

CONSTRUCT SOLAR ARRAY FMS BUILDING 5175 FORT LEONARD WOOD, MO

INDEX OF DRAWINGS

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APPLICABLE CODES/DESIGN CONSIDERATIONS

INTERNATIONAL BUILDING CODE (IBC) 2021
THE AMERICAN WITH DISABILITIES ACT (ADAAG) 2010
INTERNATIONAL MECHANICAL CODE (IMC) 2021
INTERNATIONAL PLUMBING CODE (IPC) 2021
ASHRAE 90.1 - 2016 ENERGY STANDARD FOR BUILDINGS
NATIONAL ELECTRIC CODE (NEC) 2020

OWNER: STATE OF MISSOURI
MICHAEL L. PARSON, GOVERNOR

MISSOURI NATIONAL GUARD
OFFICE OF THE ADJUTANT GENERAL
FACILITIES MANAGEMENT OFFICE

PROJECT MANAGEMENT: OFFICE OF ADMINISTRATION
DIVISION OF FACILITIES MANAGEMENT
DESIGN AND CONSTRUCTION

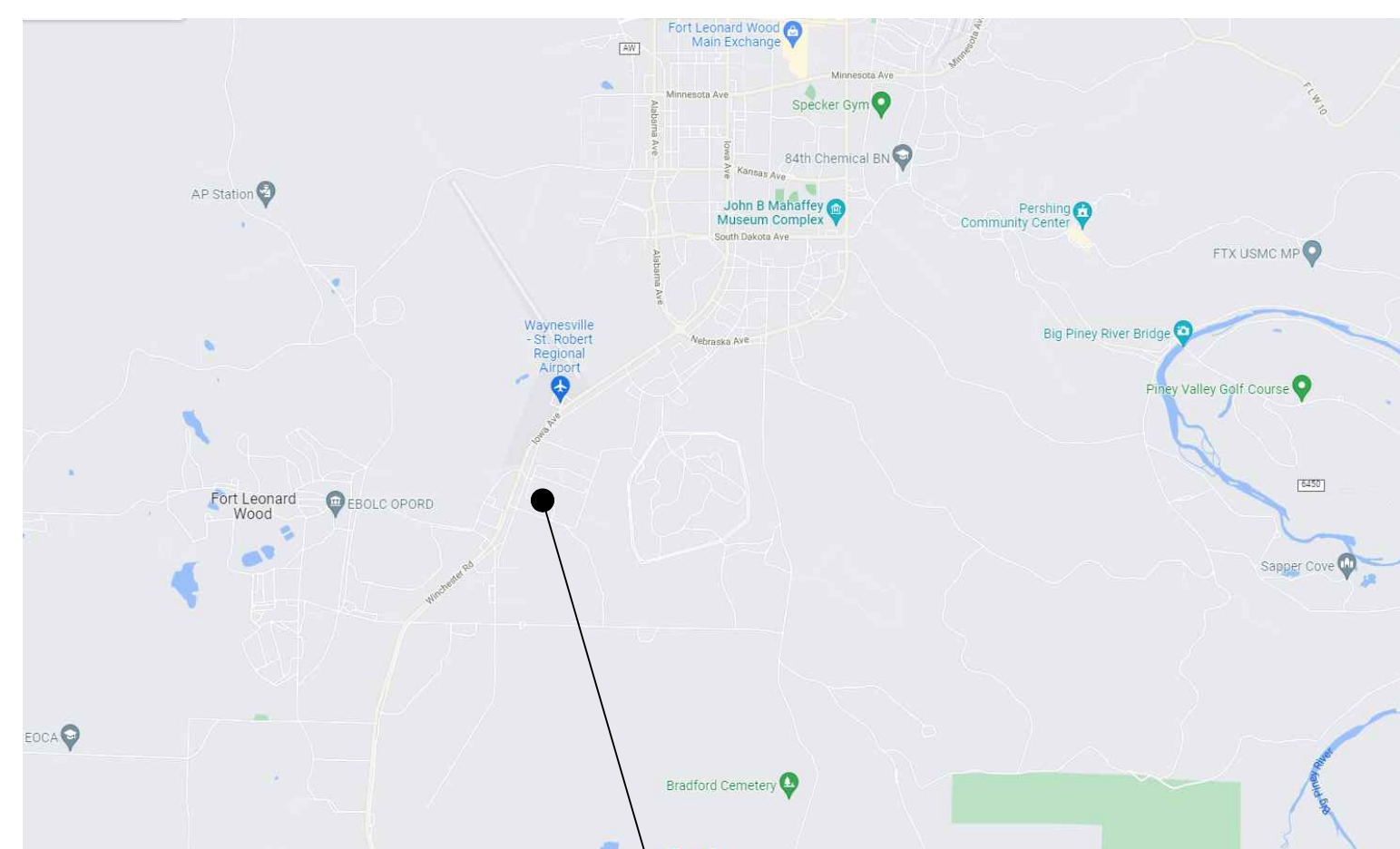
DESIGNER: CROSSED SWORDS ENGINEERING

PROJECT NUMBER: T2224-01

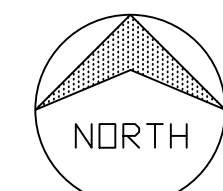
SITE NUMBER: 6306

ASSET NUMBER: 8136306004

SITE LOCATION MAP

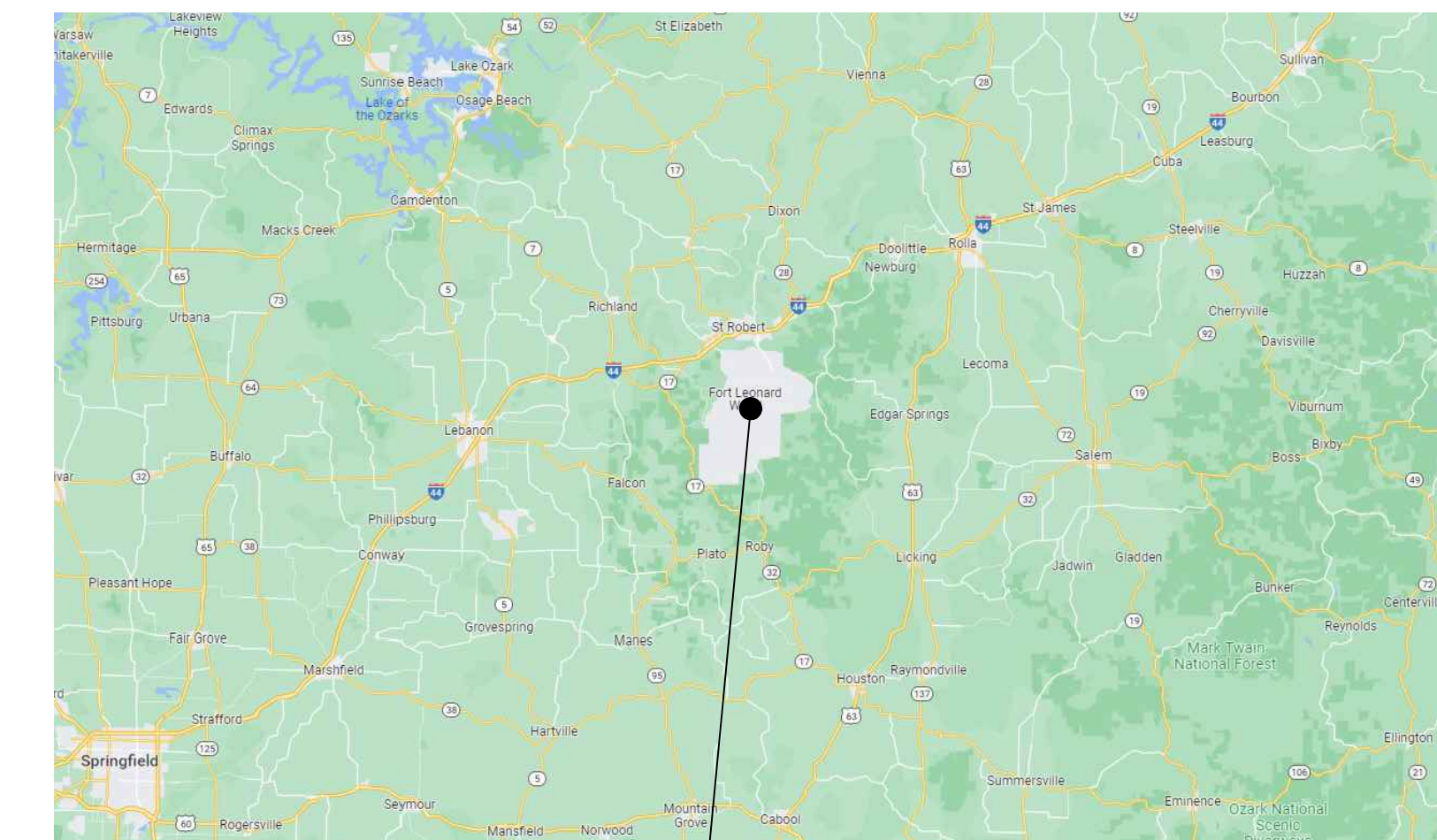


FMS BUILDING 5175
FT LEONARD WOOD, MO
SITE: 5017



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MO CERTIFICATE OF AUTHORITY
#2016003099

REGIONAL LOCATION MAP



FMS BUILDING 5175
FT LEONARD WOOD, MO
SITE: 5017



ISSUED FOR
CONSTRUCTION
2/14/2023

SHEET NUMBER:

G-001


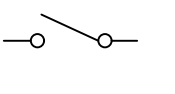
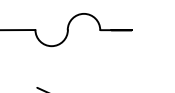
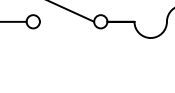

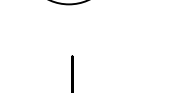
