Louden Tribe
P.O.Box 244
Galena, AK 99741
Phone: (907) 656-1711
Fax: (907) 656-2491

Louden Tribe Solar PV Electric, Com, Controller RFP

Invitation to Bid No: LT-FY24-003 ; Electrical

Publishing Date: Friday March 29th, 2024

Bid Due Date: Monday April 22nd, 2024

Louden Tribe Contact:

Brooke Sanderson

Louden Tribal Administrator

907-656-1711

brooke.sanderson@loudentribe.com

Tanana Chiefs Conference Contact:

Edward Dellamary

T.C.C. Rural Energy Specialist

907-452-8251 x3279

edward.dellamary@tananachiefs.org

Contents

Louden Tribe Invitation to Bid LT-FY24-003

The Louden Tribe (Tribe) requests proposals for the award of a contract for procurement, electrical installation, commissioning, and system integration services for a solar array and micro-grid controller in the community of Galena, AK whose power output is integrated into the City of Galena owned electric distribution system. The microgrid controller specified in the attached documents will be procured by the Tribe but installed by the Electrical contractor. A separate RFP LT-FY24-002 will be put out at the same time for a contractor to install the racking and solar panels. Contractors are encouraged to submit joint proposals if necessary to comprehensively meet the separate project components identified in the scope of services.

This Request for Proposals (RFP) details the overall scope of services desired, identifies specific qualifications, and required skills. Responses to this RFP will be used to select and negotiate with a qualified contractor(s) to provide the services described in the RFP. The Tribal Council will approve the award of this contract based on the evaluation criteria identified in this RFP.

This RFP is contingent on a grant being negotiated for funding and ***does not commit the Tribe to enter into a contract, nor does it obligate the Tribe to pay for any costs incurred in the preparation and submission of responses to this RFP***. The funding for this project will be covered under a US Department of Energy Grant that has been conditionally approved but which is being negotiated as this RFP is out for bid. The Tribe reserves the right at its sole discretion: to make selections of one or more contractors, to reject any or all submissions, to issue subsequent RFPs, to remedy technical errors in the RFP process, and to enter into a contract for all or some of the services described in this RFP.

Proposals must be received by the Louden Tribe, P.0. Box 244, Galena, Alaska 99741 or at the Tribal office located in Galena, Alaska 99741, by 12:00 p.m., local time on Monday April 22nd, 2024. All proposals must be emailed to Louden Tribe Tribal Administrator Brooke Sanderson - brooke.sanderson@loudentribe.com and their Project Manager at Tanana Chiefs Conference Edward Dellamary- Edward.Dellamary@tananachiefs.org. **Proposals received after the deadline will not be considered. FACSIMILE PROPOSALS WILL NOT BE ACCEPTED. Deadline for questions is Wednesday April 17th at 4:30 PM.**

RFP documents and supporting information may be obtained from Tanana Chiefs Conference at https://www.tananachiefs.org/category/bids/ or by calling (907) 452-8251, ext. 3279 and reaching out to Edward Dellamary, TCC Energy Program Manager. Supporting information that is available include a map of the community, photos and an electrical planset**.**

Major components of the project are outlined in the attached plans and include the following:

1. Procurement and installation of both DC and AC electrical equipment for the 1.483 MW DC / 1MWAC grid tied solar PV system integrated into the Galena, AK electrical distribution system targeted installation date between summer 2024 to spring of 2025; preference is to begin with trenching, installation of equipment on the existing inverter rack, and installation of the transformer during 2024 and complete the rest of the electrical scope of work once the solar array is finalized in spring of 2025. Installation of protective screen behind solar panels after wiring to protect DC wiring and installation of Louden supplied transformer

2. Installation of pre-specified Ageto Microgrid controller into Galena powerhouse; contractor will coordinate with the City of Galena and Ageto Energy LLC. Installation of microgrid controller includes only supplying power and communication cable to the Ageto ARC Cabinet device. Separate contractor will finalize the installation of the Ageto Microgrid Controller.
3. Installation of communication equipment to connect PV Array with Galena Powerhouse controls
4. Trenching will be outside of the scope of this RFP; however, the electrical administrator will still purchase materials needed : cables, and conduits, and installation.
5. Contractor to install protective material, hardware cloth; on the back side of the array to protect arrays and abide to NEC
6. Management of all material shipments into the community
7. Contractor must be working under Alaskan Electrical Administrators License per Alaskan code
8. Contractor will work with the Utility on the integration of the solar array, specifically the transformer that has been purchased by the Tribe will be hooked up on the low voltage side by the electrical administrator and the high voltage side will be done by another contractor who will be responsible for mounting the transformer

The tribe reserves the right to waive informalities not inconsistent with the law and reject any or all bids.

Available on Tanana Chiefs Conference website: https://www.tananachiefs.org/category/bids/

SECTION 1 - Instructions to Bidders:

The community of Galena, and project partners in the region are actively working to reduce diesel fuel consumption and costs and are moving toward diesels-off operation on their islanded microgrid through the use of solar energy, battery storage, and advanced grid-forming inverters and control systems. As a future component of the Galena Alaska microgrid system there will be a 1-2MW battery energy storage system. TCC Project Managers have confirmed with Ageto controller product designers that the system can be configured to work effectively in solar integration mode without the use of battery energy storage. A Battery Energy Storage System (BESS) will be integrated into the Galena Alaska Electric Grid at a future date and will be expected to integrate with the Ageto supervisory control however that portion of the project is not included as part of this RFP. The proposed solar PV array or arrays for Galena will need to be integrated into the Galena, Alaska electrical distribution systems similar to other functional Solar PV-Diesel hybrid systems operating in Shungnak, Noatak and Hughes, Alaska.

The Project is funded with both US Department of Energy Clean Energy Deployment on Tribal Lands funding and State of Alaska Renewable Energy Fund monies and must subscribe to pertinent DOE and State of Alaska requirements.

In addition to the above responsibilities, the Contractor will be required to:

- Travel to Galena
- Work together with the representatives of the following organizations during the stay in the Community and while performing the actual installation: Galena Tribal Council, City of Galena, Tanana Chiefs Conference, Sustainable Energy for Galena Alaska (SEGA)
- Coordinate with CITY engineers for integration, commissioning, and operation and comply with all CITY safety requirements
- Use local labor force to maximum extent possible
- Provide training for community designated representatives, SEGA and CITY utility operators

Proposal Format: Proposals must be typewritten or prepared in ink and must be attached to the form provided in this RFP. No oral, telephone, or facsimile proposals will be accepted.

Conformance to Proposal Requirements: Proposals must conform to the requirements of the RFP. All necessary attachments (residency statement, references, descriptive literature, etc.) must be submitted with the proposal. Proposal rates must be stated as indicated in the proposal. Failure to comply with all requirements of the RFP may result in proposal rejection.

Exceptions: Any deviation from proposal specifications, terms and conditions may result in proposal rejection.

Time of Completion: Contractor must be able to complete the installation & integration of the electrical equipment for the solar array, installation of communication equipment, and micro-grid controller installation before July 31, 2025. Contract shall terminate on or before September 30th, 2025, unless extended by mutual agreement.

Signature on Proposal: An authorized representative of the proposer must sign proposals in ink. Signature on a proposal certifies that the proposal is made without collusion with any person, firm, or corporation making a proposal for the same goods and/or services and is in all respects fair and without collusion or fraud. Signature on a proposal also certifies that the proposal is accurate and truthful in all respects, and that proposer has read and fully understands all proposal specifications, terms, and conditions.

Proposal Modification: Modifications or deletions made before submitting a proposal must be initialed in ink by the person signing the proposal. Proposals, once submitted, may be modified in writing before the time and date set for proposal closing. Any modifications shall be prepared on the proposer's letterhead, signed by an authorized representative, and state that the new document supersedes or modifies the prior proposal. Modifications must be submitted in a sealed envelope clearly marked "Proposal Modification," and identify the proposal number and closing date.

Proposal Withdrawals: Proposals may be withdrawn in writing on proposer's letterhead signed by an authorized representative and received by the Tribe prior to proposal closing time. Proposals may also be withdrawn in person before proposal closing time upon presentation of appropriate identification.

Protest of Proposal Specifications: A proposer who believes proposal specifications are

unnecessarily restrictive or limit competition may submit a protest, in writing, to the Tribal Council. To be considered, protests must be received at least five (5) days before the proposal closing date. Envelopes containing protests should be marked as follows: *"Louden Solar PV Electric, Com, Controller RFP LT-FY24-003"*

Required Effort: Per Louden Tribe procurement guidelines, The Louden Tribe must make a good faith effort to ensure that small businesses and minority owned business, women's business enterprises and individuals or firms located within or owned in substantial part by persons residing in the area of a Louden Tribe project are used when possible

SECTION 2 - EVALUATION CRITERIA

The Tribe's Evaluation Committee will evaluate the RFP responses. The Committee will consider how well the proposal meets the Tribe's requirements as described in the RFP. It is important that the responses are clear and complete to ensure that the Committee can adequately understand all aspects of the proposal.

Minimum Criteria

1. At least 3 years in business
2. Significant, demonstrable experience with hybrid renewable-diesel power systems
3. Significant, demonstrable experience designing & installing Solar PV arrays in Alaska
4. Certification for installation and commissioning of Micro-grid Controls
5. Work must be covered under Valid state of AK electrical Administrator license
6. At least 3 references from clients in Alaska

Criteria to be Scored

1. Price
2. Scope of Services
3. Prior experience performing similar work , and demonstrate current capacity
4. A plan of commitment to use local hire for additional work and train them
5. Recommendation from References

Award:

The Louden Tribe review committee may consist of but is not limited to the Tribal Administrator, City of Galena Utility Manager, City of Galena City Manager, Tanana Chiefs Conference Energy Project Managers, Tribal Council Staff and the General manager for Sustainable Energy for Galena (SEGA), Alaska. The Tribe reserves the right to modify the membership of the Evaluation Committee.

The Evaluation Committee will rank the proposals against the criteria in this RFP and submit its recommendation to the council for approval and execution of a professional services agreement. The Council will award the contract at its sole discretion and judgment.

Louden Tribe may reject any proposal not in compliance with all prescribed bidding procedures and requirements in this RFP, and may reject any proposals upon a finding that it is in the Tribe's interest to do so. The Tribe also reserves the right to waive any informality in any proposal and to delete matters from proposals if not prohibited by law.

Louden Tribe Invitation to Bid LT-FY24-003

Bid of_____
(hereinafter called "BIDDER"), organized and existing under the laws of the State of_____
doing business as _____*,
to the LOUDEN TRIBE, a federally recognized tribe (hereinafter called "OWNER").

In compliance with your Advertisement for Bids, BIDDER hereby proposes to perform all WORK for the **Louden Tribe Solar PV Electric, Com, Controller RFP**, in strict accordance with the CONTRACT DOCUMENTS, within the time set forth therein, and at the prices stated below.

By submission of the BID, each BIDDER certifies, and in the case of a joint BID each party thereto certifies as to his own organization, that this BID has been arrived at independently, without consultation, communication, or agreement as to any matter relating to the BID with any other BIDDER or with any competitor.

BIDDER hereby agrees to commence WORK under this contract on or before a date to be specified in the NOTICE TO PROCEED and to fully complete the PROJECT by July 31st, 2025. BIDDER further agrees to pay any liquidated damages in accordance with the Contract Documents.

