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

December 20, 2024

Scott Wyssling, PE

Digitally signed by Scott Wyssling, PE
DN: C=US, S=Utah, L=Alpine, O=Wyssling Consulting, OU=Engineering, CN="Scott Wyssling, PE", E=swyssling@wysslingconsulting.com
Reason: I am the author of this document
Location:
Date: 2024.12.20 17:28:32-07'00'
Foxit PDF Editor Version: 13.0.0

BYLD Better
1213 W Moorehead Street Suite 500
Charlotte, NC 28208

Re: Engineering Services
Middlebrook Residence
4245 Overhills Road, Spring Lake, NC
4.000 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:	Assumed 2x6 dimensional lumber at 24” on center
Roof Material:	Composite Asphalt Shingles
Roof Slope:	30 degrees
Attic Access:	Inaccessible
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** = 10 psf
- **Wind Load** based on ASCE 7-10
  - Ultimate Wind Speed = 120 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 North Carolina 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.

D. Solar Panel Anchorage

1. The solar panels shall be mounted in accordance with the most recent Pegasus 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 force for a 5/16" lag screw is 229 lbs per inch of penetration as identified in the National Design Standards (NDS) of timber construction specifications. Based on a minimum penetration depth of 2½", the allowable capacity per connection is greater than the design withdrawal force (demand). Considering the variable factors for the existing roof framing and installation tolerances, the connection using one 5/16" diameter lag screws with a minimum of 2½" embedment will be adequate and will include a sufficient factor of safety.
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 North Carolina Residential Code, 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
North Carolina License No. 46546
North Carolina COA P-2308

NORTH CAROLINA PROFESSIONAL SEAL 046546 ENGINEER SCOTT E. WYSSLING

Wyssling Consulting, PLLC
76 N Meadowbrook Drive Alpine UT 84004
North Carolina COA # P-2308

Signed 12/20/2024

THIS PLAN HAS BEEN ELECTRONICALLY SIGNED AND SEALED BY SCOTT WYSSLING, PE USING A DIGITAL SIGNATURE AND DATE. PRINTED COPIES OF THIS DOCUMENT ARE NOT CONSIDERED SIGNED AND SEALED AND THE SIGNATURE MUST BE VERIFIED ON ANY ELECTRONIC COPIES

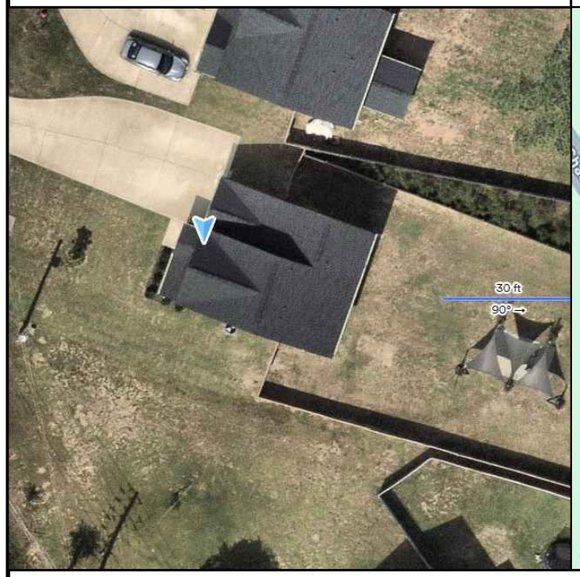
NEW PV SYSTEM DESIGN

10 MODULES - 4.000 kW DC, 2.950 kW AC SYSTEM SIZE

MIDDLEBROOK RESIDENCE - 4245 OVERHILLS ROAD, SPRING LAKE, NC 28390 APN: 0525131287.000

AERIAL MAP

NTS



VICINITY MAP

NTS

SHEET INDEX

SCOPE OF WORK

SYSTEM SIZE: 4.000kW DC / 2.950kW AC SYSTEM SIZE
PV MODULE: (10) LONGI LR5-54HABB-400M (BLACK ON BLACK)
INVERTER: (5) NEP BDM-600X [240V]
COMBINER: (1) MINIMUM 125A LOAD CENTER
AC DISCONNECT: (1) 30A NON-FUSED AC DISCONNECT

ROOF STORIES: 2
ROOF TYPE(S): COMP SHINGLE
MOUNTING(S) & RACKING(S): PEGASUS INSTAFLASH WITH PEGASUS RAIL
FLASHING: PEGASUS INSTAFLASH FLASHING
ROOF BEING REPLACED: NO
ROOF CONDITION: GOOD
ROOF HEIGHT: 25 FEET
ROOF CONSTRUCTION: GABLE

INTERCONNECTION: LOAD BREAKER
MAIN SERVICE PANEL RATING: (E) 200A
MAIN BREAKER RATING: (E) 200A
OCPD: 20A PV BREAKER

METER NUMBER: 135680762

GOVERNING CODES

2020 NATIONAL ELECTRIC CODE
2018 NORTH CAROLINA BUILDING CODE
2018 NORTH CAROLINA RESIDENTIAL CODE
2018 NORTH CAROLINA FIRE PREVENTION CODE
2018 NORTH CAROLINA FUEL GAS CODE
2018 NORTH CAROLINA EXISTING BUILDING CODE
2018 NORTH CAROLINA ENERGY CONSERVATION CODE
2018 NORTH CAROLINA MECHANICAL CODE
2018 NORTH CAROLINA PLUMBING CODE

AS ADOPTED BY SPRING LAKE INCLUDING ANY AMENDMENTS OR ADDITIONAL LISTED REQUIREMENTS. DESIGNED IN ACCORDANCE WITH THE REQUIREMENTS OF SOUTH RIVER ELECTRIC UTILITY.

EQUIPMENT IS COMPATIBLE WITH UL2703, UL1741, AND UL1703 AS APPLICABLE

DESIGN CRITERIA

WIND SPEED: 120 MPH
GROUND SNOW LOAD: 10 PSF
ASCE: 7-10
EXPOSURE CATEGORY: C
BUILDING OCCUPANCY: R-3
CONSTRUCTION TYPE: TYPE V-B
SPRINKLERS: NO

DATE	REVISION

DESIGN ENGINEER

WYSSLING CONSULTING
CORPORATE EXPERIENCE WITH SMALL BUSINESS VALUE

76 N. MEADOWBROOK DRIVE
ALPINE UT 84004
swyssling@wysslingconsulting.com
(201) 874-3483
COA NO. P-2308

SOLAR COMPANY/CLIENT

BYLD BETTER

BYLD BETTER
1213 W MOOREHEAD STREET SUITE 500
CHARLOTTE, NC

MIDDLEBROOK RESIDENCE
4245 OVERHILLS ROAD
SPRING LAKE, NC 28390
COORDINATES: 35.270253, -78.929095
APN: 0525131287.000
Deemiddle@icloud.com

COVER PAGE

NORTH CAROLINA PROFESSIONAL SEAL 046546 ENGINEER SCOTT E. WYSSLING

Wyssling Consulting, PLLC
76 N Meadowbrook Drive Alpine UT 84004
North Carolina COA # P-2308
Signed 12/20/2024

THIS PLAN HAS BEEN ELECTRONICALLY SIGNED AND SEALED BY SCOTT WYSSLING, PE USING A DIGITAL SIGNATURE AND DATE. PRINTED COPIES OF THIS DOCUMENT ARE NOT CONSIDERED SIGNED AND SEALED AND THE SIGNATURE MUST BE VERIFIED ON ANY ELECTRONIC COPIES

SCOTT E WYSSLING, PE
NC LICENSE NO 46546

DC SYSTEM SIZE: 4.000kW
AC SYSTEM SIZE: 2.950kW

PV-1

AHJ: SPRING LAKE
UTILITY: SRE

DRAWN BY: CMS
INITIAL DESIGN DATE: 12/20/2024

N

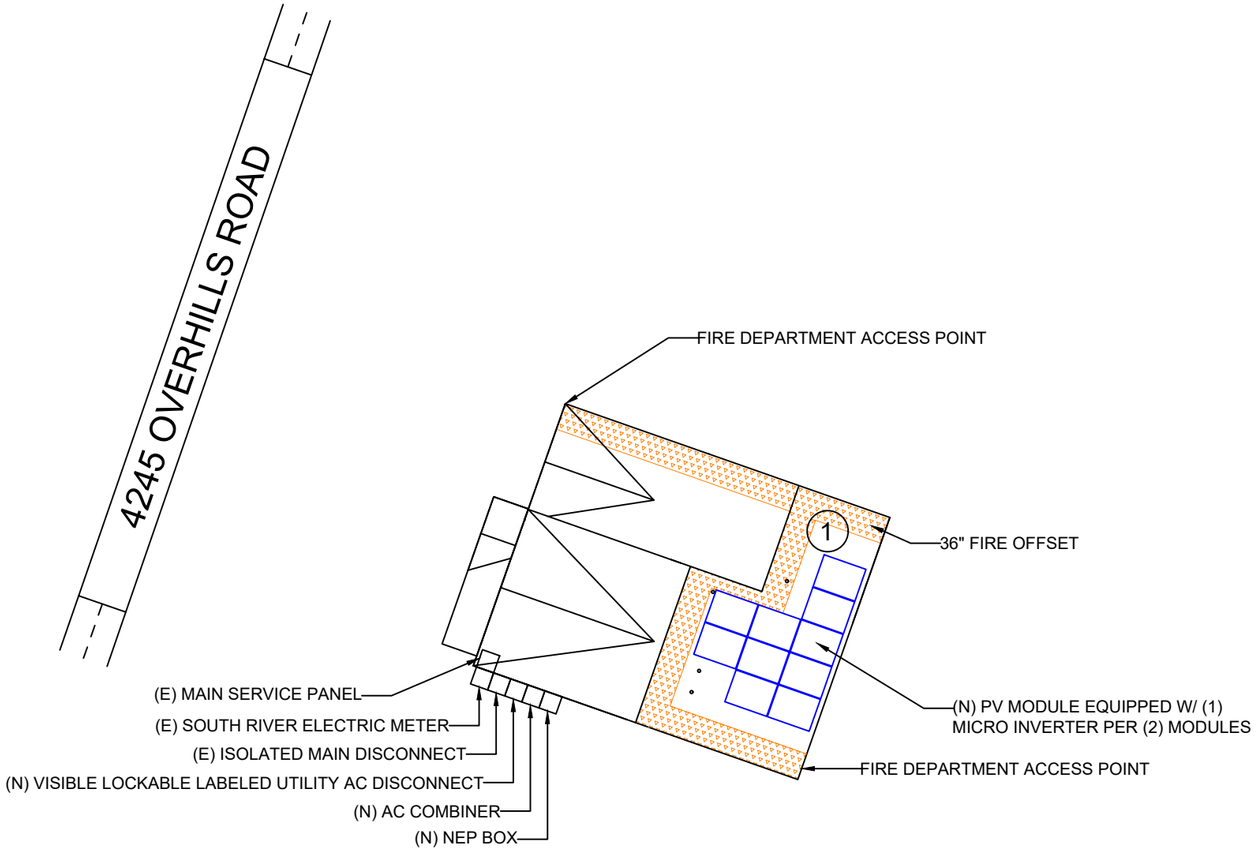
SYSTEM INFORMATION	
MODULE COUNT/TYPE	(10) LONGI LR5-54HABB-400M (BLACK ON BLACK)
INVERTER COUNT/TYPE	(5) NEP BDM-600X [240V]
MODULE WEIGHT	49.6 LBS
MODULE DIMENSIONS	67.8" x 44.65"
UNIT WEIGHT OF ARRAY	2.36 PSF

