RHDC
RALEIGH HISTORIC
DEVELOPMENT COMMISSION

CERTIFICATE OF APPROPRIATENESS PLACARD

for Raleigh Historic Resources

614 Capital Blvd
Address

Historic District

Raleigh Cotton Mills
Historic Property

COA-0033-2023
Certificate Number

3/8/2023
Date of Issue

9/8/2023
Expiration Date

Project Description:

Install solar panels on flat roof

This card must be kept posted in a location within public view until all phases of the described project are complete. The work must conform with the code of the City of Raleigh and laws of the state of North Carolina. When your project is complete, you are required to ask for a final zoning inspection in a historic district area. Telephone the RHDC office at 832-7238 and commission staff will coordinate the inspection with the inspections Department. If you do not call for this final inspection, your Certificate of Appropriateness is null and void.

Signature, Erin Morton

Raleigh Historic Development Commission

Pending the resolution of appeals, commencement of work is at your own risk.

Type or print the following:		
Applicant name: Rhian Mayhew & Lori Jones, Jordan Price Wall Gray Jones & Carlton, PLLC (counsel for HOA)		
Mailing address: P.O. Box 10669		
City: Raleigh	State: North Carolina	Zip code: 27605
Date: 3/6/2023	Daytime phone #: 919-831-4463	
Email address: RMayhew@jordanprice.com; LJones@jordanprice.com		
Applicant signature: (CAM)		

Minor work (staff review) – one copy

Major work (COA committee review) – ten copies

- Additions > 25% of building sq. footage
- New buildings
- Demolition of building or structure
- All other

Post approval re-review of conditions of approval

Office Use Only

Transaction #: _____

File #: COA-0033-2023

Fee: _____

Amount paid: _____

Received date: _____

Received by: _____

Property street address:	614 Capital Blvd., Raleigh, NC 27603
Historic district:	Not in a historic district
Historic property/Landmark name (if applicable):	Raleigh Cotton Mills
Owner name:	The Cotton Mill Condominium Homeowners Association, Inc. unit owners
Owner mailing address:	c/o York Properties, Inc. of Raleigh, PO Box 10007, Raleigh, NC 27605

For applications that require review by the COA Committee (major work), provide addressed and stamped envelopes for owners for all properties with 100 feet on all sides of the property, as well as the property owner.

Property Owner Name & Address	Property Owner Name & Address

I understand that all major work applications that require review by the Raleigh Historic Development Commission's COA Committee must be submitted by 4 p.m. on the date of the application deadline; otherwise, consideration will be delayed until the following committee meeting. An incomplete application will not be accepted.

Will you be applying for rehabilitation tax credits for this project? Yes No Did you consult with staff prior to filing the application? Yes No The above counsel has not consulted with City staff. HOA President consulted with City staff.	Office Use Only Type of work: 50

Design Guidelines: please cite the applicable sections of the design guidelines (www.rhdc.org).		
Section/Page	Topic	Brief description of work (attach additional sheets as needed).
1.3.10 (p. 23); 2.5.11 (p. 47); 2.10.12 (p. 59)	solar collectors	Installation of solar collectors on flat roof. Solar collectors not visible from street.

Minor Work Approval (office use only)

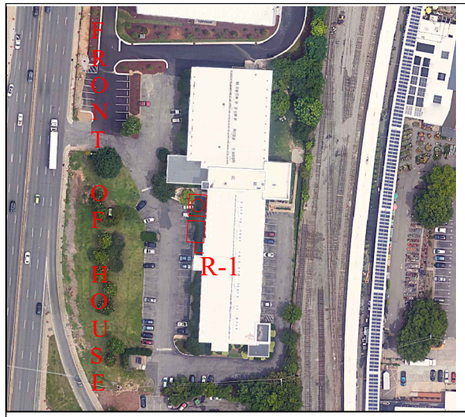
Upon being signed and dated below by the Planning Director or designee, this application becomes the Minor Work Certificate of Appropriateness. It is valid until 09/08/2023.

Please post the enclosed placard form of the certificate as indicated at the bottom of the card. Issuance of a Minor Work Certificate shall not relieve the applicant, contractor, tenant, or property owner from obtaining any other permit required by City Code or any law. Minor Works are subject to an appeals period of 30 days from the date of approval.

Signature (City of Raleigh) Erin Martin Date 03/08/2023

Written Description for Minor Work Certificate of Appropriateness Application

Installation of solar collectors on the flat roof of The Cotton Mill Condos/Raleigh Cotton Mills, located at 614 Capital Blvd., Raleigh, NC 27603. Solar collectors are not visible from the street. See photograph and site plans for further description/information.

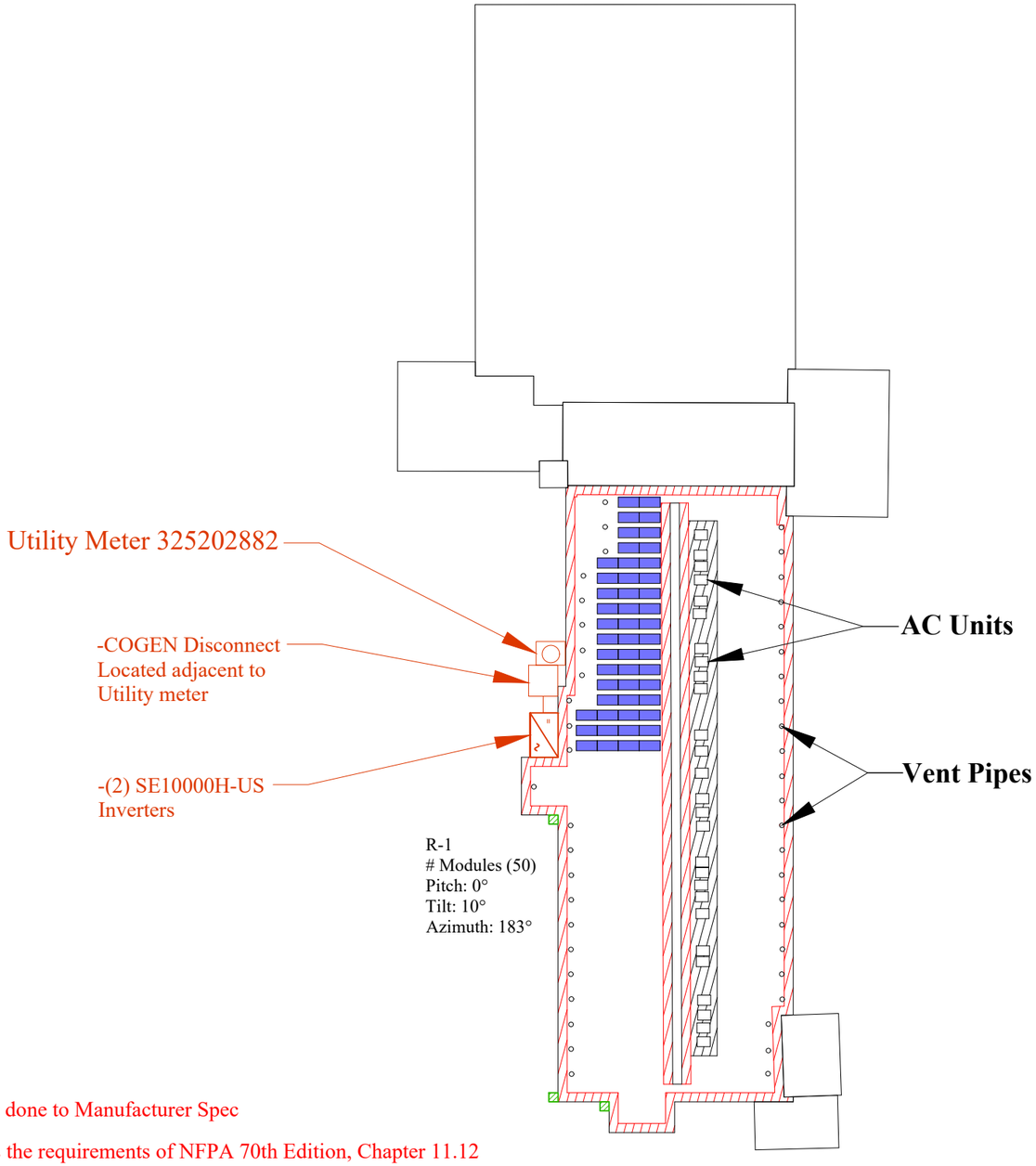


Inverter Type:	(2) SolarEdge SE10000H-US
PV Panel:	(50) ZXM6-NHLDD144-450W
Racking:	Unirac
Total Wattage:	22,500W DC
Roof Type:	EPDM
Wind Load:	0 to 10 Deg
Fastener Type:	Use Unirac Ecofoot 2+

Sheet Index

General Notes:
-(2) SolarEdge SE10000H-US Inverters located near utility meter
-SolarEdge P505 Optimizers are located on roof behind each module.
-First responder access maintained and from adjacent roof.
-Wire run from array to connection is 150 feet.

FRONT OF HOUSE



3'-5"
6'-10"

Layout Subject to Change Based on Site Conditions

Install will be done to Manufacturer Spec

System meets the requirements of NFPA 70th Edition, Chapter 11.12

Legend

- 3' / 1'-6" First responder access
- Ground Access
- Chimney
- Satellite
- Utility Meter
- Vent Pipe
- PV Disconnect
- SolarEdge Inverter

Meets All Editions of North Carolina Fire Prevention Code

3' Access Pathway

Represents all Fire Clearance including Alternative methods

1st Responder Access minimum of 36" unobstructed as per Section R324 of the 2018 IRC

Meets the requirements of the following- (2018 NC Residential Code & NBC, (2018 International Residential Code) - 2nd Printing modified by the NC Building Standards , 2018 International Energy Conservation Code, City of Raleigh Code, 2017 National Electric Code.)

Customer Info:

Cotton Mill HOA
614 Capital Blvd
Raleigh, NC
27603

Jeff Torres, P.E.
NCPE #048711
SunSmart Engineering LLC
925 Sunshine Lane, Suite #1010
Altamonte Springs, FL 32714
(407) 331-9077 - Ext 7001

Date:	5/16/2022
Drawn by:	KT
Revised by:	KT
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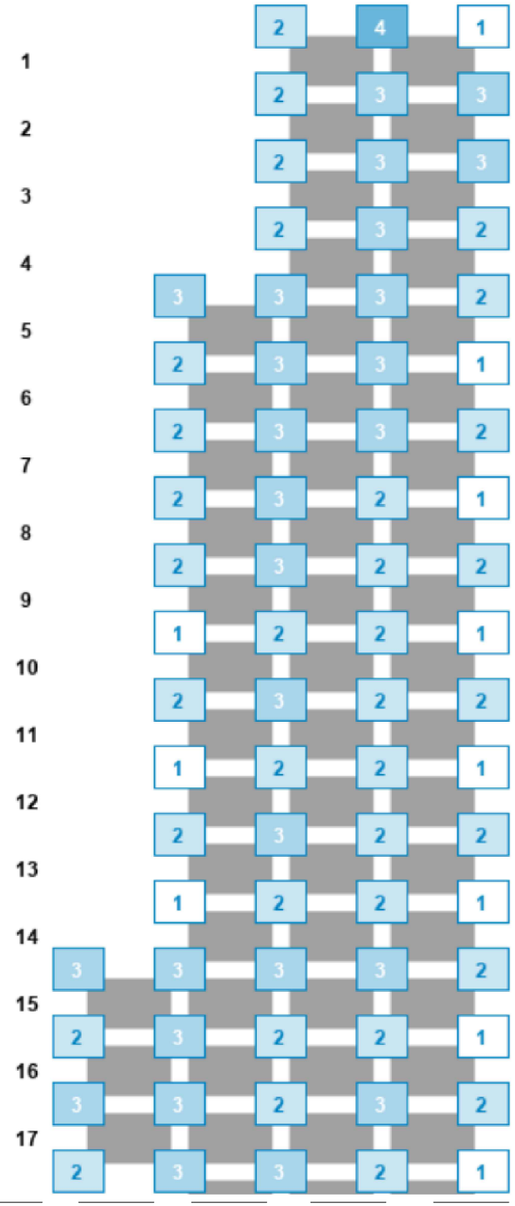
N

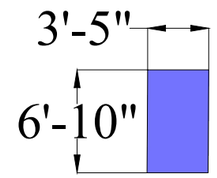
Compass for Aerial

Refer to Unirac BOM Report

50 ZXM6-NHLDD144-450W
50 SolarEdge SE10000H-US
1 200A Main Breaker
1 200A Fused Disconnect
2 125A Fuses
50 P505 Optimizer
1 125A Load Center
2 60A Breakers
2 SolarEdge SE10000H-US Inverters
1 6x6 J-Box
72 Unirac EcoFoot 2+ Base
161 30 lbs Full Blocks



R-1
Modules (50)
Pitch: 0°
Tilt: 10°
Azimuth: 183°



Plans satisfy zones NBC-1510.7.1
Install will be done to Manufacturer Spec

All modules are assumed to be exposed

EcoFoot 2+ System to be continuous with another system of 50 panels

Inverter Type:	(2) SolarEdge SE10000H-US
PV Panel:	(50) ZXM6-NHLDD144-450W
Racking:	Unirac
Total Wattage:	22,500W DC
Roof Type:	EPDM
Wind Load:	0 to 10 Deg
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COVENANT Solar & Roofing