BIDDER agrees to perform all the work described in the CONTRACT DOCUMENTS for the following unit prices or lump sum (Show total Price):

Respectfully submitted:

_____	_____	
Signature	Address	
_____	_____	_____
Title	Telephone Number	Date

NON-COLLUSION AFFIDAVIT

UNITED STATES OF AMERICA

STATE OF ALASKA

I, _____, of _____,
(Name of Officer) (Firm Name)

being duly sworn, do depose and state:

That I, or the firm, association or corporation of which I am a member, a bidder, on the contract to be awarded, by the Louden Tribe of the State of Alaska, for the construction of that certain project designated as: the **Louden Tribe Solar PV Electric, Com, Controller RFP**, located in Galena, Alaska, in the State of Alaska, have not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in connection with such contract.

_____
(Signature)

Subscribed and sworn to this _____ day of _____, 2024.

_____
Notary Public
My Commission Expires:

Bid Schedule

The Bidder shall insert a unit bid price or a lump sum price in figures opposite each pay item and total price for which an estimated quantity appears in the bid schedule. The estimated quantity of work for payment on a lump bum basis will be “all required” and as further specified in the contract.

Louden Tribe BID SCHEDULE		Louden Solar PV and Microgrid Controller
Project LT-FY24-003		
Item No.	Item Description	Amount Bid
001	Electrical work – Procurement of All Electrical Material Needed for Project (Inverters, DC combiners, wiring, junction boxes, home runs etc)	
002	Labor for electrical installation on site	
003	Installation of Ageto microgrid controller in Galena Powerhouse to include supply of 120VAC power and communications connection into Galen switchgear. Commissioning to be completed by microgrid control company	
	Total Bid:	

CONTRACTORS QUALIFICATION QUESTIONNAIRE

A. FINANCIAL

1. Have you ever failed to complete a contract due to insufficient resources?
[ ] No [ ] Yes If YES, explain:

2. Describe any arrangements you have made to finance this work:

B. EQUIPMENT

1. Describe the equipment you have available and intend to use for this project. List the item, quantity, make, model, size/capacity and present market value.

2. What percent of the total value of this contract do you intend to subcontract? _____ %

3. Do you propose to purchase any equipment for use on this project?
[ ] No [ ] Yes If YES, describe type, quantity, and approximate:

4. Do you propose to rent any equipment for this work?
[ ] No [ ] Yes If YES, describe type and quantity:

5. Is your bid based on firm offers for all materials necessary for this project?
[ ] Yes [ ] No If NO, please explain:

C. EXPERIENCE

1. Have you had previous construction contracts or subcontracts in a Rural Community?
[ ] No [ ] Yes (If yes where and please provide contact info)

Describe the most recent or current applicable contract, its completion date, and scope of work:

2. List, as an attachment to this questionnaire, other construction projects you have completed, the dates of completion, scope of work, and total contract amount for each project completed in the past 5 years which are pertinent to this project.

I hereby certify that the above statements are true and complete.

_____ _____
Name of Contractor Name and Title of Person Signing

_____ _____
Signature Date

Part 2 - General Provisions

Scope of Work

The Louden Tribe is releasing this bid document for the AC and DC electrical work, communication installation and controller procurement and installation of a 1.483MW grid-tied solar PV array in the community of Galena, Alaska and the associated 1mVA step up transformer which will be procured by the tribe. Any work completed during spring or summer months will need to be done in such a way that ground disturbance is minimized otherwise the contractor will be responsible for re-vegetation of the site. Contractor is responsible for acquiring their own housing in the community of Galena. Contractor is responsible for the procurement of all material and shipping of said material into the community. Local barge vendors that serve the community include Ruby Marine based in Nenana, AK.

1. The community in partnership with Tanana Chiefs Conference has completed extensive design work over the past 18 months and an electrical planset is available as part of this packet and will be used as the basis of design
2. Trenching will be outside of the scope of this RFP; however, the electrical administrator will still purchase materials needed: cables, and conduits, and installation
3. The microgrid controller for this project is specified as the Ageto ARC controller and must be incorporated into the existing city of Galena SCADA system
4. SEG 550 watt bifacial monocrystalline panels are the basis of design, wired in series at 1500VDC. Panels will be hung by a different contractor but all wiring must be done by electrical contractor. SMA 125kw inverters have been used as the basis of design.
5. Contractor will be expected to install mesh wire or hardware cloth behind the panels to protect DC wiring on the back of the panels and retain compliance with NEC requirements on all solar arrays
6. Louden Tribe has completed the installation of the powerline crossing the Campion road and sized that connection to handle the 1MVA AC load of the solar array and will procure a transformer for this project.

Measurement and Payment

Payment for the project will be in the form of multiple completion milestones and payment dates once an eligible contractor is selected. Contractor will be paid after receipt of properly prepared invoices. Louden Tribe and their consultants/Partners will inspect and approve all work to ensure it complies with applicable codes and standards. Any concerns or issues that the tribe has with the contractors work as completed will be addressed by a 3rd party arbitrator if they cannot be resolved between the tribe and contractor directly. No final payment will be made until the tribe is confident that all work has been completed to their standards and specifications.

Insurance Requirements

The Louden Tribe shall be named as an additional insured on all insurance policies required for this project. All of the insurance coverages shall be considered to be primary and

noncontributory to any other insurance carried by the Louden Tribe, whether through self-insurance or otherwise.

All specialty trades such as electrical, plumbing and mechanical must have appropriate licensing and be certified by the State of Alaska for the work being performed.

Certificate of Insurance

Contractor must furnish a certificate of insurance within the (10) days of receipt of the Notice-of-Intent to Award and must endorse polices to provide for a thirty (30) day prior notice of cancellation, nonrenewal or material change of the policies. Failure to furnish satisfactory evidence of insurance or lapse of policy is a material breach of the contract and grounds for termination of this agreement. Each policy shall be endorsed with a waiver of subrogation in favor of the Owner. All other insurance policies required of the Contractor by this agreement shall be endorsed to provide that such insurance shall apply as primary insurance and that any insurance or self-insured carried by the Owner will be excess only and will not contribute with the insurance required by this agreement. All other insurance policies required of the Contractor and subcontractors by this Agreement shall be endorsed to name the Owner as additional insured. All insurance shall be on an occurrence from acceptable to the Owner and having an A.M. Best rating of “A” or better.

1. Workers’ Compensation and Employers’ Liability Insurance as required by any applicable law or regulation. Employers’ liability insurance shall be in the amount no less than $500,000 each accident for bodily injury, $500,000 policy limit for bodily injury by disease and $500,000 each employee for bodily injury by disease. The Contractor shall be responsible for Workers’ Compensation Insurance for any subcontractor who directly or indirectly provides services under this contract. This coverage must include statutory coverage for states in which employees are engaging work. If there is an exposure of injury to Contractor’s employees under the U.S. Longshoremen’s Harbor Workers’ Compensation Act, the Jones Act, or under laws, regulations or statutes applicable to maritime employee, coverage shall be included for such injuries or claims. The coverage shall include waiver of subrogation against the City.

2. Commercial General Liability Insurance: The Contractor is required to provide Commercial General Liability (CGL) insurance with limits not less than $2,000,000 combined single limit per occurrence and $2,000,000 in the aggregate not excluding premises operations, independent contractors, products, and completed operations, broad form property damage, blanket contractual, explosion, collapse and underground hazards. **Limits may be a combination of primary and excess (umbrella) policy forms.**

3. Comprehensive Automobile Liability Insurance: Covering all owned hired and non-owned vehicles with coverage limits not less than $500,000 single limit per occurrence bodily injury and property damage.

4. Property Insurance: The Contractor shall submit to the Owner evidence of All Risk Builder’s Risk Insurance for all physical loss, including earthquake and flood (100% completed value basis) upon the entire work naming the Owner, the Contractor and the subcontractors as additional insured parties and as their interests may appear to the full contract sum thereof, until the project is completed by the Contractor and accepted by the Owner. The policy, by endorsement, shall specifically

State “Louden Tribe Solar PV and Microgrid Controller”

A. PROOF OF INSURANCE: The Contractor shall furnish the Owner with a Certificate of Insurance or where requested by the Owner, the policy declaration page with required endorsements attached thereto showing the type, amount, effective dates and dates of expiration of all policies. All endorsements shall reference policy number and the project name and project number. The Owner is the Louden Tribe and is to be identified on all certificates and endorsements.

B. To the fullest extent permitted by law, the Contractor shall defend, indemnify and hold harmless the Louden Tribe its officers, and employees from and against any and all loss, expense, damage, claim, demand, judgment, fine, charge, lien, liability, action, cause of action, or proceedings of any kind whatsoever (whether arising on account of damage to or loss of property, or personal injury, emotional distress or death) arising directly or indirectly in connection with the performance or activities of the Contractor hereunder, whether the same arises before or after completion of the contractor’s operations or expiration of this Agreement, except for damage, loss or injury resulting from the Owner’s gross negligence or willful misconduct.

C. Without limiting its indemnification, the Contractor shall maintain, until acceptance of the project by the Owner, occurrence type coverage of the kinds and minimum amounts set forth above. All insurance limits are minimum. If the Contractor’s policy contains higher limits, the Owner shall be entitled to coverage to the extent of such higher limits. The Owner, at its sole discretion, may raise or lower the limit.

Part 3 – Map of Galena

Part 4 – Design Documents

1. Electrical Planset
2. APA Titan Duo Solar Racking
3. Solar Panel Specification
4. Inverter Specifications

Community Map
GALENA

64° 44' 10" N 156° 54' 49" W (NAD 83)
Approximate Elevation: 153' at Airport CL Mon.
Township 9 South, Range 10 East, K.R.M., AK
U.S.G.S. Quadrangle "NULATO C2-C3-D2-D3", Alaska
NULATO RECORDING DISTRICT

LEGEND

- Residential Building
- Commercial Building
- Public Building
- Edge of Water
- Electric
- Underground Telephone
- ANCSA 17(b) Easements

0 200 400
SCALE IN FEET

SCALE: 1"=200'
Date of Photography: July 10, 2009
Magnetic Declination computed by U.S.G.S. Geomag
Program using WMM-2005.COF model as of September 12, 2009

SHEET 4 of 8

MAP NOTES
This map was prepared by the Alaska Department of Commerce, Community, and Economic Development, Division of Community and Regional Affairs (Commerce) using funding from Federal Emergency Management Agency and US Department of the Interior Bureau of Indian Affairs. Commerce contracted with Global Positioning Services, Inc. in June of 2009 to prepare the map.

This map should not be construed as a survey. On-site surveys should be conducted prior to engineering or construction. This map was compiled to meet horizontal and vertical accuracy in accordance with national map accuracy standards.

Property and utility information has been generated from readily available sources with limited accuracy checks. Property information is not intended to represent a title search of the Recorders Office record. Utility location is approximate and shows only the main lines. Generally, the information is current as of December 2009. ANTHC provided sanitation facility records.

This map is based on photography acquired on July 7 & 10, 2009, at a nominal scale, of 1 in = 800 ft. Aero-Metric Anchorage prepared the orthophoto and topographic mapping. The topographic contours were prepared at two (2) foot intervals with index contours every ten (10) feet.

FLOOD NOTES
The US Army Corps of Engineers (USACE) report "Alaska Communities Flood Hazard Data 2009", has a published flood of record which occured in 1971 with a flood elevation of 134.7' Mean Sea Level (MSL) (1943 Datum) at "Old Town". The flood control dike surrounding the Air Force Base was constructed at 136 ft Mean Sea Level (MSL) (1943 Datum). Published Flood Insurance Maps (FIRM) show detailed flood plain information. In 1955, The U.S. Geological Survey (USGS) re-adjusted the vertical datum. The 1955 datum is 23.3' higher than the 1943 datum.