LEGEND	
ROOF VENT (TYP.)	
PLUMBING VENT (TYP.)	
A/C UNIT	A/C
SATELLITE DISH	
ELECTRICAL MAST	
CHIMNEY	
FIRECODE PATHWAY	

ROOF DESCRIPTION

ROOF #	ROOF TYPE	TILT	PITCH	AZIMUTH	ROOF FRAMING	MODULE COUNT	ARRAY SQ. FT.	ATTACHMENT	MIN EMBEDMENT
1	COMP SHINGLE	30°	7:12	110°	2X6@24" O.C. RAFTERS	10	210	(1) 5/16" X 4" LAG SCREW	2.5"

TOTAL ROOF AREA SQ. FT.	1233	TOTAL ARRAY SQ. FT.	210	ROOF COVER %	17.05



SITE PLAN NOTES

1. ALL OBSTRUCTIONS MUST BE VERIFIED BEFORE WORK COMMENCES
2. CONDUIT TO BE RUN IN ATTIC IF POSSIBLE
3. VISIBLE LOCKABLE LABELED UTILITY AC DISCONNECT WILL BE INSTALLED WITHIN 10' OF SOUTH RIVER ELECTRIC METER.
4. AC DISCONNECT SHALL BE READILY ACCESSIBLE 24/7
5. REQUIRED ELECTRICAL CLEARANCE TO BE MAINTAINED

SCALE: 1/16" = 1'-0"

DESIGN ENGINEER

WYSSLING CONSULTING
CORPORATE EXPERIENCE WITH SMALL BUSINESS VALUE

76 N. MEADOWBROOK DRIVE
ALPINE UT 84004
swyssling@wysslingconsulting.com
(201) 874-3483
COA NO. P-2308

SOLAR COMPANY/CLIENT

BYLD BETTER

BYLD BETTER
1213 W MOOREHEAD STREET SUITE 500
CHARLOTTE, NC

MIDDLEBROOK RESIDENCE
4245 OVERHILLS ROAD
SPRING LAKE, NC 28390
COORDINATES: 35.270253, -78.929095
APN: 0525131287.000
Deemiddle@icloud.com

SITE PLAN

NORTH CAROLINA PROFESSIONAL SEAL 046546 ENGINEER SCOTT E. WYSSLING

Wyssling Consulting, PLLC
76 N Meadowbrook Drive Alpine UT 84004
North Carolina COA # P-2308

Signed 12/20/2024

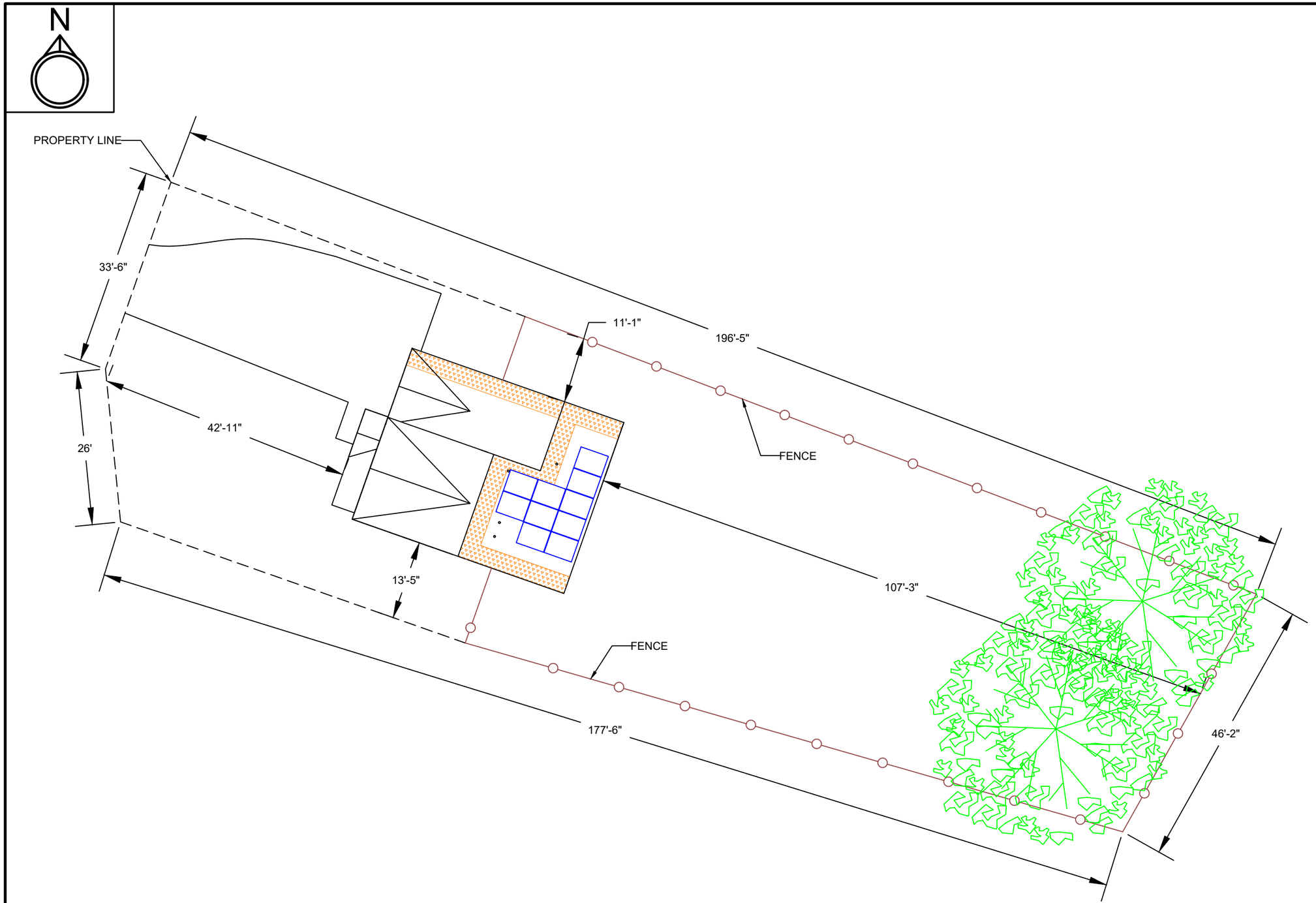
SCOTT E WYSSLING, PE
NC LICENSE NO 46546

DC SYSTEM SIZE: 4.000kW
AC SYSTEM SIZE: 2.950kW

PV-2

AHJ: SPRING LAKE
UTILITY: SRE

DRAWN BY: CMS
INITIAL DESIGN DATE: 12/20/2024



SCALE: 1/16" = 1'-0"

DESIGN ENGINEER

WYSSLING CONSULTING
CORPORATE EXPERIENCE WITH SMALL BUSINESS VALUE

76 N. MEADOWBROOK DRIVE
ALPINE UT 84004
swyssling@wysslingconsulting.com
(201) 874-3483
COA NO. P-2308

SOLAR COMPANY/CLIENT

BYLD BETTER

BYLD BETTER
1213 W MOOREHEAD STREET SUITE 500
CHARLOTTE, NC

MIDDLEBROOK
RESIDENCE
4245 OVERHILLS ROAD
SPRING LAKE, NC 28390
COORDINATES: 35.270253, -78.929095
APN: 0525131287.000
Deemiddle@icloud.com

PROPERTY PLAN

NORTH CAROLINA PROFESSIONAL SEAL 046546 ENGINEER SCOTT E. WYSSLING

Wyssling Consulting, PLLC
76 N Meadowbrook Drive Alpine UT 84004
North Carolina COA # P-2308
Signed 12/20/2024

THIS PLAN HAS BEEN ELECTRONICALLY SIGNED AND SEALED BY SCOTT WYSSLING, PE USING A DIGITAL SIGNATURE AND DATE. PRINTED COPIES OF THIS DOCUMENT ARE NOT CONSIDERED SIGNED AND SEALED AND THE SIGNATURE MUST BE VERIFIED ON ANY ELECTRONIC COPIES

SCOTT E WYSSLING, PE
NC LICENSE NO 46546

DC SYSTEM SIZE: 4.000kW
AC SYSTEM SIZE: 2.950kW

PV-3

AHJ: SPRING LAKE
UTILITY: SRE

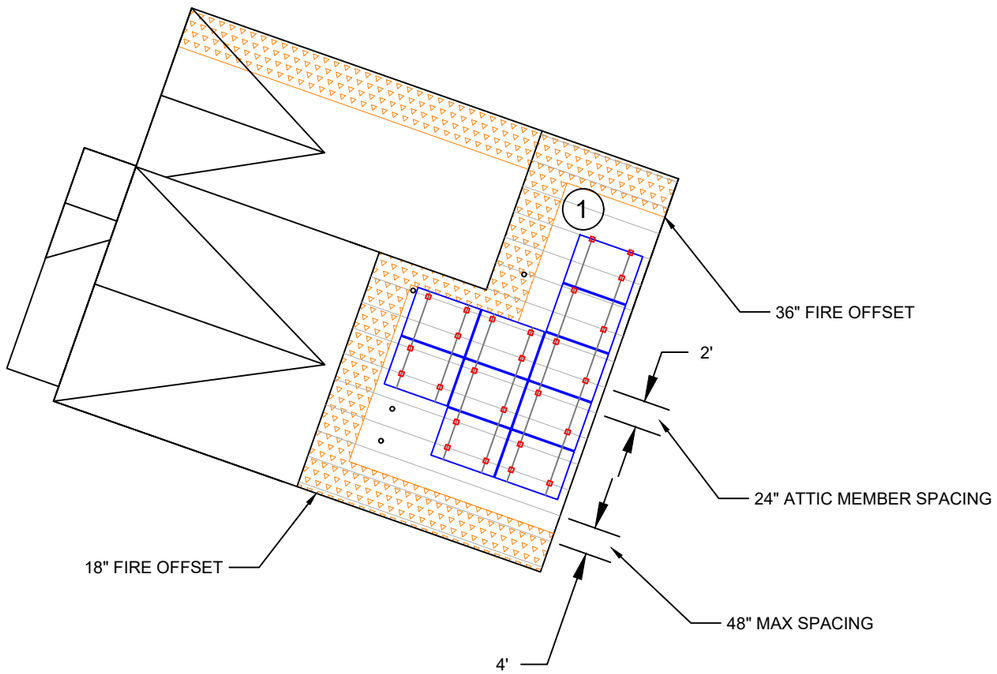
DRAWN BY: CMS
INITIAL DESIGN DATE: 12/20/2024

N

ATTACHMENT DESCRIPTION								
ROOF #	ROOF TYPE	TILT	ARRAY TILT	AZIMUTH	ROOF FRAMING	TOTAL POINTS	MAX SPACING	MAX CANTILEVER
1	COMP SHINGLE	30°	30°	110°	2X6@24" O.C. RAFTERS	26	48"	16"

PV MODULES: (10) LONGI LR5-54HABB-400M (BLACK ON BLACK)
ROOF TYPE(S): COMP SHINGLE
ROOF CONDITION: GOOD
MOUNTING TYPE(S): PEGASUS INSTAFLASH WITH PEGASUS RAIL
FLASHING: PEGASUS INSTAFLASH FLASHING
ROOF HEIGHT: 25'
ROOF FRAMING MATERIAL: WOOD
DECKING THICKNESS: 1/2'

TOTAL ATTACHMENTS: 26



EXACT LOCATION OF ROOF FRAMING MAY VARY; INSTALLER TO FOLLOW ENGINEER (WHERE APPLICABLE) AND MANUFACTURER INSTRUCTIONS/GUIDELINES WHEN INSTALLING.

