WYSSLING CONSULTING
CORPORATE EXPERIENCE WITH SMALL BUSINESS VALUE
Scott E. Wyssling, PE
Coleman D. Larsen, SE, PE
Gregory T. Elvestad, PE

76 North Meadowbrook Drive
Alpine, UT 84004
office (201) 874-3483
swyssling@wysslingconsulting.com

April 22, 2024

Ecovole
2300 Main Street
Kansas City, MO 64108

Re: Engineering Services
Buckholz-Cockrell Residence
2385 Northwest Summerfield Drive, Lee's Summit, MO
7.020 kW System

To Whom It May Concern:

We have received information regarding solar panel installation on the roof of the above referenced structure. Our evaluation of the structure is to verify the existing capacity of the roof system and its ability to support the additional loads imposed by the proposed solar system.

A. Site Assessment Information

1. Site visit documentation identifying attic information including size and spacing of framing for the existing roof structure.
2. Design drawings of the proposed system including a site plan, roof plan and connection details for the solar panels. This information will be utilized for approval and construction of the proposed system.

B. Description of Structure:

Roof Framing: 2x6 dimensional lumber at 16” on center.
Roof Material: Composite Asphalt Shingles
Roof Slope: 27 degrees
Attic Access: Accessible
Foundation: Permanent

C. Loading Criteria Used

- **Dead Load**
  - Existing Roofing and framing = 7 psf
  - New Solar Panels and Racking = 3 psf
  - TOTAL = 10 PSF
- **Live Load** = 20 psf (reducible) – 0 psf at locations of solar panels
- **Ground Snow Load** = 20 psf
- **Wind Load** based on ASCE 7-16
  - Ultimate Wind Speed = 109 mph (based on Risk Category II)
  - Exposure Category C

Analysis performed of the existing roof structure utilizing the above loading criteria is in accordance with the 2018 International Residential Code, including provisions allowing existing structures to not require strengthening if the new loads do not exceed existing design loads by 105% for gravity elements and 110% for seismic elements. This analysis indicates that the existing framing will support the additional panel loading without damage, if installed correctly.

Andrea Sessler
Digitally signed by Andrea Sessler
DN: CN=Andrea Sessler, OU=Development, OU=LS Users, DC=COLS, DC=LOC
Date: 2024.05.15 14.00.54-05'00'

RELEASE FOR CONSTRUCTION
AS NOTED ON PLANS REVIEW
DEVELOPMENT SERVICES
LEE'S SUMMIT, MISSOURI
05/15/2024 2:00:16

D. Solar Panel Anchorage

1. The solar panels shall be mounted in accordance with the most recent SunModo installation manual. If during solar panel installation, the roof framing members appear unstable or deflect non-uniformly, our office should be notified before proceeding with the installation.
2. The maximum allowable withdrawal for a M6.3 screw in ½" plywood is 55 lbs per screw (per APA technical note E830d). Connection on the roof is utilizing four (4) M6.3 screws into the existing decking to resist uplift forces. Contractor to verify installation to be performed in accordance with the manufacturer's recommendations. Based on four (4) M6.3 screws into ½" plywood 220 lbs of uplift resistance is provided per attachment.
3. Considering the wind speed, roof slopes, size and spacing of framing members, and condition of the roof, the panel supports shall be placed no greater than 48" on center.

Based on the above evaluation, this office certifies that with the racking and mounting specified, the existing roof system will adequately support the additional loading imposed by the solar system. This evaluation is in conformance with the 2018 IRC, current industry standards, and is based on information supplied to us at the time of this report.

Should you have any questions regarding the above or if you require further information do not hesitate to contact me.

Very truly yours,

Scott E. Wyssling, PE
Missouri License No. 2019011786
COA #2020037943

STATE OF MISSOURI
SCOTT E. WYSSLING
NUMBER PE-2019011786
PROFESSIONAL ENGINEER

Wyssling Consulting
76 N Meadowbrook Drive, Alpine UT 84004
COA #2020037943
Date Signed 4/22/24

RELEASE FOR CONSTRUCTION
AS NOTED ON PLANS REVIEW
DEVELOPMENT SERVICES
LEE'S SUMMIT, MISSOURI
05/15/2024 2:00:16

COCKRELL RESIDENCE

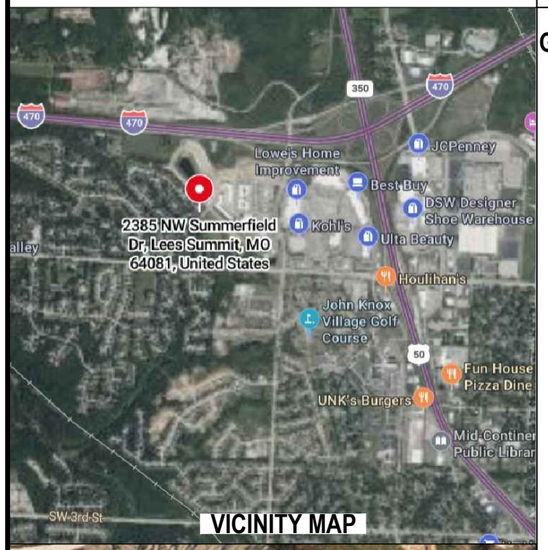
PHOTOVOLTAIC SYSTEM
2385 NW SUMMERFIELD DR.,
LEE'S SUMMIT, MO 64081

SYSTEM SIZE: 7.02 kW-DC | 4.50 kW-AC
MODULE: (18) JINKO SOLAR: JKM390M-72HBL-V[390W]
INVERTER: (9) NEP:BDM-600X [240V] MICROINVERTERS

GOVERNING CODES

ALL MATERIALS, EQUIPMENT, INSTALLATION AND WORK SHALL COMPLY WITH THE FOLLOWING

- 2017 NATIONAL ELECTRIC CODE
- 2018 INTERNATIONAL BUILDING CODE
- 2018 INTERNATIONAL RESIDENTIAL CODE
- 2018 INTERNATIONAL PLUMBING CODE
- 2018 INTERNATIONALFIRE CODE
- 2018 INTERNATIONAL MECHANICAL CODE
- IEEE STANDARD 929
- OSHA 29 CFR 1910.269
- WHERE APPLICABLE, RULES OF THE PUBLIC UTILITIES COMMISSION REGARDING SAFETY AND RELIABILITY
- THE AUTHORITY HAVING JURISDICTION
- MANUFACTURERS' LISTINGS AND INSTALLATION INSTRUCTIONS
- ANY OTHER LOCAL AMENDMENTS



VICINITY MAP


AERIAL MAP

GENERAL

1. UTILITY SHALL BE NOTIFIED BEFORE ACTIVATION OF PHOTOVOLTAIC SYSTEM.
2. 110.2 APPROVAL: ALL ELECTRICAL EQUIPMENT SHALL BE LABELED, LISTED, OR CERTIFIED BY A NATIONALLY RECOGNIZED TESTING LABORATORY ACCREDITED BY THE UNITED STATES OCCUPATIONAL SAFETY HEALTH ADMINISTRATION
3. CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS PRIOR TO INITIATING CONSTRUCTION.
4. CONTRACTOR SHALL REVIEW ALL MANUFACTURER INSTALLATION DOCUMENTS PRIOR TO INITIATING CONSTRUCTION.
5. ALL EQUIPMENT AND ASSOCIATED CONNECTIONS, ETC, AND ALL ASSOCIATED WIRING AND INTERCONNECTIONS SHALL BE INSTALLED ONLY BY QUALIFIED PERSONNEL.
6. THE CONTRACTOR OR OWNER MUST PROVIDE ROOF ACCESS (LADDER TO ROOF) FOR ALL THE REQUIRED INSPECTIONS. LADDERS MUST BE OSHA APPROVED, MINIMUM TYPE I WITH A 250LB. RATING, IN GOOD CONDITION AND DESIGNED FOR ITS INTENDED USE.
7. CONTRACTOR SHALL VERIFY THAT THE ROOF STRUCTURE WILL WITHSTAND THE ADDITIONAL LOADS.
8. LAG SCREWS SHALL PENETRATE A MINIMUM 2" INTO SOLID SAWN STRUCTURAL MEMBERS AND SHALL NOT EXCEED MANUFACTURER RECOMMENDATIONS FOR FASTENERS INTO ENGINEERED STRUCTURAL MEMBERS.
9. AN ACCESS POINT SHALL BE PROVIDED THAT DOES NOT PLACE THE GROUND LADDER OVER OPENINGS SUCH AS WINDOWS OR DOORS ARE LOCATED AT STRONG POINTS OF BUILDING CONSTRUCTION AND IN LOCATIONS WHERE THE ACCESS POINT DOES NOT CONFLICT WITH OVERHEAD OBSTRUCTIONS SUCH AS TREE LIMBS, WIRES, OR SIGNS.
10. WHERE DC CONDUCTORS ARE RUN INSIDE BUILDING, THEY SHALL BE CONTAINED IN A METAL RACEWAY; THEY SHALL NOT BE INSTALLED WITHIN 10" OF THE ROOF DECKING OR SHEATHING EXCEPT WHERE COVERED BY THE PV MODULES AND EQUIPMENT.
11. ALL FIELD -INSTALLED JUNCTION, PULL AND OUTLET BOXES LOCATED BEHIND MODULES SHALL BE ACCESSIBLE DIRECTLY OR BY DISPLACEMENT OF A MODULE SECURED BY REMOVABLE FASTENERS.