BUILDING KEY

1. Christian Church
2. Coffee Shop
3. Daycare Center
4. School
5. School
6. School Maint.
7. High School
8. Elementary School
9. City Pool
10. City Clinic
11. Elders Home
12. Court House
13. Louden Offices
14. B&B
15. Store
16. Store
17. Sweetirs Store
18. Radio Station
19. Radio Station
20. Business Hall

Plat#	Lot#	BL#	Name	Document	Rec Date	Bk & Pg/Rec.
83-04	10	2-A	Gana-a' Yoo Limited	Quit Claim Deed	6/28/1994	18 943-944
84-04	4	2	Gana-a' Yoo Limited	Statutory Warr. Deed	11/2/1998	23 429
84-04	10	4	City of Galena	Statutory QCD	1/10/1997	20 795-796
84-04	11	4	Catholic Bishop of Northern AK	Notice	6/11/2007	2007-000101-0
84-04	3	7	Gana-a' Yoo Limited	Statutory Warr. Deed	4/2/1999	23 766-767
84-04	1	10	City of Galena	Statutory QCD	8/9/2005	2005-000107-0
84-04	9	13	United State of America	Warranty Deed	6/22/1984	11 144-145
84-04	10	13	United State of America	Warranty Deed	6/22/1984	11 144-145
84-06	9	1B	United State of America	Warranty Deed	4/5/1985	12 140-141
84-06	13	1B	United State of America	Warranty Deed	4/5/1985	12 142-143

GALENA COMMUNITY MAP SHEET 4 1"=200' (2009 PHOTOGRAPHY)

Part 4 – Design Documents

1. Electrical Planset
2. APA Titan Duo Solar Racking
3. Solar Panel Specification
4. Inverter Specifications

CITY OF GALENA SOLAR
1529kW DC PV ARRAY
GALENA, AK 99741

SCOPE OF WORK

THE PROJECT SCOPE INCLUDES THE INSTALLATION OF A GRID-TIED SOLAR PHOTOVOLTAIC SYSTEM IN GALENA , AK.

THE INSTALLATION CONSISTS OF A GROUND MOUNT SOLAR ARRAY, 9 STRING-INVERTER(S), AND RELATED ELECTRICAL METERING AND SAFETY EQUIPMENT. ALL EQUIPMENT WILL BE INSTALLED AS REQUIRED BY APPLICABLE CODES AND THE LOCAL UTILITY COMPANY. DURING DAYLIGHT HOURS THIS PHOTOVOLTAIC SYSTEM (SOLAR ELECTRIC) WILL PROVIDE ELECTRICITY IN PARALLEL WITH THE LOCAL UTILITY SERVICE PROVIDER. DURING A GRID OUTAGE, THE ENERGY STORAGE SYSTEM WILL PROVIDE THE FACILITY ELECTRICAL SYSTEM WITH BACKUP POWER

SYSTEM DESCRIPTION

FACILITY SERVICE VOLTAGE: 4160V, 3 PHASE, 4 WIRE
(2688) SEG, SEG-550-BMA-TB, 550WDC, PERC MONO,
(8) SMA AMERICA, SUNNY HIGH POWER 125-US-20, 125kVA, STRING-INVERTER(S), 480VAC, 3ϕ

(88) HANWHA Q CELL, Q.PEAK DUO XL-G11, 575WDC, MONO-CRYSTALLINE,
(1) SMA AMERICA, STP 50-US-41, 50kVA, STRING-INVERTER, 480VAC, 3ϕ
(1) SMA AMERICA, SUNNY TRI POWER CORE1 50-US, 50kVA, STRING-INVERTER(S), 480VAC, 3ϕ

1529kW DC TOTAL (1478.4kW + 50.6kW)

1050.000kW AC PV (OUTPUT SOFTWARE DERATED TO 1MW TOTAL)

GENERAL NOTES

ALL ELECTRICAL WORK TO BE INSTALLED BY A QUALIFIED AND LICENSED ELECTRICAL CONTRACTOR.

ALL SOLAR MODULES SHALL BE UL LISTED 1703 & CEC APPROVED. ALL INVERTERS SHALL BE UL LISTED 1741 CERTIFIED & CEC APPROVED. ALL ELECTRICAL COMPONENTS AND MATERIALS SHALL BE LISTED FOR IT'S PURPOSE AND INSTALLED IN A WORKMAN LIKE MANNER. ALL OUTDOOR EQUIPMENT SHALL MEET APPROPRIATE NEMA STANDARDS.

THE ELECTRICAL CONTRACTOR IS ADVISED THAT ALL DRAWINGS AND COMPONENT MANUALS ARE TO BE UNDERSTOOD PRIOR TO INSTALLATION. THE CONTRACTOR IS ADVISED TO HAVE ALL SWITCHES IN THE "OFF" POSITION AND FUSES REMOVED PRIOR TO INSTALLATION OF FUSE-BEARING COMPONENTS.

THIS SYSTEM IS INTENDED TO BE OPERATED IN PARALLEL WITH THE UTILITY SERVICE PROVIDER. ANTI-ISLANDING PROTECTION IS A REQUIREMENT OF UL 1741 AND IS INTENDED TO PREVENT THE OPERATION OF THE PV SYSTEM WHEN THE UTILITY GRID IS NOT OPERATIONAL.

PERMISSION TO OPERATE THE SYSTEM IS NOT AUTHORIZED UNTIL FINAL INSPECTIONS AND APPROVALS ARE OBTAINED FROM THE LOCAL AUTHORITY HAVING JURISDICTION AND THE LOCAL UTILITY SERVICE PROVIDER.

THE METHOD OF ATTACHMENT CREATES A UNIFIED STRUCTURE TO MEET DEAD LOAD, WIND LOAD, AND SEISMIC REQUIREMENTS. SOLAR MODULES WILL BE SECURED AS SPECIFIED ON THE STRUCTURAL SHEETS. ALL STRUCTURAL DESIGN AND INSTALLATION COMPONENTS ARE THE RESPONSIBILITY OF OTHERS AND OUTSIDE THE SCOPE OF THIS DOCUMENT.

ALL FASTENERS SHALL BE CORROSION RESISTANT APPROPRIATE FOR SITE CONDITIONS. CONNECTORS SHALL BE TORQUED PER DEVICE LISTING OR ENGINEERING RECOMMENDATIONS.

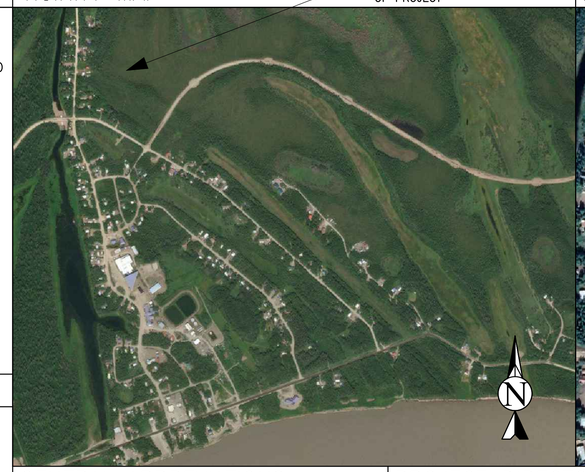
ALL LAYOUT DIMENSIONS ARE SHOWN TO THE NEAREST 1 INCH U.O.N.

APPLICABLE CODES

INTERNATIONAL BUILDING CODE, 2018
NATIONAL ELECTRICAL CODE, 2020
NATIONAL ELECTRICAL SAFETY CODE, 2020

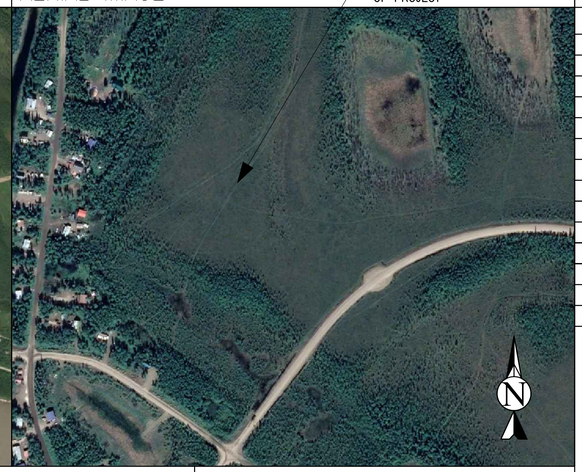
VICINITY MAP

PROPOSED LOCATION OF PROJECT



AERIAL IMAGE

PROPOSED LOCATION OF PROJECT



GENERAL ABBREVIATIONS

(E)	EXISTING
AHJ	AUTHORITY HAVING JURISDICTION
AL	ALUMINUM
APPROX	APPROXIMATE
ARY	ARRAY
ASHRAE	AMERICAN SOCIETY OF HEATING REFRIGERATING AND AIR CONDITIONING ENGINEERS
BLDG	BUILDING
CL	CENTERLINE
DAS	DATA ACQUISITION SYSTEM
DIA	DIAMETER
DO	DITTO
EW	EAST-WEST
FBO	FURNISHED BY OTHERS
FF	FORWARD FACING
GALV	GALVANIZED
HDG	HOT DIP GALVANIZED
HVAC	HEATING VENTILATION AND AIR CONDITIONING
IBC	INTERNATIONAL BUILDING CODE
ID	INSIDE DIAMETER
IEEE	INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS
MFR	MANUFACTURER
MOD	SOLAR MODULE
NEC	NATIONAL ELECTRICAL CODE
NS	NORTH-SOUTH
NTS	NOT TO SCALE
OAE	OR APPROVED EQUIVALENT
OC	ON CENTER
OD	OUTSIDE DIAMETER
OFCI	OWNER FURNISHED CONTRACTOR INSTALLED
PV	PHOTOVOLTAIC
PVC	POLY VINYL CHLORIDE
SCH	SCHEDULE
SS	STAINLESS STEEL
SSS	SOLAR SUPPORT STRUCTURE
STC	STANDARD TEST CONDITIONS
TBD	TO BE DETERMINED
TOF	TILT AND ORIENTATION FACTOR
TP	TAMPER PROOF
TSRF	TOTAL SOLAR RESOURCE FACTOR
TYP	TYPICAL
UL	UNDERWRITERS LABORATORIES
UON	UNLESS OTHERWISE NOTED
VIF	VERIFY IN FIELD
WP	WEATHER PROOF

REV 1.0

PROJECT DIRECTORY

OWNER
CITY OF GALENA

AUTHORITY HAVING JURISDICTION
GALENA CITY COUNCEL

PROJECT TEAM

CONTRACTOR
FIRM: TANANA CHIEFS CONFERENCE
CONTACT: DAVE MESSIER
PHONE: (907)-452-8251

SYSTEM DESIGNER
FIRM: MAYFIELD RENEWABLES
CONTACT: GREG KAMPS
PHONE: (541)-754-2001

SHEET INDEX

Mayfield Renewables
2210 NW Hayes Ave
Corvallis, OR 97333
541.754.2001

STAMP:

NOT FOR CONSTRUCTION

CITY OF GALENA SOLAR
GALENA, AK 99741

PROJECT NUMBER:
22-3270C

SCALE
NTS
ORIGINAL SIZE 24"X36"
SHEET SIZE ARCH "D"
0 ½" 1"

REV	ISSUED	BY	DESCRIPTION
	11/30/22	GK	75% REVIEW SET
	2/1/24	GK	CD IFP - ISSUED FOR PERMIT

SHEET NO. & NAME:
T-1
TITLE PAGE

ELECTRICAL SPECIFICATIONS

GENERAL: (GRID–TIE, NEC 2020)