SCALE: 3/32" = 1'-0"

DESIGN ENGINEER

WYSSLING CONSULTING
CORPORATE EXPERIENCE WITH SMALL BUSINESS VALUE

76 N. MEADOWBROOK DRIVE
ALPINE UT 84004
swyssling@wysslingconsulting.com
(201) 874-3483
COA NO. P-2308

SOLAR COMPANY/CLIENT

BYLD BETTER

BYLD BETTER
1213 W MOOREHEAD STREET SUITE 500
CHARLOTTE, NC

MIDDLEBROOK RESIDENCE
4245 OVERHILLS ROAD
SPRING LAKE, NC 28390
COORDINATES: 35.270253, -78.929095
APN: 0525131287.000
Deemiddle@icloud.com

ATTACHMENT PLAN

NORTH CAROLINA PROFESSIONAL SEAL 046546 ENGINEER SCOTT E. WYSSLING

Wyssling Consulting, PLLC
76 N Meadowbrook Drive Alpine UT 84004
North Carolina COA # P-2308
Signed 12/20/2024

THIS PLAN HAS BEEN ELECTRONICALLY SIGNED AND SEALED BY SCOTT WYSSLING, PE USING A DIGITAL SIGNATURE AND DATE. PRINTED COPIES OF THIS DOCUMENT ARE NOT CONSIDERED SIGNED AND SEALED AND THE SIGNATURE MUST BE VERIFIED ON ANY ELECTRONIC COPIES

SCOTT E WYSSLING, PE
NC LICENSE NO 46546

DC SYSTEM SIZE: 4.000kW
AC SYSTEM SIZE: 2.950kW

PV-4

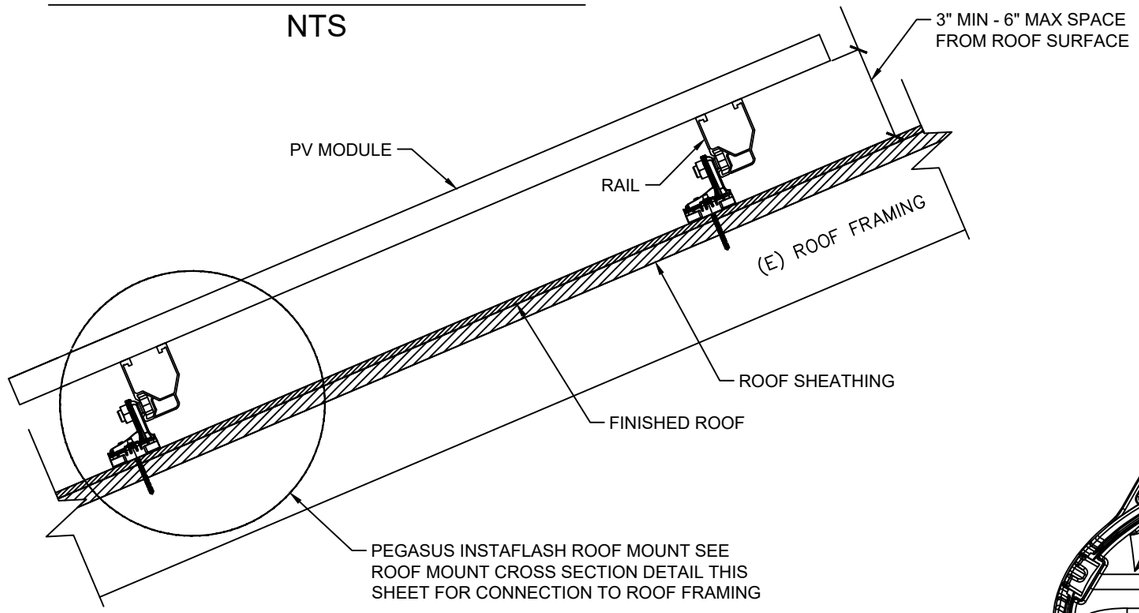
AHJ: SPRING LAKE
UTILITY: SRE

DRAWN BY: CMS
INITIAL DESIGN DATE: 12/20/2024

ROOF SECTIONS	R1	WIND SPEED: 118 MPH	GROUND SNOW LOAD: 10 PSF	ROOF TYPE: COMP SHINGLE	ROOF LAYERS (IF APPLICABLE): 1

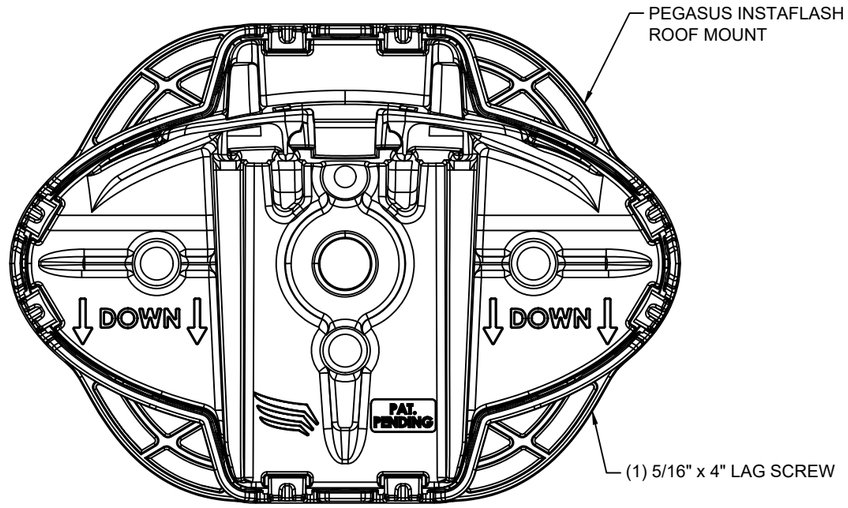
GENERAL ROOF MOUNT DETAIL

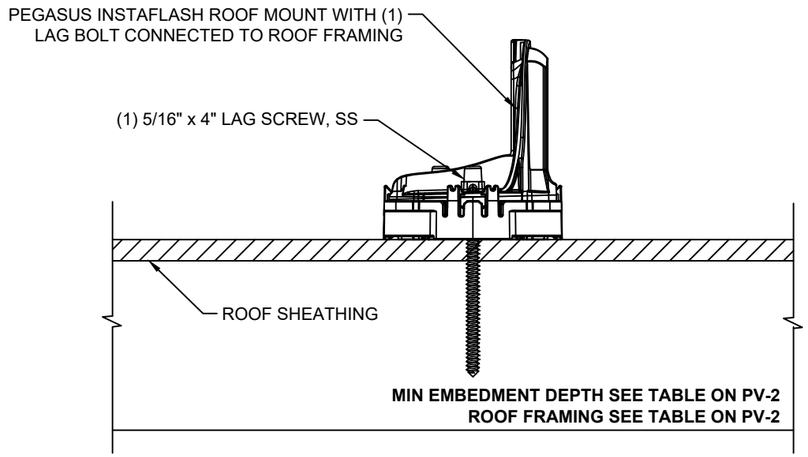
NTS



ROOF MOUNT PLAN VIEW DETAIL

NTS





ROOF MOUNT CROSS SECTION DETAIL

NTS

DESIGN ENGINEER

WYSSLING CONSULTING
CORPORATE EXPERIENCE WITH SMALL BUSINESS VALUE

76 N. MEADOWBROOK DRIVE
ALPINE UT 84004
swyssling@wysslingconsulting.com
(201) 874-3483
COA NO. P-2308

SOLAR COMPANY/CLIENT

BYLD BETTER

BYLD BETTER
1213 W MOOREHEAD STREET SUITE 500
CHARLOTTE, NC

MIDDLEBROOK RESIDENCE
4245 OVERHILLS ROAD
SPRING LAKE, NC 28390
COORDINATES: 35.270253, -78.929095
APN: 0525131287.000
Deemiddle@icloud.com

MOUNTING DETAILS

NORTH CAROLINA PROFESSIONAL SEAL 046546 ENGINEER SCOTT E. WYSSLING

Wyssling Consulting, PLLC
76 N Meadowbrook Drive Alpine UT 84004
North Carolina COA # P-2308
Signed 12/20/2024

THIS PLAN HAS BEEN ELECTRONICALLY SIGNED AND SEALED BY SCOTT WYSSLING, PE USING A DIGITAL SIGNATURE AND DATE. PRINTED COPIES OF THIS DOCUMENT ARE NOT CONSIDERED SIGNED AND SEALED AND THE SIGNATURE MUST BE VERIFIED ON ANY ELECTRONIC COPIES

SCOTT E WYSSLING, PE
NC LICENSE NO 46546

DC SYSTEM SIZE: 4.000kW
AC SYSTEM SIZE: 2.950kW

PV-5

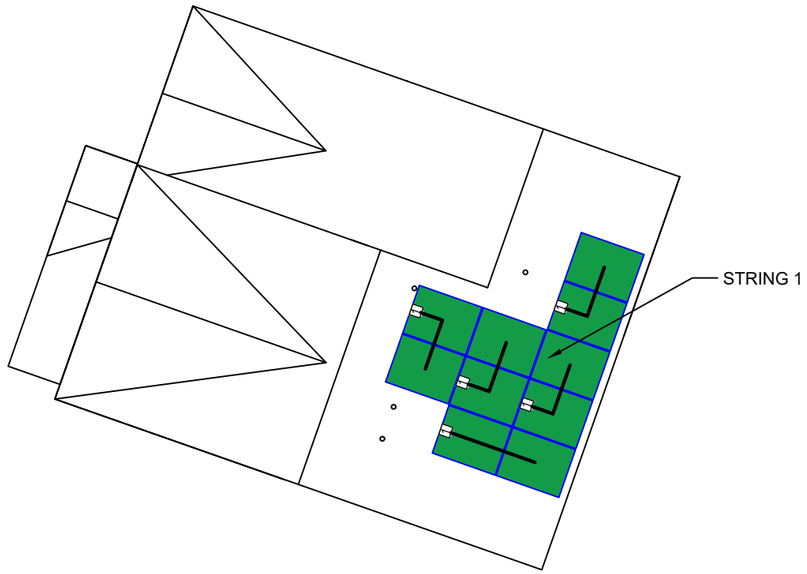
AHJ: SPRING LAKE
UTILITY: SRE

DRAWN BY: CMS
INITIAL DESIGN DATE: 12/20/2024

N

MODULE: (10) LONGI LR5-54HABB-400M (BLACK ON BLACK)
INVERTER: (5) NEP BDM-600X [240V]
COMBINER: (1) MINIMUM 125A LOAD CENTER

