WYSSLING CONSULTING
CORPORATE EXPERIENCE WITH SMALL BUSINESS VALUE
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Alpine, UT 84004
office (201) 874-3483
swyssling@wysslingconsulting.com

January 17, 2024

Current Insight
2852 W. Amini Way
South Jordan, UT 84095

Scott Wyssling, PE

Digitally signed by Scott Wyssling, PE
DN: C=US, S=Utah, L=Alpine, O=Wyssling Consulting, OU=Owner, CN="Scott Wyssling, PE", E=swyssling@wysslingconsulting.com
Reason: I am the author of this document
Location: your signing location here
Date: 2024.01.17 11:21:45-07'00'
Foxit PDF Editor Version: 11.1.0

Re: Engineering Services
Jones Residence
51 Shadow Creek Lane, Erwin NC
4.740. 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:	Prefabricated wood trusses at 24" on center. All truss members are constructed of 2x4 dimensional lumber.
Roof Material:	Composite Asphalt Shingles
Roof Slope:	22 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** = 15 psf
- **Wind Load** based on ASCE 7-10
  - Ultimate Wind Speed = 119 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 Ironridge 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 screw 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 1/17/2024

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RONALD JONES RESIDENCE

NEW PHOTOVOLTAIC ROOF MOUNT SYSTEM PROJECT - 4.740 KW DC / 3.480 KW AC

SHEET #	SHEET NAME
T-1	COVER SHEET
T-2	PLAN NOTES
PV-1	SITE PLAN LAYOUT
PV-2	ATTACHMENT DETAILS
PV-3	MOUNTING DETAILS
E-1	ELECTRICAL DIAGRAM
E-2	WARNING LABELS
S-1	SPEC SHEET
S-2	SPEC SHEET
S-3	SPEC SHEET
S-4	SPEC SHEET

PROJECT INFORMATION

PROPERTY OWNER
NAME: RONALD JONES

CONTRACTOR
NAME: BYLD

DESIGN SPECIFICATIONS
OCCUPANCY: R-3
CONSTRUCTION TYPE: SINGLE FAMILY RESIDENCE
ZOINING: RESIDENTIAL
WIND EXPOSURE: C
AHJ: HARNETT COUNTY
UTILITY: SOUTH RIVER EMC

APPLICABLE CODES & STANDARDS
NORTH CAROLINA RESIDENTIAL CODE 2018 (NCRC 2018)
NORTH CAROLINA BUILDING CODE 2018 (NCBC 2018)
NORTH CAROLINA FIRE CODE 2018 (NCFC 2018)
NATIONAL ELECTRICAL CODE, NEC 2020 CODE BOOK, NFPA 70

TYPE OF INTERCONNECTION: BACKFEED BREAKER IN THE MSP

SCOPE OF WORK
TYPE OF SYSTEM: ROOF MOUNT

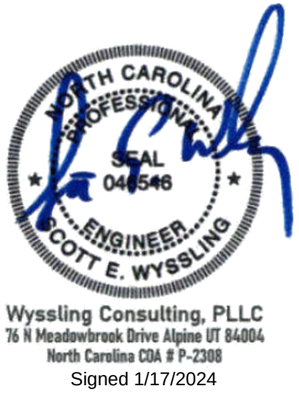
SYSTEM SIZE: STC: 12 X 395W = 4.740kW
PTC: 12 X 366.9W = 4.403kW
(12) MISSION SOLAR MSE395SX9R(395W)[BLK] MODULES
(6) NEP NORTHERN ELECTRIC BDM-600X(BDM-300X2X) MICROINVERTERS
(1) 30A KNIFE AC DICONNECT
(1) 100A PV LOAD CENTER

MSP UPGRADE: NO
MAIN BREAKER DERATE: NO

RACKING & MOUNTING

PV ATTACHMENT TYPE: IRONRIDGE FLASHVUE FOR COMP SHINGLE ROOF

RACKING TYPE: IRONRIDGE XR10 RAIL ROOF MOUNT RACKING HARDWARE



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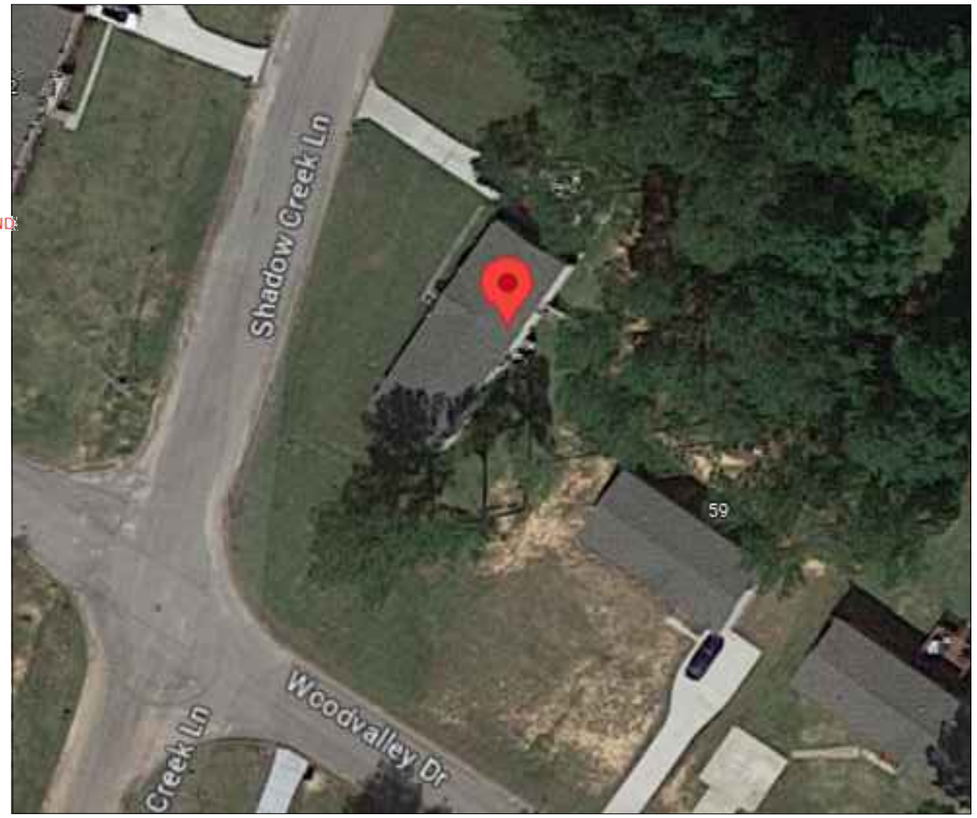
COORDINATES:
35.314735, -78.705510

AERIAL VIEW



BYLD BETTER

CONTRACTOR

BYLD

ADDRESS:1213W MOOREHEAD ST, STE500 CHARLOTTE, NC 28208
LICENSE #:

DESIGNER: OGY

RONALD JONES RESIDENCE

51 SHADOW CREEK LN,
ERWIN,
NC 28339

APN: 12059601000203

DATE:1/17/2024

DESIGN BY

CompleteSolar
A Brighter Way.