Date:	5/16/2022
Drawn by:	KT
Revised **by:**	KT
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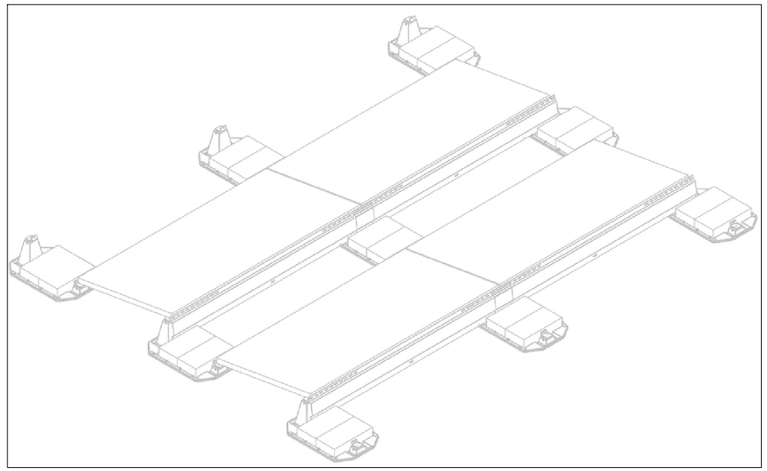
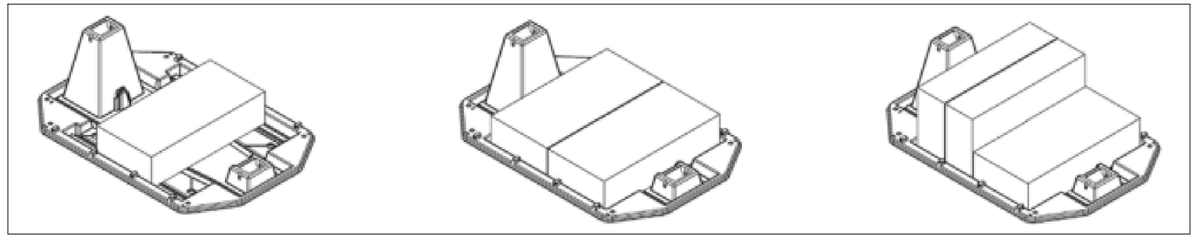
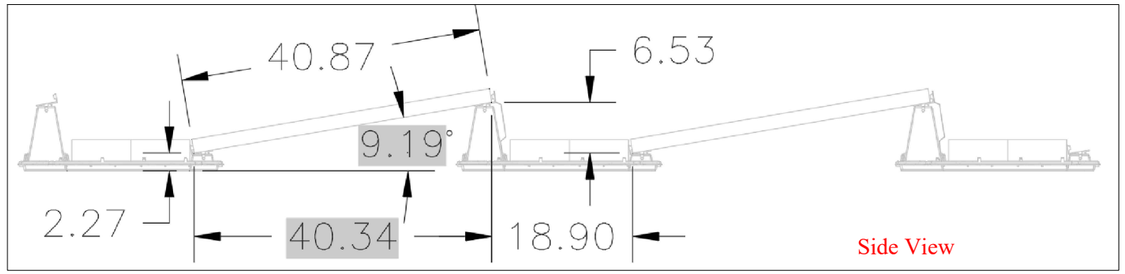
Unirac EcoFoot 2+

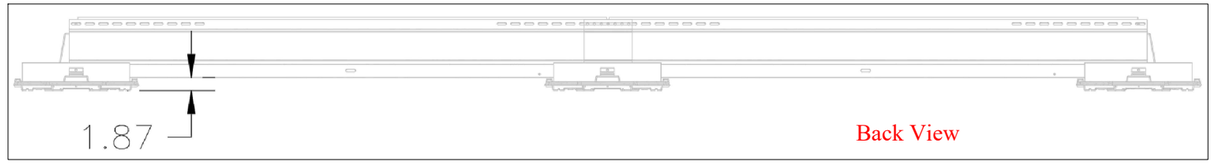


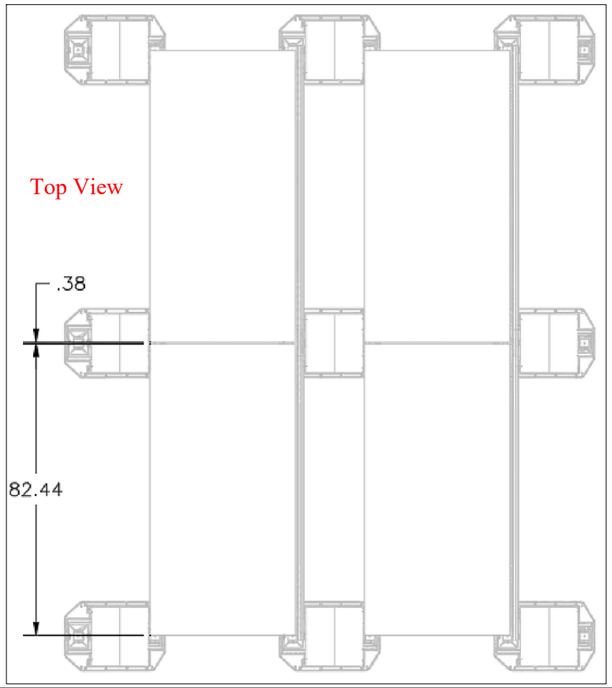
Block Configuration



Dimensions (in.)







Install will be done to Manufacturer Spec

General Notes:

-Unirac EcoFoot 2+ System is secured using (161) 30 lbs Full Blocks

-(72) EcoFoot 2+ Base with 18.9" N/S Module Spacing

-Unirac EcoFoot 2+ System to be continuous with another system of 50 panels on the same roof

Roof Section	Pitch	Roof Rafter Size & Spacing	Overhang	Notes:
R1	0/12	16"x16" @ 84" O.C	12"	

-Roof Height 50'
-Per 2018 NBC, the Roof Mounted PV System will be subject to the following design criteria: Design Wind Speed(Vult) - 120mph 3 sec gust, Exposure Category - B
-Designed as per ASCE7-16

Inverter Type:	(2) SolarEdge SE10000H-US
PV Panel:	(50) ZXM6-NHLDD144-450W
Racking:	Unirac
Total Wattage:	22,500W DC
Roof Type:	EPDM
Wind Load:	0 to 10 Deg
Fastener Type:	Use Unirac Ecofoot 2+

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COVENANT Solar & Roofing

Date:	5/16/2022
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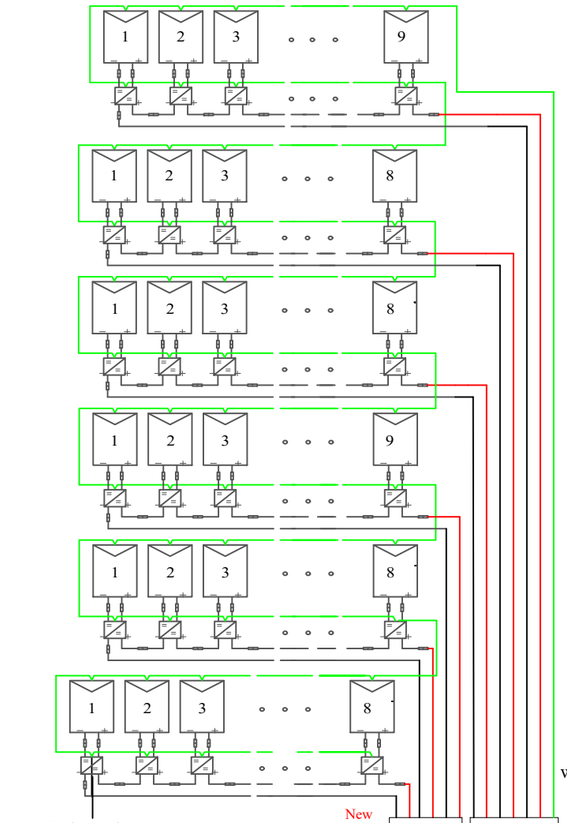


Equipment list
PV:
(50) ZXM6-NHLDD144-450W

(50) SolarEdge Power Optimizer P505
Inverter:
(1) SolarEdge SE10000H-US
(2) Strings of (8)
(1) String of (9)
(1) SolarEdge SE10000H-US
(2) Strings of (8)
(1) String of (9)

SolarEdge AC/DC Safety Switch

Combiner:
125A Load Center

AC Disconnect:
200A Disconnect

All wiring to meet the 2017 NEC and 2018 Energy Code

Inverter **1** Output Ckt	
To Overcurrent Protection Device	
AC Max Output Current	42
AC Max Output Current * 125%	52.5
Overcurrent Protection (A)	60
No. of Current Carrying Cond	<4
Conductor Gauge (AWG)	6
Inverter **2** Output Ckt	
AC Max Output Current	42
AC Max Output Current * 125%	52.5
Overcurrent Protection (A)	60
No. of Current Carrying Cond	<4
Conductor Gauge (AWG)	6
Combined Inverter Output Ckt	
AC Max Output Current	84
AC Max Output Current * 125%	105
Overcurrent Protection (A)	125
No. of Current Carrying Cond	<4
Conductor Gauge (AWG)	2

PHOTOVOLTAIC SYSTEM DC DISCONNECT
MAX CIRCUIT CURRENT: 27A
MAX POWER POINT VOLTAGE: 400 VDC
MAX SYSTEM VOLTAGE: 480 DC
MAX RATED OUTPUT CURRENT: 15 A
— Apply to DC disconnect/inverter 1

PHOTOVOLTAIC SYSTEM DC DISCONNECT
MAX CIRCUIT CURRENT: 27A
MAX POWER POINT VOLTAGE: 400 VDC
MAX SYSTEM VOLTAGE: 480 DC
MAX RATED OUTPUT CURRENT: 15 A
— Apply to DC disconnect/inverter 2

WARNING
ELECTRIC SHOCK HAZARD

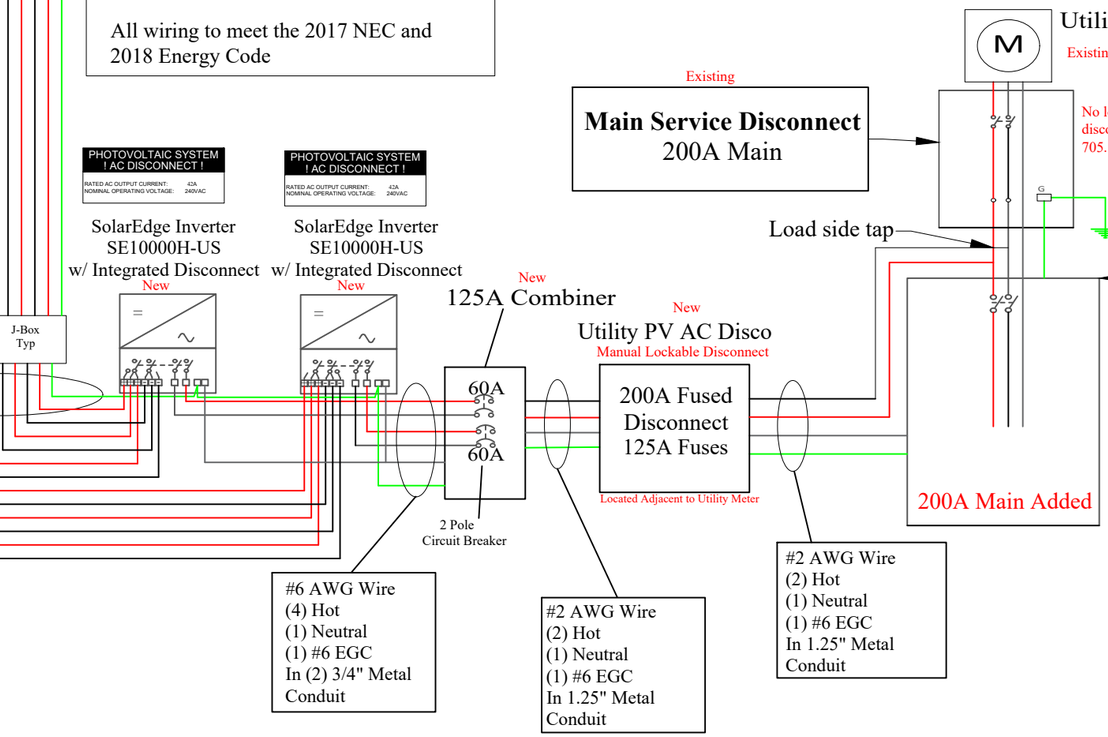
THE DC CONDUCTORS OF THIS PHOTOVOLTAIC SYSTEM ARE UNGROUNDED AND MAY BE ENERGIZED
— Apply to each J box, combiner box, disconnect,and device where energized, ungrounded circuits maybe exposed during service.

PHOTOVOLTAIC SYSTEM
! AC DISCONNECT !
RATED AC OUTPUT CURRENT: 42A
NOMINAL OPERATING VOLTAGE: 240VAC

SolarEdge Inverter
SE10000H-US
w/ Integrated Disconnect

PHOTOVOLTAIC SYSTEM
! AC DISCONNECT !
RATED AC OUTPUT CURRENT: 42A
NOMINAL OPERATING VOLTAGE: 240VAC

SolarEdge Inverter
SE10000H-US
w/ Integrated Disconnect



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Including the label below

In Case of Emergency Call
Covenant Solar &
Roofing at 732-371-2565

Meets 11.12.2.1.5

Note:
-All wiring to meet the 2017 NEC and North Carolina electric codes.
200A Disconnect
-Type of conduit to be determined on site by contractor.