STRING 1: (10) MODULES



SCALE: 3/32" = 1'-0"

DESIGN ENGINEER

WYSSLING CONSULTING
CORPORATE EXPERIENCE WITH SMALL BUSINESS VALUE

76 N. MEADOWBROOK DRIVE
ALPINE UT 84004
swyssling@wysslingconsulting.com
(201) 874-3483
COA NO. P-2308

SOLAR COMPANY/CLIENT

BYLD BETTER

BYLD BETTER
1213 W MOOREHEAD STREET SUITE 500
CHARLOTTE, NC

MIDDLEBROOK
RESIDENCE
4245 OVERHILLS ROAD
SPRING LAKE, NC 28390
COORDINATES: 35.270253, -78.929095
APN: 0525131287.000
Deemiddle@icloud.com

STRING PLAN

DC SYSTEM SIZE: 4.000kW
AC SYSTEM SIZE: 2.950kW

EE-1

AHJ: SPRING LAKE
UTILITY: SRE

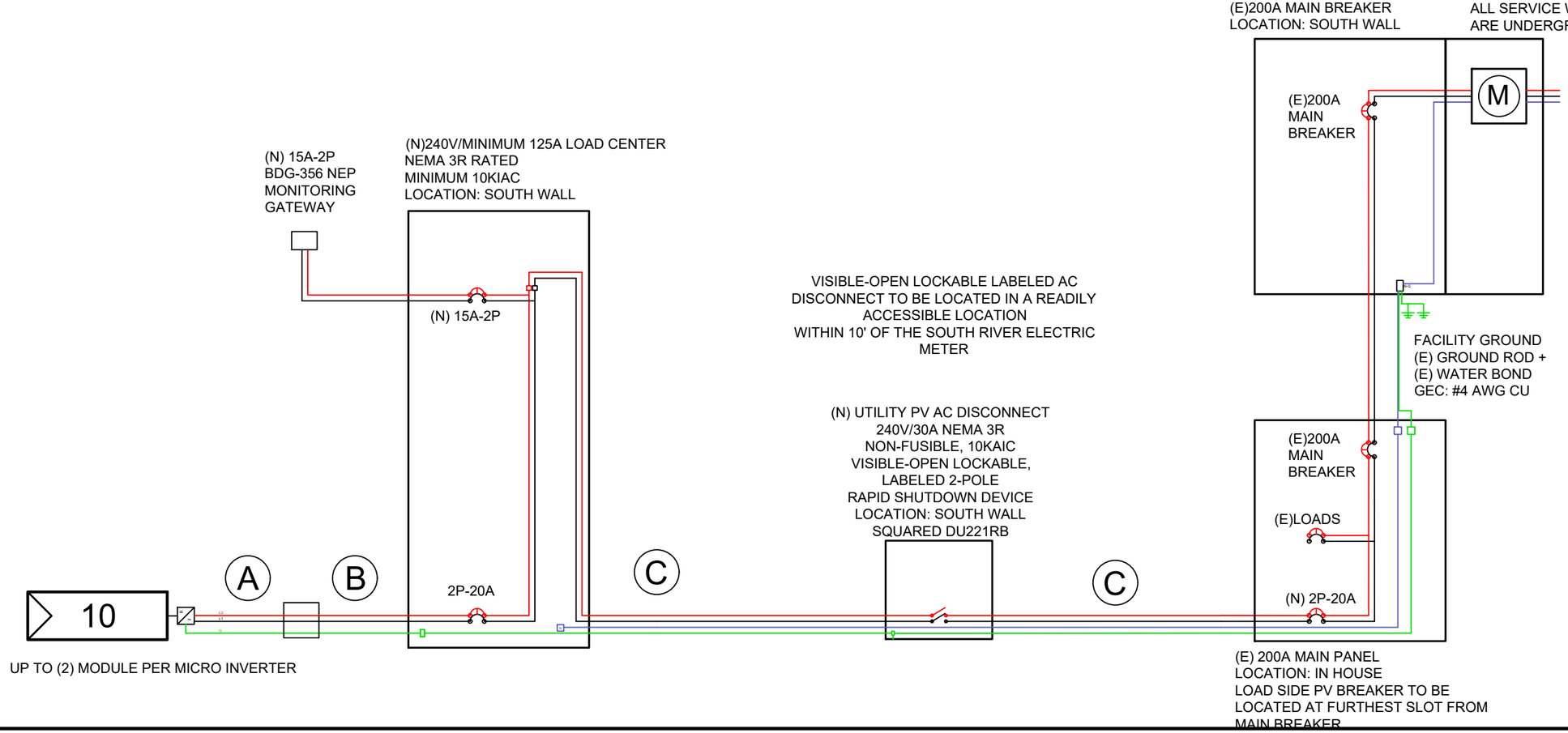
DRAWN BY: CMS
INITIAL DESIGN DATE: 12/20/2024

MODULE TYPE: (10) LONGI LR5-54HABB-400M (BLACK ON BLACK)
INVERTER TYPE: (5) NEP BDM-600X [240V] 240V

DC SYSTEM SIZE: MODULE WATTAGE: 400W X 10 MODULES = 4.000KW
AC SYSTEM SIZE: INVERTER WATTAGE: 590W X 5 INVERTERS = 2.950KW

CONDUCTOR SCHEDULE

TAG	# WIRES IN CONDUIT	MINIMUM WIRE SIZE	TYPE, MATERIAL	MINIMUM GROUND WIRE SIZE	GROUND TYPE,MATERIAL	CONDUIT	AMPS (BEFORE 125% SAFETY FACTOR)	TOTAL AMPS	WIRE AMPERAGE RATING TABLE 310.15(B)(16)	MINIMUM OCPD
A	3	#10 AWG	THWN-2, CU	#6 AWG	BARE CU	3/4 EMT	12.3	15.38	35	20
B	3	#10 AWG	THWN-2, CU	#12 AWG	THWN-2, CU	3/4 EMT	12.3	15.38	35	20
C	4	#10 AWG	THWN-2, CU	#12 AWG	THWN-2, CU	3/4 EMT	12.3	15.38	35	20



DESIGN ENGINEER

WYSSLING CONSULTING
CORPORATE EXPERIENCE WITH SMALL BUSINESS VALUE

76 N. MEADOWBROOK DRIVE
ALPINE UT 84004
swyssling@wysslingconsulting.com
(201) 874-3483
COA NO. P-2308

SOLAR COMPANY/CLIENT

BYLD BETTER

BYLD BETTER
1213 W MOOREHEAD STREET SUITE 500
CHARLOTTE, NC

FED

MIDDLEBROOK RESIDENCE
4245 OVERHILLS ROAD
SPRING LAKE, NC 28390
COORDINATES: 35.270253, -78.929095
APN: 0525131287.000
Deemiddle@icloud.com

THREE LINE DIAGRAM

DC SYSTEM SIZE: 4.000kW
AC SYSTEM SIZE: 2.950kW

EE-2

AHJ: SPRING LAKE
UTILITY: SRE

DRAWN BY: CMS
INITIAL DESIGN DATE: 12/20/2024

PV MODULE	
MODEL	LONGI LR5-54HABB-400M (BLACK ON BLACK)
PMAX	400W
VOC	37.05V
VMP	30.94V
IMP	12.93A
ISC	13.72A

INVERTER	
MODEL	NEP BDM-600X [240V]
MAX INPUT DC VOLTAGE	60V
MAX DC CURRENT	40A
MAX OUTPUT POWER	590W
MAXIMUM CONT. OUTPUT CURRENT	2.46A
CEC EFFICIENCY	0.955
NOMINAL AC VOLTAGE	240V

INTERCONNECTION PER NEC 705.12 (B) "120% RULE"	
MSP RATING	200A
MAIN DISCONNECT RATING	200A
TOTAL BACK FEED REQUIRED	15.375A
OCPD RATING	20A
(MSP RATING * 1.2)-MAIN DISCONNECT	(200A * 1.2)-200 >=15.375A, GOOD

ELECTRICAL CALCULATIONS

TAG A
FROM MODULES TO JUNCTION BOX

LARGEST STRING: 10 MODULES
NUMBER OF INVERTERS: 5
AMPS PER INVERTER: 2.46
5 * 2.46A = 12.3A * 1.25 = 15.38A TOTAL AMPS

CONDUCTOR SIZE: #10 AWG
CONDUCTOR MAX: 35A, GOOD
OCPD: 20A, GOOD

TAG B
FROM JUNCTION BOX TO AC COMBINER

LARGEST STRING: 10 MODULES
NUMBER OF INVERTERS: 5
AMPS PER INVERTER: 2.46
5 * 2.46A = 12.3A * 1.25 = 15.38A TOTAL AMPS

CONDUCTOR SIZE: #10 AWG
CONDUCTOR MAX: 35A, GOOD
OCPD: 20A, GOOD

TAG C
FROM AC COMBINER TO INTERCONNECTION

TOTAL MODULES: 10
TOTAL INVERTERS: 5
AMPS PER INVERTER: 2.46A
5 * 2.46A = 12.3A * 1.25 = 15.38A TOTAL AMPS

CONDUCTOR SIZE: #10 AWG
CONDUCTOR MAX: 35A, GOOD
OCPD: 20A, GOOD

TEMPERATURE CORRECTED VOC				
MODULE VOC	VOC COEFFICIENT	COLDEST TEMPERATURE	ADJUSTED VOC	INVERTER MAX
37.05	-0.265	-39	40.58	60, GOOD

DESIGN ENGINEER

WYSSLING CONSULTING
CORPORATE EXPERIENCE WITH SMALL BUSINESS VALUE

76 N. MEADOWBROOK DRIVE
ALPINE UT 84004
swyssling@wysslingconsulting.com
(201) 874-3483
COA NO. P-2308

SOLAR COMPANY/CLIENT

BYLD BETTER

BYLD BETTER
1213 W MOOREHEAD STREET SUITE 500
CHARLOTTE, NC

MIDDLEBROOK RESIDENCE
4245 OVERHILLS ROAD
SPRING LAKE, NC 28390
COORDINATES: 35.270253, -78.929095
APN: 0525131287.000
Deemiddle@icloud.com

ELECTRICAL NOTES

DC SYSTEM SIZE: 4.000kW
AC SYSTEM SIZE: 2.950kW

EE-3

AHJ: SPRING LAKE
UTILITY: SRE

DRAWN BY: CMS
INITIAL DESIGN DATE: 12/20/2024

1) **PHOTOVOLTAIC AC DISCONNECT**
MAXIMUM AC OPERATING CURRENT: 12.3
NOMINAL OPERATING AC VOLTAGE: 240

AT POINT OF INTERCONNECTION, MARKED AT DISCONNECTING MEANS [NEC 690.56]