ELECTRICAL

1. WIRING MATERIALS SHALL COMPLY WITH MAXIMUM CONTINUOUS CURRENT OUTPUT AT 25°C AND MAXIMUM VOLTAGE AT 600V; WIRE SHALL BE WET RATED AT 90°C.
2. EXPOSED PHOTOVOLTAIC SYSTEM CONDUCTORS ON THE ROOF WILL BE USE 2 OR PV-TYPE WIRE.
3. PHOTOVOLTAIC SYSTEM CONDUCTORS SHALL BE IDENTIFIED AND GROUPED. THE MEANS OF IDENTIFICATION SHALL BE PERMITTED BY SEPARATE COLOR-CODING, MARKING TAPE, TAGGING OR OTHER APPROVED MEANS.
4. ALL EXTERIOR CONDUIT, FITTINGS, AND BOXES SHALL BE RAIN-TIGHT AND APPROVED FOR USE IN WET LOCATIONS.
5. ALL METALLIC RACEWAYS AND EQUIPMENT SHALL BE BONDED AND ELECTRICALLY CONTINUOUS.
6. WHERE SIZES OF JUNCTION BOXES, RACEWAYS, AND CONDUITS ARE NOT SPECIFIED, CONTRACTOR SHALL SIZE THEM ACCORDING TO APPLICABLE CODES.
7. REMOVAL OF A UTILITY-INTERACTIVE INVERTER OR OTHER EQUIPMENT SHALL NOT DISCONNECT THE BUILDING CONNECTION BETWEEN THE GROUNDING ELECTRODE CONDUCTOR AND THE PV SOURCE AND/OR OUTPUT CIRCUIT GROUNDED CONDUCTOR.
8. FOR GROUNDED SYSTEMS, THE PHOTOVOLTAIC SOURCE AND OUTPUT CIRCUITS SHALL BE PROVIDED WITH A GROUND-FAULT PROTECTION DEVICE OR SYSTEM THAT DETECTS A GROUND FAULT, INDICATES THAT FAULT HAS OCCURED AND AUTOMATICALLY DISCONNECTS ALL CONDUCTORS OR CAUSES THE INVERTER TO AUTOMATICALLY CEASE SUPPLYING POWER TO OUTPUT CIRCUITS.
9. FOR UNGROUNDED SYSTEMS, THE INVERTER IS EQUIPPED WITH GROUND FAULT PROTECTION AND A GFI FUSE PORT FOR GROUND FAULT INDICATION.
10. PV MODULE FRAMES SHALL BE BONDED TO RACKING RAIL OR BARE COPPER GEC/GEC PER THE MODULE MANUFACTURER'S LISTED INSTRUCTION SHEET.
11. PV MODULE RACKING RAIL SHALL BE BONDED TO BARE COPPER GEC VIA WEEB LUG, ILSCO GBL-4DBT LAY-IN LUG, OR EQUIVALENT LISTED LUG.
12. THE PHOTOVOLTAIC INVERTER WILL BE LISTED AS UL 1741 COMPLIANT.
13. RACKING AND BONDING SYSTEM TO BE UL2703 RATED.
14. ANY REQUIRED GROUNDING ELECTRODE CONDUCTOR WILL BE CONTINUOUS, EXCEPT FOR SPLICES OR JOINTS AS BUS BARS WITHIN LISTED EQUIPMENT.
15. WHEN BACKFED BREAKER IS THE METHOD OF UTILITY INTERCONNECTION, THE BREAKERS SHALL NOT READ "LINE AND LOAD".
16. WHEN APPLYING THE 120% RULE, THE SOLAR BREAKER TO BE POSITIONED AT THE OPPOSITE END OF THE BUS BAR FROM THE MAIN BREAKER.
17. THE WORKING CLEARANCE AROUND THE EXISTING ELECTRICAL EQUIPMENT AS WELL AS THE NEW ELECTRICAL EQUIPMENT WILL BE MAINTAINED.

Wyssling Consulting, PLLC
76 N Meadowbrook Drive Alpine UT 84004
Missouri COA # 2020037943
Signed 4/22/2024

SHEET INDEX:

COCKRELL, LAURA BUCKHOLZ
2385 NW SUMMERFIELD DR.,
LEE'S SUMMIT, MO 64081

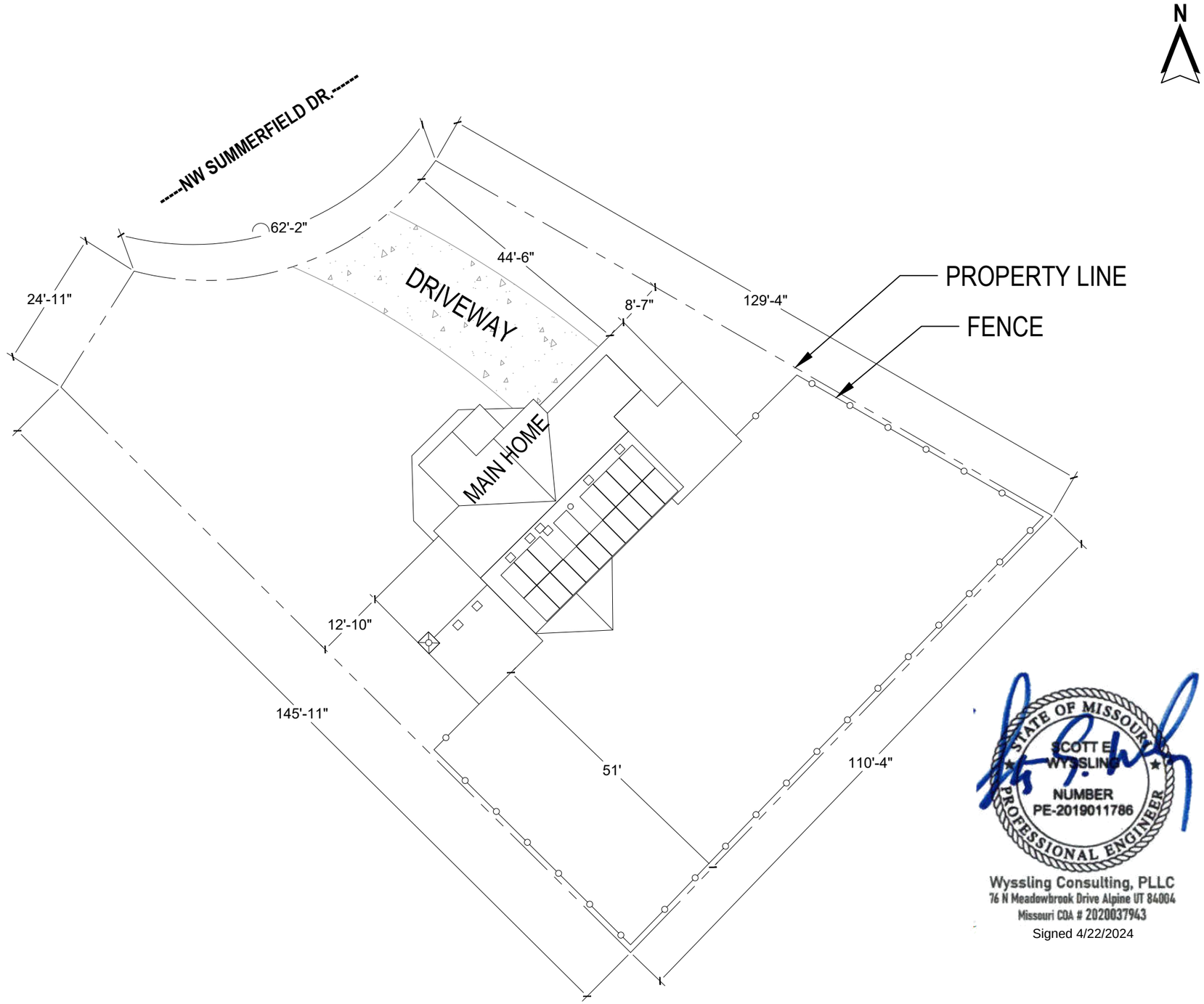
AHJ: LEE'S SUMMIT, MO

ECOVOLE
1333 NW VIVION RD., KANSAS CITY, MO ,64118
LICENSE NO: 206086
TEL : 800-799-7986

COVER PAGE

DATE: 4/19/2024
DRAWN BY: AN

REV #1
REV #2
REV #3



STATE OF MISSOURI
SCOTT E WYSSLING
NUMBER PE-2019011786
PROFESSIONAL ENGINEER

Wyssling Consulting, PLLC
76 N Meadowbrook Drive Alpine UT 84004
Missouri COA # 2020037943
Signed 4/22/2024

LEGEND:

PROPERTY LINE: ——— – – ———

DRIVEWAY: – – – – – – – – – – – –

APN: 51800340600000000

FENCE: —○———○———

SCALE: 1/20" = 1'-0"

COCKRELL, LAURA BUCKHOLZ
2385 NW SUMMERFIELD DR.,
LEE'S SUMMIT, MO 64081

AHJ: LEE'S SUMMIT, MO

ECOVOLE
1333 NW VIVION RD., KANSAS CITY, MO ,64118
LICENSE NO: 206086
TEL : 800-799-7986

PROPERTY PLAN

DATE: 4/19/2024
DRAWN BY: AN

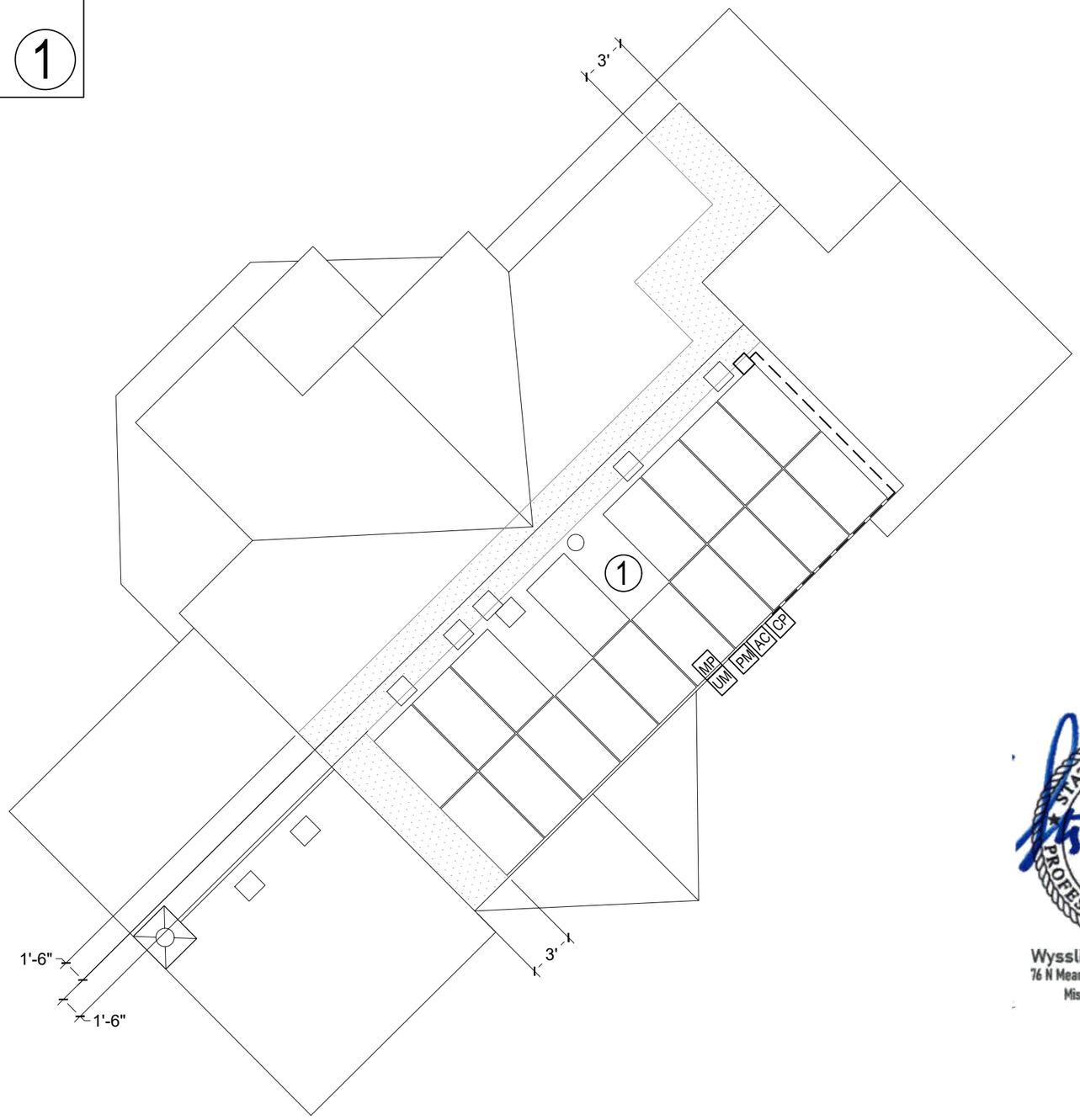
RELEASE FOR CONSTRUCTION
AS NOTED ON PLANS REVIEW
DEVELOPMENT SERVICES
LEE'S SUMMIT, MISSOURI
05/15/2024 2:00:16