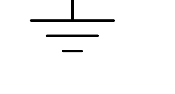
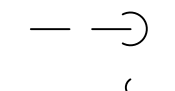

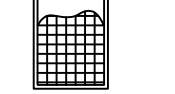

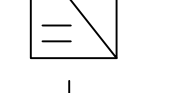
1 OF 5 SHEETS
FEBRUARY 14, 2023

GENERAL ELECTRICAL NOTES

1. PHOTOVOLTAIC (PV) SYSTEMS SHALL COMPLY WITH THE NATIONAL ELECTRIC CODE (NEC) ARTICLE 690.
2. ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH MANUFACTURERS'S LISTING AND INSTALLATION INSTRUCTIONS, AND THE RELEVANT CODES AS SPECIFIED BY THE AUTHORITY HAVING JURISDICTION'S (AHJ) APPLICABLE CODES.
3. THE UTILITY INTERCONNECTION APPLICATION MUST BE APPROVED AND PV SYSTEM INSPECTED PRIOR TO PARALLEL OPERATION
4. LOAD-SIDE INTERCONNECTION SHALL BE IN ACCORDANCE WITH [NEC 690.64 (B)]
5. ALL PV SYSTEM COMPONENTS; MODULES, UTILITY-INTERACTIVE INVERTERS, AND SOURCE CIRCUIT COMBINER BOXES ARE IDENTIFIED AND LISTED FOR USE IN PHOTOVOLTAIC SYSTEMS AS REQUIRED BY [NEC 690.4] & [NEC 690.60]
6. PV MODULES:UL 1703 CERTIFIED, NFPA 70 CLASS C FIRE INVERTER(S):UL 1741 CERTIFIED, IEEE 1547, 929, 519 COMBINER BOX(S):UL 1703 OR UL 1741 ACCESSORY
7. PV STRING HOME RUNS MUST BE LABELED AT ALL TERMINATIONS. UNLESS NOTED OTHERWISE, THE WORK SHALL INCLUDE FURNISHING MATERIALS, EQUIPMENT, ACCESSORIES, AND LABOR NECESSARY TO COMPLETE ALL INSTALLATION AS INDICATED ON THE DRAWINGS
8. SUPPORT CONDUCTORS IN VERTICAL CONDUIT IN ACCORDANCE WITH THE REQUIREMENTS OF NEC 300.19.