2) **⚠WARNING** DUAL POWER SOURCE
SECOND SOURCE IS PHOTOVOLTAIC SYSTEM

AT POINT OF INTERCONNECTION [NEC 705.12(C),690.59]

3) **MAIN PHOTOVOLTAIC SYSTEM DISCONNECT**

EACH PV SYSTEM DISCONNECTING MEANS SHALL PLAINLY INDICATE WHETHER IN THE OPEN (OFF) OR CLOSED (ON) POSITION AND BE PERMANENTLY MARKED [NEC 690.13(B)]

4) PHOTOVOLTAIC
DC DISCONNECT

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

5) PHOTOVOLTAIC
AC DISCONNECT

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

6) **WARNING: PHOTOVOLTAIC POWER SOURCE**

AT EXPOSED RACEWAYS, CABLE TRAYS, AND OTHER WIRING METHODS; SPACED AT MAXIMUM 10 FT SECTION OR WHERE SEPARATED BY ENCLOSURES, WALLS, PARTITIONS, CEILINGS, OR FLOORS [NEC 690.31(D)(2)]

7) **⚠WARNING**
ELECTRICAL SHOCK HAZARD
DO NOT TOUCH TERMINALS
TERMINALS ON BOTH LINE AND LOAD SIDES
MAY BE ENERGIZED IN THE OPEN POSITION

AT BUILDING OR STRUCTURE MAIN DISCONNECTING MEANS [NEC 690.12(E), NEC 690.13(B)]

8) ⚠ WARNING
PHOTOVOLTAIC SYSTEM
COMBINER PANEL
DO NOT ADD LOADS

AT AC COMBINER PANEL [NEC 690.13(B)]

9) **⚠WARNING**
INVERTER OUTPUT CONNECTION. DO NOT RELOCATE THIS OVERCURRENT DEVICE

A PERMANENT WARNING LABEL SHALL BE APPLIED TO THE DISTRIBUTION EQUIPMENT ADJACENT TO THE BACK-FED BREAKER FROM THE INVERTER [NEC 705.12(B)(2)] (BREAKER INTERCONNECTION ONLY)

10) SOLAR PV SYSTEM EQUIPPED WITH RAPID SHUTDOWN

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

FOR PV SYSTEMS THAT SHUT DOWN THE ARRAY AND CONDUCTORS LEAVING THE ARRAY: THE TITLE "SOLAR PV SYSTEM IS EQUIPPED WITH RAPID SHUTDOWN" SHALL UTILIZED CAPITALIZED CHARACTERS WITH A MINIMUM HEIGHT OF 3/8 IN. IN BLACK ON YELLOW BACKGROUND, AND THE REMAINING CHARACTERS SHALL BE CAPITALIZED WITH A MINIMUM HEIGHT OF 3/16 IN. IN BLACK ON WHITE BACKGROUND [NEC 690.12(D)]

11) RAPID SHUTDOWN SWITCH FOR SOLAR PV

A RAPID SHUTDOWN SWITCH SHALL HAVE A LABELED LOCATED ON OR NO MORE THAN 8 FT FROM THE SWITCH THAT INCLUDES THIS WORDING. THE LABEL SHALL BE REFLECTIVE, WITH ALL LETTERS CAPITALIZED AND HAVING A MINIMUM HEIGHT OF 3/8 IN., IN WHITE ON RED BACKGROUND [NEC 690.12(D)(2)]

LABELING NOTES:

1. LABELS CALLED OUT ACCORDING TO ALL COMMON CONFIGURATIONS. ELECTRICIAN TO DETERMINE EXACT REQUIREMENTS IN THE FIELD PER CURRENT NEC AND LOCAL CODES AND MAKE APPROPRIATE ADJUSTMENTS.
2. LABELING REQUIREMENTS BASED ON THE NATIONAL ELECTRIC CODE, OSHA STANDARD 19010.145, ANSI Z535.
3. MATERIAL BASED ON THE REQUIREMENTS OF THE AUTHORITY HAVING JURISDICTION.
4. LABELS TO BE OF SUFFICIENT DURABILITY TO WITHSTAND THE ENVIRONMENT INVOLVED [NEC 110.21] THEY SHALL BE PERMANENTLY ATTACHED, WEATHER/SUNLIGHT RESISTANT, AND SHALL NOT BE HAND WRITTEN PER NEC 110.21(B)
5. APPLICABLE LABELS TO BE A MINIMUM LETTER HEIGHT OF 3/8", WHITE ON RED BACKGROUND; REFLECTIVE, AND PERMANENTLY AFFIXED [IFC 605.11.1.1]

DESIGN ENGINEER

WYSSLING CONSULTING
CORPORATE EXPERIENCE WITH SMALL BUSINESS VALUE

76 N. MEADOWBROOK DRIVE
ALPINE UT 84004
swyssling@wysslingconsulting.com
(201) 874-3483
COA NO. P-2308

SOLAR COMPANY/CLIENT

BYLD BETTER

BYLD BETTER
1213 W MOOREHEAD STREET SUITE 500
CHARLOTTE, NC

MIDDLEBROOK RESIDENCE
4245 OVERHILLS ROAD
SPRING LAKE, NC 28390
COORDINATES: 35.270253, -78.929095
APN: 0525131287.000
Deemiddle@icloud.com

LABELS

DC SYSTEM SIZE: 4.000kW
AC SYSTEM SIZE: 2.950kW

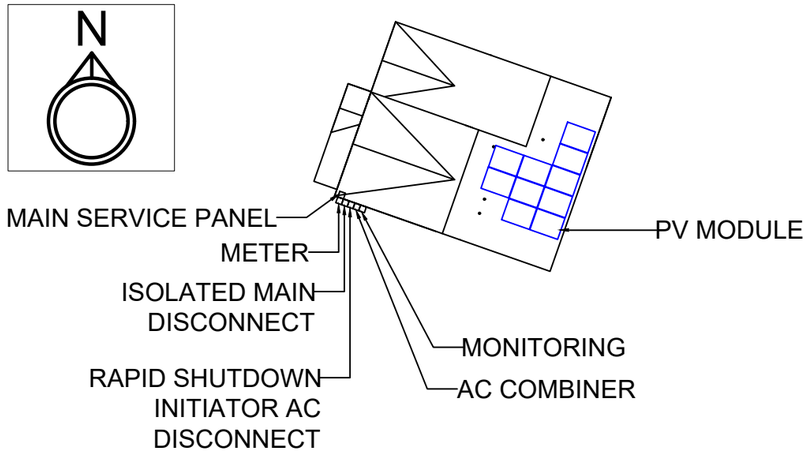
EE-4

AHJ: SPRING LAKE
UTILITY: SRE

DRAWN BY: CMS
INITIAL DESIGN DATE: 12/20/2024

CAUTION

MULTIPLE SOURCES OF POWER
POWER IS SUPPLIED TO THIS BUILDING FROM THE FOLLOWING SOURCES WITH DISCONNECTS AS SHOWN.



4245 OVERHILLS ROAD SPRING LAKE,NC 28390

LOCATION: MSP
NEC 705.10

DESIGN ENGINEER

WYSSLING CONSULTING
CORPORATE EXPERIENCE WITH SMALL BUSINESS VALUE

76 N. MEADOWBROOK DRIVE
ALPINE UT 84004
swyssling@wysslingconsulting.com
(201) 874-3483
COA NO. P-2308

SOLAR COMPANY/CLIENT

BYLD BETTER

BYLD BETTER
1213 W MOOREHEAD STREET SUITE 500
CHARLOTTE, NC

MIDDLEBROOK RESIDENCE
4245 OVERHILLS ROAD
SPRING LAKE, NC 28390
COORDINATES: 35.270253, -78.929095
APN: 0525131287.000
Deemiddle@icloud.com

PLACARD

DC SYSTEM SIZE: 4.000kW
AC SYSTEM SIZE: 2.950kW

EE-5

AHJ: SPRING LAKE
UTILITY: SRE

DRAWN BY: CMS
INITIAL DESIGN DATE: 12/20/2024

GENERAL NOTES

1. CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS AND REVIEW ALL MANUFACTURER INSTALLATION DOCUMENTS PRIOR TO INITIATING CONSTRUCTION.
2. ALL COMPONENTS SHALL BE NEW AND LISTED BY A RECOGNIZED ELECTRICAL TESTING LABORATORY AND LISTED FOR THEIR SPECIFIC APPLICATION.
3. OUTDOOR EQUIPMENT SHALL BE NEMA 3R RATED OR BETTER.
4. ACCESS TO ELECTRICAL COMPONENTS OVER 150 VOLTS TO GROUND SHALL BE RESTRICTED TO QUALIFIED PERSONNEL.
5. CONTRACTOR SHALL OBTAIN ELECTRICAL PERMITS PRIOR TO INSTALLATION AND SHALL COORDINATE ALL INSPECTIONS, TESTING COMMISSIONING, AND ACCEPTANCE WITH THE HOMEOWNER, UTILITY CO. AND CITY INSPECTORS AS NEEDED.
6. EACH MODULE TO BE GROUNDED USING THE SUPPLIED CONNECTION POINT PER THE MANUFACTURER'S REQUIREMENTS. ALL PV MODULES, EQUIPMENT, AND METALLIC COMPONENTS ARE TO BE BONDED. IF THE EXISTING GROUNDING ELECTRODE SYSTEM CANNOT BE VERIFIED OR IS ONLY METALLIC WATER PIPING, IT IS THE CONTRACTOR'S RESPONSIBILITY TO INSTALL A SUPPLEMENTAL GROUNDING ELECTRODE.
7. DC CONDUCTORS SHALL BE RUN IN EMT AND/OR MC (METAL CLAD CABLE) AND SHALL BE LABELED.
8. EXPOSED NON-CURRENT CARRYING METAL PARTS OF ELECTRICAL EQUIPMENT SHALL BE GROUNDED IN ACCORDANCE WITH APPLICABLE NEC.
9. CONFIRM LINE SIDE VOLTAGE AT THE ELECTRIC UTILITY SERVICE PRIOR TO CONNECTING INVERTER. VERIFY SERVICE VOLTAGE IS WITHIN INVERTER VOLTAGE OPERATIONAL RANGE.
10. ELECTRICAL CONTRACTOR TO PROVIDE CONDUIT EXPANSION JOINTS AND ANCHOR CONDUIT RUNS AS REQUIRED PER CODE.
11. ALL WIRING MUST BE PROPERLY SUPPORTED BY DEVICES OR MECHANICAL MEANS DESIGNED AND LISTED FOR SUCH USE, AND FOR ROOF-MOUNTED SYSTEMS, WIRING MUST BE PERMANENTLY AND COMPLETELY HELD OFF OF THE ROOF SURFACE.
12. ALL ROOF PENETRATIONS MUST BE SEALED OR FLASHED.
13. EQUIPMENT MAY BE SUBSTITUTED FOR SIMILAR EQUIPMENT BASED ON AVAILABILITY, SUBSTITUTED EQUIPMENT SHALL COMPLY WITH DESIGN CRITERIA.
14. REMOVAL OF AN INTERACTIVE INVERTER OR OTHER EQUIPMENT SHALL NOT DISCONNECT THE BONDING CONNECTION BETWEEN THE GROUNDING ELECTRODE CONDUCTOR AND THE PHOTOVOLTAIC SOURCE AND/OR OUTPUT CIRCUIT GROUNDED CONDUCTORS.
15. WHENEVER A DISCREPANCY IN THE QUALITY OF EQUIPMENT ARISES ON THE DRAWING OR SPECIFICATIONS, THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING AND INSTALLING ALL MATERIAL AND SERVICES REQUIRED BY THE STRICTEST CONDITIONS NOTED ON THE DRAWINGS OR IN THE SPECIFICATIONS TO ENSURE COMPLETE COMPLIANCE AND LONGEVITY OF THE OPERABLE SYSTEM REQUIRED BY THE ENGINEERS.
16. AC DISCONNECT SHALL BE LOCATED WITHIN 10' OF SOUTH RIVER ELECTRIC METER. AC DISCONNECT SHALL BE LOCATED ON SAME WALL OF HOUSE WHERE POSSIBLE. IF AC DISCONNECT CANNOT BE WITHIN 10' OF METER, THEN PHOTOS SHALL BE PROVIDED OF THE OBSTRUCTION FOR REVIEW.
17. IF APPLICABLE, ENERGY STORAGE SYSTEM (ESS) CAN BE USED DURING ON-GRID OPERATION TO SHIFT GENERATION FOR TIME OF USE (TOU) AND WILL NOT OPERATE OFF GRID.