SHEET
T-1
COVER SHEET

1.1. PROJECT NOTES:

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

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

1.4. GROUND FAULT DETECTION AND INTERRUPTION (GFDI) DEVICE IS INTEGRATED WITH THE MICROINVERTER IN ACCORDANCE WITH NEC 690.5(A)

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

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

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

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

1.9. SCOPE OF WORK:

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

1.11. WORK INCLUDES:

1.12. PV ROOF ATTACHMENTS - IRONRIDGE FLASHVUE FOR COMP SHINGLE

1.13. PV RACKING SYSTEM INSTALLATION - IRONRIDGE XR10 RAIL ROOF MOUNT RACKING HARDWARE

1.14. PV MODULE AND INVERTER INSTALLATION - MISSION SOLAR MSE395SX9R(395W)[BLK] MODULES/ NEP NORTHERN ELECTRIC BDM-600X(BDM-300X2X) MICROINVERTERS.

1.15. PV EQUIPMENT GROUNDING

1.16. PV SYSTEM WIRING TO A ROOF-MOUNTED JUNCTION BOX

1.17. PV LOAD CENTERS (IF INCLUDED)

1.18. PV METERING/MONITORING (IF INCLUDED)

1.19. PV DISCONNECTS

1.20. PV GROUNDING ELECTRODE & BONDING TO (E) GEC

1.21. PV FINAL COMMISSIONING

1.22. (E) ELECTRICAL EQUIPMENT RETROFIT FOR PV

1.23. SIGNAGE PLACED IN ACCORDANCE WITH LOCAL BUILDING CODE

1.24. SITE NOTES:

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

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

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

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

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

1.30. EQUIPMENT LOCATIONS:

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

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

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

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

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

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

1.37. STRUCTURAL NOTES:

1.38. RACKING SYSTEM

1.39. PV ARRAY WILL BE INSTALLED ACCORDING TO CODE-COMPLIANT INSTALLATION MANUAL. TOP CLAMPS REQUIRE A DESIGNATED SPACE BETWEEN MODULES, AND RAILS MUST ALSO EXTEND

1.40. A MINIMUM DISTANCE BEYOND EITHER EDGE OF THE ARRAY/SUBARRAY, ACCORDING TO RAI MANUFACTURER'S INSTRUCTIONS.

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

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

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

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

1.45. WIRING & CONDUIT NOTES:

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

1.47. CONDUCTORS SIZED ACCORDING TO NEC 690.8, NEC 690.7.

1.48. VOLTAGE DROP LIMITED TO 2%.

1.49. DC WIRING LIMITED TO MODULE FOOTPRINT. MICROINVERTER WIRING SYSTEMS SHALL BE LOCATED AND SECURED UNDER THE ARRAY W/ SUITABLE WIRING CLIPS.

1.50. AC CONDUCTORS COLORED OR MARKED AS FOLLOWS: PHASE A OR L1- BLACK PHASE B OR L2- RED, OR OTHER CONVENTION IF THREE PHASE PHASE C OR L3- BLUE, YELLOW, ORANGE**, OR OTHER CONVENTION NEUTRAL- WHITE OR GREY IN 4-WIRE DELTA CONNECTED SYSTEMS THE PHASE WITH HIGHER VOLTAGE TO BE MARKED ORANGE [NEC 110.15

1.51. GROUNDING NOTES:

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

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

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

1.55. EQUIPMENT GROUNDING CONDUCTORS SHALL BE SIZED ACCORDING TO NEC 690.45 AND MICROINVERTER MANUFACTURER'S INSTRUCTIONS.

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

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

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

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

1.60. GROUND-FAULT DETECTION SHALL COMPLY WITH NEC 690.5 IN GENERAL AND NEC 690.5 (A)(1) SPECIFICALLY.

1.61. DISCONNECTION AND OVER-CURRENT PROTECTION NOTES:

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

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

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

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

1.66. MICROINVERTER BRANCHES CONNECTED TO A SINGLE BREAKER OR GROUPED FUSES IN ACCORDANCE WITH NEC 110.3(B).

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

1.68. ELECTRICAL INTERCONNECTION NOTES:

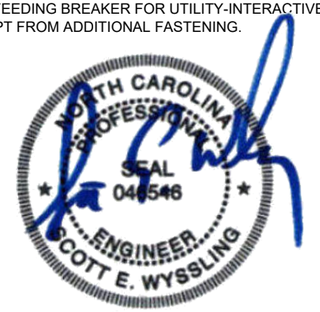
1.69. THE SUM OF THE UTILITY OCPD AND INVERTER CONTINUOUS OUTPUT MAY NOT EXCEED 120% OF THE BUSBAR RATING.

1.70. WHEN THE SUM OF THE PV SOURCES EQUALS >100% OF THE BUSBAR RATING, PV DEDICATED BACKFEED BREAKERS MUST BE LOCATED OPPOSITE END OF THE BUS FROM THE UTILITY SOURCE OCPD.

1.71. AT MULTIPLE PV OUTPUT COMBINER PANEL, THE TOTAL RATING OF ALL OVERCURRENT DEVICES SHALL NOT EXCEED THE AMPACITY OF THE BUSBAR. HOWEVER, THE COMBINED OVERCURRENT DEVICE MAY BE EXCLUDED.

1.72. SUPPLY-SIDE TAP INTERCONNECTION SHOULD BE WITH SERVICE ENTRANCE CONDUCTORS.

1.73. BACKFEEDING BREAKER FOR UTILITY-INTERACTIVE INVERTER OUTPUT IS EXEMPT FROM ADDITIONAL FASTENING.



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

Signed 1/17/2024

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BYLD BETTER

CONTRACTOR

BYLD

ADDRESS:1213W MOOREHEAD ST, STE500 CHARLOTTE, NC 28208
LICENSE #:

DESIGNER: OGY

RONALD JONES RESIDENCE

51 SHADOW CREEK LN,
ERWIN,
NC 28339

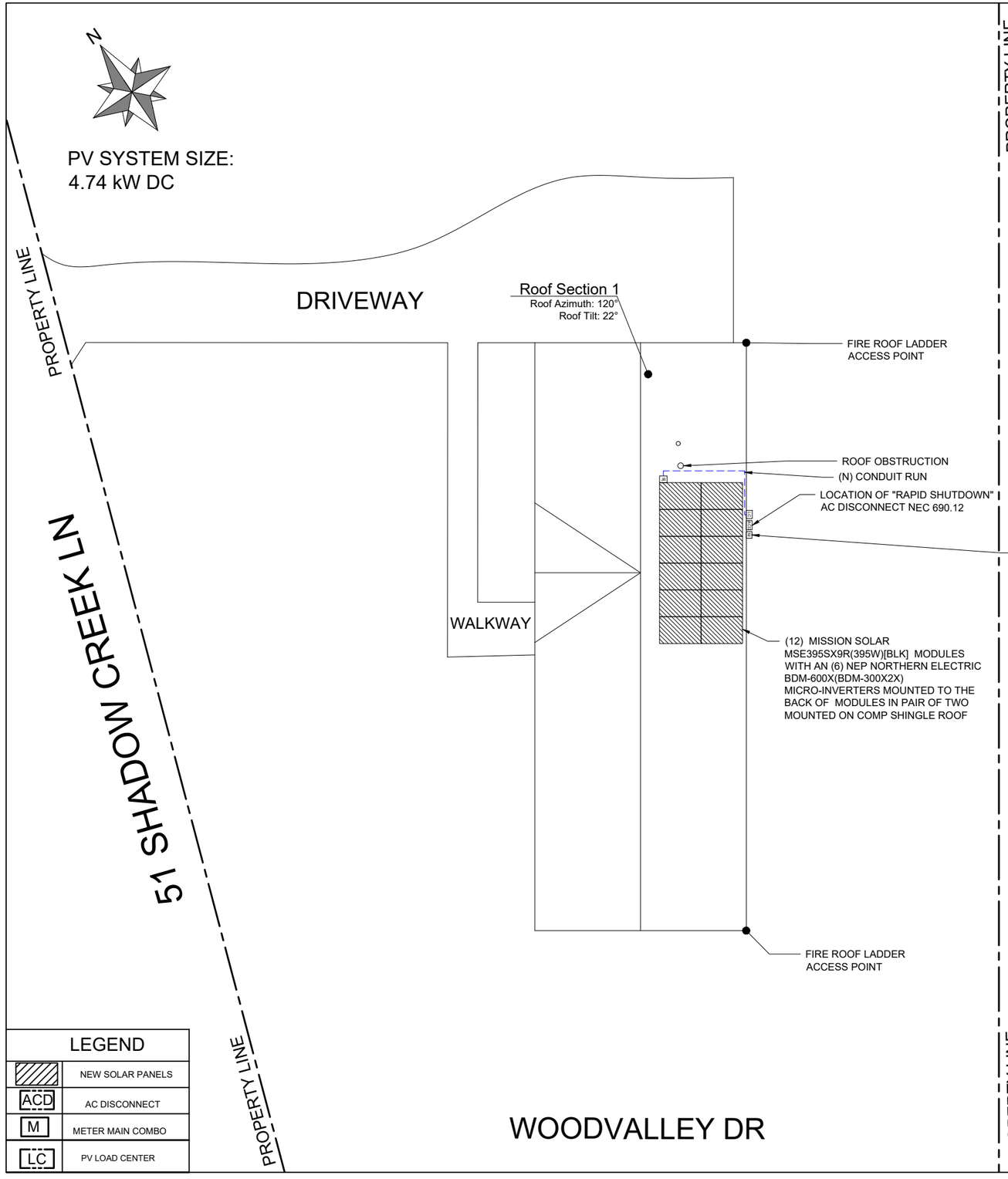
APN: 12059601000203

DATE:1/17/2024

DESIGN BY

CompleteSolar
A Brighter Way.

SHEET
T-2
PLAN NOTES



CONSTRUCTION NOTES

1. SOLAR PHOTOVOLTAIC SYSTEM TO BE INSTALLED ON RESIDENTIAL STRUCTURE.
2. THIS PROJECT HAS BEEN DESIGNED IN COMPLIANCE WITH THE IBC SECTION 1609 TO WITHSTAND A BASIC WIND EXPOSURE C.
3. THE ROOF MEMBERS ARE 2"X4" TRUSSES AT 24" ON CENTER. CONNECTION TO STRUCTURE SHALL NOT BE WITHIN 11" OF NAILING PLATES.
4. THE SOLAR PHOTOVOLTAIC INSTALLATION SHALL NOT OBSTRUCT ANY PLUMBING, MECHANICAL, OR BUILDING ROOF VENTS.
5. ALL CONDUCTORS AND CONDUITS MOUNTED ON ROOF SHALL BE MINIMUM 7/8" ABOVE ROOF SURFACE (INCLUDING CABLES UNDERNEATH MODULES AND RACKING).
6. ROOF ACCESS POINTS SHALL BE PROVIDED PER THE FOLLOWING
   - 6.1. LOCATED IN AREAS NOT REQUIRING PLACEMENT OF GROUND LADDERS OVER OPENINGS SUCH AS DOORS OR WINDOWS.
   - 6.2. LOCATED AT STRONG POINTS OF CONSTRUCTION IN LOCATIONS WHERE ACCESS POINT DOES NOT CONFLICT WITH OVERHEAD OBSTRUCTIONS SUCH AS: TREES, WIRES, OR SIGNS.

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PV SYSTEM SITE PLAN

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

BYLD BETTER

CONTRACTOR

BYLD

ADDRESS:1213W MOOREHEAD ST, STE500 CHARLOTTE, NC 28208
LICENSE #:

DESIGNER: OGY

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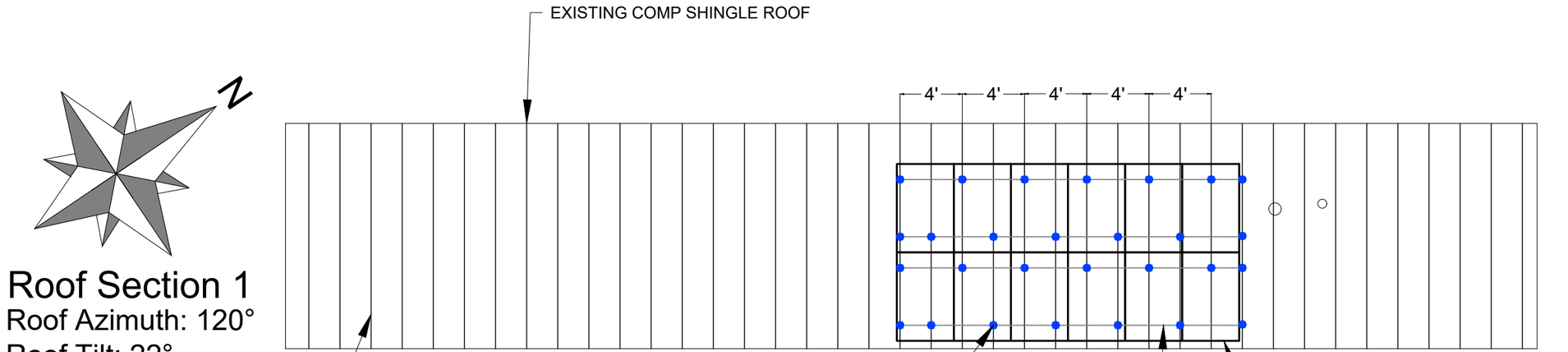
SHEET
PV-1
SITE PLAN LAYOUT



Roof Section 1
Roof Azimuth: 120°
Roof Tilt: 22°

EXISTING 2"X4" ROOF TRUSSES @ 24"O.C.