GROUNDING NOTES

1. ONLY ONE CONNECTION TO AC CIRCUITS WILL BE USED FOR SYSTEM GROUNDING (NEC 690.42).
2. RACKING AND STRUCTURAL COMPONENTS MUST BE ELECTRICALLY BONDED TOGETHER BY AN ACCEPTABLE MEANS. RACKING SYSTEM SHALL BE LISTED UL2703.
3. MODULES SHALL BE GROUNDED WITH EQUIPMENT GROUNDING CONDUCTORS BONDED TO A LOCATION MEETING MANUFACTURER REQUIREMENTS WITH A MEANS OF BONDING LISTED FOR THIS PURPOSE.
4. A GROUNDING ELECTRODE SYSTEM IN ACCORDANCE WITH NEC 690.47 AND NEC 250.50 THROUGH NEC 250.166 SHALL BE PROVIDED.
5. PV SYSTEM SHALL BE GROUNDED IN ACCORDANCE WITH NEC 250.21 AND ALL METAL PARTS OR MODULE FRAMES ACCORDING TO NEC 690.43.
6. ALL CONDUIT BETWEEN THE UTILITY AC DISCONNECT AND THE POINT OF CONNECTION IN THE MDP SHALL HAVE GROUNDED BUSHINGS AT BOTH ENDS.

ABBREVIATIONS	SYMBOLS LEGEND	SYSTEM NOTES	CONSTRUCTION GENERAL NOTES
<p>A AMPERE AC ALTERNATING CURRENT AFCI ARC-FAULT CIRCUIT INTERRUPTER AHJ AUTHORITY HAVING JURISDICTION AIC AMERAGE INTERRUPTION CAPACITY ATS AUTOMATIC TRANSFER SWITCH AWG AMERICAN WIRE GAUGE CB-# CIRCUIT BREAKER BLDG BUILDING DC DIRECT CURRENT DWG DRAWING EMT ELECTRICAL METALLIC TUBE GFCI GROUND FAULT CIRCUIT INTERRUPTER GFP GROUND FAULT PROTECTION GND GROUND GEC GROUNDING ELECTRODE CONDUCTOR IBC INTERNATIONAL BUILDING CODE IFC INTERNATIONAL FIRE CODE KW KILOWATT MCB MAIN CIRCUIT BREAKER MDP MAIN DISTRIBUTION PANEL MLO MAIN LUG ONLY MTS MANUAL TRANSFER SWITCH N NEUTRAL NEC NATIONAL ELECTRICAL CODE NTS NOT TO SCALE OC ON CENTER OCPD OVERCURRENT PROTECTION DEVICE P POLE PH PHASE POC POINT OF CONNECTION PV PHOTOVOLTAIC RMC RIGID METALLIC CONDUIT SC SOURCE CIRCUIT TYP TYPICAL UL UNDERWRITERS LABORATORY V VOLT OR VOLTAGE W WATT XFMR TRANSFORMER</p>	<p> ELECTRICAL BREAKER  ELECTRICAL DISCONNECT SWITCH  ELECTRICAL FUSE  ELECTRICAL FUSED DISCONNECT SWITCH  METER  SYSTEM OR EQUIPMENT GROUND  CONDUIT DOWN  CONTINUATION OF CONDUIT  PHOTOVOLTAIC (PV) MODULE  DC/AC INVERTER  POWER TRANSFORMER  CONNECTED CONDUCTOR</p> <p>APPLICABLE CODES</p> <p>NATIONAL ELECTRIC CODE (NEC), 2020 INTERNATIONAL BUILDING CODE (IBC), 2021 INTERNATIONAL FIRE CODE (IFC), 2021 LACLEDE ELECTRIC COOP UTILITY REQUIREMENTS</p>	<p>1. SOLAR ARRAY CONSISTS OF PV MODULES, CONNECTED IN SERIES.</p> <p>2. ARRAYS HAVE BEEN PLACED TO MINIMIZE OR ELIMINATE SHADING IMPACT FROM ADJACENT STRUCTURES AND/OR OBSTRUCTIONS.</p> <p>3. INVERTERS SHALL BE TRANSFORMERLESS STRING INVERTERS, LOCATED PER PLAN.</p> <p>SITE INFORMATION</p> <p>UTILITY COMPANY: LACLEDE ELECTRIC COOP</p> <p>POINT OF CONTACT: TERRY ROSENTHAL LACLEDE ELECTRIC COOP TROSENTHAL@LACLEDEELECTIC.COM O: 417-532-3164</p>	<p>1. ALL ELECTRICAL WORK SHALL BE PERFORMED BY A QUALIFIED LICENSED ELECTRICIAN AND/OR APPRENTICES WORKING UNDER THE DIRECT SUPERVISION OF THE LICENSED CONTRACTOR.</p> <p>2. ALL WORK CARRIED OUT SHALL COMPLY WITH THE SPECIFICATIONS, APPLICABLE MUNICIPAL AND UTILITY COMPANY SPECIFICATIONS AND LOCAL JURISDICTIONAL CODES, ORDINANCES, AND APPLICABLE REGULATIONS.</p> <p>3. PRIOR TO COMMENCEMENT OF ANY WORK, THE CONTRACTOR SHALL NOTIFY THE ENGINEER OF ANY DISCREPANCIES NOTED AMONG SITE CONDITIONS, MANUFACTURER RECOMMENDATIONS, OR AUTHORITY HAVING JURISDICTION. IF THE SPECIFIED EQUIPMENT CANNOT BE INSTALLED AS SHOWN ON THESE DRAWINGS, THE CONTRACTOR SHALL SUBMIT TO THE ENGINEER OF RECORD A WRITTEN "RFI"(REQUEST FOR INFORMATION) PROPOSING AN ALTERNATIVE OR SEEKING CLARIFICATION.</p> <p>4. THE CONTRACTOR SHALL MAINTAIN IN GOOD CONDITION ONE COMPLETE SET OF PLANS WITH ALL REVISIONS, ADDENDA, AND CHANGE ORDERS ON THE PREMISES AT ALL TIMES.</p> <p>5. UNLESS NOTED OTHERWISE, THE WORK SHALL INCLUDE FURNISHING MATERIALS, EQUIPMENT, ACCESSORIES, AND LABOR NECESSARY TO COMPLETE ALL INSTALLATIONS AS INDICATED ON THE DRAWINGS.</p> <p>6. ALL MATERIALS FURNISHED AND INSTALLED SHALL BE IN STRICT ACCORDANCE WITH ALL APPLICABLE CODES, REGULATIONS, AND ORDINANCES. CONTRACTOR SHALL ISSUE ALL APPROPRIATE NOTICES AND COMPLY WITH ALL LAWS, ORDINANCES, RULES, REGULATIONS, AND LAWFUL ORDERS OF ANY PUBLIC AUTHORITY REGARDING THE PERFORMANCE OF WORK.</p> <p>7. THE CONTRACTOR SHALL INSTALL ALL EQUIPMENT AND MATERIALS IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS UNLESS SPECIFICALLY STATED OTHERWISE.</p> <p>8. CONTRACTOR SHALL BE RESPONSIBLE FOR THE SAFETY OF WORK AREA, ADJACENT AREAS AND BUILDING OCCUPANTS THAT ARE LIKELY TO BE AFFECTED BY THE WORK UNDER THIS CONTRACT. WORK SHALL CONFORM TO ALL OSHA REQUIREMENTS AND THE LOCAL JURISDICTION.</p> <p>9. CONTRACTOR SHALL LEAVE PREMISES IN A CLEAN CONDITION. ALL DEBRIS AND OTHER REFUSE SHALL BE REMOVED FROM THE SITE AND DISPOSED OF IN A LAWFUL MANNER PER SPECIFICATIONS.</p> <p>10. THE CONTRACTOR SHALL PROTECT EXISTING IMPROVEMENTS, PAVEMENTS, CURBS, LANDSCAPING AND STRUCTURES NOT PART OF THE SCOPE OF WORK AS IDENTIFIED IN THESE PLANS.</p> <p>11. DUE TO THE FACT THAT PV MODULES ARE ENERGIZED WHENEVER THEY ARE EXPOSED TO LIGHT, CONTRACTOR SHALL DISABLE THE ARRAY DURING INSTALLATION AND SERVICE BY SHORT CIRCUITING, OPEN CIRCUITING, OR COVERING ARRAY WITH AN OPAQUE COVER ACCORDING TO MANUFACTURER'S INSTRUCTION.</p> <p>MONITORING AND CONTROLS</p> <p>CONTRACTOR SHALL PROVIDE A WIRELESS MONITORING AND CONTROLS NETWORK. THE SOLAR INVERTERS SHALL BE PROVIDED WITH MANUFACTURER STANDARD WIRELESS ACCESS CAPABILITY. CONTRACTOR SHALL PROVIDE CELLULAR HOTSPOT THAT WILL UPLOAD AND ALLOW CONTROL FROM A PASSWORD PROTECTED WEB ACCESS SYSTEM. THE CONTRACTOR SHALL INSTALL THE WEB MONITORING SOFTWARE ON AN EXISTING COMPUTER AS DESIGNATED BY THE STATE PROJECT MANAGER. SEE SPECIFICATION 263100 FOR ADDITIONAL INFORMATION.</p>