ROOF DETAIL

ROOF TYPE: ASPHALT SHINGLE

ROOF SECTION 1: 18 MODULES
AZIMUTH: 135°
PITCH: 27°

1



SYSTEM LEGEND

PHOTOVOLTAIC SYSTEM:
DC SYSTEM SIZE: 7.02 kW
AC SYSTEM SIZE: 4.50 kW

UM MAIN SERVICE METER AND SERVICE POINT

MP MAIN SERVICE PANEL

CP 125A RATED SOLAR LOAD CENTER

(18) JINKO SOLAR: JKM390M-72HBL-V[390W] WITH (9) NEP:BDM-600X [240V] MICROINVERTERS MOUNTED ONE PER TWO MODULES.

JUNCTION BOX AND CONDUIT

CONDUIT RUN

CONDUIT TO BE RUN IN ATTIC IF POSSIBLE, OTHERWISE CONDUIT BLOCKS MIN. 1"/MAX 6" ABOVE ROOF SURFACE, CLOSE TO RIDGE LINES, AND UNDER EAVES; TO BE PAINTED TO MATCH EXTERIOR/EXISTING BACKGROUND COLOR OF ITS LOCATION; TO BE LABELED AT MAX 10' INTERVALS. CONDUIT RUNS ARE APPROXIMATE AND ARE TO BE DETERMINED IN THE BY THE INSTALLERS

AC FUSED AC DISCONNECT

FIRE CODE SETBACK (18" MIN. / 36" MAX)

PM 200A RATED PV PRODUCTION METER

INSTALLER NOTES:
THE FUSED AC DISCONNECT IS WITHIN 4 FEET OF THE TAP.

STATE OF MISSOURI
SCOTT E. WYSSLING
NUMBER PE-2019011786
PROFESSIONAL ENGINEER

Wyssling Consulting, PLLC
76 N Meadowbrook Drive Alpine UT 84004
Missouri COA # 2020037943
Signed 4/22/2024

SCALE: 1/8" = 1'-0"

COCKRELL, LAURA BUCKHOLZ
2385 NW SUMMERFIELD DR.,
LEE'S SUMMIT, MO 64081

AHJ: LEE'S SUMMIT, MO

ECOVOLE
1333 NW VIVION RD., KANSAS CITY, MO ,64118
LICENSE NO: 206086
TEL : 800-799-7986

SITE PLAN

DATE: 4/19/2024
DRAWN BY: AN

PV 3

RELEASE FOR CONSTRUCTION
AS NOTED, PLANS REVIEW
DEVELOPMENT SERVICES
LEE'S SUMMIT, MISSOURI
05/15/2024 2:00:16

ROOF DETAIL

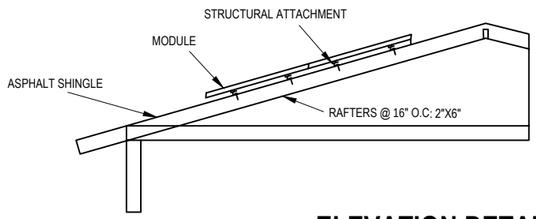
ROOF TYPE: ASPHALT SHINGLE

ROOF SECTION 1: 18 MODULES
AZIMUTH: 135°
PITCH: 27°

1

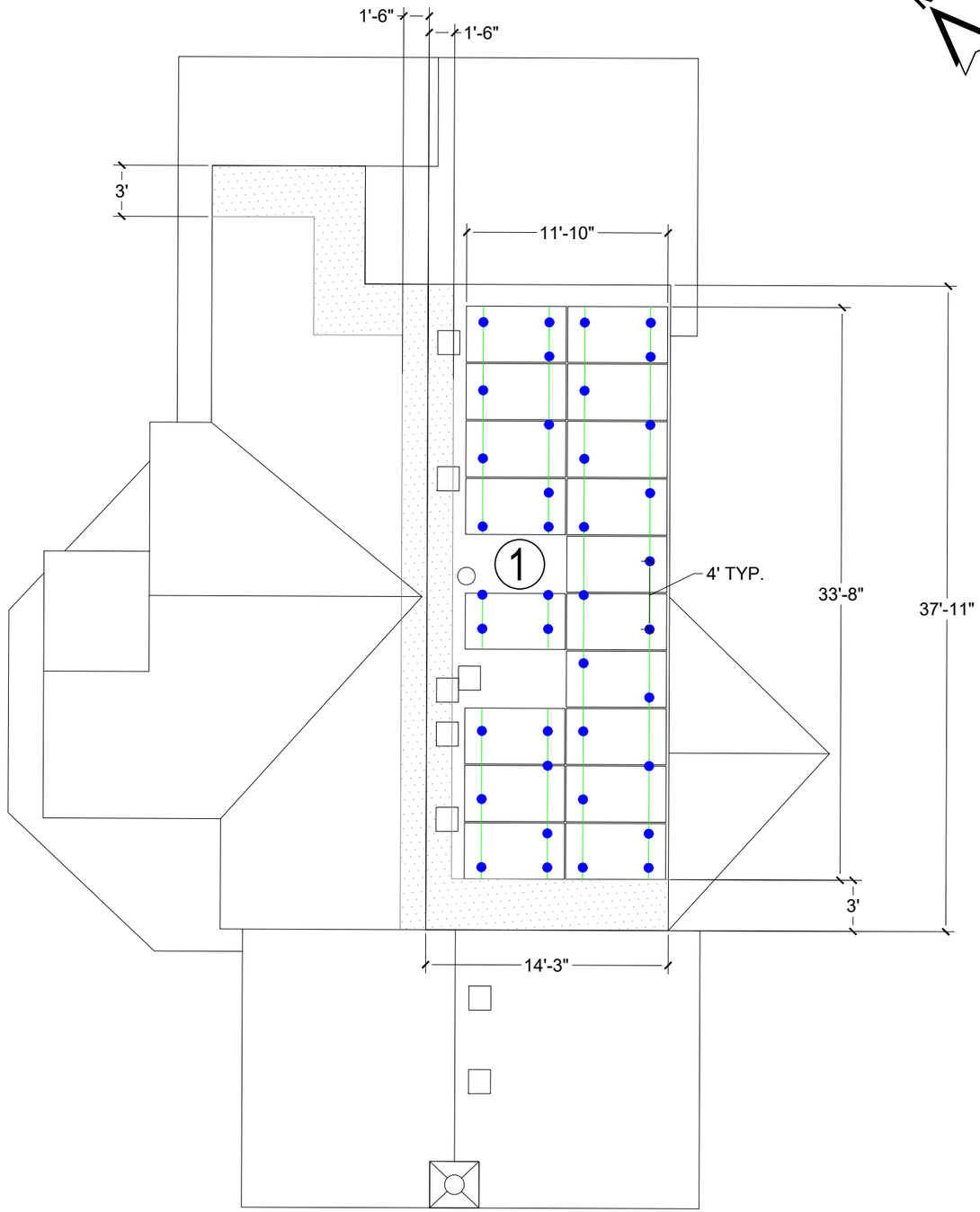
Wyssling Consulting, PLLC
76 N Meadowbrook Drive Alpine UT 84004
Missouri COA # 2020037943
Signed 4/22/2024

MODULE MECHANICAL SPECIFICATIONS	
DESIGN WIND SPEED	109 MPH
DESIGN SNOW LOAD	20 PSF
# OF STORIES	1
ROOF PITCH	27°
TOTAL ARRAY AREA (SQ. FT)	380.16
TOTAL ROOF AREA (SQ. FT)	2260
ARRAY SQ. FT / TOTAL ROOF SQ. FT	16.82%



NTS

ELEVATION DETAIL



SYSTEM LEGEND

- FIRE CODE SETBACK (18" MIN. / 36" MAX)
- ROOF ATTACHMENT POINT
- RACKING

SCALE: 1/8" = 1'-0"