1. THE ELECTRICAL CONTRACTOR SHALL EXAMINE THE DRAWINGS OF ALL TRADES WHOSE WORK RELATES TO OR IS DEPENDENT ON ELECTRICAL WORK TO BECOME FULLY INFORMED OF THE EXTENT AND CHARACTER OF THEIR SPECIFIED WORK AND BE ABLE TO COORDINATE IT WHILE AVOIDING POSSIBLE INTERFERENCE WITH THE ELECTRICAL WORK.
2. IT IS THE INTENTION OF THESE SPECIFICATIONS AND DRAWINGS TO CALL FOR FINISHED WORK, TESTED AND READY FOR OPERATION. WHEREVER THE WORD "PROVIDED" IS USED, IT SHALL MEAN, "FURNISH AND INSTALL COMPLETE AND READY FOR USE."
3. THE CONTRACTOR IS RESPONSIBLE FOR THE COMPLETE AND SATISFACTORY ELECTRIC INSTALLATION IN ACCORDANCE WITH THE TRUE INTENT OF THE DRAWINGS AND SPECIFICATIONS. THEY SHALL PROVIDE, WITHOUT EXTRA CHARGE, ALL INCIDENTAL ITEMS REQUIRED, AS A PART OF THIS ELECTRICAL INSTALLATION. THE INSTALLATION SHALL BE SO MADE THAT ITS SEVERAL COMPONENT PARTS WILL FUNCTION TOGETHER AS A WORKABLE SYSTEM, AND SHALL BE LEFT WITH ALL PARTS ADJUSTED AND IN WORKING ORDER.
4. ALL WORK SHALL COMPLY WITH NATIONAL ELECTRICAL CODE (NEC), NATIONAL FIRE PROTECTION ASSOCIATION CODES (NFPA), INTERNATIONAL CODE COUNCIL (ICC) CODES, INCLUDING INTERNATIONAL ENERGY CONSERVATION CODE (IECC), AND ALL APPLICABLE LOCAL, STATE, MUNICIPAL, AND CITY CODES, ORDINANCES AND REGULATIONS.
5. THE NAMING OF THE MANUFACTURER OR BRAND WITH CATALOG NUMBER OR OTHER PRODUCT IDENTIFICATION WITHOUT THE WORDS "OR EQUAL" IN THE SPECIFICATIONS OR NOTES SHALL INDICATE THAT IT IS THE ONLY PRODUCT APPROVED FOR PURCHASE. IF THE WORDS "OR EQUAL" ARE USED, THEY SHALL BE INTERPRETED AS ESTABLISHING A QUALITY OR PERFORMANCE STANDARD FOR THE MATERIAL OR PRODUCT TO BE PURCHASED. THIS SHALL INDICATE THAT THE ELECTRICAL CONTRACTOR IS NOT RESTRICTED TO THE USE OF THE NAMED AND IDENTIFIED PRODUCT IF A SUBSTITUTE APPROVED BY THE ARCHITECT/ENGINEER IS AVAILABLE; HOWEVER, WHERE A SUBSTITUTION IS REQUESTED, IT WILL BE PERMITTED ONLY WITH THE WRITTEN APPROVAL OF THE ARCHITECT/ENGINEER. NO SUBSTITUTE MATERIAL OR PRODUCT SHALL BE ORDERED, FABRICATED, SHIPPED, OR PROCESSED IN ANY MATTER PRIOR TO THE APPROVAL OF THE ARCHITECT/ENGINEER. THE ELECTRICAL CONTRACTOR SHALL ASSUME ALL RESPONSIBILITY FOR ADDITIONAL EXPENSES, AS REQUIRED, MAKING CHANGES FROM THE ORIGINAL MATERIAL OR PRODUCT SPECIFIED.
6. THE TERM "AS REQUIRED" REFERS TO COMPONENTS THAT MAY BE REQUIRED TO COMPLETE THE NOTED SYSTEM INDICATED IN THE PROJECT DOCUMENTS.
7. THE TERM "VERIFY" REFERS TO A CONDITION WHICH MUST BE CONFIRMED PRIOR TO PROCEEDING WITH THE ORDERING OF MATERIAL OR THE FABRICATION AND INSTALLATION OF A COMPONENT.
8. ABBREVIATIONS THROUGHOUT THE DOCUMENTS COMPLY WITH DOCUMENT ABBREVIATION LIST ON LEGEND OR ARE THOSE IN COMMON USE. ENGINEER WILL DEFINE THE INTENT OF ANY IN QUESTION.
9. THE DRAWINGS ARE DIAGRAMMATIC IN CHARACTER. LOCATIONS SHOWN FOR ELECTRICAL EQUIPMENT, DEVICES, CIRCUITING, ECT., ARE APPROXIMATE. ELECTRICAL CONTRACTOR IS RESPONSIBLE FOR COORDINATING THE WORK WITH THE ARCHITECTURAL, PLUMBING, HVAC, AND OTHER TRADE DRAWINGS FOR THE EXACT DIMENSIONS, CLEARANCES, AND ROUGHING–IN LOCATIONS. THE ELECTRICAL CONTRACTOR SHALL COOPERATE WITH THE OTHER TRADES IF FIELD ADJUSTMENTS ARE REQUIRED TO ACCOMMODATE THE WORK OF OTHERS.
10. DRAWINGS SHALL NOT BE SCALED FOR ROUGH–IN MEASUREMENTS OR USED AS SHOP DRAWINGS. WHERE DIMENSIONS ARE SHOWN ON THE PLANS OR DETAILS, THESE DIMENSIONS ARE TO BE FIELD–VERIFIED BY THE ELECTRICAL CONTRACTOR AGAINST EXISTING FIELD CONDITIONS, INSTALLATION REQUIREMENTS OF OTHER TRADES, AND THE MANUFACTURER'S SUBMITTALS FOR EQUIPMENT TO BE INSTALLED. SHOULD ANY CONFLICTS ARISE WHICH CANNOT BE EASILY RESOLVED IN THE FIELD WITHOUT CHANGING THE DESIGN INTENT, THE ELECTRICAL CONTRACTOR SHALL NOTIFY THE ENGINEER IMMEDIATELY.
11. RECORD DOCUMENTS
   A. THE ELECTRICAL CONTRACTOR SHALL MAINTAIN ACCURATE RECORDS OF ALL DEVIATIONS IN WORK AS INSTALLED FROM WORK SPECIFIED ON THE DRAWINGS, OR IN THE SPECIFICATIONS, AND IDENTIFY ORIGIN OF CHANGE.
   B. KEEP A COMPLETE SET OF RECORD DOCUMENT PRINTS IN CUSTODY DURING ENTIRE PERIOD OF CONSTRUCTION AT THE CONSTRUCTION SITE. ON COMPLETION OF THE PROJECT, TWO COMPLETE SETS OF MARKED–UP PRINTS SHOWING THESE DEVIATIONS SHALL BE DELIVERED TO GENERAL CONTRACTOR AND ARCHITECT/ENGINEER. THIS CONTRACT WILL NOT BE CONSIDERED COMPLETED UNTIL THESE RECORD DRAWINGS HAVE BEEN RECEIVED AND REVIEWED BY THE ENGINEER.
   C. THE FOLLOWING ITEMS ARE REPRESENTATIVE, BUT NOT ALL–INCLUSIVE, OR THE INFORMATION WHICH SHALL BE RECORDED ON THE AS–BUILT DRAWINGS:
      – ARRAY LAYOUT AND STRING WIRING.
      – POWER DISTRIBUTION SYSTEM, INCLUDING DISTRIBUTION EQUIPMENT AND EACH CONDUIT AND WIRE SIZE INSTALLED.
      – FINAL LAYOUT AND CIRCUITING FOR POWER AND LIGHTING, SURFACE RACEWAYS AND RELATED EQUIPMENT, INCLUDING EACH CONDUIT AND WIRE SIZE.
      – LAST LOCATION AND ARRANGEMENT OF UNDERGROUND UTILITIES AND CONNECTIONS TO EXISTING UTILITIES.
12. BEFORE ANY EQUIPMENT IS INSTALLED, DETERMINE THAT SAID EQUIPMENT WITH PROPERLY FIT WITHIN THE SPACE ALLOCATED. INSTALL ALL EQUIPMENT AND MATERIALS IN SUCH A MANNER AS TO PROVIDE REQUIRED ACCESS FOR SERVICING AND MAINTENANCE. ALLOW AMPLE SPACE FOR REMOVAL OF ALL PARTS THAT REQUIRE REPLACEMENT OR SERVICING.
13. SUFFICIENT ACCESS AND WORKING SPACE SHALL BE PROVIDED AND MAINTAINED ABOUT ALL ELECTRICAL EQUIPMENT TO PERMIT READY AND SAFE OPERATION AND MAINTENANCE OF SUCH EQUIPMENT PER NEC ARTICLE 110 REQUIREMENTS.
14. ALL MATERIALS AND EQUIPMENT SHALL BE NEW, UNDAMAGED, BEAR THE UL LABEL WHERE APPLICABLE, AND BE AS SPECIFIED FOR USE IN EACH SPECIFIC LOCATION. ANY INCIDENTAL ACCESSORIES NECESSARY TO COMPLETE THE WORK IN ALL RESPECTS AND MAKE IT READY FOR OPERATION, EVEN IF NOT SPECIFICALLY SPECIFIED, SHALL BE FURNISHED, DELIVERED, AND INSTALLED BY THE ELECTRICAL CONTRACTOR WITHOUT ADDITIONAL EXPENSE TO THE CLIENT.
15. MINOR DETAILS NOT USUALLY SHOWN OR SPECIFIED, BUT NECESSARY FOR THE PROPER INSTALLATION AND OPERATION OF A SYSTEM OR EQUIPMENT, SHALL BE INCLUDED IN THE ELECTRICAL CONTRACTOR'S ESTIMATE, AS IF SPECIFIED OR SHOWN HEREIN.
16. COORDINATE THE INSTALLATION OF ELECTRICAL MATERIALS AND EQUIPMENT ABOVE AND BELOW CEILINGS WITH SUSPENSION SYSTEM, MECHANICAL EQUIPMENT, AND OTHER BUILDING COMPONENTS. ALL COMPONENTS SHALL BE LOCATED AS TIGHT TO STRUCTURE AS POSSIBLE. COORDINATE CEILING CAVITY SPACE CAREFULLY WITH ALL TRADES.
17. THE CONTRACTOR SHALL PREPARE AN OPERATING AND MAINTENANCE MANUAL COVERING ALL SYSTEMS AND EQUIPMENT INSTALLED UNDER THIS DIVISION. SUBMIT AN OUTLINE OF A PREVENTATIVE MAINTENANCE PROGRAM FOR EACH SYSTEM.
18. WARRANTIES :