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CONSTRUCT SOLAR ARRAY

FMS BUILDING 5175
FT. LEONARD WOOD, MO 65473

PROJECT # T2224-01
SITE # 6306
ASSET # 8136306004

REVISION: _____
DATE: _____
REVISION: _____
DATE: _____
REVISION: _____
DATE: _____
ISSUE DATE: 2/14/2023

CAD DWG FILE: E-001.DWG
DRAWN BY: RFS
CHECKED BY: JC
DESIGNED BY: RFS

SHEET TITLE:
**ELECTRICAL
LEGEND AND NOTES**

SHEET NUMBER:

E-001



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CAD DWG FILE: E-101.DWG
DRAWN BY: RFS
CHECKED BY: JC
DESIGNED BY: RFS

SHEET TITLE:
ELECTRICAL PLAN
SOLAR ARRAY

SHEET NUMBER:

E-101

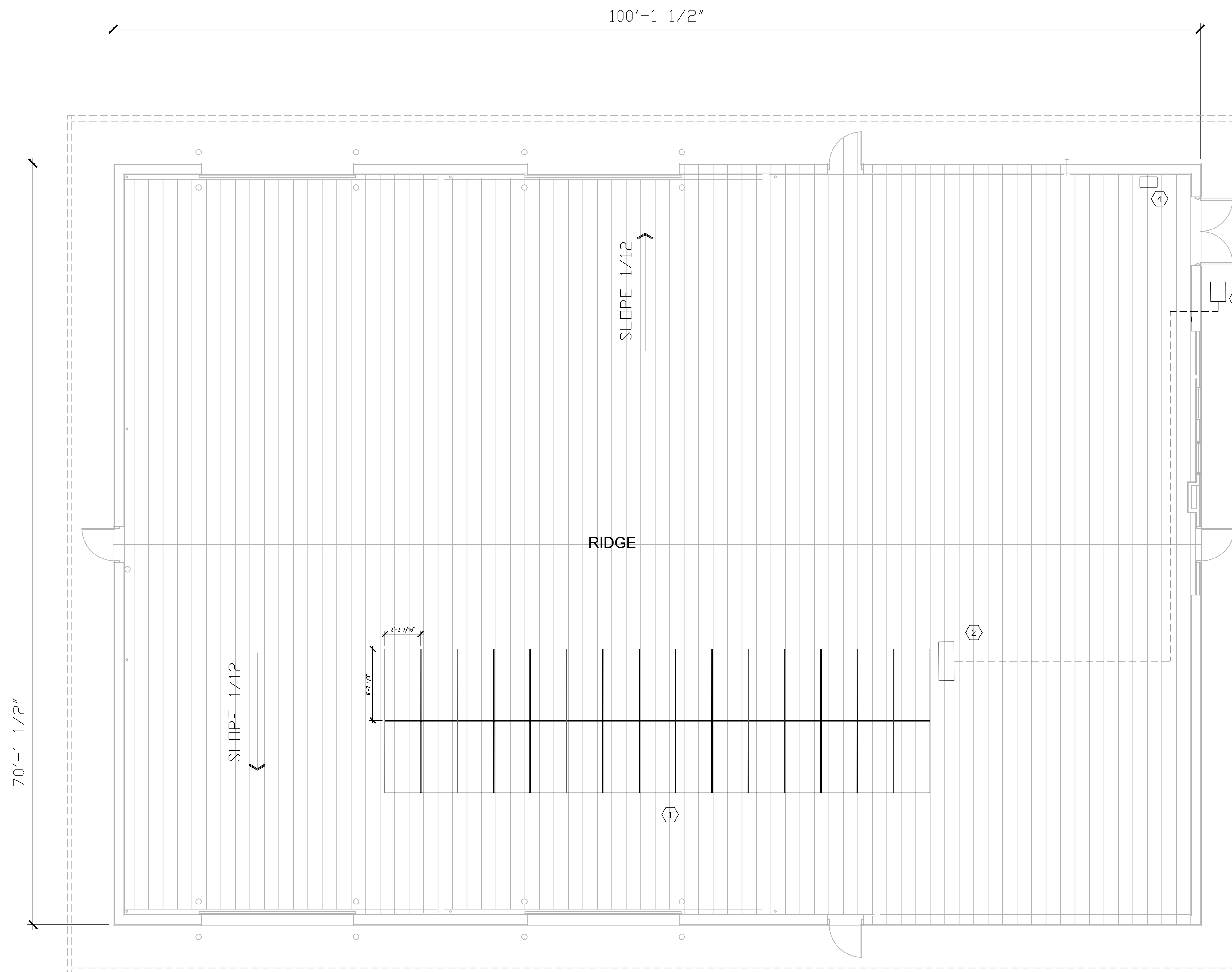
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FEBRUARY 14, 2023