COCKRELL, LAURA BUCKHOLZ
2385 NW SUMMERFIELD DR.,
LEE'S SUMMIT, MO 64081

AHJ: LEE'S SUMMIT, MO

ECOVOLE
1333 NW VIVION RD., KANSAS CITY, MO ,64118
LICENSE NO: 206086
TEL : 800-799-7986

ROOF PLAN

DATE: 4/19/2024
DRAWN BY: AN

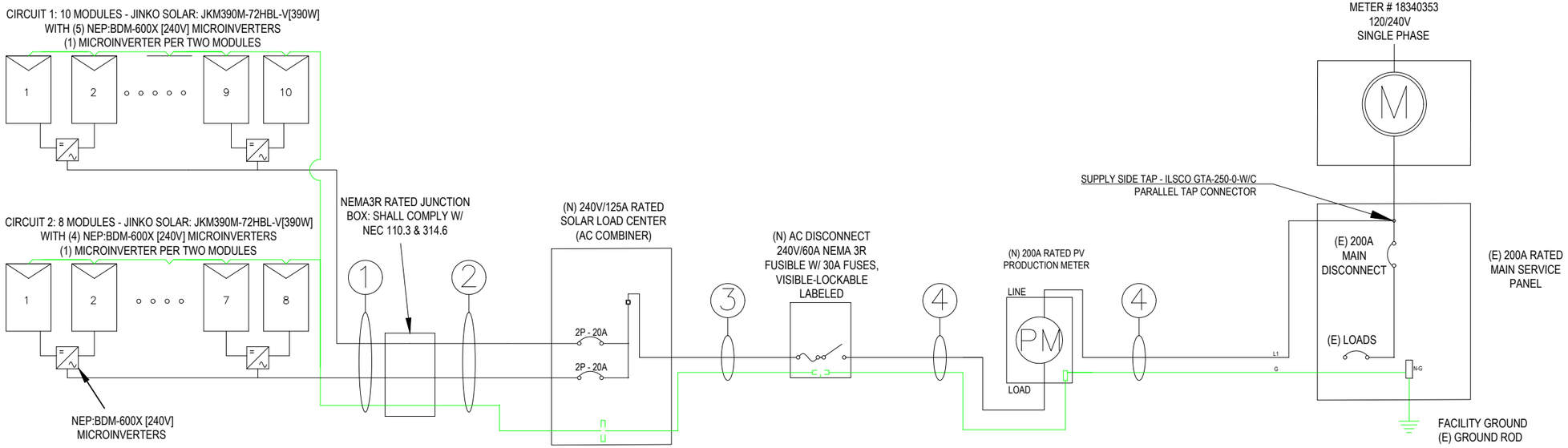
PV-3.

RELEASE FOR CONSTRUCTION
AS NOTED ON PLANS REVIEW
DEVELOPMENT SERVICES
LEE'S SUMMIT, MISSOURI
05/15/2024 2:00:16

NOTE:-ALL DC CONNNECTORS TO MODULES OR INVERTERS MUST BE OF MATCHING MANUFACTURE BRAND AND STYLE. DO NOT USE 'COMPATIBLE' CONNECTORS WHICH HAVE NOT BEEN UL TESTED FOR COMPATIBILITY. PERFORMANCE AND FIRE DAMAGE MAY RESULT FROM MIS-MATCHED CONNECTOR USAGE.

THE NEP:BDM-600X [240V] MICROINVERTERS HAVE INTEGRATED GROUND AND DOUBLE INSULATION, SO NO GEC OR EGC IS REQUIRED. THE DC CIRCUIT IS ISOLATED AND INSULATED FROM GROUND AND MEETS THE REQUIREMENTS OF NEC 690.35

CONDUCTOR AND CONDUIT SCHEDULE					
TAG	WIRE TYPE	WIRE SIZE	# OF CONDUCTORS	CONDUIT TYPE	MIN. CONDUIT SIZE
1	PV WIRE	#10	4- L1 L2	FREE AIR	N/A
1	BARE COPPER	#6	1 - BARE	FREE AIR	N/A
2	THWN-2	#10	4- L1 L2	EMT	3/4"
2	THWN-2 EGC	#10	1 - GND	EMT	3/4"
3	THWN-2	#10	3 - L1 L2 N	EMT	3/4"
3	THWN-2 EGC	#10	1 - GND	EMT	3/4"
4	THWN-2	#6	3 - L1 L2 N	EMT	3/4"
4	THWN-2 EGC	#8	1 - GND	EMT	3/4"



PV MODULE ELECTRICAL SPECIFICATIONS	
MODULE TYPE	JINKO SOLAR: JKM390M-72HBL-V[390W]
POWER MAX (P_{MAX})	390W
OPEN CIRCUIT VOLTAGE (V_{OC})	48.60V
SHORT CIRCUIT CURRENT (I_{SC})	10.46A
MAX POWER-POINT VOLTAGE (V_{MP})	39.64V
MAX POWER-POINT CURRENT (I_{MP})	9.84A
SERIES FUSE RATING	20A

INVERTER ELECTRICAL SPECIFICATIONS	
INVERTER TYPE	NEP:BDM-600X [240V] MICROINVERTERS
MAX DC OPEN CIRCUIT VOLTAGE (VDC)	60V
MAX DC INPUT CURRENT (ADC)	14 X 2
MAXIMUM OUTPUT POWER	500W
MAXIMUM CONT. OUTPUT CURRENT	2.28A
CEC EFFICIENCY	95.50%
MAXIMUM NUMBER OF UNITS PER BRANCH (20A)	7

SYSTEM OVER-CURRENT PROTECTION DEVICE (OCPD) CALCULATIONS	
INVERTER TYPE	NEP:BDM-600X [240V] MICROINVERTERS
# OF INVERTERS	9
MAX CONTINUOUS OUTPUT CURRENT	2.28
(# OF INVERTERS) X (MAX CONT. OUTPUT CURRENT) X 125% <= OCPD RATING	
(9 x 2.28A x 1.25)= 25.65A <= 30A, OK	

PHOTOVOLTAIC SYSTEM:
DC SYSTEM SIZE: 7.02 kW
AC SYSTEM SIZE: 4.50 kW
INVERTER: (9) NEP:BDM-600X [240V] MICROINVERTERS
MODULE: (18) JINKO SOLAR: JKM390M-72HBL-V[390W]

NOTES:
1. MODULES ARE BONDED TO RAIL USING UL 2703 RATED BONDING SYSTEM - INTEGRATED BONDING MID-CLAMPS + DIRECT-BURIAL LAY-IN-LUGS; SEE ATTACHED FOR SPECIFICATIONS IF APPLICABLE
2. PV DC SYSTEM IS UNGROUNDED
3. PV ARRAY WILL HAVE A GROUNDING ELECTRODE SYSTEM IN COMPLIANCE WITH NEC 250.58 AND 690.47(A)
4. PV SOURCE, OUTPUT, AND INVERTER INPUT CIRCUIT WIRING METHODS SHALL COMPLY WITH NEC 690.1(G)
5. BACKFED PV BREAKER WILL BE INSTALLED AT OPPOSITE END OF THE BUS BAR FROM THE MAIN BREAKER. A PERMANENT WARNING LABEL TO BE INSTALLED PER SYSTEM SIGNAGE, PAGE
6. BARE COPPER IS TRANSITIONED TO THWN-2 VIA IRREVERSIBLE CRIMP; WHEN PRESENT, THE GEC TO BE CONTINUOUS
7. INVERTER(S) TO BE COMPLIANT WITH UL 1741 SUPPLEMENT A
8. CONDUIT AND CONDUCTOR SPECIFICATIONS ARE BASED ON MINIMUM CODE REQUIREMENTS AND ARE NOT MEANT TO LIMIT UP-SIZING AS REQUIRED BY FIELD CONDITIONS

INSTALLER NOTES:
THE FUSED AC DISCONNECT IS WITHIN 4 FEET OF THE TAP.

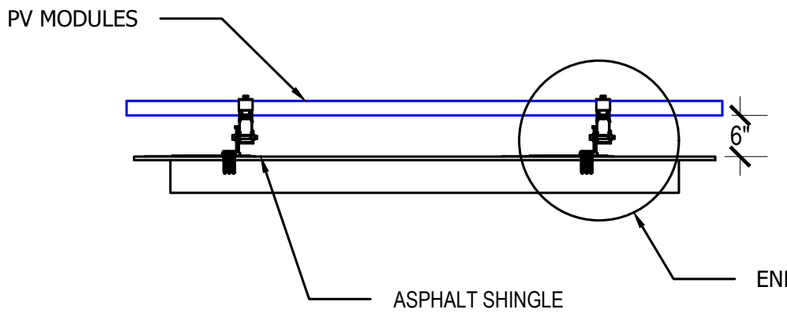
COCKRELL, LAURA BUCKHOLZ
2385 NW SUMMERFIELD DR.,
LEE'S SUMMIT, MO 64081

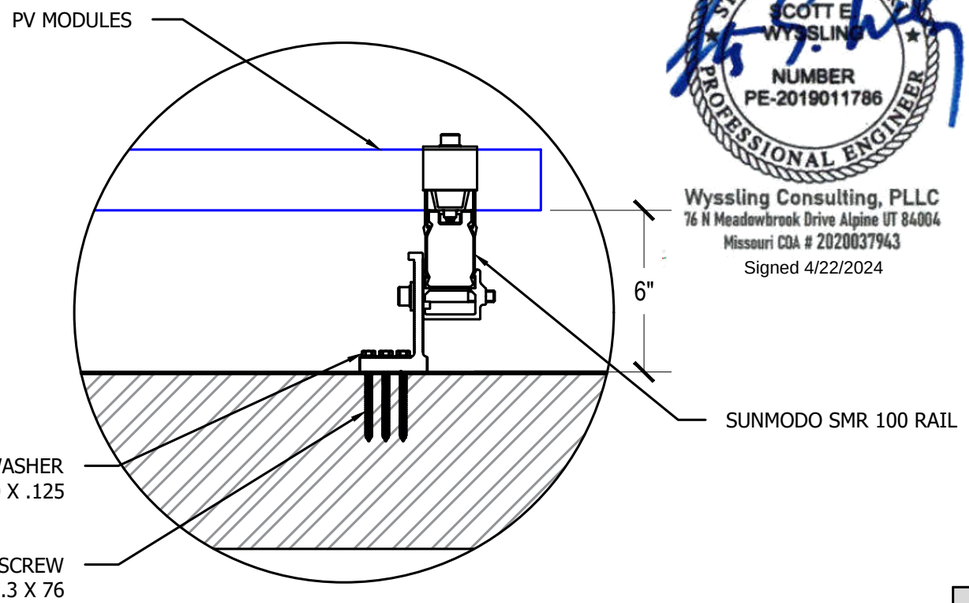
AHJ: LEE'S SUMMIT, MO

ECOVOLE
1333 NW VIVION RD., KANSAS CITY, MO ,64118
LICENSE NO: 206086
TEL : 800-799-7986

1-LINE DIAGRAM & CALCULATIONS

DATE: 4/19/2024
DRAWN BY: AN





1 ATTACHMENT DETAILS (N.T.S.)

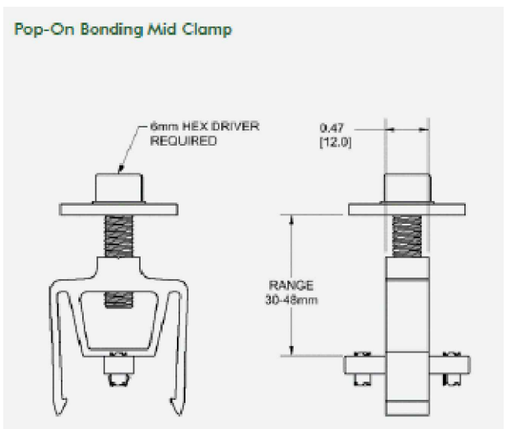
ATTACHMENT TYPE: SUNMODO NANOMOUNT (THROUGH DECK)
WITH SUNMODO SMR-100 RAILS
ROOF TYPE: ASPHALT SHINGLE, ROOF TILT: 27°