IRONRIDGE FLASHVUE FOR COMP SHINGLE ROOF@ 48" O.C. MAX

PROPOSED IRONRIDGE XR10 RAIL RACKING

PROPOSED MISSION SOLAR MSE395SX9R(395W)[BLK] PV SOLAR MODULES

NORTH CAROLINA PROFESSIONAL SEAL 046546 ENGINEER SCOTT E. WYSSLING

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PV SYSTEM MOUNTING DETAILS

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

BYLD BETTER

CONTRACTOR

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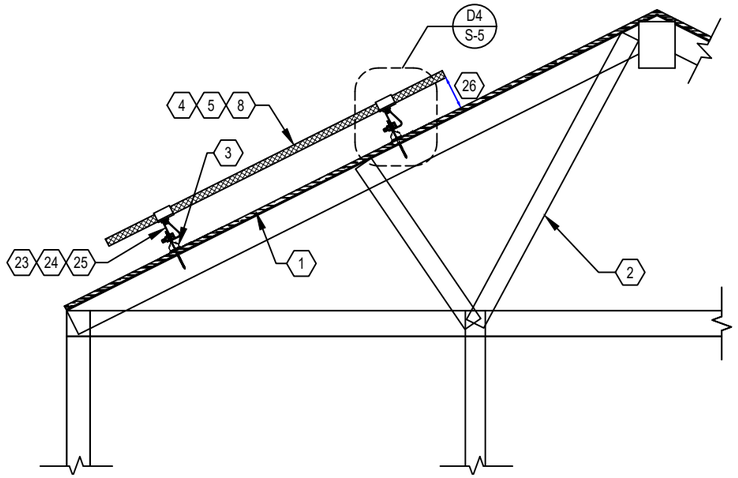
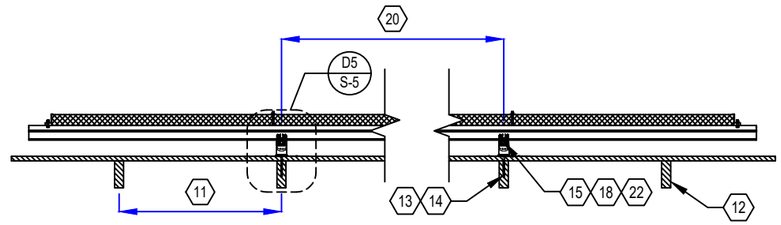
SHEET
PV-2
ATTACHMENT DETAILS



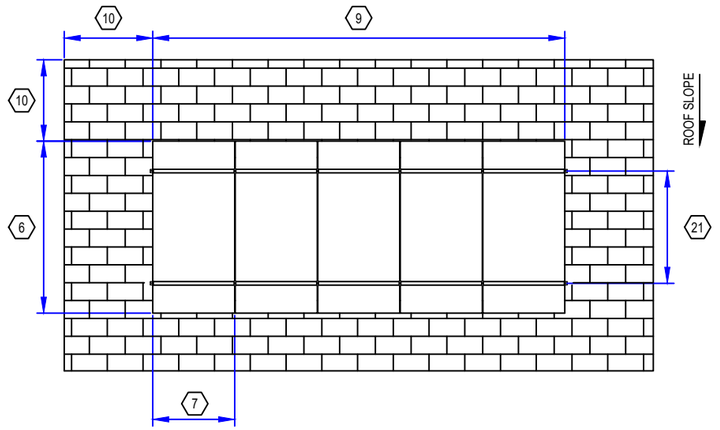
D1 RACKING DETAIL (TRANSVERSE)

NOT TO SCALE



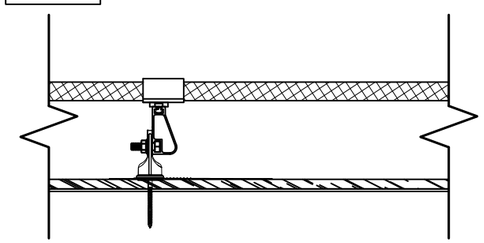
D2 RACKING DETAIL (LONGITUDINAL)

NOT TO SCALE



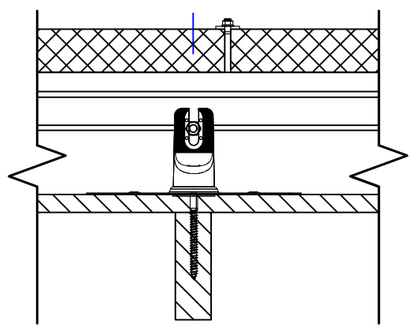
D3 RACKING DETAIL (TOP)

NOT TO SCALE



D4 DETAIL (TRANSVERSE)

NOT TO SCALE



D5 DETAIL (LONGITUDINAL)

NOT TO SCALE

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1. ROOF MATERIAL: COMP SHINGLE
2. ROOF STRUCTURE: TRUSSES
3. ATTACHMENT TYPE: IRONRIDGE FLASHVUE
4. MODULE MANUFACTURER: MISSION SOLAR
5. MODULE MODEL: MSE395SX9R(395W)[BLK]
6. MODULE LENGTH: 75.07"
7. MODULE WIDTH: 41.49"
8. MODULE WEIGHT: 48.5 LBS.
9. SEE SHEET S-1 FOR DIMENSION(S)
10. MIN. FIRE OFFSET
11. TRUSSES SPACING: 24" O.C.
12. TRUSSES SIZE: 2"X4" NOMINAL
13. LAG BOLT DIAMETER: 5/16 IN.
14. LAG BOLT EMBEDMENT: 2.5 IN.
15. TOTAL # OF ATTACHMENTS: 28
16. TOTAL AREA: 259.55 SQ. FT.
17. TOTAL WEIGHT: 582.00LBS.
18. WEIGHT PER ATTACHMENT: 20.79 LBS.
19. DISTRIBUTED LOAD: 2.24 PSF
20. MAX. HORIZONTAL STANDOFF: 48 IN.
21. MAX. VERTICAL STANDOFF: LANDSCAPE: 26 IN., PORTRAIT: 45 IN.
22. STANDOFF STAGGERING: YES
23. RAIL MANUFACTURER AND MODEL (OR EQUIV.):IRONRIDGE XR10 RAIL
24. RAIL WEIGHT: 0.436 PLF.
25. MAX. TRUSSES SPAN: 12 FT.
26. MODULE CLEARANCE: 3 IN. MIN., 6 IN. MAX.

BYLD BETTER

CONTRACTOR

BYLD

ADDRESS:1213W MOOREHEAD ST, STE500 CHARLOTTE, NC 28208
LICENSE #:

DESIGNER: OGY

RONALD JONES RESIDENCE

51 SHADOW CREEK LN,
ERWIN,
NC 28339

APN: 12059601000203

DATE:1/17/2024

DESIGN BY

CompleteSolar
A Brighter Way.