Install will be done to Manufacturer Spec

GEC NOTES
- Ungrounded system per 690.41(A)(4)
- GEC must be installed per 250.64
- GEC must be continuous un-spliced or irreversibly spliced from inverter to existing service ground system or continuous from the arrays to the existing service ground system.
- GEC must be min #8 AWG and installed in conduit
- If GEC is not in conduit, it must be #6 min

Disconnects will be Visible, lockable, adjacent to and within 10' of utility meter
All Labels & Markings for photovoltaic system will be reflective and meet all requirements for NFPA 11.12

Customer Info:

Cotton Mill HOA
614 Capital Blvd
Raleigh, NC
27603

Date:	5/16/2022
Drawn by:	KT
Revised by:	KT
Rev #:	01
Rev Date:	07/25/2022
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Inverter Type:
SolarEdge SE10000H-US
PV Panel:
(50)
ZXM6-NHLDD144-450W
Total Wattage:
22,500W DC

The Placard shall be permanently riveted..., and shall be made of red, weatherproof, hard plastic, with engraved white block lettering.

-A placard will be added with instructions and locations to be in compliance with 690.12, 690.56(B) and NEC 705.10

Rapid Shutdown Built in Per Code NEC 690.12

In compliance with NEC 250.58, NEC 690.8, NEC 250.24, NEC250.24(D)

PV AC disconnect is lockable in the open position per code NEC 705.22(7)

Conductors have a min ampacity of 60 amperes Per Code NEC 230.79(D)

Everything will be built to Code without all Specifics labeled on plan

System is in complaince with FFPC 1:11.12 7th Edition.

Smoke Detectors will be added as per NBC 553.883

Markings shall be placed on all DC Conduits, DC Combiners, Raceways, Enclosures, Junction Boxes, and Cable Assemblies at every 10', turns, and above and below penetrations in compliance with NFPA

Disconnect means shall be provided for all disconnecting all ungrounded conductors that supply or pass through the building or structure Per Code **2017** NEC Section 225.31 & Section 225.32

E04. Construction documents specify PV system circuits installed on or in buildings include a rapid shutdown function that controls specific conductors in accordance with NEC article 690.12.

E05. These construction documents specify that a label is provided with the method to initiate rapid shut down per 690.12(4).

E06. Construction drawings specify buildings or structures with both utility service and a PV system, complying with NEC article 690.l2 shall have a permanent plaque or directory including the following wording: “PHOTO VOLTAIC SYSTEM EQUIPPED WITH RAPID SHUTDOWN” as per NEC article 690.56 (C).

E07. Construction documents specify PV power circuit labels shall appear on every section of the wiring system that is separated by enclosures, walls, partitions, ceilings, or floors.

E08. Construction documents specify all warning sign(s) or label(s) shall comply with NEC article 110.21 (B). Label warnings shall adequately warn of the hazard. Labels shall be permanently affixed to the equipment, and Labels required shall be suitable for the environment.

Inverter Output Ckt Per System To Overcurrent Protection Device		
Design Temperature(F)	94°F	
Max Amb Temp Range(F)	87-95	310.15(B)(2)(a)
Temp Rating of Conductors (C)	90°C	
Current Carrying	<4	310.15(B)(3)(a)
AC Max Output Current	84A	690.8(A)(3)
AC Max Output Current * 1.25%	105A	690.8(B)
Overcurrent Protection(A)	110A	
Amp Temp Correction Factor	0.96	310.15(B)(2)(a)
Raceway Fill adjustment Factor	100%	310.15(B)(3)(a)
Wire Size(Awg)	2	310.15(B)(16)
Cond. Allowable Ampacity(A)	130A	
Cond Adjusted Ampacity(A)	125A	130A*1*0.96=124.8A
Ampacity Check 1 Per 690.8(B)(1)	Pass	84A*1.25=110A<130A Pass
Ampacity Check 2 Per 690.8(B)(2)	Pass	130A*0.96A*1=124.8A>84A Pass

All Exterior equipment is A minimum of Nema-R3 Rated

All Interactive System(S) Points of interconnection with other sources shall be marked at an accesible location at the disconnecting means as a power source and with the rated ac output current and the nominal operating AC voltage. Per NEC 690.54

Disconnect is in compliance 230.72

Supply side disconnect adjacent to Msp

Over Current Protection Device is "Next size up" Based on Inverter Maximum Continuous Output Current Rating **2017** NEC 240.4(B)

-All new equipment located adjacent to Meter on exterior wall

Labels will be placed in the correct location Per Code NEC 690.56(B), 690.56(C), & 690.53

Smoke Alarms per F.S. 553.883

Include required label for metallic raceways and conduits to sheet E-1 per NEC article 690.31(G)(3).

Add required label to sheet E-1 per NEC article 705.10.

Include required label to sheet E-1 per NEC article 705.12(B)

Photovoltaic AC disconnect shall be capable of being locked in the open position per NEC article 705.22(6).

Photovoltaic AC Overcurrent protection shall be located within 10 feet of the point where conductors are connected to the service per NEC 705.31.

PV Source Ckt		
Distance above roof	½ in. -3 ½ in.	310.15(B)
Amb. Temp. Adder for Rooftops (°F)	40	
Design temperature (°F)	136.8	
Adjusted Temp. Range for Roof	132-140	310.15(B)(2)(a)
Temp. Rating of Conductor	90°C	
No. of Current Carrying Cond.	4-6	310.15(B)(3)(a)
Max Source Circuit Current	15	690.8(A)(5)
Max Source Circuit Current * 1.25%	18.8	690.8(B)(1)
Amb. Temp Correction Factor	0.71	310.15(B)(2)(a)
Raceway Fill Adjustment Factor	80%	310.15(B)(3)(a)
Cond. Gauge (AWG)	10	310.15(B)(16)
Cond. Allowable Ampacity (Amps)	40	
Cond. Adjusted Ampacity (Amps)	23	40*.71*.8=22.7

In compliance with 230.71

System meets the grounding requirements of NEC 690.43

DC to DC Converter Current Per String - 15A

In Case of Emergency Call Covenant Solar & Roofing at 732-371-2565

Apply to Main Disconnect

Permanent sticker added to disconnect

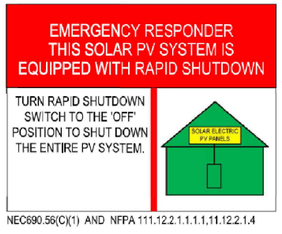
-All Electrical Service Equipment shall be located at or above BFE+1' or 8.00' NAVD

Load side tap will be done in existing Main Service Disconnect adjacent to Utility Meter

-Markings Shall Be reflective, Weather Resistant and suitable for the environment.
-Markings Shall be red with white lettering with minimum ⅜" Capital Letters

NEC 705.10 A permanent plaque or directory, denoting the location of all electric power source disconnecting means on or in the premises, shall be installed at each service equipment location and at the location(s) of the system disconnect(s) for all electric power production sources capable of being interconnected. One sign required for each PV system.

Plans Satisfy NEC 250.94 & NEC250.53(A)(2)



NEC690.56(C)(1) AND NFPA 111.12.2.1.1.1.1,11.12.2.1.4

NEC 690.35

Install will be done to Manufacturer Spec

Including the label below

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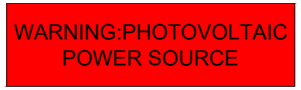
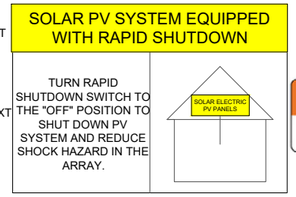


705.12(B)(3)

705.12(B)(2)(3)(b)

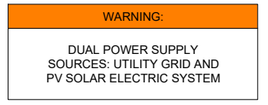
NEC 690.31 (G)(3)

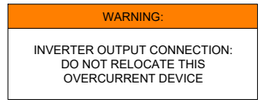
3/8 IN MIN. TEXT

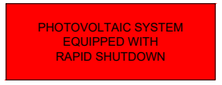


3/16 IN MIN. TEXT

Figure 690.56(C)(1)(a) Label for PV Systems that Shut down the array and the conductors leaving the array







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COVENANT Solar & Roofing

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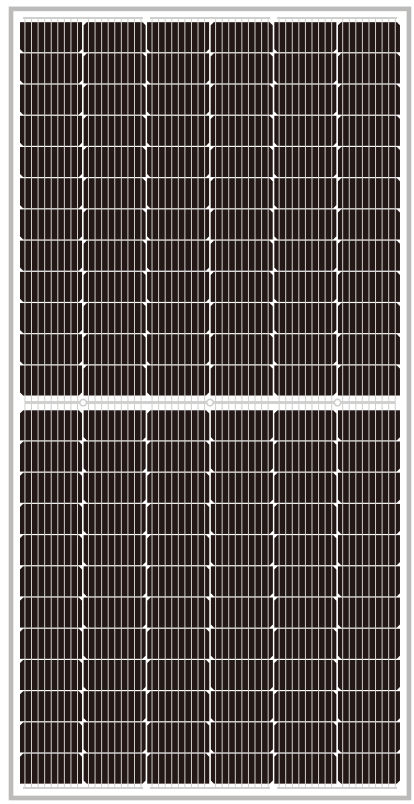
Inverter Type:
SolarEdge SE10000H-US
PV Panel:
(50)
ZXM6-NHLDD144-450W
Total Wattage:
22,500W DC

ZXM6-NHLDD144 Series

Znshinesolar 9BB HALF-CELL Bifacial Light-Weight
Double Glass Monocrystalline PERC PV Module

ZNSHINESOLAR

430W | 435W | 440W | 445W | 450W | 455W



Excellent cells efficiency

9BB technology decreases the distance between bus bars and finger grid line which is benefit to power increase.

Better Weak Illumination Response

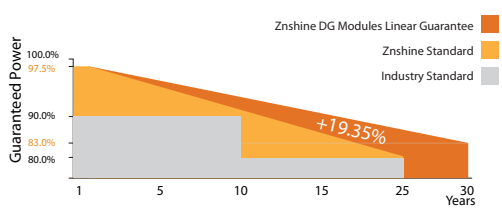
More power output in weak light condition, such as haze, cloudy, and morning

Anti PID

Limited power degradation caused by PID effect is guaranteed under strict testing condition for mass production

High wind and snow resistance

- 5400 Pa snow load
- 2400 Pa wind load



30 years power warranty

After 30 years our solar panel keeps at least 80% of its initial power output

12 years product guarantee
30 years output guarantee

Bifacial technology

Enables additional energy harvesting from rear side(up to 25%)

0.5% annual degradation over 30 years

Founded in 1988, ZNShine solar is a world's leading high-tech PV module manufacturer. With the state-of-the-art production lines, the company boasts module capacity of 6GW. Bloomberg has listed ZNShine as a global Tier 1 PV module maker. Today Znshine has distributed its sales to more than 60 countries around the globe.

www.znshinesolar.com

ZXM6-NHLDD144 Series

Znshinesolar 9BB HALF-CELL Bifacial Light-Weight Double Glass Monocrystalline PERC PV Module

ZNSHINESOLAR

ELECTRICAL CHARACTERISTICS | STC*

Nominal Power Watt Pmax(W)*	430	435	440	445	450	455
Power Output Tolerance Pmax(%)	0~+3	0~+3	0~+3	0~+3	0~+3	0~+3
Maximum Power Voltage Vmp(V)	41.30	41.50	41.70	41.90	42.10	42.30
Maximum Power Current Imp(A)	10.42	10.49	10.56	10.63	10.69	10.76
Open Circuit Voltage Voc(V)	49.70	49.90	50.10	50.30	50.50	50.70
Short Circuit Current Isc(A)	11.30	11.37	11.44	11.51	11.58	11.65
Module Efficiency (%)	19.78	20.01	20.24	20.47	20.70	20.93

*STC (Standard Test Condition): Irradiance 1000W/m², Module Temperature 25℃, AM 1.5
*Measuring tolerance: ±3%

ELECTRICAL CHARACTERISTICS | NMOT*

Maximum Power Pmax(Wp)	322.60	326.30	329.90	333.60	337.10	340.80
Maximum Power Voltage Vmpp(V)	37.90	38.00	38.20	38.40	38.60	38.70
Maximum Power Current Impp(A)	8.52	8.58	8.63	8.69	8.74	8.80
Open Circuit Voltage Voc(V)	46.40	46.60	46.80	46.90	47.10	47.30
Short Circuit Current Isc(A)	9.13	9.18	9.24	9.30	9.35	9.41

*NMOT(Nominal module operating temperature):Irradiance 800W/m²,Ambient Temperature 20℃,AM 1.5,Wind Speed 1m/s

ELECTRICAL CHARACTERISTICS WITH 25% REAR SIDE POWER GAIN

Front power Pmax/W	430	435	440	445	450	455
Total power Pmax/W	538	544	550	556	563	569
Vmp/V(Total)	41.40	41.60	41.80	42.00	42.20	42.40
Imp/A(Total)	13.00	13.08	13.16	13.24	13.33	13.41
Voc/V(Total)	49.80	50.00	50.20	50.40	50.60	50.80
Isc/A(Total)	13.65	13.73	13.81	13.89	14.44	14.52

MECHANICAL DATA

Solar cells	Mono PERC
Cells orientation	144 (6×24)
Module dimension	2094×1038×30 mm(With Frame)
Weight	28 kg
Glass	2.0 mm+2.0mm, High Transmission, AR Coated Heat Strengthened Glass
Junction box	IP 68, 3 diodes
Cables	4 mm² ,350 mm
Connectors	MC4-compatible

TEMPERATURE RATINGS

NMOT	44℃ ±2℃
Temperature coefficient of Pmax	-0.36%/℃
Temperature coefficient of Voc	-0.29%/℃
Temperature coefficient of Isc	0.05%/℃
Refer.Bifacial Factor	70±5%

WORKING CONDITIONS

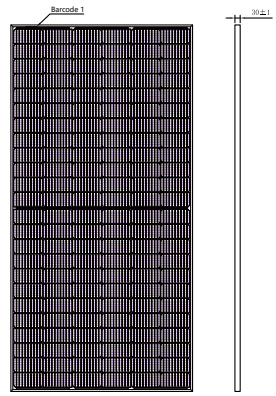
Maximum system voltage	1500 V DC
Operating temperature	-40℃~+85℃
Maximum series fuse	25 A
Maximum load(snow/wind)	5400 Pa / 2400 Pa

*Do not connect Fuse in Combiner Box with two or more strings in parallel connection
*Remark:Electrical data in this catalog do not refer to a single module and they are not part of the offer.They only serve for comparison among different module types.