   A. PROVIDE COMPLETE WARRANTY INFORMATION FOR EACH ITEM, WHICH SHALL INCLUDE NAME OF PRODUCT OR EQUIPMENT, DATE OF BEGINNING OF WARRANTY OR BOND, DURATION OF WARRANTY OR BOND, AND NAMES, ADDRESSES, AND TELEPHONE NUMBERS OF MANUFACTURING/SERVICING PERSONNEL, AS WELL AS PROCEDURES FOR FILING A CLAIM AND OBTAINING WARRANTY SERVICES.
   B. THE CONTRACTOR SHALL WARRANT ALL MATERIALS, WORKMANSHIP AND THE SUCCESSFUL OPERATION OF ALL EQUIPMENT AND APPARATUS INSTALLED FOR A PERIOD OF (1) YEAR FROM THE DATE OF FINAL ACCEPTANCE OF THE ENTIRE WORK AS IDENTIFIED IN THE GENERAL CONDITIONS.
19. THE CONDUIT SYSTEM AND ELECTRICAL ENCLOSURES SHALL BE SECURELY BONDED TOGETHER AND SUPPORTS PER NEC REQUIREMENTS.
20. CONDUIT JOINTS SHALL BE CUT SQUARE AND REAMED SMOOTH. BENDS OR OFFSETS SHALL BE MADE WITH AN APPROVED BENDER OR HICKEY, OR HUB–TYPE CONDUIT FITTINGS. BENDS SHALL BE MADE SO THAT THE CONDUIT IS NOT DAMAGED AND ITS INTERNAL DIAMETER IS NOT EFFECTIVELY REDUCED. THERE SHALL NOT BE MORE THAN THE EQUIVALENT OF FOUR QUARTER BENDS (360° TOTAL) BETWEEN PULL POINTS.
21. CONCEALED CONDUIT SYSTEMS SHALL BE RUN IN A DIRECT LINE WITH LONG SWEEP BENDS AND OFFSETS. EXPOSED CONDUIT RUNS SHALL BE PARALLEL TO AND AT RIGHT ANGLES TO BUILDING LINES, USING CONDUIT FITTINGS FOR ALL TURNS AND OFFSETS.
22. FEEDERS AND BRANCH CIRCUITS SHALL BE PROVIDED WITH APPROPRIATELY SIZED INSULATED EQUIPMENT GROUNDING CONDUCTOR, WHETHER SPECIFICALLY NOTED OR NOT. IF NOTED, THE ELECTRICAL CONTRACTOR IS REQUIRED TO USE THE SIZE OF GROUNDING CONDUCTOR INDICATED ON DRAWINGS. THIS CONDUCTOR SHALL BE CONNECTED FROM THE ELECTRICAL PANEL GROUND BAR TO THE DESIGNATED GROUNDING CONNECTION ON THE ELECTRICAL DEVICE SERVED. ENSURE LISTED GROUND BAR KITS HAVE BEEN INSTALLED PER NEC REQUIREMENTS IN THE ELECTRICAL PANELS.
23. FLOATING CONDUIT GROUNDS ARE NOT ACCEPTABLE. ENSURE ALL FEEDERS (NEW AND EXISTING) ARE PROVIDED WITH APPROPRIATELY–SIZED INSULATED GROUND WIRE, WHETHER NOTED OR NOT. IF NOTED, THE ELECTRICAL CONTRACTOR IS REQUIRED TO USE THE SIZE OF GROUND WIRE INDICATED ON DRAWINGS. THE GROUND WIRE SHALL BE CONNECTED FROM THE ELECTRICAL PANEL GROUNDED BUS BAR TO THE ELECTRICAL DEVICES. ENSURE FULL SIZE GROUND BUS HAS BEEN INSTALLED PER NEC IN EXISTING ELECTRICAL PANELS. IF REQUIRED, PROVIDE GROUND BUS BAR KIT AND CONNECT AS REQUIRED PER NEC ARTICLE 250.
24. ELECTRICAL CONTRACTOR SHALL FURNISH AND INSTALL JUNCTION AND PULL BOXES TO PROVIDE ACCESS POINTS FOR PULLING AND FEEDING CONDUCTORS INTO A RACEWAY SYSTEM. JUNCTION AND PULL BOXES AND THEIR COVERS SHALL BE FORMED FROM SHEET STEEL, AND SHALL BE BARE METAL OR FINISHED IN GRAY ENAMEL PAINT. BOXES SHALL BE IN INDUSTRY STANDARD SIZES.
25. OUTLET BOXES WITH THE CORRECT FITTING FOR THE APPLICATION SHALL BE LOCATED AT EACH CONDUCTOR SPLICE POINT, AT EACH OUTLET, SWITCH POINT, OR JUNCTION POINT, AND AT EACH PULL POINT FOR THE CONNECTION OF CONDUIT AND OTHER RACEWAYS. OUTLET BOXES FOR CONCEALED WIRING SHALL BE MADE FROM GALVANIZED OR CADMIUM–PLATED SHEET STEEL, AND THEY SHALL HAVE A DEPTH OF AT LEAST 1.5 INCHES, WHETHER SINGLE OR GANGED. THE BOXES SHALL BE LARGE ENOUGH SIZE TO ACCOMMODATE THE NUMBER OF WIRING DEVICES AND CONDUCTORS AS SPECIFIED IN THE FILL SCHEDULE OF THE CURRENT NEC. SECURE BOXES WITH MOUNTING BRACKET, BRACES, HANGER OR BOX MOUNTING SUPPORT.
26. CONDUCTOR SIZES #6 AWG AND SMALLER SHALL BE FACTORY COLOR–CODED WITH AN INDUSTRY STANDARD DESIGNATED COLOR FOR EACH PHASE AND A NEUTRAL CONDUCTOR. CONDUCTOR SIZES #4 AWG AND LARGER SHALL HAVE COLORS FIELD APPLIED USING THE COLOR MARKING TAPE OR BY PAINTING THE INSULATION. THESE COLORS SHALL BE USED CONSISTENTLY THROUGHOUT THE SYSTEM.
27. ALL JOINTS OR SPLICES FOR CONDUCTORS #8 AWG AND LARGER SHALL BE MADE WITH A MECHANICAL COMPRESSION CONNECTOR. AFTER THE CONDUCTORS HAVE BEEN MADE MECHANICALLY AND ELECTRICALLY SECURE, THE ENTIRE JOINT OR SPLICE SHALL BE VOVERED WITH 3M SCOTCH BRAND NO. 33 TAPE, OR APPROVED EQUAL, TO MAKE THE INSULATION VALUE AT THE JOINT OR SPLICE EQUAL TO THE VALUE OF THE CONDUCTORS INSULATION. THE CONNECTORS SHALL BE UL APPROVED.
28. FOR ALUMINUM CONDUCTOR TERMINATIONS, ALUMINUM BI–METALLIC PIN CONNECTORS ARE RECOMMENDED UNLESS COMPACT–TYPE CONDUCTORS ARE USED. THESE CONNECTORS SHALL BE UL LISTED PER UL486B, RATED FOR USE UP TO 600V AND TEMPERATURE UP TO 90° C. CONNECTORS SHALL BE INSTALLED WITH MANUFACTURER'S SPECIFIED CRIMPING TOOLS AND DIES.
29. INSTALLATION IN AREAS OF DRYWALL CEILING SHALL BE COORDINATED SUCH THAT ACCESS PANELS ARE NOT REQUIRED. ELEMENTS REQUIRING ACCESS SHALL BE LOCATED IN THE AREAS OF ACCESSIBLE CEILING, OR IN THE LOCATIONS COORDINATED WITH ARCHITECT. ACCESS PANELS REQUIRED WITHIN DRYWALL CEILINGS SHALL BE INSTALLED SYMMETRICALLY WITH OTHER PANELS OR DEVICES, AND SHALL BE MINIMUM SIZE REQUIRED, "MUD–IN" TYPE, AND FIRE RATED, IF REQUIRED. ACCESS PANELS IN FIRE–RATED WALLS AND CEILINGS SHALL HAVE PROPER UL LABEL AND FIRE RATING LISTING.
   WALL AND CEILING ROUGH–IN INSTALLATIONS FOR LOW–VOLTAGE CONTROL WIRING ANY TYPE SUCH AS DATA/TELECOMMUNICATIONS WIRING, FIRE ALARM WIRING, HVAC CONTROL WIRING, SECURITY WIRING, TV CABLING, OPTICAL FIBER CABLING, ECT., SHALL BE COMPLETE AND READY FOR INSPECTION AT THE TIME ELECTRICAL ROUGH–IN INSPECTIONS ARE REQUESTED. ALL SHARP EDGES, CONDUIT ENDS AND METAL STUDS, ECT., FOR LOW–VOLTAGE CABLING SHALL BE PROTECTED BY INSULATED BUSHINGS OR GROMMETS, AND SECURELY FASTENED IN THE OPENINGS FOR THE WALL ROUGH–IN INSPECTIONS. WORK SHALL BE INSTALLED IN A NEAT AND WORKMANLIKE MANNER (GROUPED CABLES ROUTED WITH SQUARE CORNERS AND PARALLEL TO BUILDING LINES.) CABLES SHALL BE INSTALLED PER NEC REQUIRED SEPARATIONS, AND SUPPORTED FROM THE BUILDING STRUCTURE. CABLE TIES USED IN DUCTS, PLENUMS, AND OTHER AIR–HANDLING SPACES ARE REQUIRED TO HAVE A TESTING LABORATORY LISTING NUMBER AND LABEL ON EACH UNOPENED PACKAGE AS BEING APPROVED FOR USE IN THESE LOCATIONS.
30. ELECTRICAL CABINETS AND ENCLOSURES LOCATED IN PUBLIC AREAS SHALL BE LOCKABLE TYPE.
31. PENETRATIONS THROUGH STRUCTURAL MEMBERS SHALL NOT BE PERMITTED WITHOUT SPECIFIC WRITTEN PERMISSION FROM STRUCTURAL ENGINEER AND ARCHITECT. SUBMIT REQUESTS FOR PENETRATIONS TO ARCHITECT FOR REVIEW AND DISPOSITION. PRIOR TO CORE DRILLING THROUGH FLOORS, VERIFY CLEARANCE OF BEAMS, DUCTWORK, ECT., IN CEILING SPACE BELOW, AND X–RAY FOR CONDUIT AND/OR REBAR IN SLAB.
32. ALL ROOF PENETRATIONS SHALL BE SEALED WATER TIGHT. PROVIDE FLASHING AND COUNTER FLASHING AS REQUIRED.
33. RACEWAYS SHALL BE PROVIDED WITH EXPANSION FITTINGS WHERE NECESSARY TO COMPENSATE FOR THERMAL EXPANSION AND CONTRACTION, AND TO ALLOW FOR MINOR MOVEMENT OF THE STRUCTURAL ELEMENTS OF THE BUILDING. EXPANSION FITTINGS FOR METAL RACEWAYS SHALL BE MADE ELECTRICALLY CONTINUOUS BY EQUIPMENT BONDING JUMPERS OR OTHER MEANS.