GENERAL ELECTRICAL NOTES

1. CONDUIT A AND B AMPS EQUAL TO LARGEST STRING ON TAG.
2. CONDUIT A SHALL BE RUN THROUGH ATTIC IF POSSIBLE.
3. EQUIPMENT MAY BE SUBSTITUTED FOR SIMILAR EQUIPMENT BASED ON AVAILABILITY, SUBSTITUTED EQUIPMENT SHALL COMPLY WITH DESIGN CRITERIA. WIRE SIZES ARE BASED ON MINIMUMS AND ARE NOT MEANT TO LIMIT UPSIZING AS REQUIRED BY FIELD CONDITIONS/AVAILABILITY.
4. WIRING SHALL COMPLY WITH MAXIMUM CONTINUOUS CURRENT OUTPUT AT 25°C AND MAXIMUM VOLTAGE AT 600V; WIRE SHALL BE WET RATED AT 90°C.
5. EXPOSED PHOTOVOLTAIC SYSTEM CONDUCTORS ON THE ROOF WILL BE TYPE 2 OR PV-TYPE WIRE.
6. PHOTOVOLTAIC SYSTEM CONDUCTORS SHALL BE IDENTIFIED AND GROUPED. THE MEANS OF IDENTIFICATION SHALL BE PERMITTED BY SEPERATE COLOR-CODING, MARKING TAPE, TAGGING OR OTHER APPROVED MEANS.
7. ALL CONDUCTORS AND TERMINATIONS SHALL BE RATED FOR INSTALL LOCATION
8. ALL EXTERIOR CONDUIT, FITTINGS, AND BOXES SHALL BE RAIN-TIGHT AND APPROVED FOR USE IN WET LOCATIONS.
9. ALL METALLIC RACEWAYS AND EQUIPMENT SHALL BE BONDED AND ELECTRICALLY CONTINUOUS.
10. WHERE SIZES OF JUNCTION BOXES, RACEWAYS, AND CONDUITS ARE NOT SPECIFIED, CONTRACTOR SHALL SIZE THEM ACCORDING TO APPLICABLE CODES.
11. 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.
12. 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 OCCURRED, AND AUTOMATICALLY DISCONNECTS ALL CONDUCTORS OR CAUSES THE INVERTER TO AUTOMATICALLY CEASE SUPPLYING POWER TO OUTPUT CIRCUITS.
13. FOR UNGROUNDED SYSTEMS, THE INVERTER IS EQUIPPED WITH GROUND FAULT PROTECTION AND A GFI FUSE PORT FOR GROUND FAULT INDICATION.
14. PV MODULE FRAMES SHALL BE BONDED TO RACKING RAIL OR BARE COPPER GEC/GEC PER THE MODULE MANUFACTURER'S LISTED INSTRUCTION SHEET.
15. PV MODULE RACKING RAIL SHALL BE BONDED TO BARE COPPER GEC VIA WEEB LUG, IL SCO GBL-4DBT LAY IN LUG, OR EQUIVALENT LISTED LUG.
16. THE PHOTOVOLTAIC INVERTER WILL BE LISTED AS AUL 1741 COMPLIANT.
17. RACKING AND BONDING SYSTEM TO BE UL2703 RATED.
18. ANY REQUIRED GROUNDING ELECTRODE CONDUCTOR WILL BE CONTINUOUS, EXCEPT FOR SPLICES OR JOINTS AS BUSBARS WITHIN LISTED EQUIPMENT
19. WHEN BACKFEED BREAKER IS THE METHOD OF UTILITY INTERCONNECTION, THE BREAKERS SHALL NOT READ "LINE AND LOAD."
20. WHEN APPLYING THE 120% RULE, THE SOLAR BREAKER TO BE POSITIONED AT THE OPPOSITE END OF THE BUSBAR FROM THE MAIN BREAKER.
21. THE WORKING CLEARANCE AROUND THE EXISTING ELECTRICAL EQUIPMENT AS WELL AS THE NEW ELECTRICAL EQUIPMENT WILL BE MAINTAINED.
22. LISTED CONDUIT AND CONDUCTOR SIZES ARE BASED ON MINIMUM CODE REQUIREMENTS AND ARE NOT MEANT TO LIMIT UPSIZING AS REQUIRED BY FIELD CONDITIONS/AVAILABILITY.
23. NEP BDM-600X [240V] INVERTERS HAVE INTEGRATED GROUND AND DOUBLE INSULATION. NO GEG OR EGC IS REQUIRED. THE DC CIRCUIT IS ISOLATED AND INSULATED FROM GROUND AND MEETS THE REQUIREMENTS OF NEC.
24. CALCULATIONS ARE BASED ON A) ASHRAE 2# AVERAGE HIGH = 32°C B)NEC TABLE 310.15(B)2(a) 75° DERATE FACTOR = 0.96 C) NEC TABLE NEC 310.15(B)(16) 75°C.
25. SUPPLEMENTAL GROUNDING ELECTRODE TO BE INSTALLED NO CLOSER THAN 6' FROM EXISTING WHEN REQUIRED. NEC 250.53(A)(2) DOES NOT REQUIRE IT IF CONTRACTOR CAN PROVE THAT A SINGLE ROD HAS A RESISTANCE TO EARTH OF 25 OHMS OR LESS.
26. WHEN CABLE, INCLUDING PV CABLE(S), IS RUN BETWEEN ARRAYS OR TO JUNCTION BOXES IT SHALL BE ENCLOSED IN CONDUIT. [NEC 300.4, 690.31(A) AND (C)]
27. THE CABLE CONNECTORS USED ON THE OUTPUT SIDE OF THE OPTIMIZER OR MICROINVERTER TOGETHER WITH THE ARRAY CABLE USED BETWEEN THEM ARE OF THE SAME MANUFACTURER OR ARE LISTED FOR COMPATIBILITY. [NEC 690.33(C)]
28. SOME WIRE CONNECTORS SUPPLY INSTRUCTIONS FOR THE PRELIMINARY PREPARATION OF CONDUCTORS, SUCH AS USE OF CONDUCTOR TERMINATION COMPOUND (ANTIOXIDANT COMPOUND). SOME CONNECTORS ARE SHIPPED PRE-FILLED WITH CONDUCTOR TERMINATION COMPOUND (ANTIOXIDANT COMPOUND). FOR NON-PREFILLED CONNECTORS, CONDUCTOR TERMINATION COMPOUND MAY BE USED IF RECOMMENDED BY THE CONNECTOR MANUFACTURER AS PRELIMINARY PREARATION OF THE CONDUCTOR.

DESIGN ENGINEER

WYSSLING CONSULTING
CORPORATE EXPERIENCE WITH SMALL BUSINESS VALUE

76 N. MEADOWBROOK DRIVE
ALPINE UT 84004
swyssling@wysslingconsulting.com
(201) 874-3483
COA NO. P-2308

SOLAR COMPANY/CLIENT

BYLD BETTER

BYLD BETTER
1213 W MOOREHEAD STREET SUITE 500
CHARLOTTE, NC

MIDDLEBROOK RESIDENCE
4245 OVERHILLS ROAD
SPRING LAKE, NC 28390
COORDINATES: 35.270253, -78.929095
APN: 0525131287.000
Deemiddle@icloud.com

DESIGN NOTES

DC SYSTEM SIZE: 4.000kW
AC SYSTEM SIZE: 2.950kW

PV-6

AHJ: SPRING LAKE
UTILITY: SRE

DRAWN BY: CMS
INITIAL DESIGN DATE: 12/20/2024

DESIGN ENGINEER

WYSSLING CONSULTING
CORPORATE EXPERIENCE WITH SMALL BUSINESS VALUE

76 N. MEADOWBROOK DRIVE
ALPINE UT 84004
swyssling@wysslingconsulting.com
(201) 874-3483
COA NO. P-2308

SOLAR COMPANY/CLIENT

BYLD BETTER

BYLD BETTER
1213 W MOOREHEAD STREET SUITE 500
CHARLOTTE, NC

MIDDLEBROOK
RESIDENCE
4245 OVERHILLS ROAD
SPRING LAKE, NC 28390
COORDINATES: 35.270253, -78.929095
APN: 0525131287.000
Deemiddle@icloud.com

SITE PHOTOS

DC SYSTEM SIZE: 4.000kW
AC SYSTEM SIZE: 2.950kW

PV-7

AHJ: SPRING LAKE
UTILITY: SRE

DRAWN BY: CMS
INITIAL DESIGN DATE: 12/20/2024

Hi-MO 5

LR5-54HABB
390~415M

- Suitable for distributed projects
- Advanced module technology delivers superior module efficiency
  - M10 Gallium-doped Wafer • Integrated Segmented Ribbons • 9-busbar Half-cut Cell
- Globally validated bifacial energy yield
- High module quality ensures long-term reliability

25-year Warranty for Materials and Processing

30-year Warranty for Extra Linear Power Output

Complete System and Product Certifications

IEC 61215, IEC 61730, UL 61730
ISO9001:2015: ISO Quality Management System
ISO14001: 2015: ISO Environment Management System
ISO45001: 2018: Occupational Health and Safety
IEC62941: Guideline for module design qualification and type approval