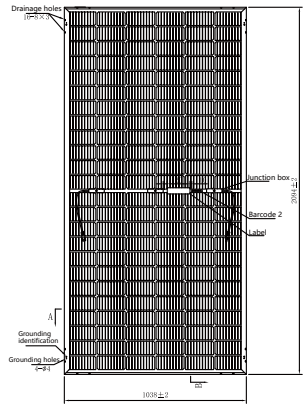
PACKAGING CONFIGURATION

Piece/Box	36
Piece/Container(40'HQ)	792
Piece/Container(with additional small package)	/

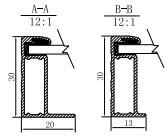
DIMENSIONS(MM)



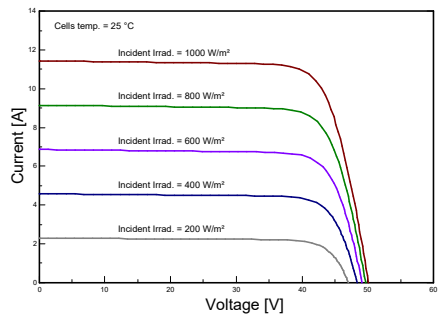
Front View



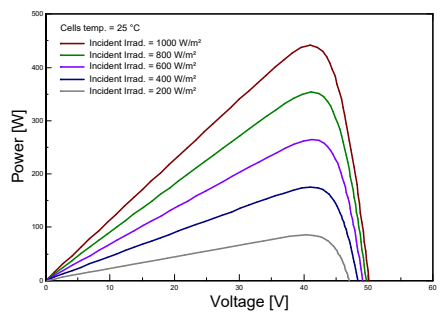
Back View



I-V CURVES OF PV MODULE(440W)



P-V CURVES OF PV MODULE(440W)



Add : 1#, Zhixi Industrial Zone, JintanJiangsu 213251, P.R. China Tel: +86 519 6822 0233 E-mail: info@znshinesolar.com

INVERTERS

Single Phase Inverter with HD-Wave Technology

for North America

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

12-25 YEAR WARRANTY

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)

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/ Single Phase Inverter with HD-Wave Technology

for North America

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

MODEL NUMBER	SE3000H-US	SE3800H-US	SE5000H-US	SE6000H-US	SE7600H-US	SE10000H-US	SE11400H-US	
APPLICABLE TO INVERTERS WITH PART NUMBER	SEXXXXH-XXXXXBXX4							
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
Power Factor	1, Adjustable - 0.85 to 0.85							
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	600kΩ Sensitivity							
Maximum Inverter Efficiency	99	99.2						%
CEC Weighted Efficiency	99						99 @ 240V 98.5 @ 208V	%
Nighttime Power Consumption	< 2.5							W

(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

Single Phase Inverter with HD-Wave Technology

for North America

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

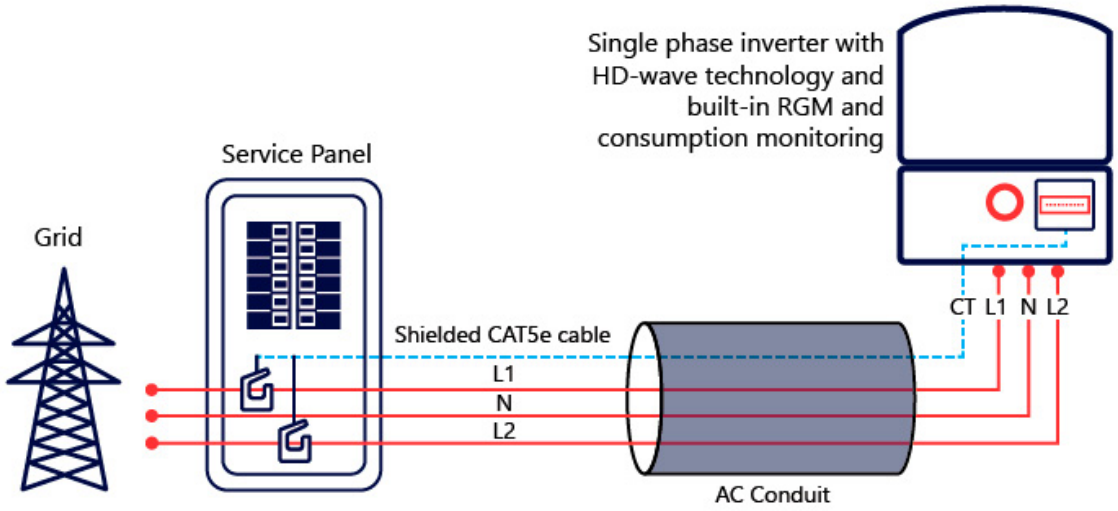
MODEL NUMBER	SE3000H-US	SE3800H-US	SE5000H-US	SE6000H-US	SE7600H-US	SE10000H-US	SE11400H-US	
ADDITIONAL FEATURES								
Supported Communication Interfaces	RS485, Ethernet, ZigBee (optional), Cellular (optional)							
Revenue Grade Metering, ANSI C12.20	Optional[3]							
Consumption metering								
Inverter Commissioning	With the SetApp mobile application using Built-in Wi-Fi Access Point for Local Connection							
Rapid Shutdown - NEC 2014, NEC 2017 and NEC 2020, 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	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	-40 to +140 / -40 to +60[4]							°F / °C
Protection Rating	NEMA 4X (Inverter with Safety Switch)							

(3) Inverter with Revenue Grade Meter P/N: SExxxxH-US000BNC4; Inverter with Revenue Grade Production and Consumption Meter P/N: SExxxxH-US000BNI4 . For consumption metering, current transformers should be ordered separately: SEACT0750-200NA-20 or SEACT0750-400NA-20. 20 units per box

(4) Full power up to at least 50°C / 122°F; for power de-rating information refer to: https://www.solaredge.com/sites/default/files/se-temperature-derating-note-na.pdf

How to Enable Consumption Monitoring

By simply wiring current transformers through the inverter's existing AC conduits and connecting them to the service panel, homeowners will gain full insight into their household energy usage helping them to avoid high electricity bills



RoHS

Power Optimizer

For North America

P370 / P400 / P401 / P485 / 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
- Meets NEC requirements for arc fault protection (AFCI) and Photovoltaic Rapid Shutdown System (PVRSS)
- Module-level voltage shutdown for installer and firefighter safety

solaredge

/ Power Optimizer

For North America

P370 / P400 / P401 / P485 / P505

Optimizer model (typical module compatibility)	P370 (for higher-power 60 and 72-cell modules)	P400 (for 72 & 96-cell modules)	P401 (for high power 60 and 72 cell modules)	P485 (for high-voltage modules)	P505 (for higher current modules)	
INPUT						
Rated Input DC Power[1]	370	400	430	485	505	W
Absolute Maximum Input Voltage (Voc at lowest temperature)	60	80	60	125[2]	83[2]	Vdc
MPPT Operating Range	8 - 60	8 - 80	8-60	12.5 - 105	12.5 - 83	Vdc
Maximum Short Circuit Current (Isc)	11	10.1	12.5	11	14	Adc
Maximum DC Input Current	13.75	12.5	14.65	12.5	17.5	
Maximum Efficiency	99.5					%
Weighted Efficiency	98.8					%
Overvoltage Category	II					
OUTPUT DURING OPERATION (POWER OPTIMIZER CONNECTED TO OPERATING SOLAREDGE INVERTER)						
Maximum Output Current	15					Adc
Maximum Output Voltage	60			80		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 Part 15 Class B, IEC61000-6-2, IEC61000-6-3					
Safety	IEC62109-1 (class II safety), UL1741, NEC/PVRSS					
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 153 x 29.5 / 5.1 x 6 x 1.16	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	655 / 1.5	845 / 1.9	1064 / 2.3	gr / lb
Input Connector	MC4[3]			MC4[3]	MC4[3]	
Input Wire Length	0.16 / 0.5					m / ft
Output Wire Type / Connector	Double Insulated / MC4					
Output Wire Length	1.2 / 3.9					m / ft
Operating Temperature Range[4]	-40 to +85 / -40 to +185					˚C / ˚F
Protection Rating	IP68 / Type6B					
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) Longer inputs wire lengths are available for use. For 0.9m input wire length order P401-xxxLxxx
(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: https://www.solaredge.com/sites/default/files/se-temperature-derating-note-na.pdf

PV System Design Using a SolarEdge Inverter[6][7]		Single Phase HD-Wave	Single phase	Three Phase for 208V grid	Three Phase for 277/480V grid	
Minimum String Length (Power Optimizers)	P370, P400, P401	8		10	18	
	P485, P505	6		8	14	
Maximum String Length (Power Optimizers)		25		25	50	
Maximum Power per String		5700[8] (6000 with SE7600-US - SE11400-US)	5250[8]	6000[9]	12750[10]	W
Parallel Strings of Different Lengths or Orientations		Yes				

(6) For detailed string sizing information refer to: http://www.solaredge.com/sites/default/files/string_sizing_na.pdf
(7) It is not allowed to mix P485/P505 with P370/P400/P401 in one string
(8) A string with more than 30 optimizers does not meet NEC rapid shutdown requirements; safety voltage will be above the 30V requirement
(9) 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
(10) For 277/480V grid: it is allowed to install up to 15,000W per string when the maximum power difference between each string is 2,000W

Intertek RoHS

UNIRAC

U-BUILDER PROJECT REPORT

VERSION: 3.1.6

PROJECT TITLE	PROJECT ID	CREATED
EcoFoot2+	7120FDA6	Aug. 19, 2022, 1:39 p.m.

NAME	Cotton Mill HOA
ADDRESS	614 Capital Blvd
CITY, STATE	Raleigh, NC
MODULE	Znshinesolar ZXM6-NHLDD144 -450

Designed by troyp@cedgreentechse.com

EcoFoot2+

Znshinesolar

100 - ZXM6-NHLDD144 -450

2339.24 ft^2

45.00 KW

NOTE: Installation of the project is intended to happen within the year of project designed in UBuilder. If it's past one year please rerun the design or contact Unirac Engineering Services.

BILL OF MATERIALS

LEGEND: Base System Part Accessory

PART NUMBER	PART TYPE	DESCRIPTION	QUANTITY	SUGGESTED QUANTITY	UNIT PRICE (USD)	TOTAL LIST PRICE (USD)
ES20142	Base	EcoFoot2+ Base with EPDM Slip Strips	139	139	33.60	4670.40
ES10466	Clamp	EcoFoot Universal Clamp Kit	134	134	19.75	2646.50
ES20311H	Wind Deflector	Ecofoot2+ 86" Wind Deflector	100	100	21.93	2193.00
008009P	Wire Management	Ilsco Lay in Lug	1	1	7.54	7.54
ES10378	Wire Management	38" Bonding Jumper	33	33	5.85	193.05
User Supplied	Ballast Block	BALLAST BLOCK	294	294	0.00	0.00

BASE SYSTEM PRICE	ACCESSORIES PRICE	TOTAL PRICE
$9710.49	$0.00	$9710.49
$0.216 PER WATT	$0.000 PER WATT	$0.216 PER WATT

This design is to be evaluated to the product appropriate Unirac Code Compliant Installation Manual which references International Building Code 2009, 2012, 2015, 2018 and ASCE 7-05, ASCE 7-10, ASCE 7-16 and California Building Code 2010, 2016. The installation of products related to this design is subject to requirements in the above mentioned installation manual.

DETAILED PARTS DESCRIPTION

QTY

Base ES20142 EcoFoot2+ Base with EPDM Slip Strips — 139

EcoFoot2+ Base with EPDM Slip Strips Supports Modules at 10° in Landscape, and 5° in Portrait.

Clamp ES10466 EcoFoot Universal Clamp Kit — 134

Upper and Lower Pre-assembled Universal Clamps for 32-50 mm modules. Includes 2 Clevis Pins.

Wind Deflector ES20311H Ecofoot2+ 86" Wind Deflector — 100

EcoFoot2+ 86" Wind Deflector for 72-Cell Landscape. G90 Galvanized Steel

Wire Management 008009P Ilsco Lay in Lug — 1

Bonds ground wire to racking or module frame.

Wire Management ES10378 38" Bonding Jumper — 33

Ecofoot 2+ only and is one per row minus one row per array

Ballast Block UserSupplied BALLAST BLOCK — 294

Standard 4x8x16 inch cap blocks. Nationwide availability. Please confirm the weight of your ballast block as this will affect the total blocks required for your installation.