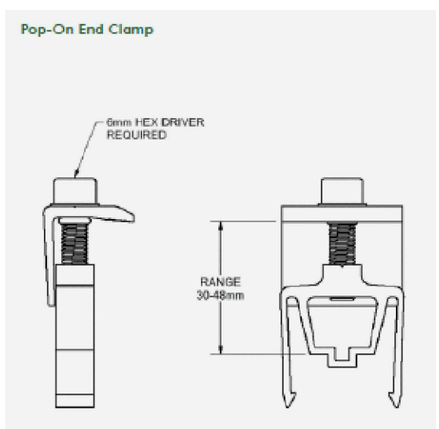
MODULE WEIGHT: 49.6 LBS
MODULE DIMENSIONS: 6.58' X 3.28'
MODULE WEIGHT/ SQ. FOOT: 2.29 LBS

TOTAL NO. OF MODULES: 18
TOTAL MODULE WEIGHT: 892.8 LBS

STATE OF MISSOURI
SCOTT E WYSSLING
NUMBER PE-2019011786
PROFESSIONAL ENGINEER

Wyssling Consulting, PLLC
76 N Meadowbrook Drive Alpine UT 84004
Missouri COA # 2020037943
Signed 4/22/2024





BILL OF MATERIAL		
EQUIPMENT	**MAKE**	**QUANTITY**
MODULE	JINKO SOLAR: JKM390M-72HBL-V[390W]	18
INVERTER	NEP:BDM-600X [240V] MICROINVERTERS	9
END CLAMPS	MODULE END CLAMP STANDARD	16
MID CLAMPS	MODULE MIDDLE CLAMP SET STANDARD(INTEGRATED GROUNDING)	28
MOUNTING POINTS	SUNMODO NANOMOUNT (THROUGH DECK)	39
MOUNTING RAILS	SUNMODO SMR-100 RAILS	12
FUSED AC DISCONNECT	PV SYSTEM FUSED AC DISCONNECT 60A RATED WITH 30A FUSES	1
SOLAR LOAD CENTER	125A RATED SOLAR LOAD CENTER WITH (2) 20A / 2P BREAKER	1
PV METER	200A RATED PV PRODUCTION METER	1

COCKRELL, LAURA BUCKHOLZ
2385 NW SUMMERFIELD DR.,
LEE'S SUMMIT, MO 64081

AHJ: LEE'S SUMMIT, MO

ECOVOLE
1333 NW VIVION RD., KANSAS CITY, MO ,64118
LICENSE NO: 206086
TEL : 800-799-7986

MOUNTING DETAILS AND BOM

DATE: 4/19/2024
DRAWN BY: AN

RELEASE FOR CONSTRUCTION
AS NOTED ON PLANS REVIEW
DEVELOPMENT SERVICES
LEE'S SUMMIT, MISSOURI
05/15/2024 2:00:16

WARNING: PHOTOVOLTAIC POWER SOURCE

NEC 690.31(E)(3) - CONDUIT/ALL JUNCTION BOXES

! WARNING !
ELECTRIC SHOCK HAZARD
THE DC CONDUCTORS OF THIS PHOTOVOLTAIC SYSTEM ARE UNGROUNDED AND MAY BE ENERGIZED.

AT EACH DC DISCONNECTING MEANS, JUNCTION BOXES, CONDUIT RACEWAY, INVERTER
NEC 690.35(F) - UNGROUNDED SYSTEM

! WARNING !
ELECTRIC SHOCK HAZARD.
DO NOT TOUCH TERMINALS.
TERMINALS ON BOTH LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION.

AT EACH DC DISCONNECTING MEANS
NEC 690.17(4) - GROUNDED SYSTEMS

PHOTOVOLTAIC DC DISCONNECT

AT EACH DC DISCONNECTING MEANS
NEC 690.14(C)(2)

MAXIMUM VOLTAGE: -- V DC
MAXIMUM CIRCUIT CURRENT: -- A DC
MAX RATED OUTPUT CURRENT OF THE CHARGE CONTROLLER OR DC-TO-DC CONVERTER (IF INSTALLED): -- A DC

AT EACH DC DISCONNECTING MEANS
NEC 690.14(C)(2)

! WARNING !
ELECTRIC SHOCK HAZARD
IF A GROUND FAULT IS INDICATED, NORMALLY GROUNDED CONDUCTORS MAY BE UNGROUNDED AND ENERGIZED

AT EACH INVERTER
NEC 690.5(C) - GROUNDED SYSTEM

PHOTOVOLTAIC SYSTEM METER

AT PRODUCTION METER
NOT A CODE REQUIREMENT

PHOTOVOLTAIC AC DISCONNECT

AT EACH AC DISCONNECTING MEANS & NEAR PV BREAKER
NEC 690.14(C)(2)

PHOTOVOLTAIC AC DISCONNECT

OPERATING CURRENT: 20.52 A AC
OPERATING VOLTAGE: 240 V AC

AT EACH AC DISCONNECTING MEANS & POINT OF INTERCONNECTION
NEC 690.54

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

AT EACH AC DISCONNECTING MEANS
NEC 705.12(D)(4)

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

AT POINT OF INTERCONNECTION
OVERCURRENT DEVICE
NEC 705.12(D)(7)

! WARNING !
DUAL POWER SOURCES.
POWER IS BEING SUPPLIED TO THIS PANEL FROM THE UTILITY AND A SOLAR PV SYSTEM. THE SOLAR PV DISCONNECT IS LOCATED:

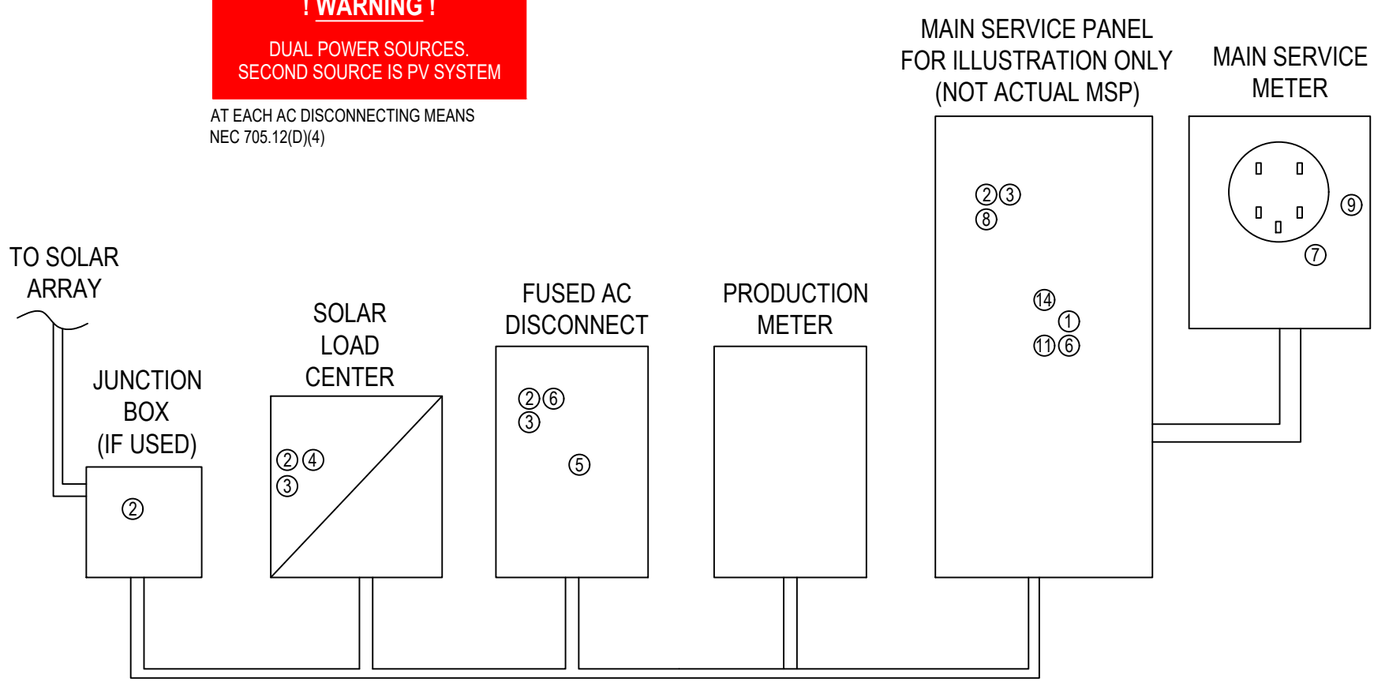
AT POINT OF INTERCONNECTION
NEC 705.12(D)(4), 690.56(B)

DUAL POWER SOURCE
PHOTOVOLTAIC CIRCUIT

OPERATING VOLTAGE (AC): 240 V

MAXIMUM CURRENT (AC): 20.52 AMPS

MAXIMUM POWER (AC): 4.50 KW



ALL SIGNAGE MUST BE PERMANENTLY ATTACHED AND BE WEATHER RESISTANT/SUNLIGHT RESISTANT AND CANNOT BE HAND-WRITTEN PER NEC 110.21(B)

PERMANENT PLAQUE OR DIRECTORY PROVIDING THE LOCATION OF THE SERVICE DISCONNECTING MEANS AND THE PHOTOVOLTAIC SYSTEM DISCONNECTING MEANS IF NOT IN THE SAME LOCATION
[NEC 690.56(B)]