GENERAL NOTES

1. SEE GENERAL NOTES SHEET E-001 FOR ADDITIONAL INFORMATION
2. ALL CONDUIT RUNS ABOVE GRADE.
3. SYSTEM INFORMATION. (FOR REFERENCE ONLY)
SOLAR MODULE WEIGHT: 49.6 LBS.
SOLAR MODULE DIMENSIONS: 79.06"X39.45"X1.57"
4. ALL WORK SHALL BE IN ACCORDANCE WITH THE NATIONAL ELECTRIC CODE (NEC) 2020 AND UTILITY STANDARDS.

PLAN NOTES

1. INSTALL ROOF MOUNTED SOLAR ARRAY. SEE SHEET E-601 FOR DETAILED SOLAR MODULE AND EQUIPMENT INFORMATION. ROOF MOUNTS SHALL BE PER DETAILS ON SHEET E-501.
2. INSTALL NEW DC TO AC SOLAR INVERTER.
3. INSTALL NEW AC FUSED DISCONNECT PER UTILITY COMPANY REQUIREMENTS.
4. CONNECT SOLAR ARRAY AC VIA ROOF MOUNTED WIRE AND CONDUIT TO EXISTING ELECTRICAL PANEL P-1.



1	ROOF PLAN	
3/16"=1'-0"	-	



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CONSTRUCT SOLAR ARRAY

FMS BUILDING 5175