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EcoFoot2+

Znshinesolar

100 - ZXM6-NHLDD144 -450

2339.24 ft^2

45.00 KW

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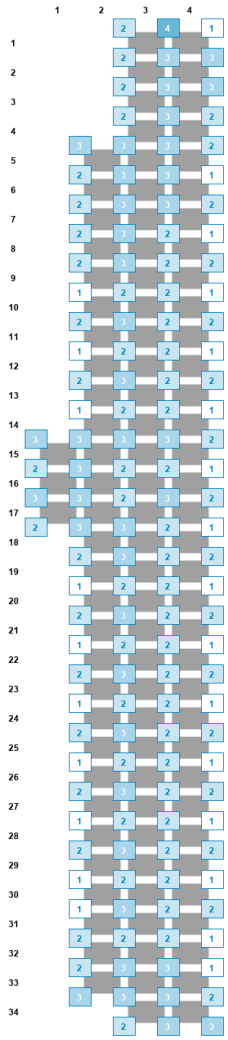
INSTALLATION AND DESIGN PLAN

Roof Area 1

Roof Area 1 / Roof Area 1 - Array 1



LEGEND

Module

1 Standard corner bay with CMU block count

4 Supplemental bay with CMU block count

NOTE

Blocks above with values greater than 3 require extra ballast bays, except north-most bays which require extra bays for values greater than 6. The proper number of bays are provided in the Bill of Materials. The installer must install these extra bays as near to the indicated location as possible.

Layout Dimensions

NS DIMENSION	~ 169.14 ft
EW DIMENSION	~ 27.69 ft

ROW	MODULES	BAYS	BALLAST BLOCKS (CMU)	BALLAST WEIGHT (LBS)
1	2	3	7	210
2	2	3	8	240
3	2	3	8	240
4	2	3	7	210
5	3	4	11	330
6	3	4	9	270
7	3	4	10	300
8	3	4	8	240
9	3	4	9	270
10	3	4	6	180
11	3	4	9	270
12	3	4	6	180
13	3	4	9	270
14	3	4	6	180
15	4	5	14	420
16	4	5	10	300
17	4	5	13	390
18	3	5	11	330
19	3	4	9	270
20	3	4	6	180
21	3	4	9	270
22	3	4	6	180
23	3	4	9	270
24	3	4	6	180
25	3	4	9	270
26	3	4	6	180
27	3	4	9	270
28	3	4	6	180

29	3	4	9	270
30	3	4	6	180
31	3	4	8	240
32	3	4	7	210
33	3	4	9	270
34	2	4	11	330
35	0	3	8	240

U-BUILDER PROJECT REPORT

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EcoFoot2+

Znshinesolar

100 - ZXM6-NHLDD144 -450

2339.24 ft^2

45.00 KW

NOTE: Installation of the project is intended to happen within the year of project designed in UBuilder. If it's past one year please rerun the design or contact Unirac Engineering Services.

ENGINEERING REPORT

Plan review

AVERAGE PSF	4.74 psf

TOTAL NUMBER OF MODULES	100
TOTAL KW	45.00 KW
TOTAL MODULE AREA	~3429 ft^2
TOTAL WEIGHT ON ROOF	16252 lbs
TOTAL RACKING WEIGHT	562 lbs
TOTAL MODULE WEIGHT	6172 lbs
TOTAL BALLAST WEIGHT	8820 lbs
TOTAL BALLAST BLOCK COUNT	294
MAX BAY LOAD (DEAD)	193 lbs
DEFLECTOR COUNT	100

Loads Used for Design

BUILDING CODE	ASCE 7-16
BASIC WIND SPEED	120.00 mph
GROUND SNOW LOAD	15.00 psf
SEISMIC (Ss)	0.117
ELEVATION	296.00 ft
WIND EXPOSURE	B
MRI	50
VELOCITY PRESSURE, QZ	25.09 psf

Loads Determined by Zip 27603

CITY, STATE	Raleigh, NC
BASIC WIND SPEED	106.00 mph
GROUND SNOW LOAD	15.00 psf

Inspection

PRODUCT	ECOFOOT2+
MODULE MANUFACTURER	Znshinesolar
MODEL	ZXM6-NHLDD144 -450
MODULE WATTS	450 watts
MODULE LENGTH	82.44"
MODULE WIDTH	40.86"
MODULE THICKNESS	1.18"
MODULE WEIGHT	61.72 lbs
BALLAST BLOCK (CMU) WEIGHT	30.0 lbs
MAX BLOCKS PER BAY NORTH ROW	6
MAX BLOCKS PER BAY(EXCEPT NORTH ROW)	3
BUILDING HEIGHT	50.00 ft
LONGEST BUILDING LENGTH	200.00 ft
SHORTEST BUILDING LENGTH	40.00 ft
ROOF TYPE	EPDM
PARAPET HEIGHT	>= 1 Array Height (> 11 inches)
SLIP SHEET	YES
ECOFOOT SURFACE	EPDM

Roof Area 1 - Array 1

AVERAGE PSF	4.74 psf

ROOF SLOPE:	0
TOTAL NUMBER OF MODULES:	100
TOTAL KW:	45.00 KW
TOTAL AREA:	3429 ft^2
TOTAL WEIGHT ON ROOF:	16252 lbs
RACKING WEIGHT:	562 lbs
TOTAL MODULE WEIGHT:	6172 lbs
BALLAST WEIGHT:	8820 lbs

MINIMUM SEISMIC SEPARATION (UNATTACHED ARRAYS) *	
ARRAY TO ARRAY:	12.0"
TO FIXED OBJECT ON ROOF:	24.0"
TO ROOF EDGE WITH QUALIFYING PARAPET:	24.0"
TO ROOF EDGE WITHOUT QUALIFYING PARAPET:	48.0"
MAX ARRAY (SEISMIC) (FOR UNATTACHED ARRAYS) *	
MAX NUMBER OF NORTH-SOUTH ROWS:	91
MAX NUMBER OF EAST-WEST COLUMNS:	149

*See ASCE 7-16 Section 13.6.12 for more details

UPLIFT

Ballast weight calculation for single selected module (row - 1, col - 3,Roof Area 1, Array 1) for Uplift

Uplift Gcp	-0.33
Obstruction Factor	1.00
Exposure Factor	1.00
Building Factor	1.11
Slope Adjustment Factor	1.00
Large Module Factor	1.00
Sub Array Factor	1.00
Modified Uplift Gcp	-0.37
Module Weight	61.72 lbs
Racking Weight	13.77 lbs
Uplift: 0.6*qh*Modified Gcp*Module area*cos(10)	127.01 lbs
Required Ballast : 0.6D = FV-0.6*(Module weight + Racking weight)	81.71 lbs
Ballast to be Provided : Required ballast/0.6	136.19 lbs

SLIDING

Ballast weight calculation for single selected module (row - 1, col - 3,Roof Area 1, Array 1) for Sliding

Drag Gcp	1.42
Uplift Gcp for Drag	0.61
Area Reduction Factor	0.15
Building Factor	1.11
Obstruction Factor	1.00
Exposure Factor	1.00
Large Module Factor	1.00
Modified Drag Gcp	0.24
Modified Uplift Gcp For Drag	0.10
Module Area	23.39 ft^2
Module Area for Drag	4.06 ft^2
Module Area for Uplift	23.04 ft^2
Roof Pitch	0°
Friction Coefficient	0.687
Weight on Module: module_weight + racking_weight_per_module	72.74 lbs
Drag Load on Module : (0.6 * Qz * (Modified Drag Gcp * Module area for drag * (1 / Friction coefficient) + Modified uplift Gcp for drag * Module area for uplift) - 0.6 * weight_on_module) * 1/0.6	23.74 lbs

SLIDING CONDITION FOR THE ARRAY

Total Ballast Required for Sliding	2603.57 lbs
Total Ballast Required for Uplift	8820.00 lbs
No Additional Ballast Required for sliding	

EcoFoot2+ WIND DESIGN DETAIL

Velocity Pressure Exposure Coefficient, Kz	0.81	Table 26.10-1 (ASCE 7-16)
Ground Elevation Factor, Ke	0.99	Section 26.9 (ASCE 7-16)
Wind Directionality Factor, Kd	0.85	Table 26.6-1 (ASCE 7-16)
Topographic Factor, Kzt	1.00	Section 26.8.2 (ASCE 7-16)
MRI Factor, Fc	1.00	
Numerical Coefficient	0.002555	Section 26.10.2 (ASCE 7-16)
Velocity Pressure, qz	25.09 psf	Section 26.10.2 (ASCE 7-16)

EcoFoot2+ U-BUILDER PRODUCT ASSUMPTIONS

EcoFoot2+ – Ballasted Flat Roof Systems

Limitations of Responsibility: It is the user's responsibility to ensure that inputs are correct for your specific project.
Unirac is not the solar, electrical, or building engineer of record and is not responsible for the solar, electrical, or building design for this project.

Building Assumptions

1. Roof Slope ≥ 0° (0:12) and ≤ 3° (5/8:12) for Seismic Design Category C, D, E and F. For low seismic regions Seismic Design Category A and B (provided Array Importance factor = 1.0), Roof Slope ≥ 0° (0:12) and ≤ 7° (1 1/2:12).
2. Roofing Material Types: Mineral Cap EDPM, PVC, TPO, or Tar & Gravel
3. Surrounding Building Grade: Level

Ballast Blocks

The installer is responsible for procuring the ballast blocks (Concrete Masonry Units – CMU) and verifying the required minimum weight needed for this design. CMU should comply with ASM standard specification for concrete roof pavers designation (C1491 or C90 with an integral water repellent suitable for the climate it is placed. It is recommended that the blocks are inspected periodically for any signs of degradation. If degradation of the block is observed, the block should immediately be replaced.
The CMU ballast block should have nominal dimensions of 4"x8"x16". The actual block dimensions are 3/8" less than the nominal dimensions. Ballast blocks should have a weight as specified for the project in the "Inspection" section of this report.

Design Parameters

1. Risk Category II
2. Wind Design
    a. Basic Wind Speed: 85-180 mph (ASCE 7-10)/85-180 mph (ASCE 7-16)
    b. Exposure: B, C or D (ASCE 7-10/ASCE 7-16)
    c. 25year Design Life/50year Design Life for ASCE 7-10, 50year Design Life for ASCE 7-16.
    d. Elevation: Insertion of the project at - grade elevation can result in a reduction of wind pressure. If your project is in a special case study region or in an area where wind studies have been performed, please verify with your jurisdiction to ensure that elevation effects have not already been factored into the wind speed. If elevation effects have been included in your wind speed, please select 0 ft as the project site elevation.
    e. Wind Tunnel Testing: Wind tunnel testing coefficients have been utilized for design of the system.
3. Snow Design
    a. Ground Snow Load: 0-60psf (ASCE 7-10/ASCE 7-16)
    b. Exposure Factor: 0.9
    c. Thermal Factor: 1.2
    d. Roof Snow Load: Calculation per Section 7.3 (ASCE 7-10/ASCE 7-16)
    e. Unbalanced/Drifting/Sliding: Results are based on the uniform snow loading and do not consider unbalanced, drifting, and sliding conditions
4. Seismic Design
    a. Report *SEAOC PV1-2012/ASCE 7-16 SECTION 13.6.12 – Structural Seismic Requirements and Commentary for Rooftop Solar Photovoltaic Arrays*
    b. Seismic Site Class: A, B, C, or D (ASCE 7-10/ASCE 7-16)
    c. Importance Factor Array (Ip): 1.0
    d. Importance Factor Building (Ie): 1.0
    e. Site Class: D

Properties

1. Bay Weight: ~4.04 lbs
2. Module Gaps (E/W) = 0.5 in
3. Bays: North row bays overhang the module by ~22.5 inches.

Testing

1. Coefficient of Friction
2. Wind Tunnel
3. UL 2703
4. Component Testing (Bay and Clamp)

Setbacks

For the wind tunnel recommendations in U-Builder to apply, the following setbacks should be observed/followed for U-Builder wind design:

1. Modules should be placed a minimum of 3 feet from the edge of the building in any direction and maximum setback distance is 0.5 * building height.
2. If the array is located near an obstruction that is 3.5 feet wide and 3.5 feet high or larger, the nearest module of the array must be located a distance from the obstruction that is greater than or equal to the height of the obstruction. Exception: When using ASCE 7-16 Building Code and using the obstruction feature in the module editor to accurately model the size and location of obstruction.
3. Installations within the setbacks listed above require site specific engineering[2]
4. The setbacks above are for wind. High seismic areas, fire access isles, mechanical equipment, etc., may require larger setbacks than listed above for wind.

Site Specific Engineering

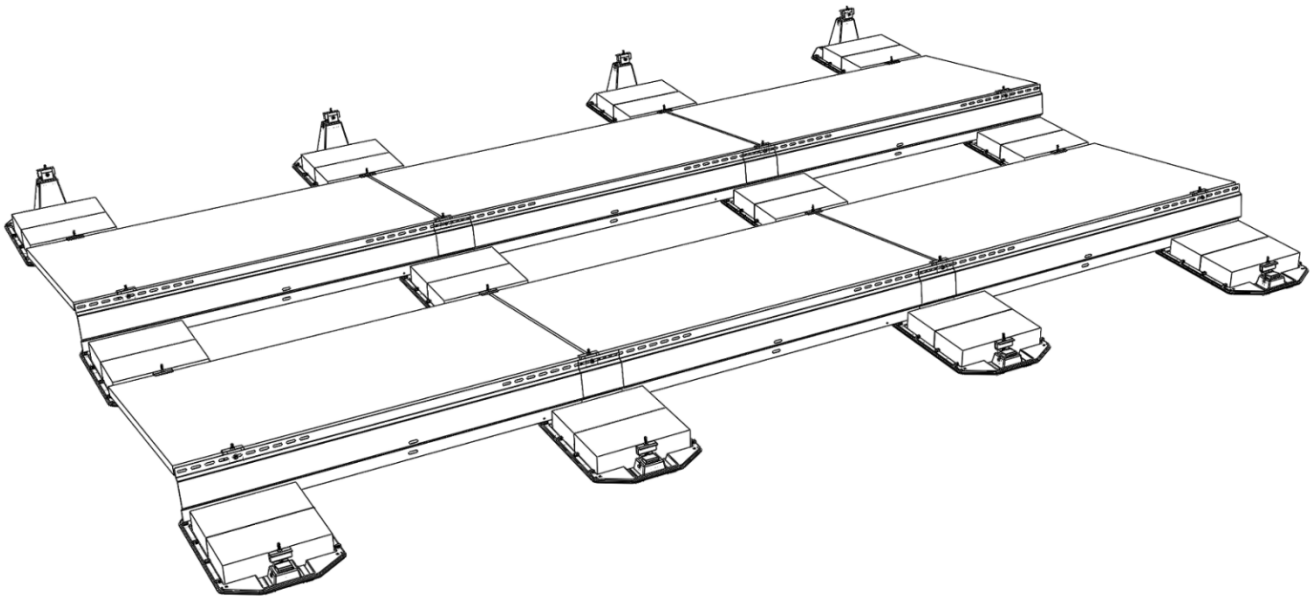
Conditions listed below are beyond the current capabilities of U-Builder. Site specific engineering is required.

