315168D	SM LIGHT RAIL 168" DRK	168"
315240M	SM LIGHT RAIL 240" MILL	240"
315240D	SM LIGHT RAIL 240" DRK	240"



1411 BROADWAY BLVD. NE
ALBUQUERQUE, NM 87102 USA
PHONE: 505.242.6411
WWW.UNIRAC.COM

PRODUCT LINE:	SOLARMOUNT
DRAWING TYPE:	PART DETAIL
DESCRIPTION:	LIGHT RAIL
REVISION DATE:	9/11/2017

DRAWING NOT TO SCALE
ALL DIMENSIONS ARE
NOMINAL

PRODUCT PROTECTED BY
ONE OR MORE US PATENTS
LEGAL NOTICE

SM-P02

SHEET

2"X2"
AHJ APPROVAL
STAMP



DESCRIPTION	DATE	REVISION
INITIAL	2021.SEPT.7	1

Solar Specialist

EVIE ABERCROMBIE

System Engineer

TIM WACHTMAN

System Designer

JOHN CANFIELD

Customer Info

JOHN SAUNDERS & KATHRYN CHOLAKIAN
301 SE 18TH AVE,
OLYMPIA, WA 98501
PARCEL # 39400200500

Project Details

8.16 kW
ROOFTOP PV
SYSTEM

TILT

16° / 4:12 PITCH & 30° / 7:12 PITCH

AZIMUTH

0° / 180°

DC SYSTEM RATING

8.16 kW

AC SYSTEM RATING

7.6 kW

ESTIMATED ANNUAL PRODUCTION

7,177 kWh/Yr

Drawing

EQUIPMENT:
RACKING SYSTEM, RAIL

Sheet

S-6



April 28, 2020

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

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 7-05, ASCE/SEI 7-10, ASCE/SEI 7-16
2. 2006-2018 International Building Code, by International Code Council, Inc. w/ Provisions from SEAOC PV-2 2017.
3. 2006-2018 International Residential Code, by International Code Council, Inc. w/ Provisions from SEAOC PV-2 2017.
4. AC428, Acceptance Criteria for Modular Framing Systems Used to Support Photovoltaic (PV) Panels, November 1, 2012 by ICC-ES.
5. 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.

1478 Stone Point Drive, Suite 190, Roseville, CA 95661
T 916.961.3960 F 916.961.3965 W www.pzse.com
Experience | Integrity | Empowerment

1 of 2



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, kzt 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



EXPIRES 08/02/2021

1478 Stone Point Drive, Suite 190, Roseville, CA 95661
T 916.961.3960 F 916.961.3965 W www.pzse.com
Experience | Integrity | Empowerment

2 of 2

2”X2”
AHJ APPROVAL
STAMP



DESCRIPTION	DATE	REVISION
INITIAL	2021.SEPT.7	1

Solar Specialist
EVIE ABERCROMBIE
System Engineer
TIM WACHTMAN
System Designer
JOHN CANFIELD
Customer Info
JOHN SAUNDERS & KATHRYN CHOLAKIAN 301 SE 18TH AVE, OLYMPIA, WA 98501 PARCEL # 39400200500

Project Details
8.16 kW/ ROOFTOP PV SYSTEM
TILT
16° / 4:12 PITCH & 30° / 7:12 PITCH
AZIMUTH
0° / 180°
DC SYSTEM RATING
8.16 kW
AC SYSTEM RATING
7.6 kW
ESTIMATED ANNUAL PRODUCTION
7,177 kWh/Yr
Drawing
EQUIPMENT: RACKING SYSTEM, ENGINEERING STAMP
Sheet

S-7

ENGINEERING REPORT

Plan review

Distributed Dead Load	2.59 psf
-----------------------	----------

Average Roof Point Dead Load	21.46 lbs
------------------------------	-----------

TOTAL NUMBER OF MODULES	24
TOTAL KW	8.16 kW
TOTAL MODULE AREA	~464 ft²

Loads Used for Design

BUILDING CODE	ASCE 7-10
BASIC WIND SPEED	110.00 mph
GROUND SNOW LOAD	25.00 psf
SEISMIC (SS)	1.32
ELEVATION	215.00 ft
WIND EXPOSURE	B

Loads Determined by Zip98501

CITY, STATE	Olympia, WA
BASIC WIND SPEED	110.00 mph
GROUND SNOW LOAD	15.00 psf

Inspection

PRODUCT	SOLARMOUNT FLUSH
MODULE MANUFACTURER	Q-Cells
MODEL	24 - Q.PEAK DUO BLK-G8+340
MODULE WATTS	340 watts
MODULE LENGTH	68.50"
MODULE WIDTH	40.60"
MODULE THICKNESS	1.26"
MODULE WEIGHT	43.90 lbs
EXPANSION JOINTS	Every 40'
RAILS DIRECTION	CROSS-SLOPE
BUILDING HEIGHT	30.00 ft
ROOF TYPE	Shingle
ATTACHMENT TYPE	Flashloc Comp Kit
RAFTER SPACING	1.00"
TOTAL WEIGHT	1201.68 lbs

Roof Area 1 / Roof Area 1 - Array 1

Portrait Modules - Rails Running Across Slope

SOLARMOUNT LIGHT RAIL SPANS [IN]	ZONE 1	ZONE 2	ZONE 3
DESIGN SPAN	48	48	48
Max Cantilever	16	16	16
Max Span	68	68	51