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PROJECT # T2224-01
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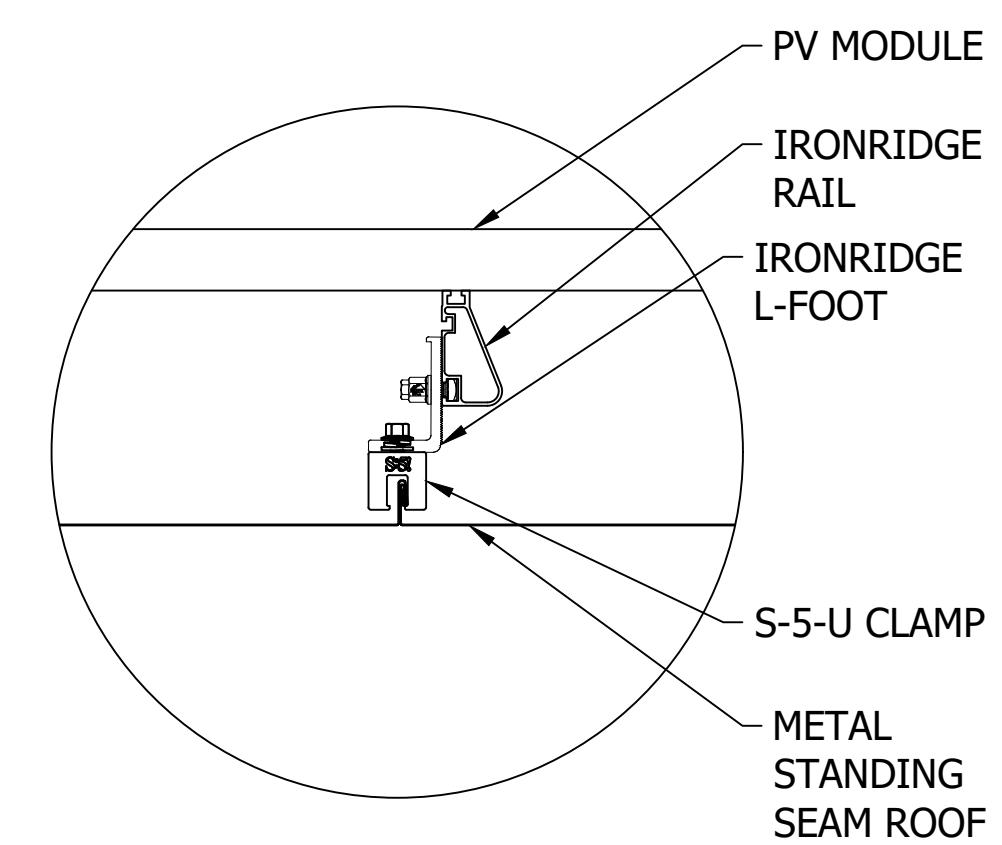
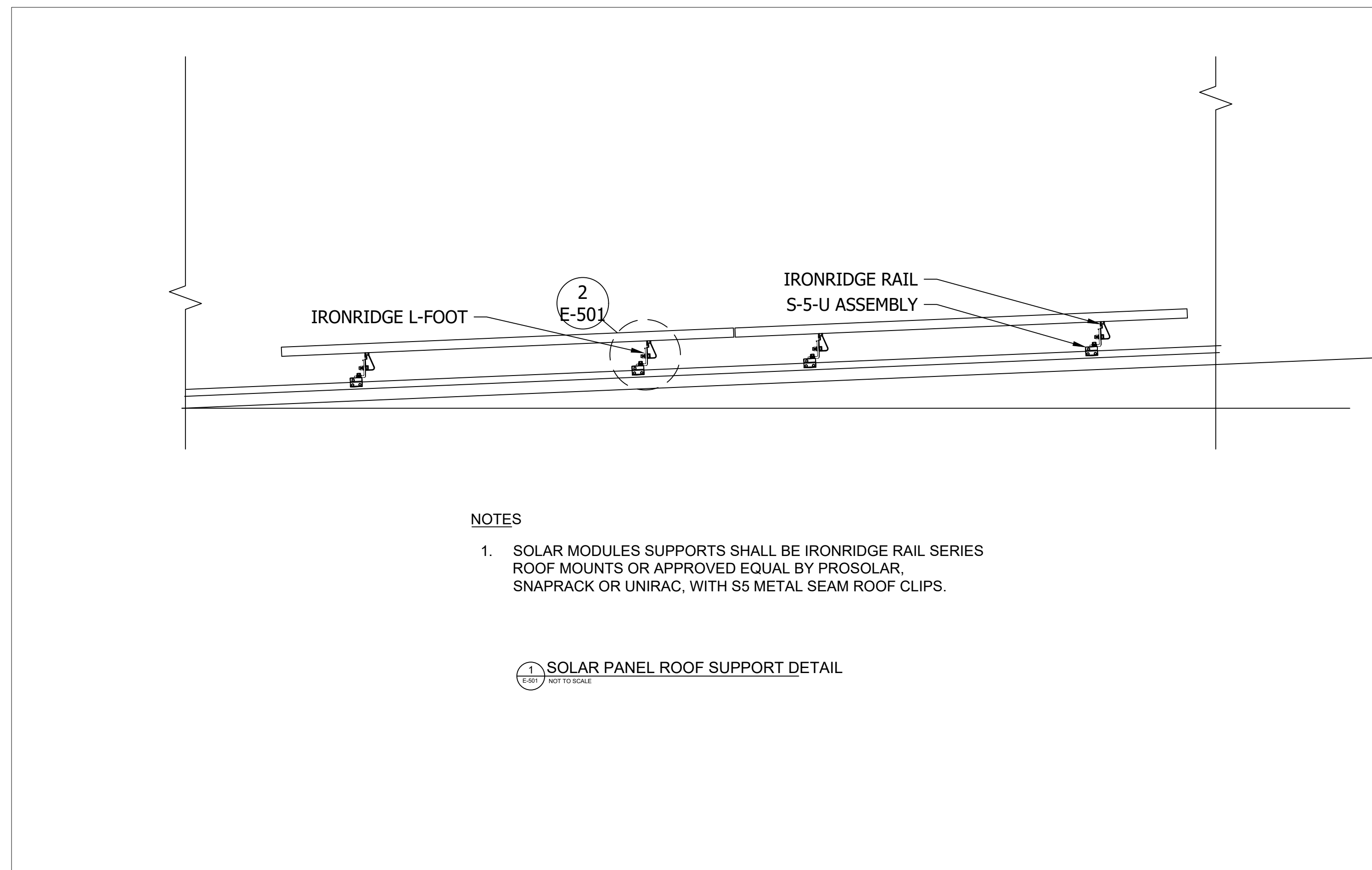
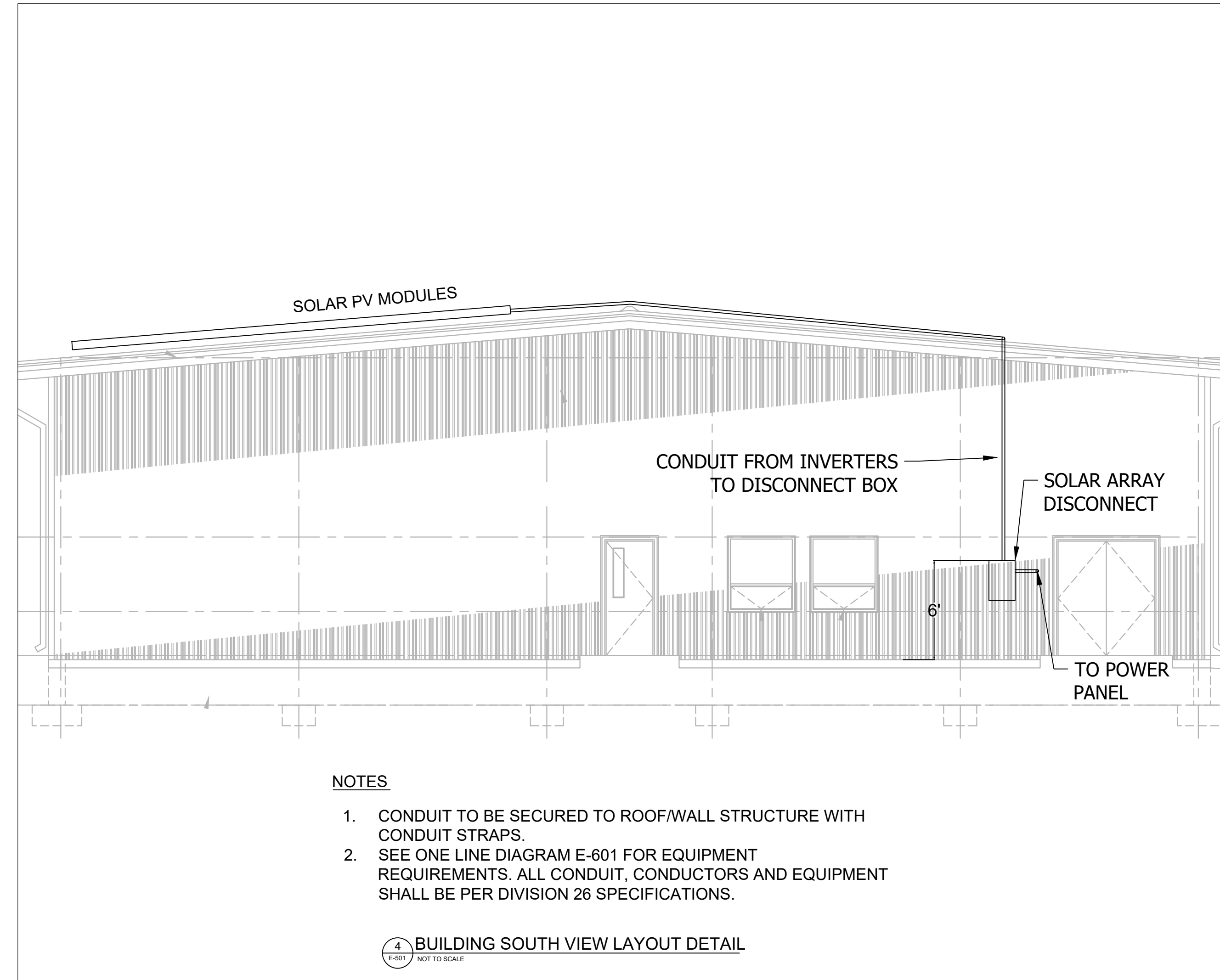
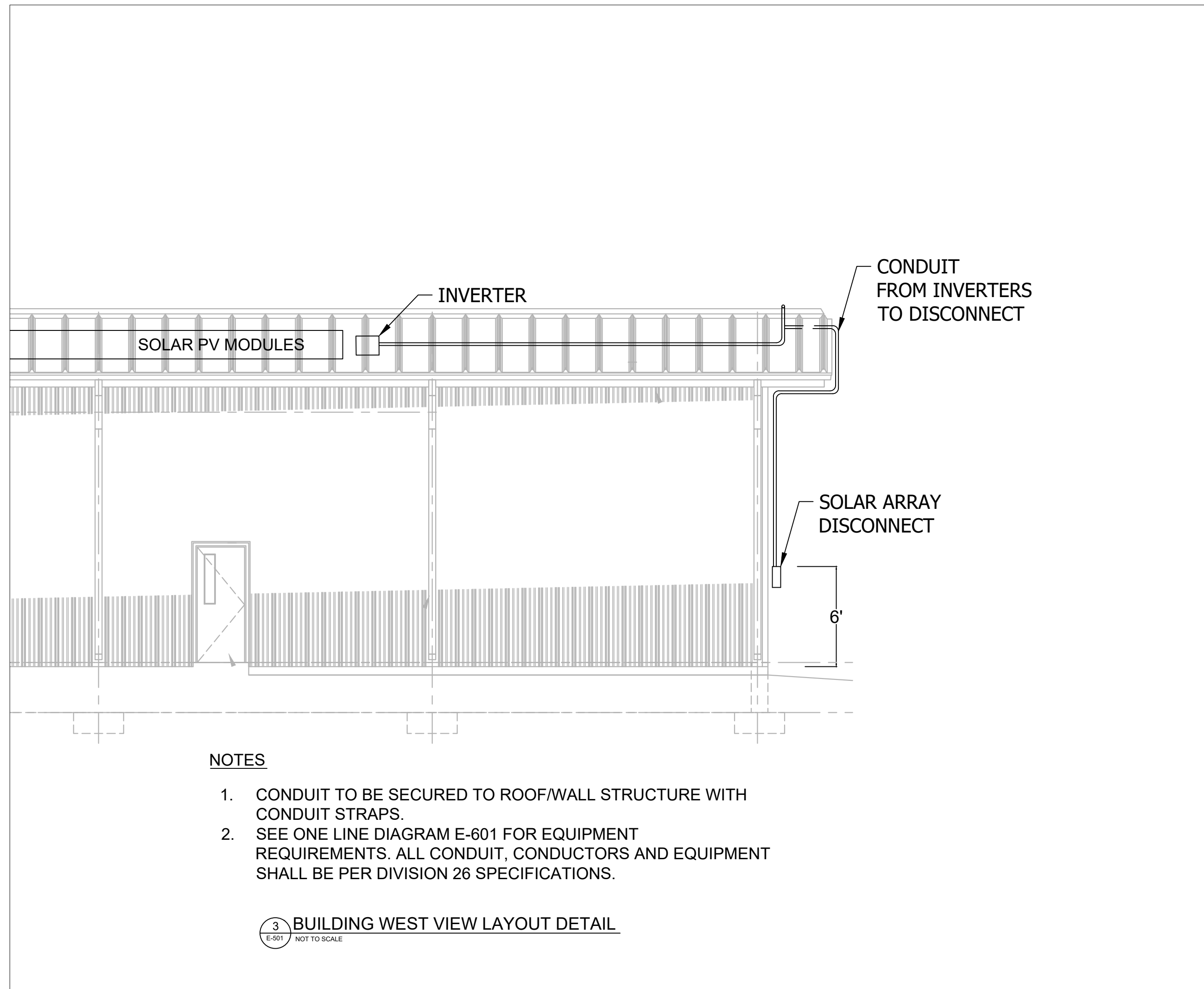
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DRAWN BY: RFS
CHECKED BY: RFS
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SHEET TITLE:
**ELECTRICAL
DETAILS**