WHERE THE PV SYSTEMS ARE REMOTELY LOCATED FROM EACH OTHER, A DIRECTORY IN ACCORDANCE WITH 705.10 SHALL BE PROVIDED AT EACH PV SYSTEM DISCONNECTING MEANS.
PV SYSTEM EQUIPMENT AND DISCONNECTING MEANS SHALL NOT BE INSTALLED IN BATHROOMS
[NEC 690.4(D),(E)]

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

LABELS ARE NOT DRAWN TO SCALE

COCKRELL, LAURA BUCKHOLZ
2385 NW SUMMERFIELD DR.,
LEE'S SUMMIT, MO 64081

AHJ: LEE'S SUMMIT, MO

ECOVOLE
1333 NW VIVION RD., KANSAS CITY, MO ,64118
LICENSE NO: 206086
TEL : 800-799-7986

ELECTRICAL LABELS & ELEVATION

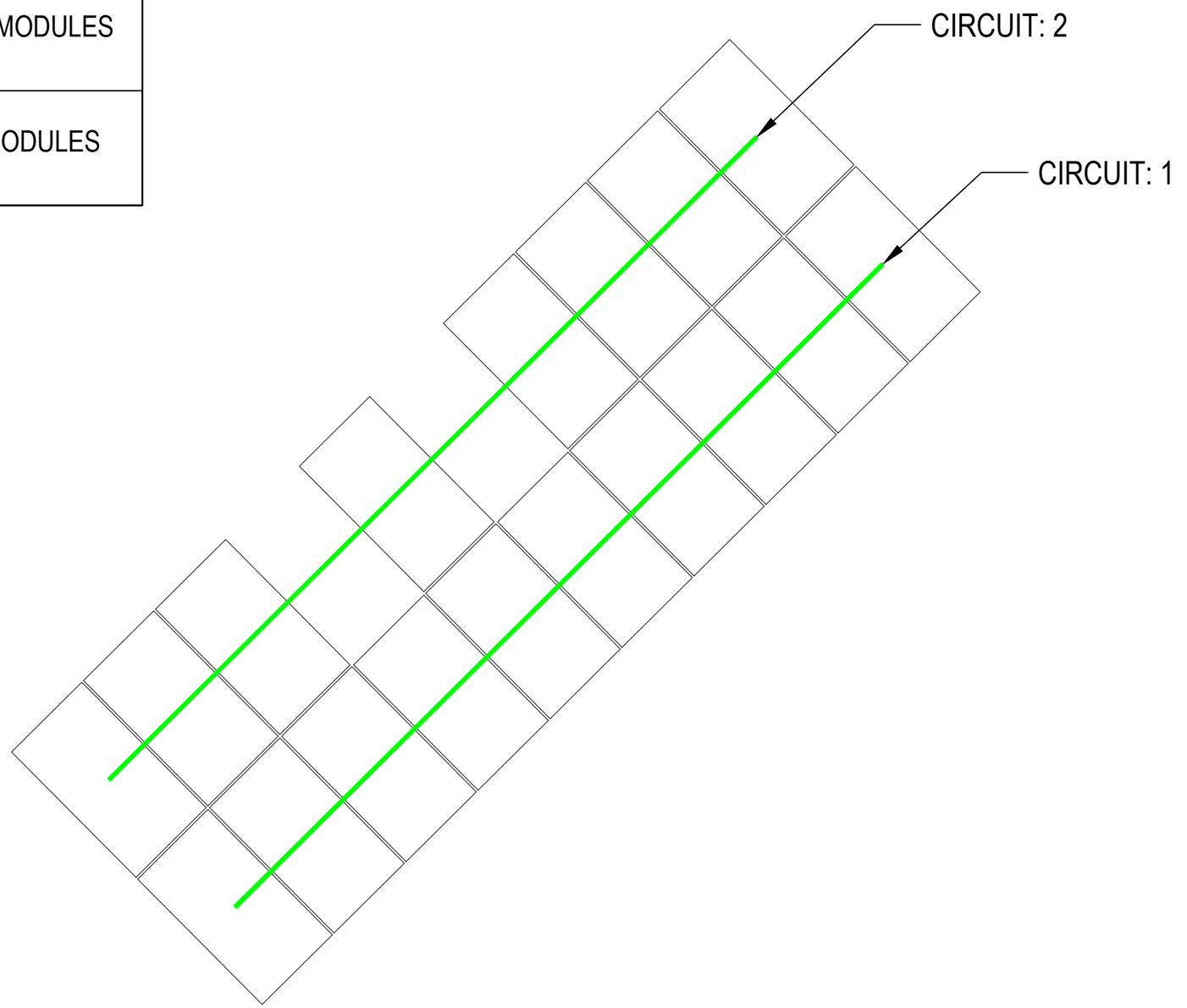
DATE: 4/19/2024
DRAWN BY: AN

CIRCUIT DETAIL

NEP CIRCUITS

CIRCUIT # 1: 10 MODULES

CIRCUIT # 2: 8 MODULES



FOR INSTALLER USE ONLY

COCKRELL, LAURA BUCKHOLZ
2385 NW SUMMERFIELD DR.,
LEE'S SUMMIT, MO 64081

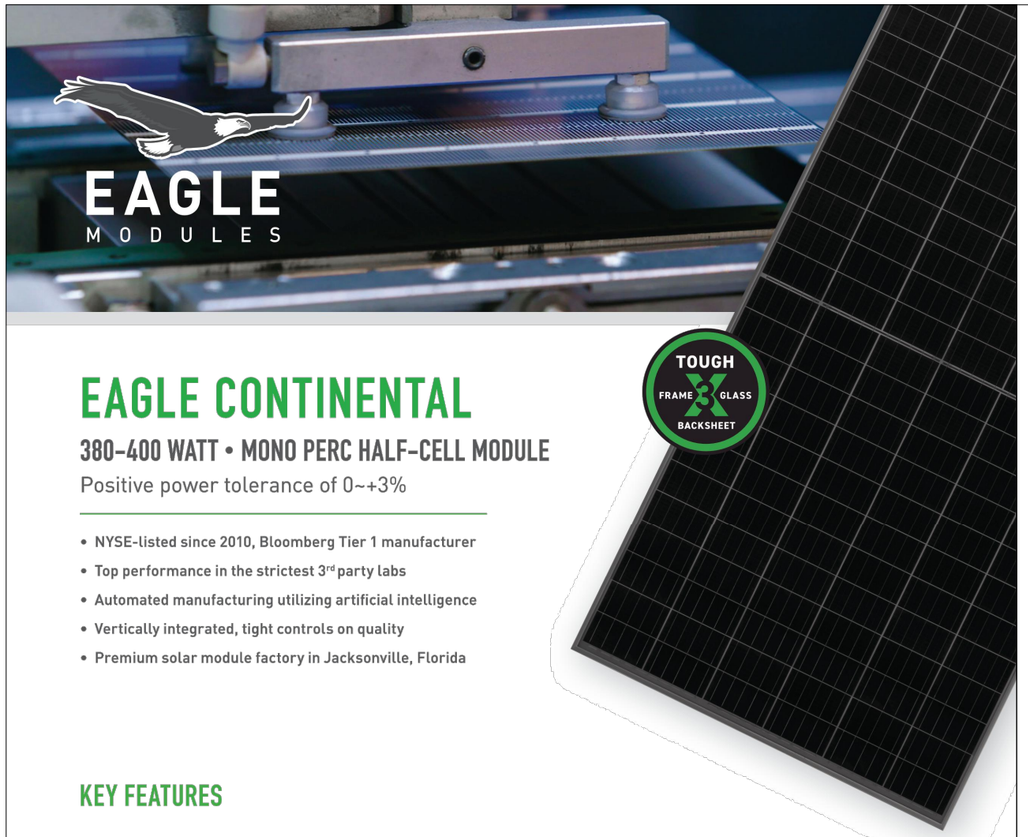
AHJ: LEE'S SUMMIT, MO

ECOVOLE
1333 NW VIVION RD., KANSAS CITY, MO ,64118
LICENSE NO: 206086
TEL : 800-799-7986

CIRCUIT MAP

DATE: 4/19/2024
DRAWN BY: AN

PV-7



EAGLE CONTINENTAL

380-400 WATT • MONO PERC HALF-CELL MODULE

Positive power tolerance of 0~+3%

- NYSE-listed since 2010, Bloomberg Tier 1 manufacturer
- Top performance in the strictest 3rd party labs
- Automated manufacturing utilizing artificial intelligence
- Vertically integrated, tight controls on quality
- Premium solar module factory in Jacksonville, Florida

TOUGH FRAME GLASS BACKSHEET

KEY FEATURES

Superior Aesthetics
Black backsheet and black frame create ideal look for residential applications.

Diamond Half-Cell Technology
World-record breaking efficient mono PERC half-cells deliver high power in a small footprint.

Thick and Tough
Fire Type 1 rated module engineered with a thick frame, 3.2mm front side glass, and thick backsheet for added durability.

Shade Tolerant
Twin array design allows continued performance even with shading by trees or debris.

Protected Against All Environments
Certified to withstand humidity, heat, rain, marine environments, wind, hailstorms, and packed snow.

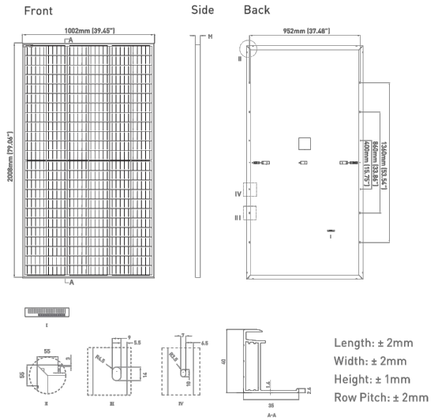
Warranty
12-year product and 25-year linear power warranty.