WIRING METHODS:

1. WIRING METHODS AND INSTALLATION PRACTICES SHALL CONFORM TO THE NATIONAL ELECTRICAL CODE (NEC), LOCAL STATE CODES, AND OTHER APPLICABLE LOCAL CODES. THE INTERIOR OF RACEWAYS INSTALLED BELOW GRADE AND IN WET LOCATIONS ABOVE GRADE SHALL BE CONSIDERED WET LOCATIONS, NEC 300.5(B) AND 300.9.
2. EXPOSED PV SOURCE CIRCUIT WIRING SHALL BE USE–2 OR PV WIRE, 90 DEGREE C, WET RATED AND UV RESISTANT. EXPOSED CABLES, SUCH AS MODULE LEADS SHALL BE SECURED WITH MECHANICAL OR OTHER SUNLIGHT RESISTANT MEANS.
3. FOR FUNCTIONALLY GROUNDED PV SYSTEMS, PV SOURCE AND OUTPUT CIRCUIT CONDUCTORS SHALL BE RED FOR POSITIVE, BLACK FOR NEGATIVE AND GREEN FOR GROUND.
4. FIELD WIRING THAT IS NOT COLOR CODED SHALL BE MARKED AT BOTH ENDS WITH PERMANENT WIRE MARKERS TO IDENTIFY POLARITY, INVERTER NUMBER AND CIRCUIT IDENTIFICATION. SOURCE CIRCUITS SHALL BE IDENTIFIED AT THE POINTS OF TERMINATION, CONNECTION AND SPLICES.
5. CONDUIT TYPES USED IN THE PV INSTALLATION SHALL BE APPROVED FOR THEIR SPECIFIC APPLICATION AND SUPPORTED PROPERLY PER NEC.
6. STRAIGHT CONDUIT RUNS SHALL HAVE EXPANSION FITTINGS PER NEC 300.7, IF EXPOSED TO WEATHER AND MORE THAN ¼" OF EXPANSION AND CONTRACTION IS EXPECTED.
7. IF USED, WIRENUTS ARE TO BE INSTALLED PER LOCATION REQUIREMENTS AND MANUFACTURERS SPECIFICATIONS BY A QUALIFIED/CERTIFIED PERSON. WIRENUTS SHALL NOT BE USED ON DC CONDUCTORS.
8. DC MATERIALS SHALL BE LISTED WITH A DC VOLTAGE RATING GREATER THAN OR EQUAL TO THE MAXIMUM PV SYSTEM VOLTAGE.
9. INTERCONNECT WIRING AND POWER CONDUCTORS INTERFACING THE UNIT MUST BE IN ACCORDANCE WITH THE NEC ANSI/NFPA 70 AND ANY APPLICABLE LOCAL CODES. CONDUCTORS MUST CONFORM TO THE MINIMUM BEND RADIUS SPECIFIED IN THE SPECIFIC NEC ARTICLE. KEEP ALL WIRE BUNDLES AWAY FROM ANY SHARP EDGES TO AVOID DAMAGE TO WIRE INSULATION. CONDUCTORS SHOULD BE MADE OF COPPER AND RATED FOR 90 DEGREE C MINIMUM UNLESS OTHERWISE NOTED. FOR OUTDOOR INSTALLATIONS, INTERCONNECT CONDUITS AND FITTINGS MUST BE PROPERLY NEMA RATED AS REQUIRED BY THE NEC.
10. CONNECTORS SHALL BE TORQUED PER DEVICE LISTING OR MANUFACTURERS RECOMMENDATIONS.
11. AC WIRING SHALL BE COPPER WIRE, RATED AT 90 DEGREE CELSIUS, AND RATED FOR 600 VAC UNLESS OTHERWISE NOTED.
12. PROPERLY SUPPORT EXPOSED PV SOURCE CIRCUITS TO MAINTAIN THE INTEGRITY OF THE CONDUCTOR'S INSULATION.
13. CONDUIT THAT IS MOUNTED ON PITCHED ROOFS SHALL BE MOUNTED WITH FLASHED CONDUIT SUPPORTS PER NEC 386.30.
14. WIRING MUST BE PROPERLY SUPPORTED BY DEVICES OR MECHANICAL MEANS DESIGNATED AND LISTED FOR SUCH USE, AND MUST BE PERMANENTLY AND COMPLETELY HELD OFF OF THE ROOF SURFACE PER NEC 110.2, 110.3(A), 110.3(B)
15. CONDUCTORS SHALL BE SUPPORTED PER NEC 300.19 AS REQUIRED.
16. FIELD MADE CONNECTORS FOR PV QUICK CONNECTS SHALL BE THE SAME TYPE AND MANUFACTURER AS THE PV MODULES AND USE THE MANUFACTURER SPECIFIED CRIMPING TOOL.
17. WHERE MATING CONNECTORS ARE NOT OF THE IDENTICAL TYPE AND BRAND, THEY SHALL BE LISTED AND IDENTIFIED FOR INTERMATEABILITY, AS DESCRIBED IN THE MANUFACTURER'S INSTRUCTIONS.

GROUNDING:

1. ONLY ONE CONNECTION TO DC CIRCUITS AND ONE CONNECTION TO AC CIRCUITS WILL BE USED FOR SYSTEM GROUNDING (REFERENCED TO THE SAME POINT). THIS WILL NORMALLY BE LOCATED AT THE INVERTER.
2. EQUIPMENT GROUNDING CONDUCTORS AND SYSTEM GROUNDING CONDUCTORS WILL HAVE AS SHORT A DISTANCE TO GROUND AS POSSIBLE AND A MINIMUM NUMBER OF TURNS.
3. NON–CURRENT CARRYING METAL PARTS SHALL BE CHECKED FOR PROPER EQUIPMENT GROUNDING; NOTING THAT TERMINAL LUGS BOLTED ON AN ENCLOSURE'S FINISHED SURFACE MAY BE INSULATED BECAUSE OF PAINT/FINISH. PAINT/FINISH AT POINT OF CONTACT SHALL BE PROPERLY REMOVED.
4. MODULES SHALL BE BONDED WITH EQUIPMENT GROUNDING CONDUCTORS BONDED TO A LOCATION APPROVED BY THE MANUFACTURER WITH A MEANS OF BONDING LISTED FOR THIS PURPOSE. RACKING SYSTEMS THAT COMPLY WITH UL2703 SHALL BE USED TO BOND MODULES TO RACKING SYSTEMS.
5. GROUNDING SYSTEM COMPONENTS SHALL BE LISTED FOR THEIR PURPOSE, INCLUDING BUT NOT LIMITED TO GROUND RODS, GROUNDING LUGS, GROUNDING CLAMPS, ETC.

DISCONNECTING MEANS:

1. MEANS SHALL BE PROVIDED TO DISCONNECT THE PV SYSTEM FROM WIRING SYSTEMS INCLUDING POWER SYSTEMS, ENERGY STORAGE SYSTEMS, AND UTILIZATION EQUIPMENT AND ITS ASSOCIATED PREMISES WIRING.
2. THE DISCONNECTING MEANS SHALL NOT BE REQUIRED TO BE SUITABLE AS SERVICE EQUIPMENT AND SHALL BE RATED IN ACCORDANCE WITH ARTICLE 690 PART III, DISCONNECTING MEANS.
3. A SINGLE DISCONNECTING MEANS SHALL BE PERMITTED FOR THE COMBINED AC OUTPUT OF ONE OR MORE INVERTERS IN AN INTERACTIVE SYSTEM.

REQUIRED SAFETY SIGNS AND LABELS:

1. THE MARKING SHALL ADEQUATELY WARN OF THE HAZARD USING EFFECTIVE WORDS AND/OR COLORS AND/OR SYMBOLS. NEC 110.21
2. THE LABEL SHALL BE PERMANENTLY AFFIXED TO THE EQUIPMENT OR WIRING METHOD AND SHALL NOT BE HAND WRITTEN. NEC 110.21
3. THE LABEL SHALL BE OF SUFFICIENT DURABILITY TO WITHSTAND THE ENVIRONMENT INVOLVED. NEC 110.21
4. LABELS AND MARKINGS SHALL BE APPLIED TO THE APPROPRIATE COMPONENTS IN ACCORDANCE WITH THE NEC.
5. SOLAR MODULES AND INVERTERS ARE SUPPLIED FROM THE MANUFACTURER WITH MARKINGS PRE–APPLIED TO MEET THE REQUIREMENTS OF NEC 690.51 & 690.41(B)(1).
6. DESIGN REQUIREMENTS FOR NEC REQUIRED LABELS, WHERE COLOR IS INDICATED, ARE SHOWN ON THE LABELS AND MARKINGS SHEET.
7. UNLESS OTHERWISE STATED ON LABEL SPECIFIC NOTES (SEE NOTE 6), OSHA 1910.145 AND ANSI Z535 RECOMMENDED SPECIFICATIONS ARE AS FOLLOWS:
   a. ROUNDED OR BLUNT CORNERS FREE OF SHARP EDGES.
   b. VISIBLE AT A MINIMUM DISTANCE OF 5ft OR GREATER.
   c. "DANGER" HEADER; RED BACKGROUND WITH WHITE LETTERING.
   d. "WARNING" HEADER; ORANGE BACKGROUND WITH BLACK LETTERING.
   e. "CAUTION" HEADER; YELLOW BACKGROUND WITH BLACK LETTERING.
   f. "NOTICE" LABEL HEADER TO BE IN BLUE WITH WHITE LETTERING.
   g. OTHER TEXT TO BE BLACK ON A WHITE BACKGROUND.

RACEWAY LEGEND

- FIBER CABLE
- CAT–5 ETHERNET
- RS–485 DATACOM
- DC CONDUCTOR/CONDUIT (DC)
- MEDIUM VOLTAGE CONDUCTOR/CONDUIT (MV)
- AC CONDUCTOR/CONDUIT (AC)
- COMMUNICATION CONDUCTOR/CONDUIT (COM)
- OVER HEAD WIRE (OHW)

GENERAL SYMBOL LEGEND

- STRING OF SOLAR MODULES
- INVERTER
- DC — DC SIDE OF INVERTER
- AC — AC SIDE OF INVERTER
- EQUIPMENT GROUNDING LOCATION
- GROUND OR GROUNDING ELECTRODE
- SPLICE OR TAP
- NON–DRAWOUT CIRCUIT BREAKER
- FUSE
- SWITCH
- N.O. — RELAY OR CONTACT N.O.
- N.C. — RELAY OR CONTACT N.C.
- (3) 4000:5 — CURRENT TRANSFORMER
- TRANSFORMER
- M — METER
- HH — HANDHOLE
- C — CAMERA
- TELEPHONE OR DATA OUTLET
- DUPLEX CONVENIENCE OUTLET, 120V, 20A, GROUNDING TYPE SPECIFICATION GRADE
- J — JUNCTION–BOX
- OMITTED MODULE
- SPARE MODULE
- NON–ACTIVE MODULE
- DAS — DATA AQUISITION SYSTEM
- THERMO COUPLE TEMPERATURE SENSOR
- PYRANOMETER – SOLAR RADIATION
- CELL/ MODULE TEMPERATURE SENSOR
- ANEMOMETER
- BAROMETRIC PRESSURE SENSOR
- HUMIDITY SENSOR
- RAIN GAUGE
- 52 — REMOVABLE DRAWOUT BREAKER
- FUTURE REMOVABLE DRAWOUT BREAKER
- REMOVABLE DRAWOUT BREAKER 2
- 480V 120V — POTENTIAL TRANSFORMER