SHEET NUMBER:

E-501





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CAD DWG FILE: E-601.DWG
DRAWN BY: RFS
CHECKED BY: JC
DESIGNED BY: RFS

SHEET TITLE:
**ELECTRICAL
ONE LINE DIAGRAM**

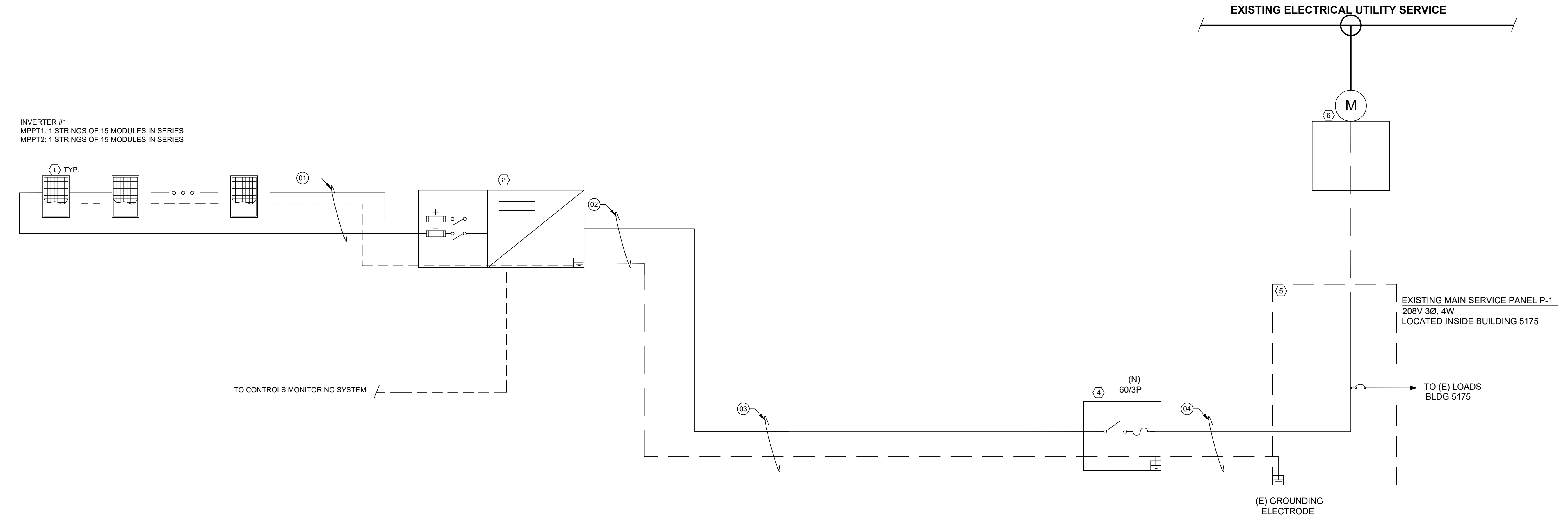
SHEET NUMBER:
E-601

**BUILDING 5175 - 10 KW AC OUTPUT SOLAR ARRAY
DC TO AC RATIO 1.2**

SHEET NOTES

- SOLAR MODULES INCLUDE OUTDOOR RATED QUICK CONNECTS WITH MULTI CONTACT CONNECTORS FOR MODULE INTERCONNECTION. DO NOT REMOVE THE QUICK CONNECTS, OTHERWISE THE MODULE WARRANTY AND THE UL LISTING MAY BE INVALIDATED.
- PV MODULES STRUNG IN SERIES. MODULE AND RACKING GROUNDING ACCOMPLISHED VIA CONTINUOUS CU CONDUCTOR.
- MODIFY EXISTING ELECTRICAL PANEL AS REQUIRED FOR THE CONNECTION OF INVERTER OUTPUT POWER TO THE PANEL.

INVERTER #1
MPPT1: 1 STRINGS OF 15 MODULES IN SERIES
MPPT2: 1 STRINGS OF 15 MODULES IN SERIES



PV EQUIPMENT LIST		
ID	QTY	DESCRIPTION
1	30	JINKO JMK400M-72HL-V, SOLAR MODULE
2	1	10.0 kW STRING INVERTER, 2 MPPT WITH 6 INPUT PAIRS PER MPPT, 208V, 3 PHASE OUTPUT, 60 HZ, FRONIUS SYMO MODEL 10.0-3 208
3	0	NOT USED
4	1	SOLAR SYSTEM AC DISCONNECT, FUSED 60A, 3 PHASE, NEMA 3R
5	1	EXISTING MAIN PANEL P-1, 208V, 3PH.
6	1	EXISTING METER LOCATED AT BUILDING 5175 TRANSFORMER

WIRE AND CONDUIT SCHEDULE					
ID	CONDUCTOR	EGC	CONDUIT	CONDUCTORS IN CONDUIT	TEMPERATURE RATING
01	10 AWG PV WIRE	10 AWG	--	--	75C
02	8 AWG THWN-2	10 AWG	3/4"	4	75C
03	8 AWG THWN	10 AWG	3/4"	4	75C
04	8 AWG THWN	10 AWG	3/4"	4	75C

- ALL EXPOSED SOURCE CIRCUIT CONDUCTORS SHALL BE 600V RATED PV-WIRE SUITABLE FOR USE WITH TRANSFORMERLESS INVERTERS.
- ALL CONDUIT TO BE PER SPECIFICATIONS UNLESS OTHERWISE REQUIRED BY LOCAL AHJ.
- ALL CONDUIT SIZES ARE BASED ON MINIMUM PER NEC CODE REQUIREMENTS.
- WIRE AMPACITY IS BASED ON NUMBER OF WIRES PER CONDUIT. IF CONDUITS ARE INSTALLED DIFFERENTLY THAN SHOWN, WIRE SIZES MAY BE AFFECTED.

SITE CONDITIONS:	
ASHRAE MAX AVG. TEMP:	98.3°F
ASHRAE EXTREME MIN TEMP:	-0.4°F

PV MODULE OUTPUT	
VOC:	49.1 Vdc
TEMP. COEFFICIENT OF Voc	-0.29 %/°C
ISC	10.61 Adc
VMP	40.16 Vdc
IMP	9.96 Adc

INVERTER DETAILS	
RATED POWER OUTPUT (kW)	10.0
OUTPUT VOLTAGE (V)	208
OUTPUT CURRENT (A)	27.7

SOURCE CIRCUIT DETAILS	
MODULES PER STRING	15
TEMPERATURE ADJUSTED VOC	824.9
SHORT CIRCUIT CURRENT	49.1