1. Wind designs for a project design life exceeding 25 years[1]/ASCE 7-16
2. Building assumptions and design parameters outside of U-Builder assumptions[2]
3. Attachments[2]
4. Risk Category III or IV projects (U-Builder can be adjusted for the correct wind, but not the seismic or snow design)[2]
5. Wind tunnel testing reduction factors are not permitted by the Authority Having Jurisdiction (AHJ)[3]
6. Seismic designs that fall outside SEAOC PV1-2012/ASCE 7-16 SECTION 13.6.12 recommendations (>3% roof slope, or AHJ's that require shake table testing or non-linear site-specific response history analysis)[3]
7. Signed and sealed site-specific calculations, layouts, and drawings[3]

Notes:

[1]Please contact info@unirac.com.
[2] Please contact EngineeringServices@unirac.com for more information.
[3]Please contact Theresa Allen with PZSE Structural Engineers at theresa@pzse.com. These items will require direct coordination with PZSE to complete the requested services.

EcoFoot2+®



Installation Guide

EcoFoot2+® 10-Degree Ballasted Racking System

Document No. ECO-002_850

Rev 1.7, January 2020

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Revision History

Revision	Description of Changes	Date
1.0	Initial EcoFoot2+ Release	2014-August-18
1.1	Updated for UL1703	2014-November-25
1.2	Module Removal Addendum	2015-January-08
1.3	Updated for UL2703	2017-January-10
1.4	Updated for Compatible Modules and Reformatting	2017-April-13
1.5	Updated for Grounding Method, Product Logo and Trademark Notice	2017-May-24
1.6	Updated UL2703 Fire Rating language Mid-Support Span Addendum B Added Ground Path Addendum C Added	2018-January-05
1.7	Update UL2703 Stamp	2020-January-27

Table of Contents – EcoFoot2+ Install Guide

Field Support Contact Information

Ecolibrium Solar proudly offers dedicated engineering expertise and superior customer support. For questions about the installation procedures or a specific application, please contact our Field Support Specialists at 866-488-6794 or FieldSupport@EcolibriumSolar.com.

Installer Responsibility

The installer is solely responsible for:

- Utilizing all necessary safety equipment, as required by applicable rules and regulations.
- Complying with all applicable local and national building codes, including any that may supersede this manual.
- Ensuring that Ecolibrium Solar® EcoFoot2+® and other products are appropriate for the specific installation and are designed for the installation environment.
- Ensuring that the roof, its rafters, connections, and other structural support members can support the array under all conditions.
- Maintaining the waterproof integrity of the roof including selection of appropriate flashing if the system is being installed using attachments.
- Ensuring safe installation of all electrical aspects of the entire system

Legal Notices

Disclaimer of Liability

ECOLIBRIUM SOLAR® does not assume responsibility and expressly disclaims liability for loss, damage, or expense arising out of, or in any way connected with installation, operation, use, or maintenance by using this manual.

ECOLIBRIUM SOLAR assumes no responsibility for any infringement of patents or other rights of third parties, which may result from use of modules. No license is granted by implication or under any patent or patent rights. The information in this manual is believed to be reliable, but does not constitute an expressed and/or implied warranty.

ECOLIBRIUM SOLAR reserves the right to make changes to the product, specifications, data sheets and this manual without prior notice. This document is not prescriptive regarding safety and does not purport to address all the safety concerns that may arise with its use. Contractors should become familiar with all applicable safety, health, and regulatory requirements before beginning work.

Unauthorized field modification of ECOLIBRIUM SOLAR components or assemblies may affect ECOLIBRIUM SOLAR warranty coverage. Provide written drawings for ECOLIBRIUM SOLAR's review, comment and approval prior to attempting any field modifications.

Warnings & Safety

Both electrical and roofing knowledge are required to correctly and safely install a solar photovoltaic system. Only qualified and certified installation professionals should install EcoFoot2+. Failure to follow the methods and procedures outlined in this guide may result in injury and/or damage to property.

Carefully read this guide before starting any work. Store a copy of this guide on the job site at all times and contact Ecolibrium Solar with any installation questions related to EcoFoot2+.

Please note the following warnings when installing EcoFoot2+:

- EcoFoot2+ components fit together tightly and could cause pinch injuries.
- EcoFoot2+ components may be hot to the touch if left in the sun.

Please follow the safety requirements below when installing EcoFoot2+:

- Always keep children and unauthorized people away from work areas.
- Always wear required OSHA approved Personal Protective Equipment (PPE).
- Always use insulated tools when working with or near electrical systems.
- Always provide OSHA approved fall protection for all installation personnel.
- Never wear jewelry during mechanical and electrical installation work.
- Never work in rain, snow or extremely windy conditions.
- Never leave a module unsupported or unsecured on the roof.
- Never install broken photovoltaic modules.
- Never use photovoltaic modules as a work surface.

EcoFoot2+ General Application Notes

Site-Specific System Design: Ecolibrium Solar provides drafting services on all EcoFoot2+ projects. This service produces a site-specific design package with an Engineered Stamped Layout including detailed ballast plan and bill of materials.

Roof Type: EcoFoot2+ is designed to mount photovoltaic modules to a range of roof surfaces, including: EPDM, TPO, PVC, Mineral Cap Sheet (a.k.a. Rolled Asphalt), Tar and Gravel.

Roof Slope Range: 0-7 degrees maximum, 3-degree limit for unattached seismic.

Wind Zone: EcoFoot2+ is designed to mount photovoltaic modules on flat roof surfaces with a maximum pitch of 7 degrees in areas with extreme wind conditions. Please contact Ecolibrium Solar for clarification or assistance.

***Installation Requirements*:** EcoFoot2+ is ballasted photovoltaic racking designed as a system which requires all EcoFoot2+ components, the specific module, and ballast placement prescribed in the PE stamped design. The absence of any of these elements in any given sub-array could present a compromised condition on the roof. Arrays shall not be left unattended in such a state during an installation.

This install guide officially documents the components used and proper methods for an EcoFoot2+ installation. Bonding elements are incorporated into EcoFoot2+ components. As the system is built on the roof, components and modules are bonded together. Specific steps to ensure a bonded system are described through the installation guide. It is the installer's responsibility to ensure that the system is safely and properly installed, and that the system is bonded back to a final ground point.

When wiring the array, keep bare copper from contacting bare aluminum.

Thermal and Seismic Design Requirements: EcoFoot2+ is a flexible and expandable design that accommodates various array geometries.
Maximum widths for arrays are as follows:

- 60-cell modules, 26 modules in a row
- 72-cell modules, 22 modules in a row

Minimum spacing between sub-arrays is 6". Site specifics may further limit array sizes and spacing.

Re-Inspection: Ecolibrium recommends periodic re-inspection of the installation for loose components, loose fasteners, and any corrosion, such that if found, the affected components are to be immediately replaced.

Compatible Modules: Ecolibrium Solar has evaluated many photovoltaic modules for installation compatibility with the EcoFoot 2+ 10-degree racking system. A list of compatible modules may be found in "EcoFoot2+ Install Guide Appendix - Compatible Modules.pdf" on our website: www.ecolibriumsolar.com

UL2703 Qualification: In cases where UL 2703 certification is required, the EcoFoot2+ system conforms to the UL2703 Standard for grounding and bonding and fire ratings. The EcoFoot2+ system may be used to ground and/or mount a PV module complying with UL1703 only when the specific module has been evaluated for grounding and /or mounting in compliance with the included instructions.

EcoFoot2+ Racking maintains a Class A fire rating when installed in landscape orientation according to the installation instructions, on a low slope roof Class A roof with Type 1 and Type 2 modules.

Further information about Ecolibrium Solar's UL2703 Listing, including module load ratings may be found in "EcoFoot2+ Install Guide Appendix - UL2703 Qualification.pdf" at www.ecolibriumsolar.com.

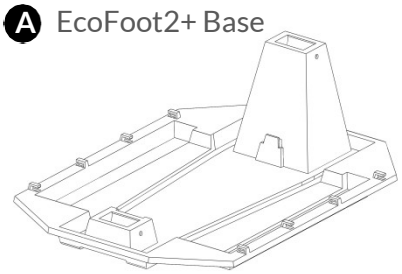
UL2703 System Label: The label shown below is stamped into to the Wind Deflector (identified as component 5 in the installation guide).

*The Date Code **ABCYZZ** shown above will appear on production parts, letters defined as follows:*

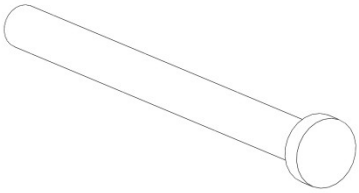
- *ABC shall be an acronym for identifying the source factory*
- *Y shall be the Quarter of the year (i.e. 1, 2, 3, 4) of manufacture*
- *ZZ shall be the last 2 digits of the year of manufacture*

EcoFoot2+® Core Components

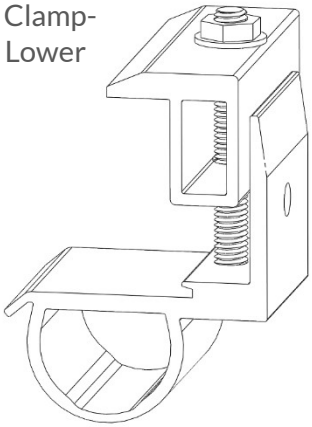
A EcoFoot2+ Base



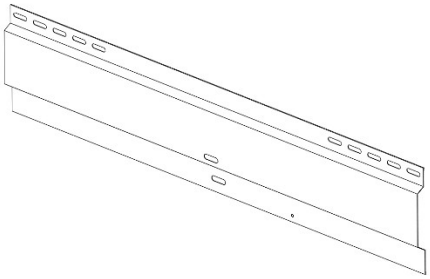
D Clevis Pin



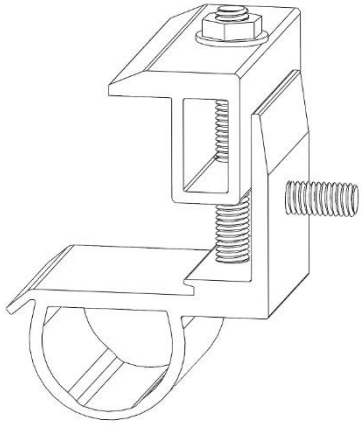
B Clamp-Lower



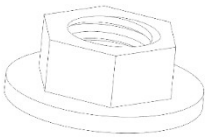
E Deflector



C Clamp-Upper



F Nut



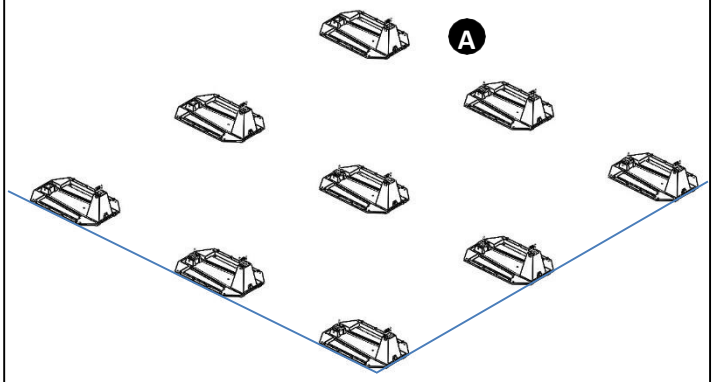
1 Chalk lines on roof denoting two outside edges of the EcoFoot2+® according to project drawing. Place EcoFoot2+® Bases (A) in position.

Tip: Ensure lines are square using 3-4-5 principle.

Tip: As you build the array, panels will space Bases. Roughly place a few rows of Bases at a time so that they are within reach of final location.

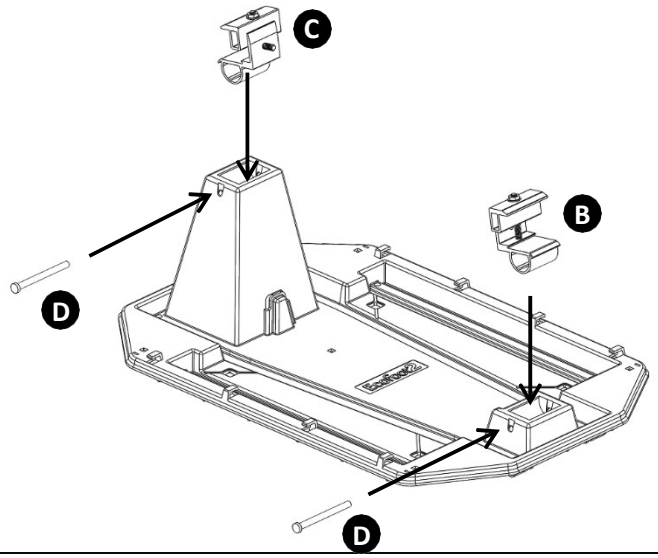
Tip: If installation requires 2 blocks or fewer on the north row, north row Bases can be turned around 180 degrees and tucked under the panel.