LONGi

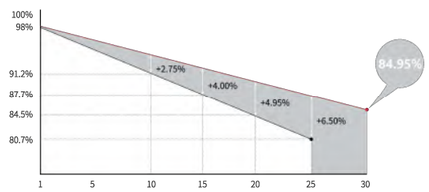
Hi-MO 5

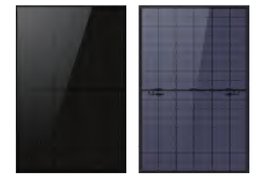
LR5-54HABB 390~415M

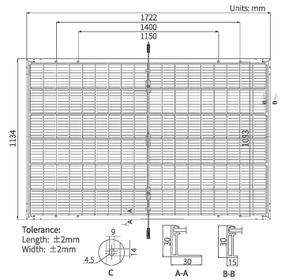
21.3%	0~3%	<2%	0.45%	HALF-CELL
MAX MODULE EFFICIENCY	POWER TOLERANCE	FIRST YEAR POWER DEGRADATION	YEAR 2-30 POWER DEGRADATION	Lower operating temperature

Additional Value

30-Year Power Warranty







Mechanical Parameters

Cell Orientation	108 (6×18)
Junction Box	IP68, three diodes
Output Cable	4mm², ±1200mm length can be customized
Glass	Dual glass, 2.0+1.6mm heat strengthened glass
Frame	Anodized aluminum alloy frame
Weight	22.5kg
Dimension	1722×1134×30mm
Packaging	36pcs per pallet / 216pcs per 20' GP / 936pcs or 792pcs(Only for USA) per 40' HC

Electrical Characteristics

STC : AM1.5 1000W/m² 25℃ NOCT : AM1.5 800W/m² 20℃ 1m/s

Test uncertainty for Pmax: ±3%

Module Type	LR5-54HABB-390M		LR5-54HABB-395M		LR5-54HABB-400M		LR5-54HABB-405M		LR5-54HABB-410M		LR5-54HABB-415M	
Testing Condition	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT
Maximum Power (Pmax/W)	390	291.5	395	295.2	400	299.0	405	302.7	410	306.5	415	310.2
Open Circuit Voltage (Voc/V)	36.58	34.39	36.81	34.61	37.05	34.84	37.29	35.06	37.53	35.29	37.77	35.51
Short Circuit Current (Isc/A)	13.57	10.95	13.65	11.01	13.72	11.07	13.79	11.13	13.87	11.19	13.94	11.25
Voltage at Maximum Power (Vmp/V)	30.47	28.43	30.70	28.64	30.94	28.86	31.18	29.09	31.42	29.31	31.66	29.54
Current at Maximum Power (Imp/A)	12.80	10.26	12.87	10.31	12.93	10.36	12.99	10.41	13.05	10.45	13.11	10.50
Module Efficiency(%)	20.0		20.2		20.5		20.7		21.0		21.3	

Electrical characteristics with different rear side power gain (reference to 400W front)

Pmax /W	Voc/V	Isc /A	Vmp/V	Imp /A	Pmax gain
420	37.05	14.41	30.94	13.58	5%
440	37.05	15.09	30.94	14.22	10%
460	37.15	15.78	31.04	14.87	15%
480	37.15	16.46	31.04	15.52	20%
500	37.15	17.15	31.04	16.16	25%

Operating Parameters

Operational Temperature	-40℃ ~ +85℃
Power Output Tolerance	0 ~ 3%
Voc and Isc Tolerance	±3%
Maximum System Voltage	DC1500V (IEC/UL)
Maximum Series Fuse Rating	30A
Nominal Operating Cell Temperature	45±2℃
Protection Class	Class II
Bifaciality	70±5%
Fire Rating	UL Similar type 38 * IEC Class C

*Reference Standard: UL61730 Second Edition, Dated October 28, 2022

Mechanical Loading

Front Side Maximum Static Loading	5400Pa
Rear Side Maximum Static Loading	2400Pa
Hailstone Test	25mm Hailstone at the speed of 23m/s

Temperature Ratings (STC)

Temperature Coefficient of Isc	+0.050%/℃
Temperature Coefficient of Voc	-0.265%/℃
Temperature Coefficient of Pmax	-0.340%/℃

LONGi

No.8369 Shangyuan Road, Xi'an Economic And Technological Development Zone, Xi'an, Shaanxi, China.
Web: www.longi.com

DESIGN ENGINEER

WYSSLING CONSULTING
CORPORATE EXPERIENCE WITH SMALL BUSINESS VALUE

76 N. MEADOWBROOK DRIVE
ALPINE UT 84004
swyssling@wysslingconsulting.com
(201) 874-3483

MODULE

PRODUCT DATASHEET

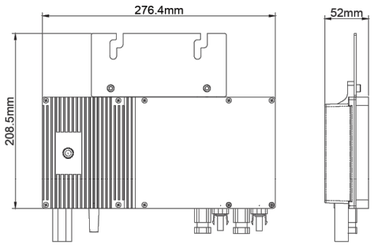
BDM-500/(300x2)600X MICROINVERTER

CEC Listing as Utility Interactive Grid Support Inverter

(NC0141, NC0142)

STANDARD DIMENSIONS

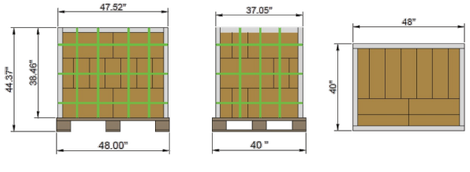
(mm)



Weight: 3.9 kg

Certifications

UL 1741, CSA C22.2, NO. 107.1, IEC/EN 62109-1, IEC/EN 62109-2, IEEE 1547, VDE-AR-N 4105*, VDE V 0126-1-1/A1, G83/2, CEI 21, AS 4777.2, AS 4777.3, EN50438, ABNT NBR 16149/16150



Per box: 5 pcs
Boxes per layer: 8
Layers: 3

Pallet Qty: 120 pcs
Pallet weight: 473 kg

SPECIFICATIONS

Model	BDM-500	BDM-300x2 (BDM-600X)
Input (DC)		
Recommended Max PV Power:	375 W x 2	450 W x 2
Max DC Open Circuit Voltage:	60 Vdc	60 Vdc
Max DC Input Current:	20 A x 2	20 A x 2
MPPT Tracking Accuracy:	> 99.5%	> 99.5%
MPPT Tracking Range:	22 – 55 Vdc	22 – 55 Vdc
ISC PV (Absolute Maximum):	20 A x 2	20 A x 2
Maximum Backfeed Current to Array:	0 A	0 A
Output (AC)		
Peak AC Output Power:	500 W	600 W
Max Continuous Output Power(240V):	500 W	590 W
Max Continuous Output Power(208V):	476 W	590 W
Nominal Power Grid Voltage:	1φ: 240 Vac 3φ: 208 Vac	
Allowable Power Grid Voltage:	1φ: 211-264 Vac (adjustable) 3φ: 183-228 Vac (adjustable)	
Rated Output Current:	1φ: 2.08A 3φ: 2.29 A	1φ: 2.46 A 3φ: 2.84 A
Maximum Units Per Branch (20A): *(All NEC adjustment factors considered)*	1φ: 7 units 3φ: 7 units	1φ: 6 units 3φ: 5 units
Allowable Power Grid Frequency:	59.3 - 60.5 Hz (adjustable)	
THD:	< 5% (at rated power)	
Power Factor:	-0.9~0.9	
Current (inrush) (Peak and Duration):	9.4 A, 15 US	
Nominal Frequency:	60 Hz	
Max Output Fault Current:	2.4 Arms for 3 cycles	
Max Output Overcurrent Protection:	10 A	
System Efficiency		
Weighted Average Efficiency (CEC):	95.5%	
Nighttime Tare Loss:	0.2 W	
Protection Function		
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	
Communications:	Power line Communications / WiFi	
Environment Category:	Indoor and outdoor	
Wet Location:	Suitable	
Pollution Degree:	PD 3	
Over Voltage Category:	II(PV), III (AC MAINS)	

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 2023 Section 690.11 DC Arc-Fault Circuit Protection
- NEC 2023 Section 690.12 Rapid Shutdown of PV Systems on Buildings
- NEC 2023 Section 690.33 Mating Connectors
- NEC 2023 Section 705.12 Point of Connection (AC Arc-Fault Protection)

DESIGN ENGINEER

WYSSLING CONSULTING
CORPORATE EXPERIENCE WITH SMALL BUSINESS VALUE

76 N. MEADOWBROOK DRIVE
ALPINE UT 84004
swyssling@wysslingconsulting.com
(201) 874-3483

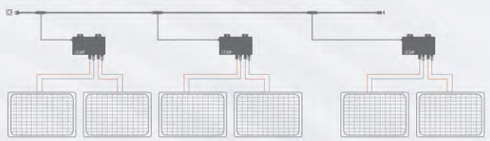
INVERTER

Features

Convenient
- WiFi, Ethernet, or Cell
- Easy to configure web portal
- Touch screen for easy Configuration and Troubleshooting
- Supports dual voltage (100/240) and dual frequency (50/60 Hz)

Safe and reliable
- Supports local monitoring without internet

Globally Certified
- UL 60950-1 2nd edition, CSA C22.2 2nd edition, FCC Part 15 Clase B AS/NZS 60950.1:2011 Inc A1, AS/NZS CISPR 22: 2009+A1:2010
- EN 60950-1:2006+A11:2009+A1:2010
- Revenue Grade Production Monitoring ANSI C12.20 +/- 0.5%



More efficiency — Maximum 3.5W

Certification global — UL 60950-1 2.ª edition, CSA C22.2 2.ª edition, FCC Part 15 Clase B

More reliability — IP30

northernep.com

Ver No.: BDG-256-05232024

Model BDG-256

Communications interface	**BDM-256**
Communication with Microinverter	PLC
Ethernet	10/100 auto-sensing, auto-negotiation
USB	USB 2.0 interface, auto-sensing, auto-negotiation
Wi-Fi	Support
Monitoring Capability	255 devices (depending on power grid interference)
Human interface	
Display	LCD touch screen
Power requirements	
AC input	100-240 Vac, 50/60Hz, 60mA
Power Consumption	3.5 Watts maximum
Revenue Grade Production Monitoring	
Accessory required	ANSI C12.20 +/-0.5% accuracy
Mechanical data	
Dimensions	6.69" x 4.33" x 1.46" (170mm x 110 mm x 37 mm)
Weight	5.29 oz (150g)
Ambient temperature range	40˚C to +55˚C (-40˚F to 131˚F) -40˚C to +49˚C (-40˚F to 120˚F) if installed in an enclosure
Cooling	Natural convection - no fans
Environmental Rating	IP30. For installation indoors or in an NRTL-certified NEMA type 3R enclosure
Characteristics	
Standard warranty term	5 year
Compliance	UL 60950-1 2nd Edition Rev Dec 19, 2011 CSA C22.2 2nd Edition Rev Dec 19, 2011 FCC Part 15 Class B AS/NZS 60950.1:2011 Inc A1 AS/NZS CISPR 22: 2009+A1:2010 EN 60950-1:2006+A11:2009+A1:2010 +A12:2011 EN 55022:201 EN 61000-3-2:2006+A1:2009+A2:2009 EN 61000-3-3:2008 EN 55024:2010 EMC Directive 2004/108/EC

northernep.com

DESIGN ENGINEER

WYSSLING CONSULTING
CORPORATE EXPERIENCE WITH SMALL BUSINESS VALUE

76 N. MEADOWBROOK DRIVE
ALPINE UT 84004
swyssling@wysslingconsulting.com
(201) 874-3483

MONITORING GATEWAY

Product data sheet
Characteristics

DU221RB
SWITCH NOT FUSIBLE GD 240V 30A 2P NEMA3R

Product availability: Stock - Normally stocked in distribution facility

Main

Product	Single Throw Safety Switch
Line Rated Current	30 A
Certifications	UL listed
Enclosure Rating	NEMA 3R
Disconnect Type	Non-fusible disconnect
Factory Installed Neutral	None
Mounting Type	Surface
Number of Poles	2
Electrical Connection	Lugs
Duty Rating	General duty
Width	7.75 in
Height	9.63 in
Wire Size	3.75 in