ASSEMBLED IN THE USA
From foreign components

- ISO9001:2008 Quality Standards
- ISO14001:2004 Environmental Standards
- IEC61215, IEC61730 certified
- ISO 45001 2018 Occupational Health & Safety Standards
- UL1703/61730 certified

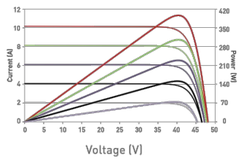
BUILDING YOUR TRUST IN SOLAR. WWW.JINKOSOLAR.US

ENGINEERING DRAWINGS

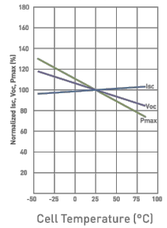


ELECTRICAL PERFORMANCE & TEMPERATURE DEPENDENCE

Current-Voltage & Power-Voltage Curves (400W)



Temperature Dependence of Isc, Voc, Pmax



MECHANICAL CHARACTERISTICS

Cells	Mono PERC Diamond Cell (158.75 x 158.75mm)
No. of Half Cells	**144 (6 x 24)**
Dimensions	2008 x1002 x 40mm (79.06 x 39.45 x 1.57in)
Weight	**22.5kg (49.6lbs)**
Front Glass	3.2mm, Anti-Reflection Coating High Transmission, Low Iron, Tempered Glass
Frame	**Anodized Aluminum Alloy**
Junction Box	IP68 Rated
Output Cables	**12 AWG, 1400mm (55.12in)**
Connector	Staubli MC4 Series
Fire Type	Type 1
Pressure Rating	5400Pa (Snow) & 2400Pa (Wind)
Hailstone Test	50mm Hailstones at 35m/s

TEMPERATURE CHARACTERISTICS

Temperature Coefficients of Pmax	**-0.35%/°C**
Temperature Coefficients of Voc	-0.29%/°C
Temperature Coefficients of Isc	**0.048%/°C**
Nominal Operating Cell Temperature (NOCT)	45±2°C

MAXIMUM RATINGS

Operating Temperature (°C)	**-40°C~+85°C**
Maximum System Voltage	1500VDC (UL and IEC)
Maximum Series Fuse Rating	**20A**

PACKAGING CONFIGURATION

(Two pallets = One stack)

27pcs/pallet, 54pcs/stack, 594pcs/40'HQ Container

WARRANTY

12-year product and 25-year linear power warranty

1st year degradation not to exceed 2.5%, each subsequent year not to exceed 0.6%, minimum power at year 25 is 83.1% or greater.

ELECTRICAL CHARACTERISTICS

Module Type	JKM380M-72HBL-V		JKM385M-72HBL-V		JKM390M-72HBL-V		JKM395M-72HBL-V		JKM400M-72HBL-V	
	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT
Maximum Power (Pmax)	380Wp	280Wp	385Wp	283Wp	390Wp	287Wp	395Wp	291Wp	400Wp	294Wp
Maximum Power Voltage (Vmp)	39.10V	36.5V	39.37V	36.8V	39.64V	37.0V	39.90V	37.4V	40.16V	37.6V
Maximum Power Current (Imp)	9.72A	7.67A	9.78A	7.71A	9.84A	7.75A	9.90A	7.77A	9.96A	7.82A
Open-circuit Voltage (Voc)	48.2V	45.4V	48.4V	45.6V	48.6V	45.8V	48.8V	46.0V	49.1V	46.2V
Short-circuit Current (Isc)	10.30A	8.32A	10.38A	8.38A	10.46A	8.45A	10.54A	8.51A	10.61A	8.57A
Module Efficiency STC (%)	18.89%		19.13%		19.38%		19.63%		19.88%	

***STC:** Irradiance 1000W/m² | Cell Temperature 25°C | AM = 1.5
NOCT: Irradiance 800W/m² | Ambient Temperature 20°C | AM = 1.5 | Wind Speed 1m/s

*Power measurement tolerance: ±3%

The company reserves the final right for explanation on any of the information presented hereby. JKM380-400M-72HBL-V-F1-US

BUILDING YOUR TRUST IN SOLAR. WWW.JINKOSOLAR.US

COCKRELL, LAURA BUCKHOLZ
2385 NW SUMMERFIELD DR.,
LEE'S SUMMIT, MO 64081

AHJ: LEE'S SUMMIT, MO

ECOVOLE
1333 NW VIVION RD., KANSAS CITY, MO ,64118
LICENSE NO: 206086
TEL : 800-799-7986

MODULE DATASHEET

DATE: 4/19/2024
DRAWN BY: AN

PV 8.1

RELEASE FOR CONSTRUCTION
AS NOTED ON PLANS REVIEW
DEVELOPMENT SERVICES
LEE'S SUMMIT, MISSOURI
05/15/2024 2:00:17

NORTHERN ELECTRIC

BDM-600X MICROINVERTER

INPUT(DC)	Recommended Max PV Power (Wp)	450 x 2		
	Max DC Open Circuit Voltage (Vdc)	60		
	Max DC Input Current (Adc)	14 x 2		
	MPPT Tracking Accuracy	>99.5%		
	MPPT Tracking Range (Vdc)	22-55		
	Isc PV (absolute maximum) (Adc)	18 x 2		
	Maximum Inverter Backfeed Current to the Array (Adc)	0		
OUTPUT (AC)	Peak AC Output Power (Wp)	580 (continuous)		
	Rated AC Output Power (Wp)	500		
	Nominal Power Grid Voltage (Vac)	240	208	230
	Allowable Power Grid Voltage (Vac)	211-264*	183-229*	configurable*
	Allowable Power Grid Frequency (Hz)	59.3 a 60.5*		configurable*
	THD	<3% (at rated power)		
	Power Factor (cos phi, fixed)	>0.99 (at rated power)		
	Rated Output Current (Aac)	2.28	2.78	2.52
	Current (inrush)(Peak and Duration)	24A, 15us		
	Nominal Frequency (Hz)	60		50
	Maximum Output Fault Current (Aac)	4.4A peak		
	Maximum Output Overcurrent Protection (Aac)	10		
	Maximum Number of Units Per Branch (20A) (All NEC adjustment factors have been considered)	7	6	6
SYSTEM EFFICIENCY	Weighted Averaged Efficiency (CEC)	95.50%		
PROTECTION FUNCTIONS	Night Time Tare Loss (Wp)	0.11		
	Over/Under Voltage Protection	Yes		
	Over/Under Frequency Protection	Yes		
	Anti-Islanding Protection	Yes		
	Over Current Protection	Yes		
	Reverse DC Polarity Protection	Yes		
	Overload Protection	Yes		
	Protection Degree	NEMA-6 / IP-66 / IP-67		
	Ambient Temperature	-40°F to +149°F (-40°C to +65°C)		
	Operating Temperature	-40°F to +185°F (-40°C to +85°C)		
	Display	LED LIGHT		
	Comunications	Power Line		
	Dimension (W-H-D)	10.91"x5.20"x1.97"(277x132x50 mm)		
	Weight	6.4 lbs. (2.9 kg)		
	Environment Category	Indoor and outdoor		
	Wet Location	Suitable		
	Pollution Degree	PD 3		
	Overvoltage Category	II(PV), III (AC MAINS)		
	Product Safety Compliance	UL 1741 CSA C22.2 No. 107.1	IEC/EN 62109-1 IEC/EN 62109-2	
	Grid Code Compliance* (Refer to the label for the detailed grid code compliance)	IEEE 1547	VDE-AR-N 4105* VDE V 0126-1-1/A1 G83/2, CEI 021 AS 4777.2 & AS 4777.3,EN50438 ABNT NBR 16149/1615	

* Grid parameters are configurable through a BDG-256 or BDG-256P3 gateway
* All NEC required adjustment factors have been considered for AC outputs. AC current outputs will not exceed stated values for Rated Output AC Current

COMPLIANCE
*NEC 2020 Section 690.11 DC Arc-Fault Circuit Protection
*NEC 2020 Section 690.12 Rapid Shutdown of PV Systems on Buildings
*NEC 2020 Section 705.12 Point of Connection (AC Arc-Fault Protection)

COCKRELL, LAURA BUCKHOLZ
2385 NW SUMMERFIELD DR.,
LEE'S SUMMIT, MO 64081

AHJ: LEE'S SUMMIT, MO

ECOVOLE
1333 NW VIVION RD., KANSAS CITY, MO ,64118
LICENSE NO: 206086
TEL : 800-799-7986

INVERTER DATASHEET

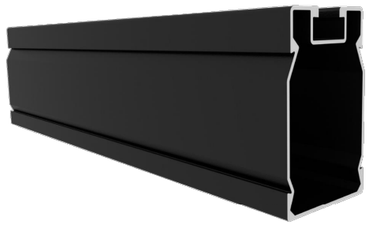
DATE: 4/19/2024
DRAWN BY: AN

PV8.2

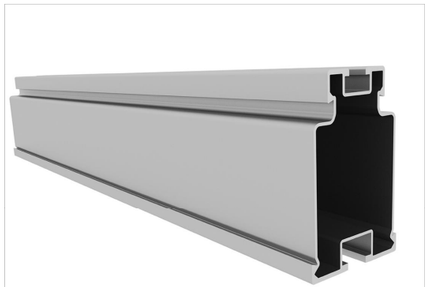
RELEASE FOR CONSTRUCTION
AS NOTED ON PLANS REVIEW
DEVELOPMENT SERVICES
LEE'S SUMMIT, MISSOURI
05/15/2024 2:00:17

SUNMOD

SMR100 Rail



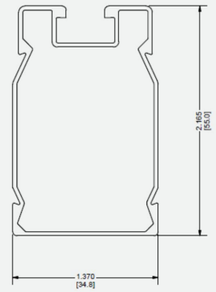
SMR300 Rail



Part Number	Description
A20422-XXX-BK	SMR100 Rail, Black Anodized
A20444-XXX-ML	SMR300 Rail, Mill Finish
A20440-BK1	Rail End Cap, SMR100, Black
A20445-001	Rail End Cap, SMR300

Cut Sheet

SMR100 Rail



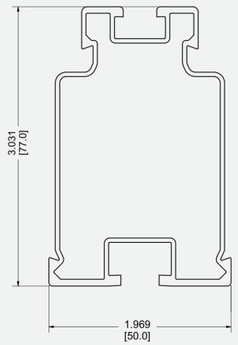
Mechanical Properties

Material: 6005-T5 Aluminum
Weight: 0.4126 lbs/ft (0.614 kg/m)
Ultimate Tensile Strength: 37.7 ksi (260 MPa)
Yield Strength: 34.8 ksi (240 MPa)

Section Properties

Sx: 0.196 in^3 (3.21 cm^3)
Sy: 0.146 in^3 (2.39 cm^3)
Area (X-section): 0.352 in^2 (2.27 cm^2)