SHEET
PV-3
MOUNTING DETAILS

PV Module Ratings @ STC	
Module Make/Model	MISSION SOLAR MSE395SX9R(395W)[BLK]
Max Power-Point Current (Imp)	10.68A
Max Power-Point Voltage (Vmp)	36.99V
Open-Circuit Voltage (Voc)	45.18V
Short-Circuit Current (Isc)	11.24A
Max Series Fuse (OCPD)	20A
Nominal Maximum Power at STC (Pmax)	395W
Maximum System Voltage	1000V
Voc Temperature Coefficient	-0.259 %/°C

SYSTEM SUMMARY	
	BRANCH #1
INVERTERS PER BRANCH	6
MAX CONTINUOUS OUTPUT CURRENT	14.52A
MAX CONTINUOUS OUTPUT POWER	3480W
ARRAY STC POWER	4740W
ARRAY PTC POWER	4402.8W
MAX CONTINUOUS OUTPUT CURRENT	14.52A
MAX CONTINUOUS OUTPUT POWER	3480W
DERATED (CEC) AC POWER	4204.67W

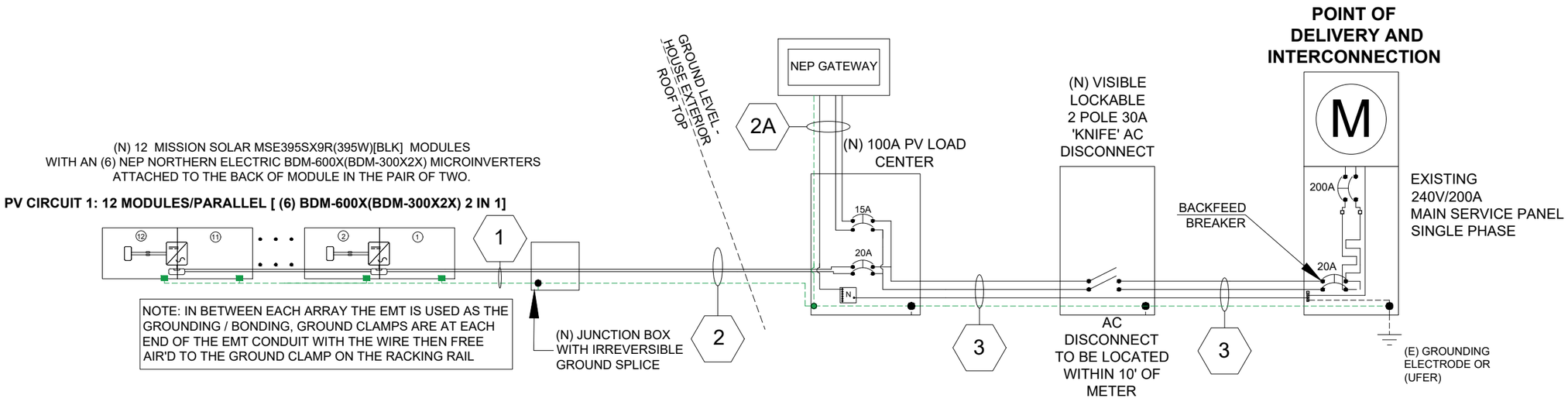
Inverter Ratings	
Inverter Make/Model	NEP NORTHERN ELECTRIC BDM-600X(BDM-300X2X) MICROINVERTERS
Max DC Volt Rating	60V
Max Continous Output Power	580W
Max Nominal Voltage	240V
Max Continous output Current	2.42A
Max OCPD Rating	20A

DESIGN TEMPERATURES	
ASHRAE EXTREME LOW	-10°C
ASHRAE 2% HIGH	35°C

Conduit and Conductor Schedule

Tag	Description	Wire Gauge	# of Conductors	Conduit Type	Conduit Size
1	PV Cable	10 AWG	1	N/A - Free Air	N/A - Free Air
1	Bare Copper Ground (EGC/GEC)	6 AWG	1	N/A - Free Air	N/A - Free Air
2	THWN-2	10 AWG	2	EMT	3/4"
2	THWN-2 - Ground	10 AWG	1	EMT	3/4"
2A	THWN-2	14 AWG	3	N/A - Free Air	N/A - Free Air
2A	THWN-2 - Ground	14 AWG	1	N/A - Free Air	N/A - Free Air
3	THWN-2	10 AWG	3	EMT	3/4"
3	THWN-2 - Ground	10 AWG	1	EMT	3/4"

METER # 14709723
MAIN SERVICE PANEL
240/120V 1Ø, 3W
MAIN BUSS: 200A
MAX BREAKER SIZE:
(200A X 1.2) - 200A = 40.0A



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CompleteSolar
A Brighter Way.

SHEET
E-1
ELECTRICAL DIAGRAM

WARNING

ELECTRICAL SHOCK HAZARD

TERMINALS ON LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION

LABEL LOCATION:
INVERTER(S), AC DISCONNECT(S), AC COMBINER PANEL (IF APPLICABLE).
PER CODE(S): NEC : 690.13(B), NEC : 690.17(E), NEC : 690.17(4)

RAPID SHUTDOWN SWITCH FOR SOLAR PV SYSTEM

LABEL LOCATION:
UTILITY SERVICE ENTRANCE/METER, INVERTER/DC DISCONNECT IF REQUIRED BY LOCAL AHJ, OR OTHER LOCATIONS AS REQUIRED BY LOCAL AHJ.
PER CODE(S): NEC : 690.56(C)(3), NEC : 690.12, NEC 690.56, IFC: 605.11.1, IFC : 1204.5.3

WARNING

POWER SOURCE OUTPUT CONNECTION

DO NOT RELOCATE THIS OVERCURRENT DEVICE

LABEL LOCATION:
ADJACENT TO PV BREAKER (IF APPLICABLE).
PER CODE(S): NEC : 705.12(B)(3)(2), NEC : 705.12(B)(2)(3)(b), NEC : 705.12(D)(2)(3)(b)

WARNING

THIS EQUIPMENT FED BY MULTIPLE SOURCES. TOTAL RATING OF ALL OVERCURRENT DEVICES, EXCLUDING MAIN SUPPLY OVERCURRENT DEVICE, SHALL NOT EXCEED AMPACITY OF BUSBAR.

LABEL LOCATION:
AC DISCONNECT(S), PHOTOVOLTAIC SYSTEM POINT OF INTERCONNECTION.
PER CODE(S): NEC : 690.54, NEC : 690.54, NEC : 690.54

MAIN PHOTOVOLTAIC SYSTEM DISCONNECT

LABEL LOCATION: PV SYSTEM DISCONNECT
PER CODE(S): NEC 690.13(B)

WARNING

DUAL POWER SOURCE
SECOND SOURCE IS PHOTOVOLTAIC SYSTEM

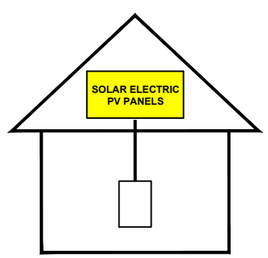
LABEL LOCATION:
MAIN SERVICE PANEL (IF APPLICABLE).
PER CODE(S): NEC : 705.12(C) & 690.59