GENERAL ABBREVIATIONS

A	AMPERE(S)
AC	ALTERNATING CURRENT
ACSW	AC SWITCH
AF	AMPERE FRAME, AMP FUSE
AFCI	ARC FAULT CIRCUIT INTERRUPTER
AIC	AMPERE INTERRUPTING CAPACITY
AL	ALUMINUM
AS	AMPERE SWITCH
AT	AMP TRIP
ATS	AUTOMATIC TRANSFER SWITCH
AWG	AMERICAN WIRE GAUGE
BOS	BALANCE OF SYSTEM
C	CONDUIT
CB	CIRCUIT BREAKER
CBR	COMBINER BOX
CBSS	CIRCUIT BREAKER SAFETY SWITCH
CMIL	CIRCULAR MIL
COM	COMMUNICATIONS
CT	CURRENT TRANSFORMER
CU	COPPER
DC	DIRECT CURRENT
DCCT	DC CONTACTOR
DCSW	DC SWITCH
EC	ELECTRICAL SUBCONTRACTOR
EGC	EQUIPMENT GROUNDING CONDUCTOR
EMT	ELECTRICAL METALLIC TUBING
FMC	FLEXIBLE METAL CONDUIT
FO	FIBER–OPTIC CABLE
GE	GROUNDING ELECTRODE
GEC	GROUNDING ELECTRODE CONDUCTOR
GFCI	GROUND FAULT CIRCUIT INTERRUPTER
GFDI	GROUND FAULT DETECTION AND INTERRUPTION
GND	GROUND
GOAB	GROUP OPERATED AIR BREAK
HH	HANDHOLE
HVAC	HEATING VENTILATION AND AIR CONDITIONING
IMC	INTERMEDIATE METAL CONDUIT
IMP	MAXIMUM POWER CURRENT
INV	INVERTER
ISC	SHORT CIRCUIT CURRENT (AVAILABLE)
JB	JUNCTION BOX
K	THOUSAND
LA	LIGHTNING ARRESTER
LB	LOAD BREAK
LFMC	LIQUID–TIGHT FLEXIBLE METAL CONDUIT
LI	LOAD INTERRUPTER
LTG	LIGHTING
M	MILLION
MBJ	MAIN BONDING JUMPER
MC4	MULTI–CONTACT TYPE 4 (SOLARLINE2)
MCB	MAIN CIRCUIT BREAKER
MDSS	MULTIPLE DISCONNECT SAFETY SWITCH
MFR	MANUFACTURER
MLO	MAIN LUG ONLY
MPC	MINI POWER CENTER
MPPT	MAXIMUM POWER POINT TRACKING
MSD	MAIN SERVICE DISCONNECT
MTR	METER
MV	MEDIUM VOLTAGE
N	NEUTRAL
NEC	NATIONAL ELECTRIC CODE
NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
NGR	NEUTRAL GROUNDING REACTOR
OCPD	OVER CURRENT PROTECTION DEVICE
P	POLE
PB	PULL BOX
PH	PHASE
PME	PAD MOUNTED ENCLOSURE
PNL	PANEL BOARD
POC	POINT OF CONNECTION
PT	POTENTIAL TRANSFORMER
PTC	PVUSA TEST CONDITIONS
PVCB	PHOTOVOLTAIC CIRCUIT BREAKER
PWR	POWER
RCBR	RE–COMBINER BOX
RCL	RECLOSER
RECT	RECTIFIER
RGS	RIGID GALVANIZED STEEL
RMC	RIGID METAL CONDUIT
RPVT	REMOTE PV TIE
RSD	RAPID SHUTDOWN DEVICE/SWITCH
RTU	REMOTE TERMINAL UNIT
SBJ	SYSTEM SIDE BONDING JUMPER
SCH	SCHEDULE
SPD	SURGE PROTECTIVE DEVICE
SS	STAINLESS STEEL
SSBJ	SUPPLY–SIDE BONDING JUMPER
STR	STRING
SWBD	SWITCHBOARD
SWGR	SWITCHGEAR
TBD	TO BE DETERMINED
TEL	TELEPHONE CABLE
TP	TAMPER PROOF
TYP	TYPICAL
UON	UNLESS OTHERWISE NOTED
UPS	UNINTERRUPTIBLE POWER SUPPLY
V	VOLT(S)
VA	VOLT–AMP
VD	VOLTAGE DROP
VIF	VERIFY IN FIELD
VMP	MAXIMUM POWER VOLTAGE
VOC	OPEN CIRCUIT VOLTAGE
W	WATT(S)
WH	WATT–HOUR
WP	WEATHER PROOF
XFMR	TRANSFORMER

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CITY OF GALENA SOLAR
GALENA, AK 99741

PROJECT NUMBER: 22–3270C

SCALE: NTS

ORIGINAL SIZE 24"X36"
SHEET SIZE ARCH "D"
0 ½" 1"

REV	ISSUED	BY	✔	DESCRIPTION
	11/30/22	GK	BB	75% REVIEW SET
	2/1/24	GK	BB	CD IFP – ISSUED FOR PERMIT

SHEET NO. & NAME: E–0.0
ELECTRICAL SPECIFICATIONS

PRINT DATE: 2/8/2024 5:49 PM DWG LOCATION: g:\shared drives\Design\Projects\tanana chiefs conference\22-3270c – village of galena\working set\working set\E-0.0 ELECTRICAL SPECIFICATIONS.dwg

1.0 INTRODUCTION

1.1 The following testing and commissioning specification is general in nature and intended to provide the requirements for developing the detailed Commissioning Plan. The Commissioning Plan shall cover all Project scope including all labor, equipment, activities , tests, and procedures required to comprehensively execute the Commissioning Requirements. Commission Plan and Requirements shall cover the Project apparatus, equipment, devices and auxiliary systems and their associated protection, control, and instrumentation schemes/systems required prior to energization, energization and phase in activities, subsequent in-service checks and testing, and commissioning close-out. All equipment, devices, components and materials specific to the Project shall be included.

1.2 Typical testing & commissioning activities may include visual and mechanical inspections , insulation resistance, continuity and line "End-to-End" testing, ratio and polarity, equipment setting and calibration, verification of operability, system functionality, and placement of the equipment into service.

1.3 Contractor shall ensure and verify that all protection schemes and electrical equipment tested for the Project are operational and within Owner's, industry and manufacturer's tolerances and are installed in accordance with Contract documents, Contractor's Issued for Construction (IFC) design specifications and drawings, and manufacturer's requirements.

1.4 At Owner's option, all scope covered in this specification is subject to Owner oversight or witness of testing, and review of test documentation, before a specific test or activity may be accepted.

2.0 CODES, STANDARDS, AND REFERENCES

2.1 Development of the Commissioning Plan and execution of the Commissioning Requirements shall be in accordance with the manufacturer's recommendations and requirements and the applicable requirements of the industry codes and standards including those listed below.

2.1.1 NETA – International Electric Testing Association

2.1.2 ATS – Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems

2.1.3 NEC – National Electric Code

2.1.4 NESC – National Electric Safety Code

2.1.5 OSHA – Occupational Safety and Health Organization

2.1.6 ANSI – American National Standards Institute

2.2 Direct references to standards provided herein are provided for clarity. It is the Contractor's responsibility to ensure and verify all applicable standard and code requirements, in addition to the manufacturer's recommendations and requirements, are met.

2.3 The latest edition of the Industry Standards as detailed in the Contract and Contract Exhibits shall be used.

2.4 As available, use the manufacturer's instruction manuals applicable to each piece of equipment or system component tested. Wherever the provisions of said publications are in conflict, the more stringent requirements shall apply.

3.0 QUALIFICATIONS OF COMMISSIONING PERSONNEL

3.1 Contractor shall submit the resume of the Commissioning Manager(s) assigned to the Project for Owner review and approval. The resumes should include similar projects executed and should show completion of at least one project of similar scope for the team position being proposed. The Commissioning Manager(s) shall be competent individuals responsible for all aspects of the safe and complete execution of the Commissioning Plan.

3.2 Once the resumes are submitted and approved, these assigned resources may not be substituted without prior approval from Owner.

3.3 Any requested changes to the resumes of the personnel anticipated to work on these projects shall be submitted to Owner for review no later than two (2) weeks prior to mobilization.

3.4 Contractor's Commissioning Team shall perform a thorough review of the Commissioning Plan, and ideally shall be involved in the development. Commissioning team shall review and be familiar with all applicable Project documents, single lines and schematics, commissioning forms and procedures related to the Commissioning work.

4.0 SAFETY REQUIREMENTS

4.1 The purpose of the Commissioning Specific Safety & Environmental Plan is to ensure that the safety and environmental requirements of the Project are communicated in a consistent manner, which in turn will reinforce the safety and environmental compliance of all Project stakeholders to the job site. The goal is to complete the Project with zero accidents / incidents. This section provides minimum requirements that must be met.

4.2 Contractor will be responsible for the safety of all personnel and equipment during the testing and commissioning activities.

4.3 Suitable PPE, barricades and warning signs shall be used for all activities.

4.4 All commissioning tests shall be made with proper regard for the protection of both the equipment, commissioning personnel, other onsite personnel not directly involved in commissioning activities, and any station operating personnel.

4.5 No commissioning test shall be performed without the prior knowledge of the Owner.

4.6 All tests shall be performed by or under the direct supervision of the designated competent person / qualified individual.

4.7 Follow the local, state and National safety rules and the site-specific safety rules.

4.8 Properly protect all equipment tested and checked for operation, to ensure that any subsequent testing of other equipment or system does not disturb, damage, or otherwise interfere with the functional capability of the equipment.

5.0 REPORTING

5.1 Documentation, including preliminary copies of all test record forms, shall be available on a same day basis to Owner upon request.

5.2 Contractor shall provide the Final Testing & Commissioning Report containing all test reports and forms for all equipment and systems tested. The Report will document that all equipment and systems were tested in accordance with the project requirements and as specified. The report will be submitted within two weeks following completion of testing and commissioning activities and before the Commissioning Team demobilizes from the site. Report shall include copies of all testing records, and the following:

5.2.1 Summary of project.

5.2.2 Description of equipment tested.

5.2.3 Description of tests.

5.2.4 Test data.

5.2.5 Analysis, explicit statement of all pass / fail for each test and commissioning activity, conclusion and recommendations.

5.3 Preliminary and final test reports shall indicate all deficiencies found during the testing, including a description of the corrective action taken to remedy and the results of re-testing verifying resolution of deficiencies.

5.4 Final Commissioning Plan shall indicate all pass/fail criteria and basis for criteria. In general test results that fall within the guidelines of NETA Testing and Commissioning Standards are considered acceptable, unless otherwise specified.

5.5 The drawing mark-up standard to be used for this project is as follows:

5.5.1 'red' for drawing additions

5.5.2 'green' for removals, and

5.5.3 'blue' for commenting and

5.5.4 'yellow' highlighting for verification of drawing items or for wire point to point tracing and verification.

6.0 SCOPE OF WORK REQUIREMENTS

6.1 Contractor shall perform continuity testing of 100% of wiring and functional testing of 100% of wiring, schemes and systems installed under the scope of each project to verify proper operation as defined by the schematics, wiring diagrams and the requirements of the project. Functional operation of schemes and systems shall be verified through energization of all circuits referenced to the schematics and wiring diagrams demonstrating proper operation of the related devices. Installed wiring shall be verified against the project wiring diagrams.

6.2 Contractor shall test grounding system in accordance with the project site.

6.3 All buses, cables, and wiring, along with equipment nameplate information shall be compared with the drawings and verified. Contractor shall provide nameplate photos for all PV Plant equipment and apparatuses and control house equipment.

6.4 The following items regarding interconnection facilities are included as a general listing of minimum requirements to be detailed and included in the Commissioning Plan.

6.4.1 Power Distribution Center (PDC)/Switchgear

6.4.1.1 Inspection of PDC and components

6.4.1.2 Circuit breaker mechanical checks

6.4.1.3 Circuit breaker interchangeability

6.4.1.4 Ground and test device testing

6.4.1.5 Feeder cable partial discharge testing

6.4.2 Power Transformers

6.4.2.1 External inspection

6.5 Insulation Resistance Testing

6.5.1 All underground AC and DC power cables shall have insulation resistance measured.

6.5.2 Test voltage shall be applied as specified in NETA-ATS Table 100.1 and shall be applied for a minimum of one minute or until voltage and resistance stabilizes.

6.5.3 For 600 V, 1000 V, and over 1000 V rated conductors, insulation resistance results greater than or equal to 100 MΩ are acceptable. Insulation resistance values less than 5 MΩ are considered a failed test.