SMR300 Rail



Mechanical Properties

Material: 6005-T5 Aluminum
Weight: 0.783 lbs/ft (1.167 kg/m)
Ultimate Tensile Strength: 37.7 ksi (260 MPa)
Yield Strength: 34.8 ksi (240 MPa)

Section Properties

Sx: 0.527 in^3 (8.64 cm^3)
Sy: 0.303 in^3 (4.97 cm^3)
Area (X-section): 0.669 in^2 (4.32 cm^2)

D10225-V005
Dimensions shown are inches (and millimeters)
Details are subject to change without notice

SUNMOD

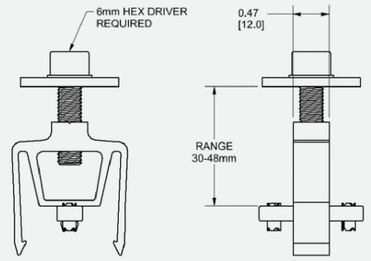
Mid Clamp

End Clamp

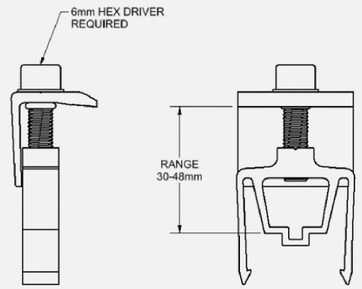
Part Number	Description
K10417-003	Mid Clamp, SMR Pop-On, Clear
K10418-BK3	Mid Clamp, SMR Pop-On, Black
K10418-003	End Clamp, SMR Pop-On, Clear
K10418-BK3	End Clamp, SMR Pop-On, Black

Cut Sheet

Pop-On Bonding Mid Clamp



Pop-On End Clamp



Materials:

1. Extrusions 6005-T5 Aluminum
2. Hardware 304 Stainless Steel

D10225-V005
Dimensions shown are inches (and millimeters)
Details are subject to change without notice

COCKRELL, LAURA BUCKHOLZ
2385 NW SUMMERFIELD DR.,
LEE'S SUMMIT, MO 64081

AHJ: LEE'S SUMMIT, MO

ECOVOLE
1333 NW VIVION RD., KANSAS CITY, MO ,64118
LICENSE NO: 206086
TEL : 800-799-7986

RACKING DATASHEET

DATE: 4/19/2024
DRAWN BY: AN

RELEASE FOR CONSTRUCTION
AS NOTED ON PLANS REVIEW
DEVELOPMENT SERVICES
LEE'S SUMMIT, MISSOURI
05/15/2024 2:00:17
BY

SUNMOD

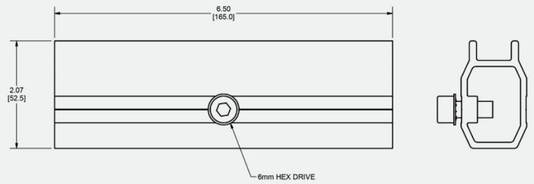
SMR Rail Splices

L-Foot Adaptors

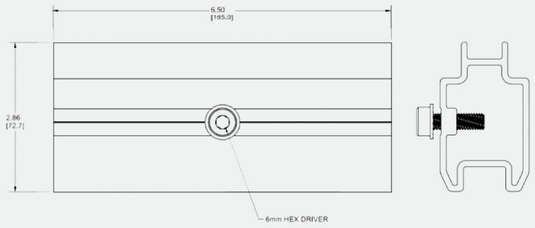
Part Number	Description
K10421-002	Structural Splice, SMR100
K10485-001	Structural Splice, SMR300
K10433-001	L Foot Adaptor, SMR100, Clear
K10433-BK1	L Foot Adaptor, SMR100, Black
K10434-001	L Foot Adaptor, SMR300, Clear

Cut Sheet

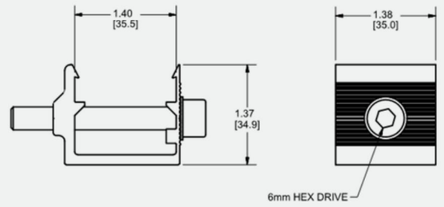
SMR100 Bonding Rail Splice



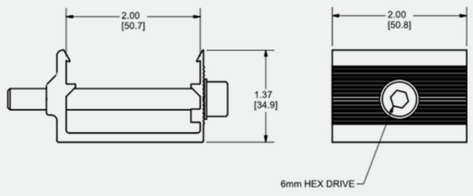
SMR300 Bonding Rail Splice



SMR100 L-Foot Adaptor



SMR300 L-Foot Adaptor



Materials:
1. Extrusions 6005-T5 Aluminum
2. Hardware 304 Stainless Steel

D10225-V005

Dimensions shown are inches (and millimeters)

Details are subject to change without notice

COCKRELL, LAURA BUCKHOLZ
2385 NW SUMMERFIELD DR.,
LEE'S SUMMIT, MO 64081

AHJ: LEE'S SUMMIT, MO

ECOVOLE
1333 NW VIVION RD., KANSAS CITY, MO ,64118
LICENSE NO: 206086
TEL : 800-799-7986

RACKING DATASHEET

DATE: 4/19/2024
DRAWN BY: AN

PV-8.4

RELEASE FOR CONSTRUCTION
AS NOTED ON PLANS REVIEW
DEVELOPMENT SERVICES
LEE'S SUMMIT, MISSOURI
05/15/2024 2:00:17

SUNMODO
LEADING by DESIGN

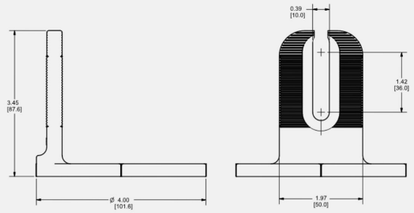
NanoMount

Part Number	Description
K50058-BK1	NanoMount • NanoMount • USWR Gasket

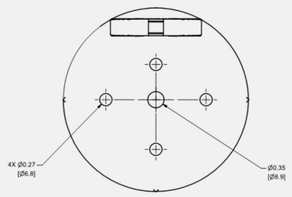
See Published data for allowable loads. Care should be taken to avoid concentrated loads during installation.

Cut Sheet

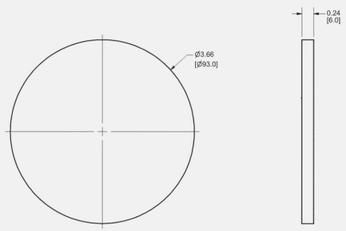
NanoMount



Material: Aluminum
Finish: Black Powder Coating



NanoMount Gasket



Material: USWR Gasket with Adhesive

D10214-V004
Dimensions shown are inches (and millimeters) Details are subject to change without notice

SUNMODO
LEADING by DESIGN

NanoMount Lag Bolt

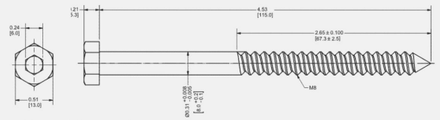
NanoMount Decking Screw

Part Number	Description
K50049-BK1	Lag Bolt Assembly • Hex Lag Bolt M8X115, DIN 571, 304S • Sealing Washer .33 ID X .75 X .157
K50055-BK1	Decking Screw Assembly • Self-Tapping Screw, #14 X 3.00 • Sealing Washer .26ID X .50X .125

Cut Sheet

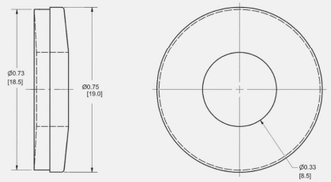
Lag Bolt Assembly

1. Hex Lag Bolt M8X115, DIN 571, 304



Material: Stainless Steel
Finish: Clear

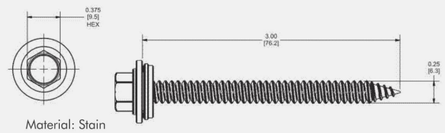
2 Sealing Washer .33ID X.75X.157



Material: EPDM + Stainless Steel

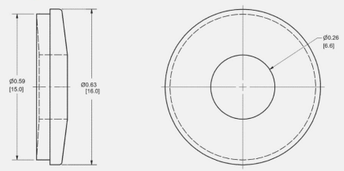
Decking Screw Assembly

1. Self-Tapping Screw, #14 X 3.00



Material: Stain
Finish: Clear

2. Sealing Washer .26ID X .50X .125



Material: EPDM + Stainless Steel

D10214-V004
Dimensions shown are inches (and millimeters) Details are subject to change without notice

COCKRELL, LAURA BUCKHOLZ
2385 NW SUMMERFIELD DR.,
LEE'S SUMMIT, MO 64081

AHJ: LEE'S SUMMIT, MO

ECOVOLE
1333 NW VIVION RD., KANSAS CITY, MO ,64118
LICENSE NO: 206086
TEL : 800-799-7986

ATTCHMENT DATASHEET

DATE: 4/19/2024
DRAWN BY: AN

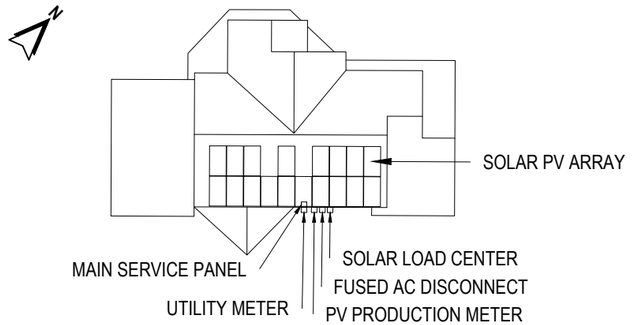
PV-8.3

RELEASE FOR CONSTRUCTION
AS NOTED ON PLANS REVIEW
DEVELOPMENT SERVICES
LEE'S SUMMIT, MISSOURI
05/15/2024 2:00:17

⚠ CAUTION ⚠

POWER TO THIS BUILDING IS SUPPLIED FROM THE FOLLOWING SOURCES WITH DISCONNECTS LOCATED AS SHOWN

SERVICE 1 OF 1



2385 NW SUMMERFIELD DR., LEE'S SUMMIT, MO 64081

COCKRELL, LAURA BUCKHOLZ
2385 NW SUMMERFIELD DR.,
LEE'S SUMMIT, MO 64081

AHJ: LEE'S SUMMIT, MO

ECOVOLE
1333 NW VIVION RD., KANSAS CITY, MO ,64118
LICENSE NO: 206086
TEL : 800-799-7986

PLACARD

DATE: 4/19/2024
DRAWN BY: AN