Tip: If installation requires butyl, then butyl will be preinstalled on the bottom of the Base with protective tape. Ensure these butyl components are placed where specified in project drawing. Remove protective tape after step 6.

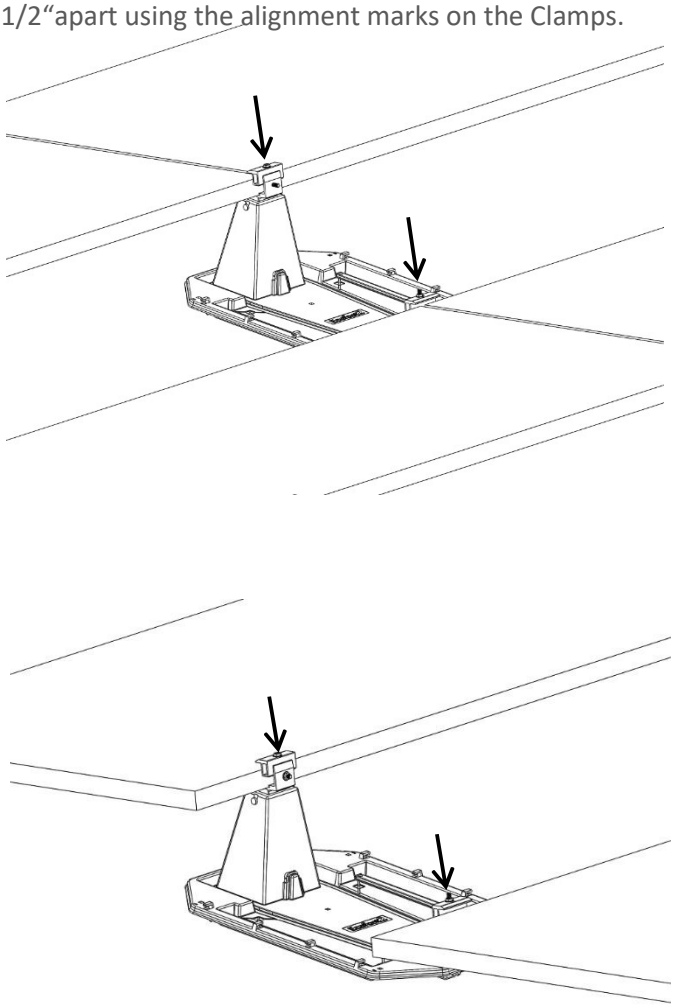


2 Place Lower Clamp (B) and Upper Clamp (C) into EcoFoot2+ Base (A) as shown. Push Clevis Pin (D) completely into EcoFoot2+® Base(A) to secure Rocker.

Tip: Only install Clamps where modules will rest. Refer to diagram below for correct placement and orientation of Clamps.



3 Place module onto EcoFoot2+® Base (A). Using a 1/2" deep socket, torque Nuts (F) to 14 ft-lbs. Space modules 1/2“apart using the alignment marks on the Clamps.

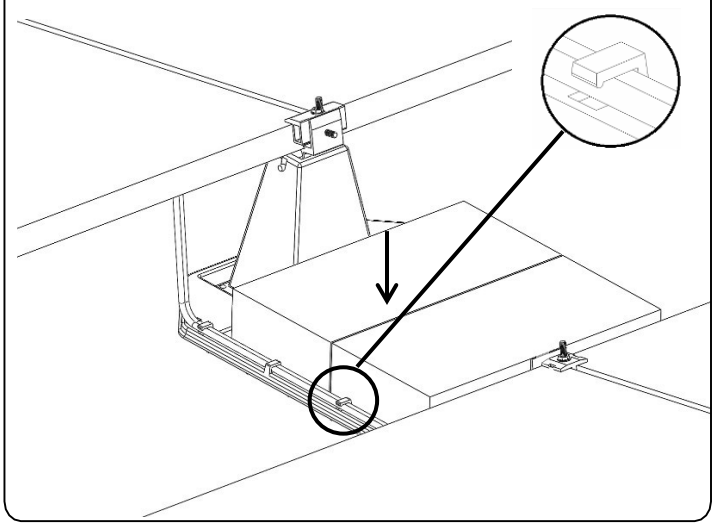


4. Place Ballast (not included) as required per PE Certified Ballast Plan provided.

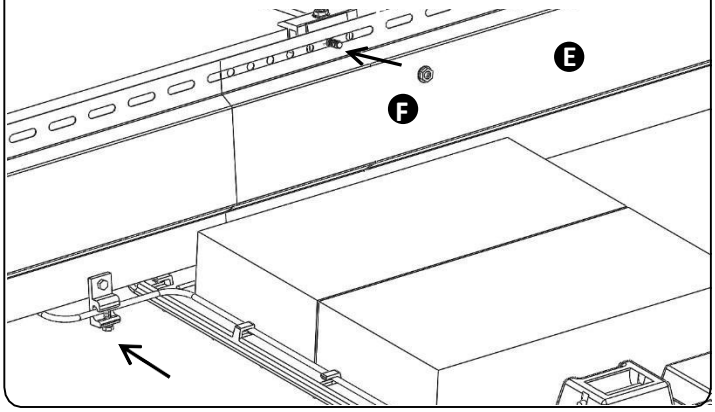
Tip: See note below for ballast block placement. In freeze/thaw environments, use concrete block with minimum compressive strength of 3,000psi (ref ASTM C1491-03 Standard Specifications for Concrete Roof Pavers).

5. Route, connect and secure conductors.

Tip: Wire clips attached to the module flange (not included) can be used to dress conductors in a row of modules. Integrated snap features in the Base can be used to dress conductors bridging rows.



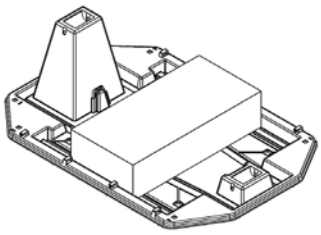
6. Place Deflectors (E) into slot on EcoFoot2+® Base and attach to Rocker using Nut (F) provided. Using a 1/2" deep socket, torque Nut (F) to 14 ft-lbs. Application of anti-seize on threaded post is recommended.
7. EcoFoot2+ is listed to carry module-to-module ground bond through the wind deflector. Each row of modules/wind deflectors must be grounded per the NEC and ANSI/NFPA 70 as described in Addendum C of this Install Guide. See Addendum C for requirements and Ground and Bond Path.



EcoFoot2+® Ballast Block Placement

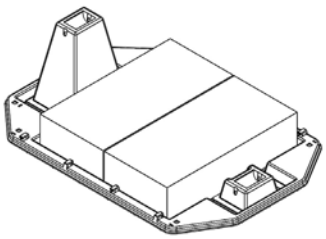
One Block

When using a single ballast block, lay the block flat in the center of EcoFoot2+ Base tray.



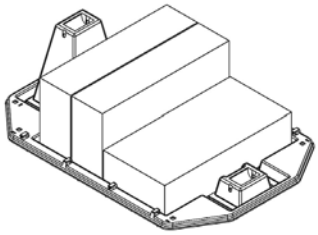
Two Blocks

When using two ballast blocks, lay the blocks flat in the EcoFoot2+ Base tray.

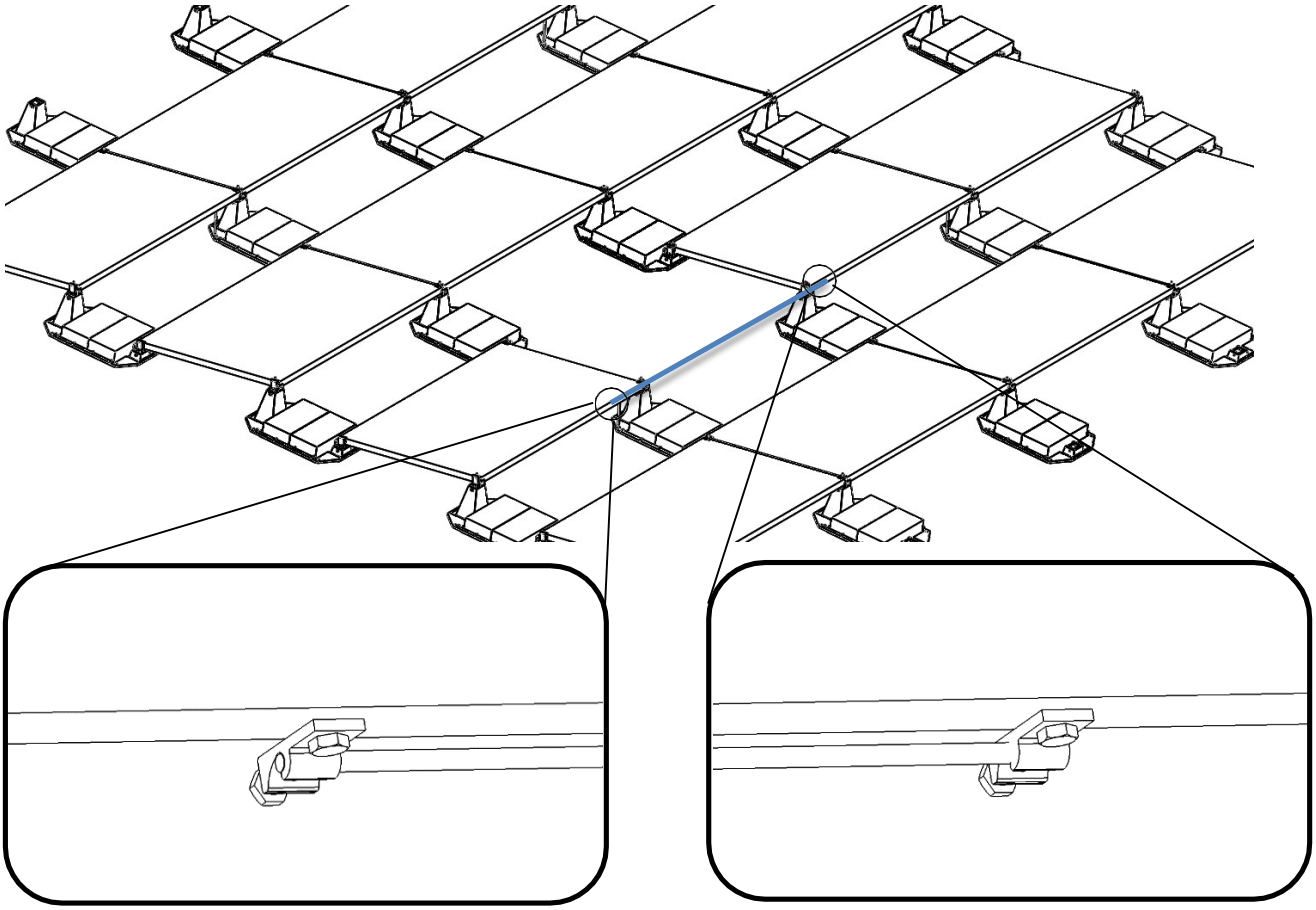


Three Blocks

When placing three ballast blocks in the EcoFoot2+ Base tray, lay one block flat and two on the long edge. This configuration helps to prevent blocks from becoming dislodged accidentally.



ADDENDUM A Module Removal



Note: If a module is to be removed from an array, the following steps must be taken.

a) **Determine module to be removed**
Identify and mark the module to be removed.

b) **Install ground lug on adjacent modules**
Install a WEEB Lug 6.7 on both modules adjacent to the module to be removed. Utilize the grounding hole on the frame of the module.

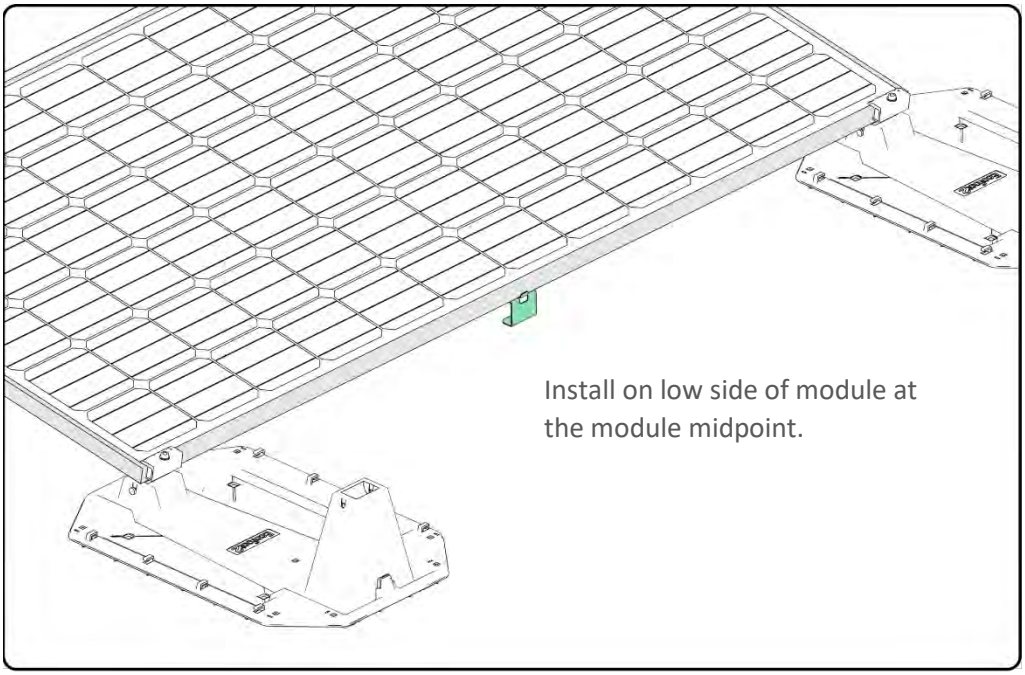
c) **Connect Bonding Jumper**
Lay a bare #6 CU conductor into the two lay in lugs connected to the adjacent modules. Tighten lay-in lug terminal screw onto the conductor and torque to 7 ft- lbs.