GENERATION DISCONNECT SWITCH
MAXIMUM AC OPERATING CURRENT: 14.52 AMPS
NOMINAL OPERATING AC VOLTAGE: 240.0 VAC

LABEL LOCATION:
AC DISCONNECT(S), PHOTOVOLTAIC SYSTEM POINT OF INTERCONNECTION.
PER CODE(S): NEC : 690.54

SOLAR PV SYSTEM EQUIPPED WITH RAPID SHUTDOWN

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



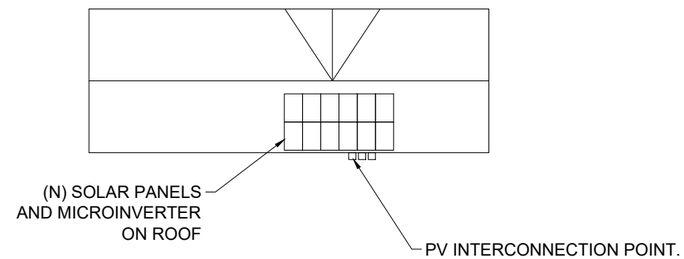
LABEL LOCATION:
ON OR NO MORE THAT 3 M (10 FT) FROM THE SERVICE DISCONNECTING MEANS TO WHICH THE PV SYSTEMS ARE CONNECTED.
PER CODE(S): NEC : 690.56(C)(1)(a)

CAUTION:

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

51 SHADOW CREEK LN

WOODVALLEY DR



PERMANENT SIGNAGE NOTES:

1. NOT ALL PLACARDS SHOWN MAY BE REQUIRED BY LOCAL AHJ. CONTRACTOR TO VERIFY PLACARD REQUIREMENTS WITH LOCAL AHJ BEFORE INSTALLATION.
2. ALL PLAQUES AND SIGNAGE REQUIRED BY THE LATEST EDITION OF THE NATIONAL ELECTRICAL CODE
3. ALTERNATE POWER SOURCE PLACARD SHALL BE METALLIC OR MACHINE PRINTED LETTERS IN A CONTRASTING COLOR TO THE PLAQUE. THIS PLAQUE WILL BE ATTCHED BY POP RIVETS OR SCREWS OR OTHER APPROVED METHOD.
4. DIRECTORY PLACARD MARKING CONTENT AND FORMAT: RED BACKGROUND, WHITE LETTERING, MINIMUM 3/8" LETTER HIEGHT, ALL CAPITAL LETTERS, ARIAL OR SIMILAR FONT, NON BOLD, REFLECTIVE WEATHER RESISTANT MATERIAL SUITABLE FOR THE ENVIRONMENT.

BYLD BETTER

CONTRACTOR

BYLD

ADDRESS:1213W MOOREHEAD ST, STE500 CHARLOTTE, NC 28208
LICENSE #:

DESIGNER: OGY

RONALD JONES RESIDENCE

51 SHADOW CREEK LN,
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DATE:1/17/2024

DESIGN BY

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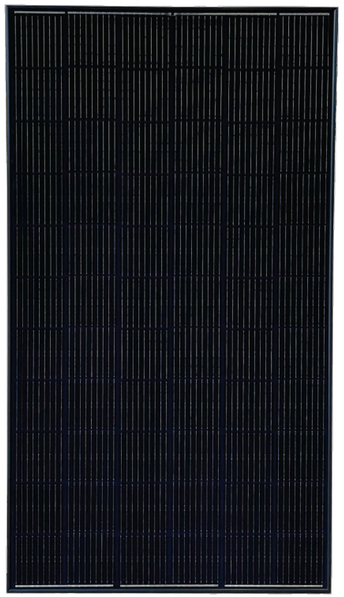
SHEET
E-2
WARNING LABELS

MSE PERC 66

MISSION SOLAR ENERGY

395W Positive Power Tolerance

Class leading power output **-0 to +3%**



FRAME-TO-FRAME WARRANTY

Degradation guaranteed not to exceed 2% in year one and 0.58% annually from years two to 30 with 84.08% capacity guaranteed in year 25.
For more information, visit www.missionsolar.com/warranty

CERTIFICATIONS

CEC · TÜV SUD · c UL us LISTED

UL 61730 / IEC 61215 / IEC 61730 / IEC 61701

If you have questions or concerns about certification of our products in your area, please contact Mission Solar Energy.

True American Quality
True American Brand

Mission Solar Energy is headquartered in San Antonio, Texas where we manufacture our modules. We produce American, high-quality solar modules ensuring the highest-in-class power output and best-in-class reliability. Our product line is tailored for residential, commercial and utility applications. Every Mission Solar Energy solar module is certified and surpasses industry standard regulations, proving excellent performance over the long term.

Demand the best. Demand Mission Solar Energy.

Certified Reliability
- Tested to UL 61730 & IEC Standards
- PID resistant
- Resistance to salt mist corrosion

Advanced Technology
- 9 Busbar
- Passivated Emitter Rear Contact
- Ideal for all applications

Extreme Weather Resilience
- Up to 5,400 Pa front load & 3,600 Pa back load
- Tested load to UL 61730
- 40 mm frame

BAA Compliant for Government Projects
- Buy American Act
- American Recovery & Reinvestment Act

MODULES ASSEMBLED DESIGNED & ENGINEERED IN THE USA OF U.S. AND WORLD PARTS

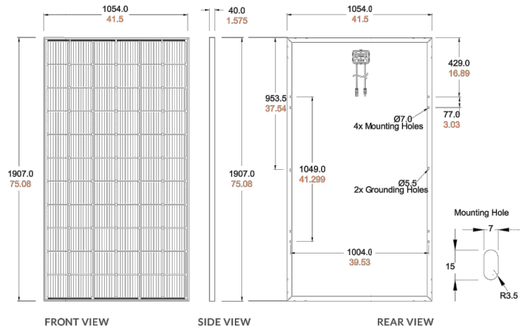
25 YEAR FRAME-TO-FRAME WARRANTY

Class Leading
390-400W

MSE PERC 66

BASIC DIMENSIONS

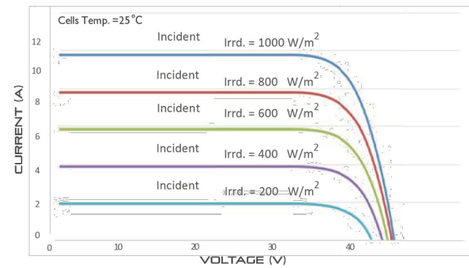
[UNITS: MM/IN]



CURRENT-VOLTAGE CURVE

MSE385SX9R: 385WP, 66 CELL SOLAR MODULE

Current-voltage characteristics with dependence on irradiance and module temperature



CERTIFICATIONS AND TESTS

IEC	61215, 61730, 61701
UL	61730

TÜV SUD · CEC · c UL us LISTED

Mission Solar Energy
8303 S. New Braunfels Ave., San Antonio, Texas 78235
www.missionsolar.com | info@missionsolar.com

Mission Solar Energy reserves the right to make specification changes without notice.