Ordering and shipping details

Category	00106 - D & DU SW,NEMA3R, 30-200A
Discount Schedule	DE1A
GTIN	00785901490340
Nbr. of units in pkg.	1
Package weight(Lbs)	4.6500000000000004
Returnability	Y
Country of origin	MX

Offer Sustainability

California proposition 65	WARNING: This product can expose you to chemicals including:
- - - - - - - Substance 1	Lead and lead compounds, which is known to the State of California to cause cancer and birth defects or other reproductive harm.
- - - - - - - More information	For more information go to www.p65warnings.ca.gov

Contractual warranty

Warranty period	18 months

DESIGN ENGINEER

WYSSLING CONSULTING
CORPORATE EXPERIENCE WITH SMALL BUSINESS VALUE

76 N. MEADOWBROOK DRIVE
ALPINE UT 84004
swyssling@wysslingconsulting.com
(201) 874-3483

AC DISCONNECT

PEGASUS

INSTAFLASH™

Never Deal With Caulking Again!
Factory-installed, non-hardening sealant

Before **InstaFlash Installed:**
Sealant is contained above roof surface by a protective cage.

After **InstaFlash Installed:**
Sealant is compressed to fill all holes and voids.

Protective Cage
Prevents sealant from getting on hands or roof. Collapses upon lag installation.

Effortless Lifetime Roof Protection

The non-hardening sealant completely fills any missed pilot holes, shingle rips, voids, or other potential water ingress points under the entire footprint of the 4.6" wide base.

25-Year Warranty
Manufactured with advanced materials and coatings to outlast the roof itself

Code Compliant
Fully IBC/CBC Code Compliant
Exceeds ASCE 7-16 Standards
FL Cert of Approval FL41396
UL2703 Certified

Self-Healing
The proprietary non-hardening sealant will flex and reseal over years of thermal expansion and contraction

Larger Spans
The extra-large L-foot and proprietary lag screw result in larger spans between mounts

Pegasus Solar Inc | 506 West Ohio Avenue, Richmond, CA 94804 | **www.pegasussolar.com**

PEGASUS

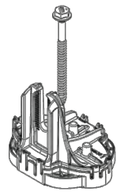
INSTAFLASH™

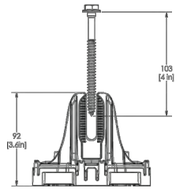
1
Drill pilot hole in the center of the rafter using a 7/32" bit.

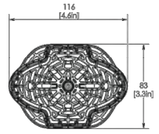
2
Place the InstaFlash over the pilot hole.
Note: the direction of the InstaFlash Down arrows should point down the roof.

3
Insert the lag screw through the center hole into the pilot hole.

4
Drive the lag until the InstaFlash is fully seated to the roof.







SPECIFICATIONS	INSTAFLASH KITS				
	PIF-RB0	PIF-RBDT	PIF-RBSH	PIF-RM0	PIF-RMDT
Finish	Black			Mill	
Kit Contents	Black InstaFlash, 5/16" x 4.0" SS Lag	Black InstaFlash, 5/16" x 4.0" SS Lag, Dovetail T-bolt w/ Nut	Black InstaFlash, 5/16" x 4.0" SS Lag, M10 Hex Bolt w/ Nut	Mill Insta-Flash, 5/16" x 4.0" SS Lag	Mill InstaFlash, 5/16" x 4.0" SS Lag, Dovetail T-bolt w/ Nut
Attachment Type	Rafter Attached				
Roof Type	Sloped Roof: Composition Shingle, Rolled Asphalt | Flat roof: Modified Bitumen Roof, Built-Up Roof				
Sealant Application	Factory Installed				
Installation Temperature	0°F to 170° F				
Cure Time	Instantly Waterproof; Non-hardening				
Service Temperature	-40°F to 195° F				
Certifications	IBC, ASCE/SEI 7-16, FL Cert of Approval FL41396, TAS 100(A), UL2703				
Install Application	Most Railed Systems, Pegasus Tilt Leg Kit				
Kit Quantity	24				
Boxes per Pallet	36				

SCAN FOR INSTALLATION VIDEO

SCAN FOR FREE TRIAL

Pegasus Solar Inc | 506 West Ohio Avenue, Richmond, CA 94804 | **www.pegasussolar.com**

DESIGN ENGINEER

WYSSLING CONSULTING
CORPORATE EXPERIENCE WITH SMALL BUSINESS VALUE

76 N. MEADOWBROOK DRIVE
ALPINE UT 84004
swyssling@wysslingconsulting.com
(201) 874-3483

ATTACHMENT

PEGASUS SOLAR®
A Better Day on the Job

RAIL SYSTEM

Instant Bonding
The N-S Bonding Jumper bonds row to row with no tools.

One Clamp Anywhere
The Multi-Clamp works as mid- or end-clamp, and fits standard 30-40mm frames.

Lifetime Wire Management
Open rail channel holds and protects wires. Clamps won't pinch wires after tightening.

Bonding Structural Splice
Connect rails instantly, without tools, interference or limitations.

Next-Level Solar Mounting

A complete system for hassle-free rooftop installation, from watertight mounts to lifetime wire management.

Simplicity
1/2"socket for everything.
One clamp for mid or end.
No tool splicing and bonding.
Easy wire management.

Code Compliant
UL 2703 listed
LTR-AE-001-2012 listed
Class A fire rating for any slope
ASCE 7-16 PE Certified

Premium Aesthetics
The narrowest panel gap available. Optional Hidden End Clamps and End Caps provide a flush look on the edge of the array.

Watertight for Life
Secured on industry-leading Pegasus Mounts, for composite shingle and tile roofs.
Backed by a 25-year warranty.

Pegasus Solar Inc | 506 West Ohio Avenue, Richmond, CA 94804 | T: 510.210.3797 | **www.pegasussolar.com**

PEGASUS SOLAR®

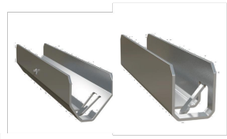
RAIL SYSTEM

Pegasus Rail

Available in 14′ and 7′ lengths for easy layout and shipping.
Open-channel design holds MC4 connectors, PV wire and trunk cables.
Black and Mill finish

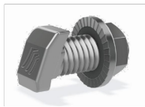
Pegasus Max Rail

Maximum-strength design.
Meets specifications for high snow-load and hurricane zones.
Black and Mill finish



Splice and Max Splice

Installs by hand.
Works over mounts.
Structurally connects and bonds rails automatically; UL2703 listed as reusable.



Dovetail T-bolt

Dovetail shape for extra strength.
Uses ½" socket.

Multi-Clamp

Fits 30-40mm PV frames, as mid- or end-clamp.
Twist-locks into position; doesn't pinch wires in rail.
Bonds modules to rail; UL2703 listed as reusable

Hidden End Clamp

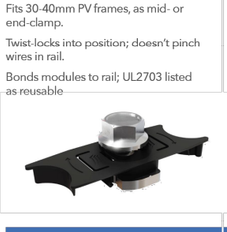
Offers premium edge appearance.
Preinstalled pull-tab grips rail edge, allowing easy, one-hand installation.
Tucks away for reuse.

Ground Lug

Holds 6 or 8 AWG wire.
Mounts on top or side of rail.
Assembled on MLPE Mount.
UL2703 listed as reusable.

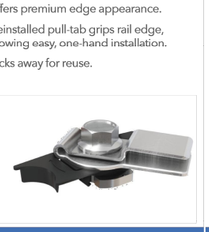
N-S Bonding Jumper

Installs by hand, eliminates row-to-row copper wire.
UL2703 listed as reusable only with Pegasus Rail.



MLPE Mount

Secures and bonds most micro-inverters and optimizers to rail.
Connectors and wires easily route underneath after installation.
UL2703 listed as reusable.



Cable Grip

Secures four PV wires or two trunk cables.
Stainless-steel backing provides durable grip.
Eliminates sagging wires.

Wire Clip

Hand operable.
Holds wires in channel.
Won't slip.

End Cap and Max End Cap

Fits flush to PV module and hides raw or angled cuts.
Hidden drain quickly clears water from rail.

Certifications:
- UL 2703, Edition 1
- LTR-AE-001-2012
- ASCE 7-16 PE certified
- Class A fire rating for any slope roof

FREE
PEGASUS SOLAR
Design Tool

Quickly calculate the most efficient layout, spans and materials needed to suit your job. Visit the Pegasus Customer Portal. **pegasussolar.com/portal**

LOAD		SPAN			
SNOW (PSF)	WIND (MPH)	32″	4′	6′	8′
0	120	PEGASUS MAX RAIL	PEGASUS MAX RAIL	PEGASUS MAX RAIL	PEGASUS MAX RAIL
	160	PEGASUS MAX RAIL	PEGASUS MAX RAIL	PEGASUS MAX RAIL	PEGASUS MAX RAIL
	190	PEGASUS MAX RAIL	PEGASUS MAX RAIL	PEGASUS MAX RAIL	
15	140	PEGASUS MAX RAIL	PEGASUS MAX RAIL	PEGASUS MAX RAIL	
	160	PEGASUS MAX RAIL	PEGASUS MAX RAIL	PEGASUS MAX RAIL	
	190	PEGASUS MAX RAIL	PEGASUS MAX RAIL	PEGASUS MAX RAIL	
30	160	PEGASUS MAX RAIL	PEGASUS MAX RAIL	PEGASUS MAX RAIL	
	190	PEGASUS MAX RAIL	PEGASUS MAX RAIL	PEGASUS MAX RAIL	
45	190	PEGASUS MAX RAIL	PEGASUS MAX RAIL	PEGASUS MAX RAIL	
70	190	PEGASUS MAX RAIL	PEGASUS MAX RAIL	PEGASUS MAX RAIL	
110	190	PEGASUS MAX RAIL	PEGASUS MAX RAIL	PEGASUS MAX RAIL	

For reference only. Spans above are calculated using ASCE 7-16 for a Gable Roof, Exposure Category B, 7-20deg roof angle, 30ft mean roof height with non-exposed modules. For PE certified span tables, visit www.pegasussolar.com/spans.

Pegasus Solar Inc | 506 West Ohio Avenue, Richmond, CA 94804 | T: 510.210.3797 | **www.pegasussolar.com**

DESIGN ENGINEER

WYSSLING CONSULTING
CORPORATE EXPERIENCE WITH SMALL BUSINESS VALUE

76 N. MEADOWBROOK DRIVE
ALPINE UT 84004
swyssling@wysslingconsulting.com
(201) 874-3483

RAIL