DESIGN PRESSURES [PSF]	ZONE 1	ZONE 2	ZONE 3
Up	-8.7	-17.6	-27.5
Down	20.2	20.2	20.2
Downslope	6.0	6.0	6.0
Lateral	2.2	2.2	2.2

MAXIMUM POINT LOADS [LBS]	ZONE 1	ZONE 2	ZONE 3
Up	-99.3	-200.9	-314.0
Down	230.6	230.6	230.6
Downslope	68.5	68.5	68.5
Lateral	25.1	25.1	25.1
Tributary Area [ft²]	11.4	11.4	11.4
ROOF PITCH:	18°		

Roof Area 2 / Roof Area 2 - Array 1

Portrait Modules - Rails Running Across Slope

SOLARMOUNT LIGHT RAIL SPANS [IN]	ZONE 1	ZONE 2	ZONE 3
DESIGN SPAN	48	48	48
Max Cantilever	16	16	16
Max Span	68	68	51

DESIGN PRESSURES [PSF]	ZONE 1	ZONE 2	ZONE 3
Up	-8.7	-17.6	-27.5
Down	20.2	20.2	20.2
Downslope	6.0	6.0	6.0
Lateral	2.2	2.2	2.2

MAXIMUM POINT LOADS [LBS]	ZONE 1	ZONE 2	ZONE 3
Up	-99.3	-200.9	-314.0
Down	230.6	230.6	230.6
Downslope	68.5	68.5	68.5
Lateral	25.1	25.1	25.1
Tributary Area [ft²]	11.4	11.4	11.4
ROOF PITCH:	18°		

2"X2"
AHJ APPROVAL
STAMP



DESCRIPTION	DATE	REVISION
INITIAL	2021.SEPT.7	1

Solar Specialist

EVIE ABERCROMBIE

System Engineer

TIM WACHTMAN

System Designer

JOHN CANFIELD

Customer Info

JOHN SAUNDERS & KATHRYN CHOLAKIAN
301 SE 18TH AVE,
OLYMPIA, WA 98501
PARCEL # 39400200500

Project Details

8.16 kW
ROOFTOP PV
SYSTEM

TILT

16° / 4:12 PITCH & 30° / 7:12 PITCH

AZIMUTH

0° / 180°

DC SYSTEM RATING

8.16 kW

AC SYSTEM RATING

7.6 kW

ESTIMATED ANNUAL PRODUCTION

7,177 kWh/Yr

Drawing








EQUIPMENT:
RACKING SYSTEM, SITE
SPECIFIC ENGINEERING

Sheet

S-8

DETAILED PARTS DESCRIPTION

QTY

	Rail 315168D SM LIGHT RAIL 168" DARK	16
Structural aluminum extrusion containing slots that accept module and roof attachment hardware, electrical bonding accessories, and splice bars.		
	Mid Clamp 302045D UNIVERSAL AF SERIES MID CLAMP DARK	32
Universal Aesthetic Fastener (Mid), Universal for modules between 30-46mm and features twist and lock installation, 1 tool install, UL2703 integrated bonding, and low profile hardware and 1/2 module gap for optimal aesthetics. Made from Aluminum and Stainless Steel hardware.		
	End Clamp 302050D UNIVERSAL AF SERIES END CLAMP DARK	32
Universal Aesthetic Fastener (End), Universal for modules between 30-46mm without the use of spacers or extra parts, Features twist and lock installation, 1 tool install, UL2703 integrated bonding, and low profile hardware for optimal aesthetics. Clamps can be placed anywhere on the rail and rail can be cut flush with the clamp for optimal aesthetics. Made from Aluminum and Stainless Steel hardware, Caps are PC/ASA.		
	Flashing 004085D FLASHLOC COMP KIT DRK	56
FLASHLOC is the ultimate attachment for composition shingle and rolled comp roofs. The all-in-one mount installs fast and looks great with dark anodized finish. 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.		
	Microinverter Mounting 008013S MICRO MNT BND T-BOLT 1/4in x 3/4in SS	24
Attaches micro-inverter flange to beam using 3/4" x 1/4" bonding T-Bolt.		
	Grounding Lug (Weeb) 008002S GROUND WEEBLUG #1	8
For electrical bonding of PV modules and rails. Accepts one 14AWG to 6AWG or two 12 AWG to 10 AWG copper wires. Tin plated copper body, 1/4" stainless steel fasteners.		
	Conduit Mount 00802CM E-BOSS CONDUIT MOUNT COMP KIT	20
Attach conduit mount directly to deck, using an included flashing and hardware or mounted to a rail or L-Foot using T-bolt. Accomodates both 1" and 3/4" conduit.		

2"x2"
AHJ APPROVAL
STAMP



DESCRIPTION	DATE	REVISION
INITIAL	2021.SEPT.7	1

Solar Specialist

EVIE ABERCROMBIE

System Engineer

TIM WACHTMAN

System Designer

JOHN CANFIELD

Customer Info

JOHN SAUNDERS & KATHRYN CHOLAKIAN
301 SE 18TH AVE,
OLYMPIA, WA 98501
PARCEL # 39400200500

Project Details

8.16 kW
ROOFTOP PV
SYSTEM

TILT

16° / 4:12 PITCH & 30° / 7:12 PITCH

AZIMUTH

0° / 180°

DC SYSTEM RATING

8.16 kW

AC SYSTEM RATING

7.6 kW

ESTIMATED ANNUAL PRODUCTION

7,177 kWh/Yr

Drawing

EQUIPMENT:
RACKING SYSTEM, BILL OF
MATERIALS

Sheet

S-9