C-SA2-MKTG-0027 REV 4 03/18/2022

ELECTRICAL SPECIFICATION

PRODUCT TYPE			MSExxxSX9R (xxx = P_{max})		
Power Output	P_{max}	W_p	390	395	400
Module Efficiency		%	19.4	19.7	19.9
Tolerance		%	0/+3	0/+3	0/+3
Short Circuit Current	I_{sc}	A	11.19	11.24	11.31
Open Circuit Voltage	V_{oc}	V	45.04	45.18	45.33
Rated Current	I_{mp}	A	10.63	10.68	10.79
Rated Voltage	V_{mp}	V	36.68	36.99	37.07
Fuse Rating		A	20	20	20
System Voltage		V	1,000	1,000	1,000

TEMPERATURE COEFFICIENTS

Normal Operating Cell Temperature (NOCT)	43.75°C (±3.7%)
Temperature Coefficient of Pmax	-0.367%/°C
Temperature Coefficient of Voc	-0.259%/°C
Temperature Coefficient of Isc	0.033%/°C

OPERATING CONDITIONS

Maximum System Voltage	1,000Vdc
Operating Temperature Range	-40°F to 185°F (-40°C to +85°C)
Maximum Series Fuse Rating	20A
Fire Safety Classification	Type 1*
Front & Back Load (UL Standard)	Up to 5,400 Pa front and 3,600 Pa back load, Tested to UL 61730
Hail Safety Impact Velocity	25mm at 23 m/s

Mission Solar Energy uses quality sourced materials that result in a Type 1 fire rating. Please note, the 'Fire Class' Rating is designated for the fully-installed PV system, which includes, but is not limited to, the module, the type of mounting used, pitch and roof composition.

MECHANICAL DATA

Solar Cells	P-type mono-crystalline silicon
Cell Orientation	66 cells (6x11)
Module Dimension	1,907mm x 1,054mm x 40mm
Weight	48.5 lbs. (22 kg)
Front Glass	3.2mm tempered, low-iron, anti-reflective
Frame	40mm Anodized
Encapsulant	Ethylene vinyl acetate (EVA)
Junction Box	Protection class IP67 with 3 bypass-diodes
Cable	1.2m, Wire 4mm2 (12AWG)
Connector	Staubli PV-KBT4/6II-UR and PV-KST4/6II-UR, MC4, Renhe 05-8

SHIPPING INFORMATION

Container Feet	Ship To	Pallet	Panels	390W Bin
53'	Most States	30	780	304.20 kW
Double Stack	CA	26	676	263.64 kW

PALLET [26 PANELS]

Weight	Height	Width	Length
1,300 lbs. (572 kg)	47.56 in (120.80 cm)	46 in (116.84 cm)	77 in (195.58 cm)

www.missionsolar.com | info@missionsolar.com

BYLD BETTER

CONTRACTOR

BYLD

ADDRESS:1213W MOOREHEAD ST, STE500 CHARLOTTE, NC 28208
LICENSE #:

DESIGNER: OGY

RONALD JONES RESIDENCE

51 SHADOW CREEK LN,
ERWIN,
NC 28339

APN: 12059601000203

DATE:1/17/2024

DESIGN BY

CompleteSolar
A Brighter Way.

SHEET
S-1
SPEC SHEET

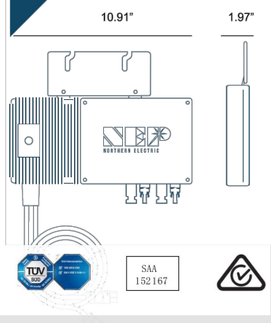
NORTHERN ELECTRIC

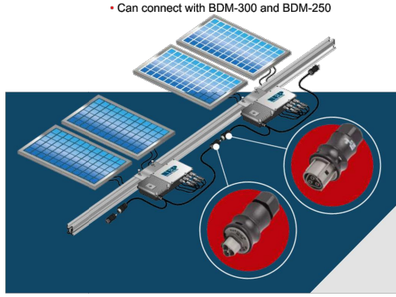
BDM-600X (BDM-300X2X) MICROINVERTER

Features

- Low cost $/watt micro inverter
- High continuos output power up to 580Wac, recommended for dua max 450W solar panel
- High efficiency with 95.5% CEC
- Globally certified for UL1741, SAA, TUV, VDE-AR-N 4105, VDE 0126, G83/2, CEL 021, IEC61727, EN50438
- Integrated grounding for easy installation
- NEMA-6/IP-66/IP-67 enclosure rating
- Integrated monitoring and power line communication with RDG-256 gateway
- Can connect with BDM-300 and BDM-250

northernep.com





Important product information

- NEP is committed to developing Clean, Affordable, Reliable and Efficient (CARE) products for our customers worldwide.
- NEP microinverters have an isolation transformer and basic isolation between the DC input and the AC output network.

NORTHERN ELECTRIC

BDM-600X (BDM-300X2X) MICROINVERTER

* 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 2014 Section 690.11 DC Arc-Fault Circuit Protection
*NEC 2014 Section 690.12 Rapid Shutdown of PV Systems on Buildings
*NEC 2014 Section 705.12 Point of Connection (AC Arc-Fault Protection)

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)	2.42	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%		
	Night Time Tare Loss (Wp)	0.11		
PROTECTION FUNCTIONS	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	

BYLD BETTER

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A Brighter Way.

SHEET
S-2
SPEC SHEET

Tech Brief

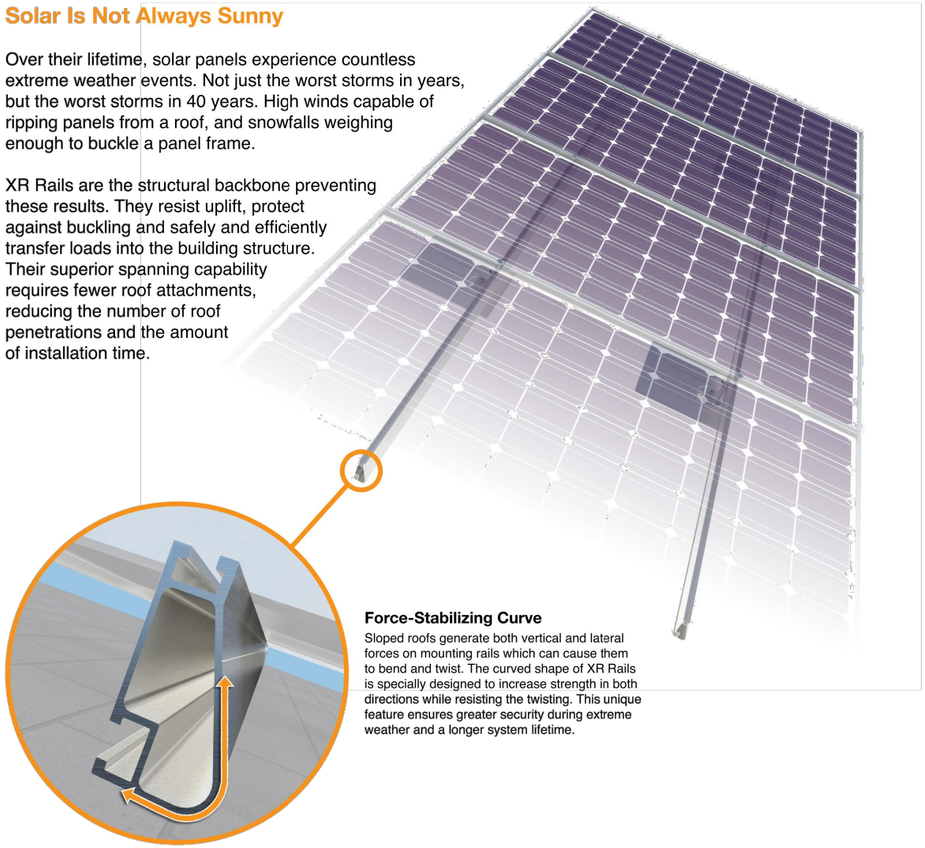
IRONRIDGE

XR Rail Family

Solar Is Not Always Sunny

Over their lifetime, solar panels experience countless extreme weather events. Not just the worst storms in years, but the worst storms in 40 years. High winds capable of ripping panels from a roof, and snowfalls weighing enough to buckle a panel frame.