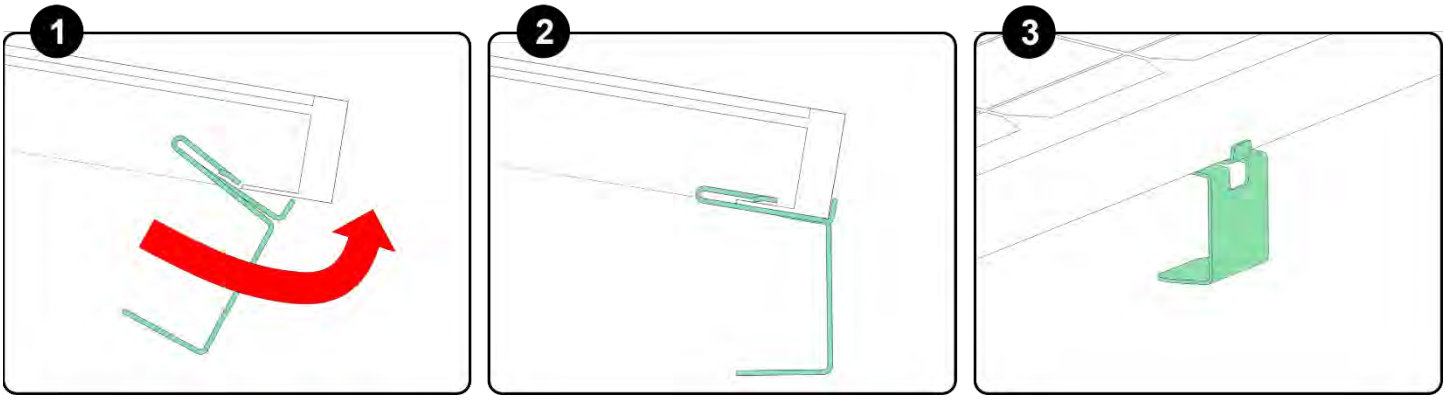
When wiring the array, keep bare copper from contacting bare aluminum.

ADDENDUM B Universal Support Brackets Installation

Universal Mid Support Brackets are a non-standard item and only used in heavy load conditions with light-duty panels. The design team at Ecolibrium Solar will indicate use when required.

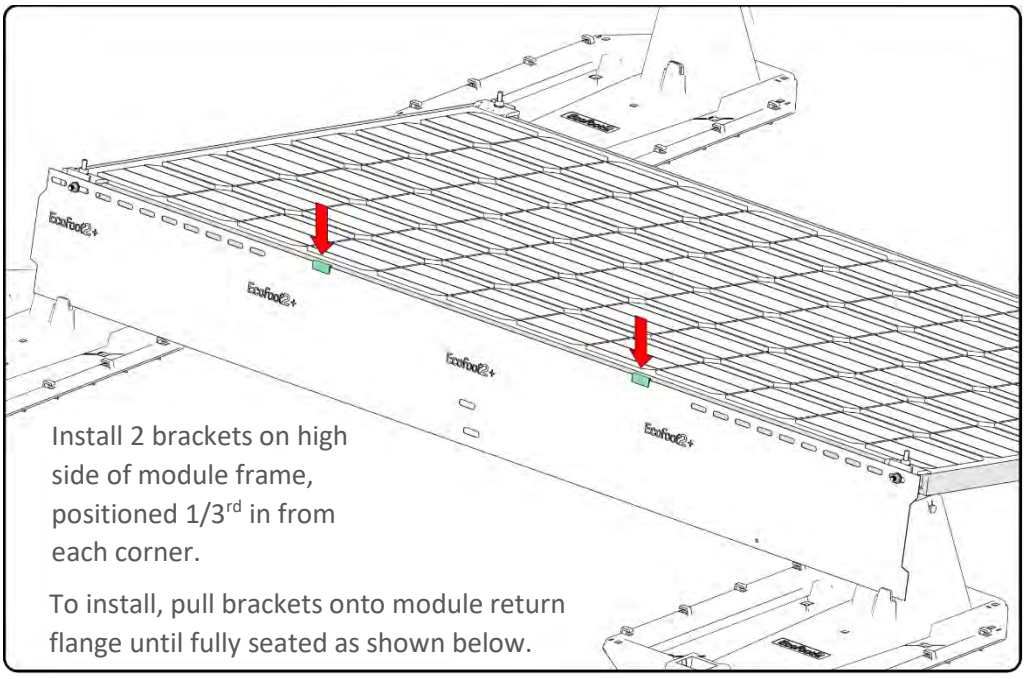
Installing Lower Universal Mid-Support

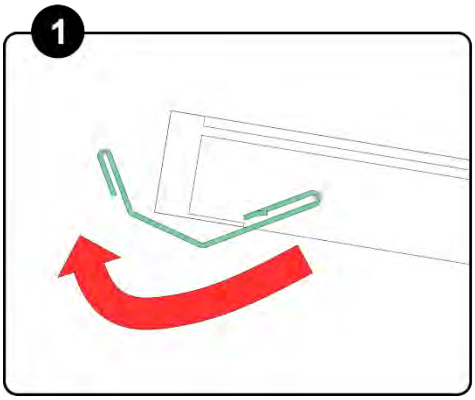


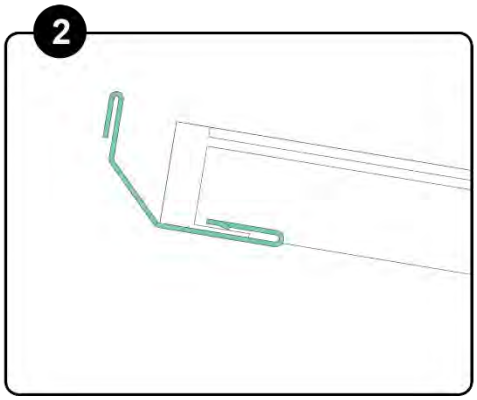


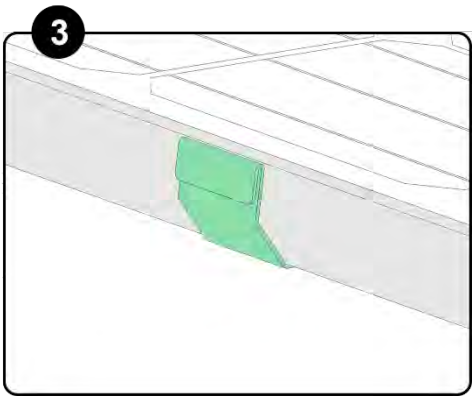
To install, pull bracket onto the midpoint of module return flange until upright locking tab pops up on the frame's edge. This indicates the bracket is fully engaged.

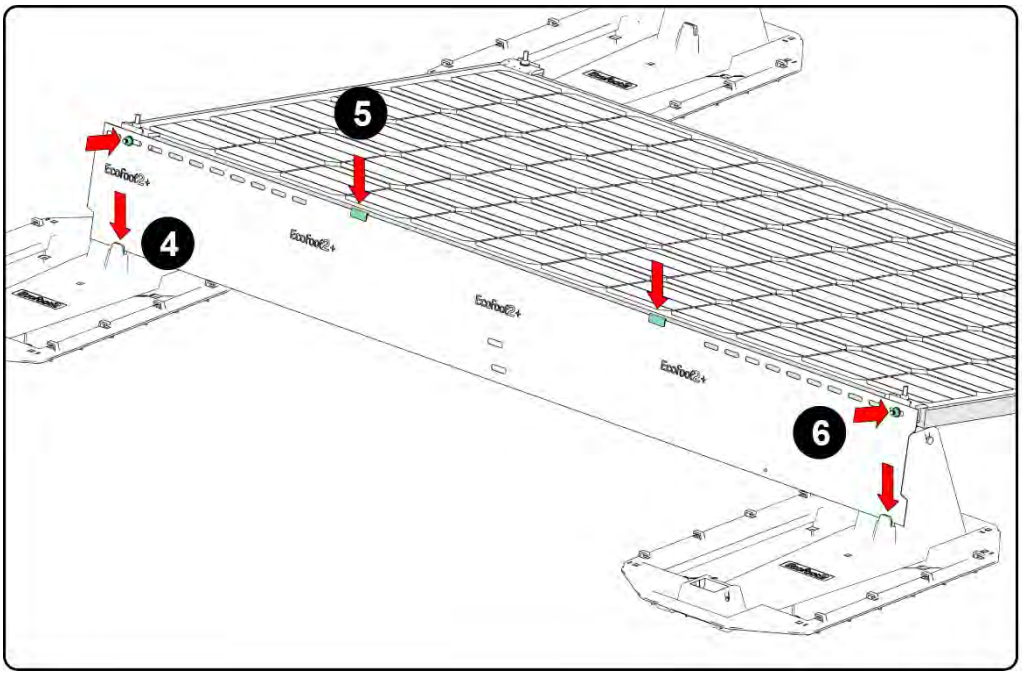
Installing Upper Universal Mid-Support











Installing the Wind Deflector

4. Drop bottom of Wind Deflector into slot located on EcoFoot2+ Base..
5. Clip top of Wind Deflector into 2 Upper Universal Mid-Support Brackets.
6. Attach Wind Deflector to EcoFoot2+ Rocker using Nut provided.

ADDENDUM C Grounding & Bonding

The EcoFoot2+ system has been tested by TüV Rheinland and conforms to UL 2703 for Grounding and Bonding when installed per the published installation instructions.

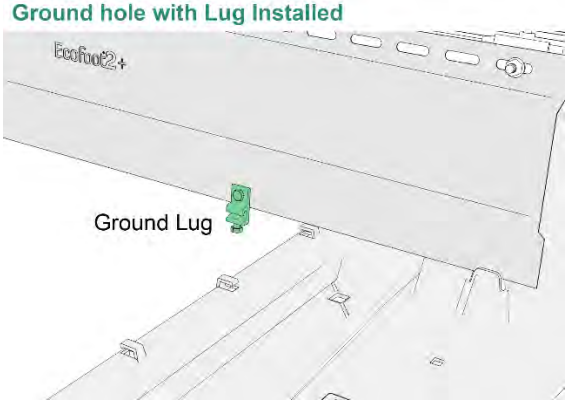
EcoFoot2+ carries module-to-module ground bond through the Wind Deflector, Item E listed in the "EcoFoot2+ Core Components" table in this document.

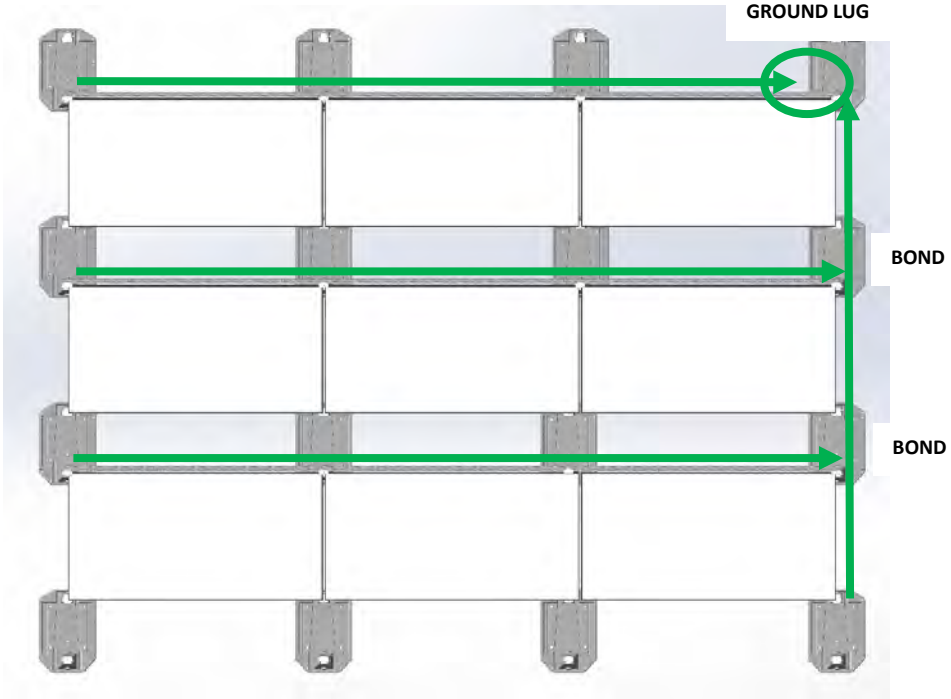
Each row of modules/wind deflectors in an array of up to 400 modules must be grounded per the NEC and ANSI/NFPA 70 either through the designated ground hole in the Wind Deflector, or by drilling a ¼" ground hole into the Wind Deflector a minimum of ½" from any edge. One Ground Lug is required for every 400 modules connected within an array.

Ecolibrium Solar recommends using #6 copper ground wire in conjunction with WEEB grounding devices such as the WEEB-LUG-6.7 or WEEB DSK516. Lugs are a single use component.

Other grounding methods must be reviewed and approved by a licensed master electrician or electrical engineer and Authority Having Jurisdiction (AHJ).

Ground hole with Lug Installed





Green lines represent ground bond path. Wind Deflectors carry module-to-module east/west ground bond. Bonding jumpers carry row-to-row north/south ground bond.