XR Rails are the structural backbone preventing these results. They resist uplift, protect against buckling and safely and efficiently transfer loads into the building structure. Their superior spanning capability requires fewer roof attachments, reducing the number of roof penetrations and the amount of installation time.



Force-Stabilizing Curve

Sloped roofs generate both vertical and lateral forces on mounting rails which can cause them to bend and twist. The curved shape of XR Rails is specially designed to increase strength in both directions while resisting the twisting. This unique feature ensures greater security during extreme weather and a longer system lifetime.

Compatible with Flat & Pitched Roofs

XR Rails are compatible with FlashFoot and other pitched roof attachments.

IronRidge offers a range of tilt leg options for flat roof mounting applications.

Corrosion-Resistant Materials

All XR Rails are made of 6000-series aluminum alloy, then protected with an anodized finish. Anodizing prevents surface and structural corrosion, while also providing a more attractive appearance.

Tech Brief

XR Rail Family

The XR Rail Family offers the strength of a curved rail in three targeted sizes. Each size supports specific design loads, while minimizing material costs. Depending on your location, there is an XR Rail to match.

XR10

XR10 is a sleek, low-profile mounting rail, designed for regions with light or no snow. It achieves spans up to 6 feet, while remaining light and economical.

- 6' spanning capability
- Moderate load capability
- Clear & black anodized finish
- Internal splices available

XR100

XR100 is the ultimate residential mounting rail. It supports a range of wind and snow conditions, while also maximizing spans up to 10 feet.

- 10' spanning capability
- Heavy load capability
- Clear & black anodized finish
- Internal splices available

XR1000

XR1000 is a heavyweight among solar mounting rails. It's built to handle extreme climates and spans up to 12 feet for commercial applications.

- 12' spanning capability
- Extreme load capability
- Clear anodized finish
- Internal splices available

Rail Selection

The table below was prepared in compliance with applicable engineering codes and standards.* Values are based on the following criteria: ASCE 7-16, Gable Roof Flush Mount, Roof Zones 1 & 2e, Exposure B, Roof Slope of 8 to 20 degrees and Mean Building Height of 30 ft. Visit IronRidge.com for detailed certification letters.

Load		Rail Span					
Snow (PSF)	Wind (MPH)	4'	5' 4"	6'	8'	10'	12'
None	90	XR10		XR100		XR1000	
	120						
	140						
	160						
20	90						
	120						
	140						
	160						
30	90						
	160						
40	90						
	160						
80	160						
120	160						

*Table is meant to be a simplified span chart for conveying general rail capabilities. Use approved certification letters for actual design guidance.

BYLD BETTER

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DESIGN BY

CompleteSolar
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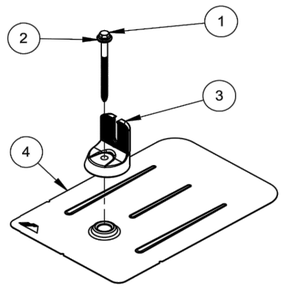
SHEET
S-3
SPEC SHEET

Cut Sheet

IRONRIDGE

FlashVue

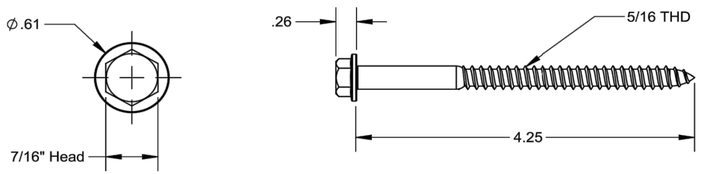


ITEM NO	DESCRIPTION	QTY IN KIT
1	BOLT, LAG 5/16 X 4.25"	1
2	WASHER, EPDM BACKED	1
3	FM FLASHING, MILL OR BLACK	1
4	GRIP CAP, MILL OR BLACK	1

FLASHVUE

PART NUMBER	DESCRIPTION
FV-01-M1	FLASHING, FLASHFOOT, MILL
FV-01-B1	FLASHING, FLASHFOOT, BLACK

1) BOLT, LAG 5/16 x 4.25"

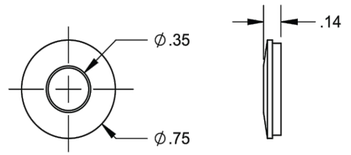


Property	Value
Material	300 Series Stainless Steel
Finish	Clear

v1.0

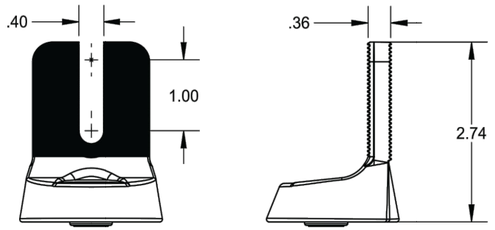
Cut Sheet

2) Washer, EPDM Backed



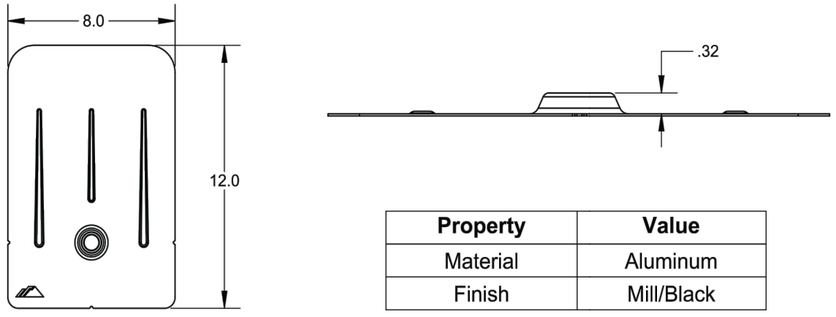
Property	Value
Material	300 Series Stainless Steel
Finish	Clear

3) Grip Cap



Property	Value
Material	Aluminum
Finish	Mill/Black

4) FM Flashing



Property	Value
Material	Aluminum
Finish	Mill/Black

v1.0

BYLD BETTER

CONTRACTOR

BYLD

ADDRESS:1213W MOOREHEAD ST, STE500 CHARLOTTE, NC 28208
LICENSE #:

DESIGNER: OGY

RONALD JONES RESIDENCE

51 SHADOW CREEK LN,
ERWIN,
NC 28339

APN: 12059601000203

DATE:1/17/2024

DESIGN BY

CompleteSolar
A Brighter Way.

SHEET
S-4
SPEC SHEET