6.5.4 The concentric shields of all MV cables shall be tested to ground with a 1000/500 VDC megohmmeter at 1000 VDC to check the integrity of the outer jacket.

6.5.5 Any test results for any component which are outside the acceptable range shall be recorded as a deficiency on the applicable test report with any corrective action or re-testing performed.

6.6 Cables – Low Voltage (1000 V Maximum) and Medium Voltage (Cables above 1000 V)

6.6.1 Verify uniform resistance for all parallel conductors.

6.6.2 Tested cables shall include applicable cables from the PV modules to the combiner boxes, from combiner boxes to DC disconnects, from DC disconnects to re-combiner boxes, from re- combiner boxes to the inverter, from the inverter to the transformer, and any other applicable locations.

6.7 Inverter Equipment

6.7.1 Inverters shall be commissioned and tested using the manufacturer's recommended procedures and results shall meet all manufacturer requirements.

6.7.2 Inverter commissioning reports shall utilize reporting forms provided by the inverter manufacturer.

6.8 Switches – Low and Medium Voltage

6.8.1 DC and AC Switches, Low Voltage

6.8.1.1 Confirm proper electrically-bonded equipment ground.

6.8.1.2 Confirm that metal-enclosed switches are clean, and debris has been removed.

6.8.1.3 Verify that switches used in DC applications are rated and installed accordingly.

6.8.1.4 Verify that warning signs where provided are in accordance with NEC.

6.9 Racking Equipment

6.9.1 Racking equipment shall be commissioned and tested using the manufacturer's recommended procedures. For a single-axis tracker system, this includes mechanical drive components and electrical tracker controller equipment.

6.9.2 Test reports shall utilize manufacturer-provided reporting forms, if available.

6.10 IV Curve Trace Tests

6.10.1 100% of DC feeders at the inverter shall be tested using a Solmetric IV curve tracer.

6.10.2 100% of all PV Strings at the combiner box or harness shall be tested using a Solmetric IV curve tracer. Strings shall be evenly distributed across all inverter blocks.

6.10.2.1 If the installed PV modules have multiple module bin class or technologies, the selected 100% shall include sample sizes representative of all installed modules.

6.10.3 The Commissioning Test Report shall include, open-circuit voltage, short-circuit current readings, the maximum power voltage, and maximum power current.

6.10.4 This test will be conducted under full sun with irradiance of at least 500 W/m² and stable sky conditions (no cirrus clouds or fast-moving clouds near sun) within the time period of six (6) hours centered about solar noon. Solar noon can be determined using reference tools such as http://www.esrl.noaa.gov/gmd/grad/solcalc/.

6.10.5 At each DC Feeder/String Harness:

6.10.5.1 Verify all field terminations are complete within inverter/recombiner.

6.10.5.2 Lockout/Tagout all DC disconnect(s), circuit breaker(s), or fuses in the open (off) position at the inverter/recombiner.

6.10.5.3 Verify configuration of terminations in inverter to see if negative needs to be isolated. This will need to be done if negative shares a common bus.

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CITY OF GALENA SOLAR
GALENA, AK 99741

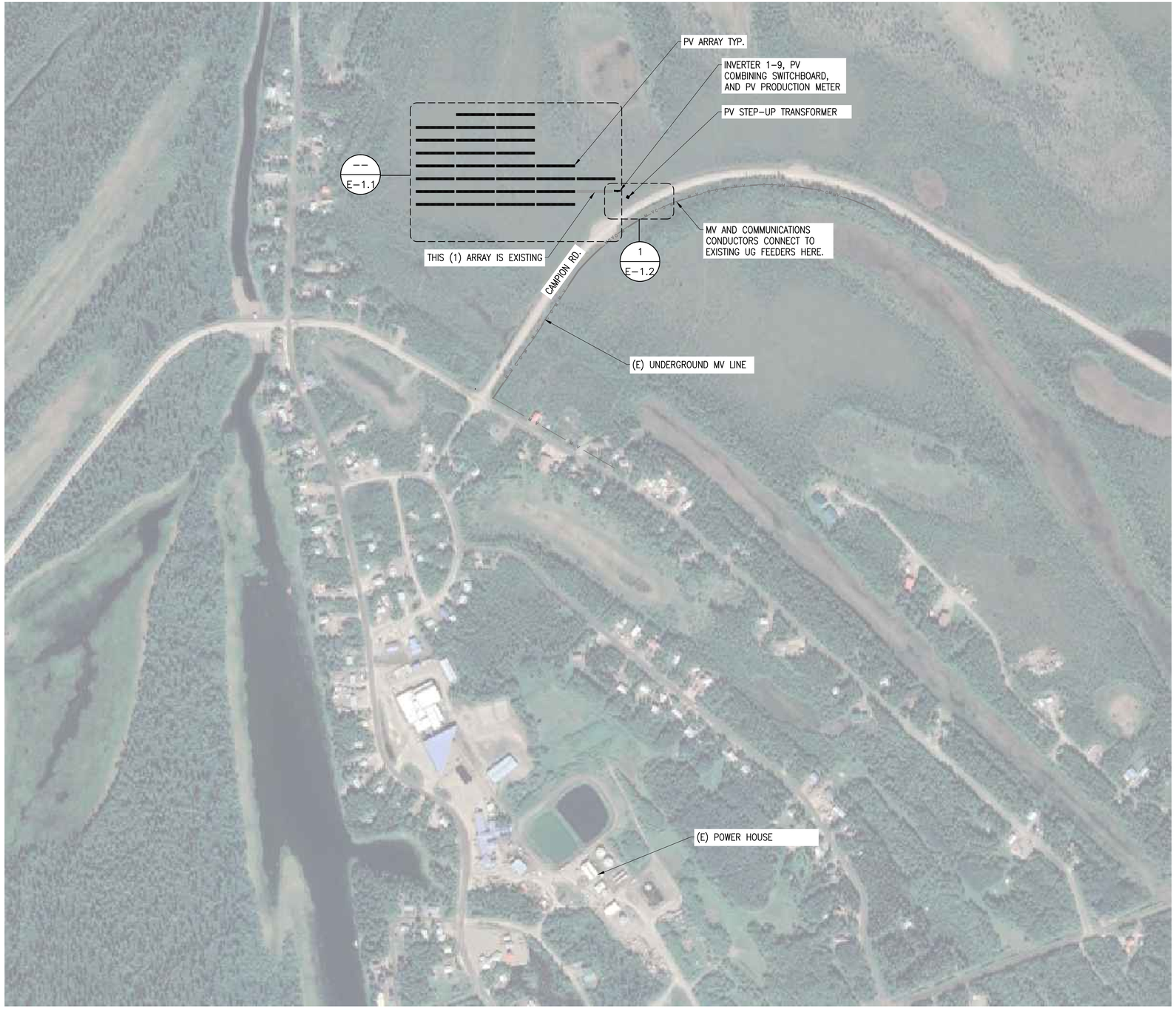
PROJECT NUMBER:
22-3270C

SCALE
NTS

ORIGINAL SIZE 24"X36"
SHEET SIZE ARCH "D"
0 ½" 1"

REV	ISSUED	BY	DESCRIPTION
	11/30/22	GK	BB 75% REVIEW SET
	2/1/24	GK	BB CD IFP - ISSUED FOR PERMIT

SHEET NO. & NAME:
E-0.1
COMMISSIONING PLAN NOTES



ELECTRICAL SITEPLAN

SCALE: 1" = 250'

0 250' 500'

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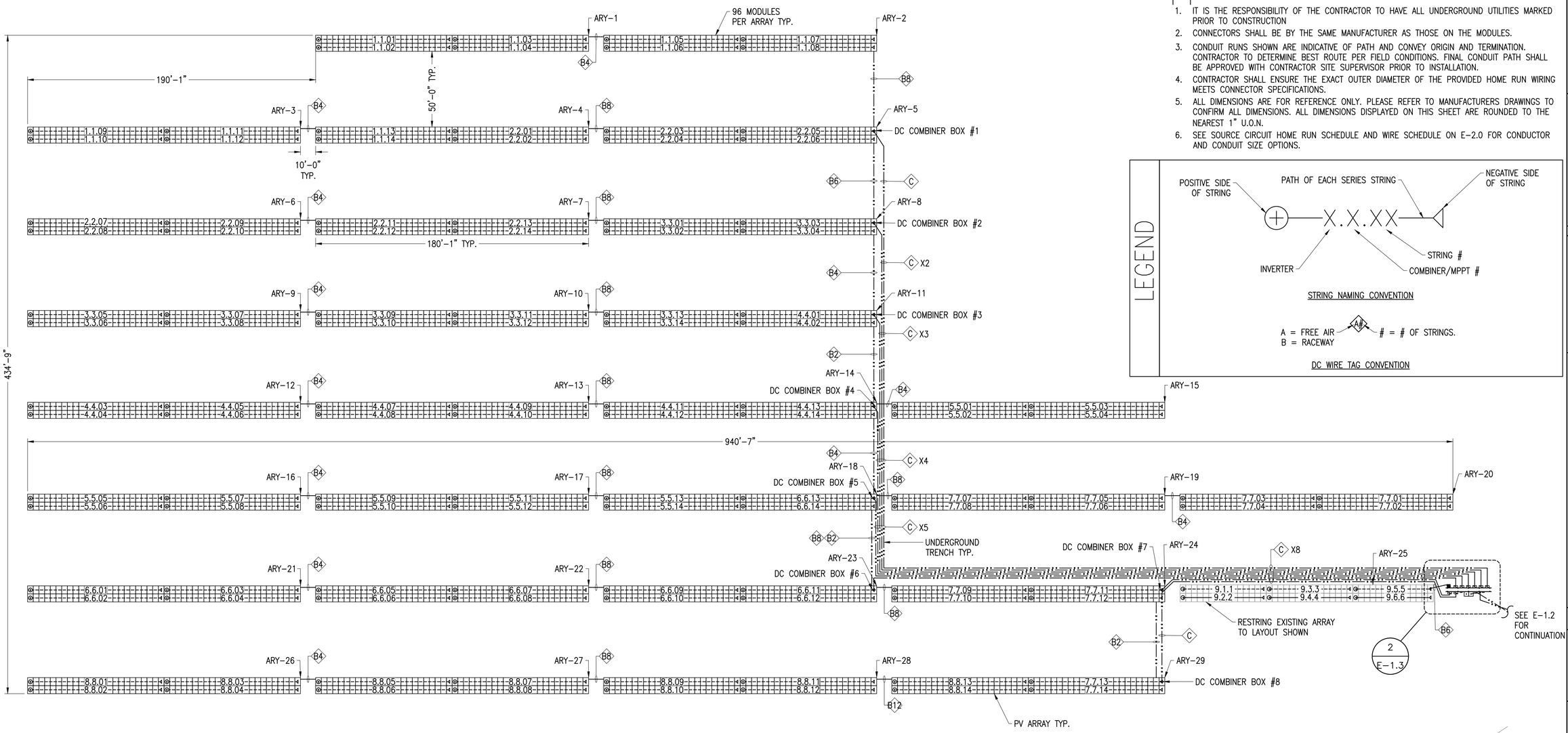
PROJECT NUMBER:
22-3270C

SCALE
AS SHOWN
ORIGINAL SIZE 24"X36"
SHEET SIZE ARCH "D"
0 ½" 1"

v.1.9

REV	ISSUED	BY	DESCRIPTION
	11/30/22	GK	BB 75% REVIEW SET
	2/1/24	GK	BB CD IFP - ISSUED FOR PERMIT

SHEET NO. & NAME:
E-1.0
ELECTRICAL SITEPLAN



SHEET NOTES

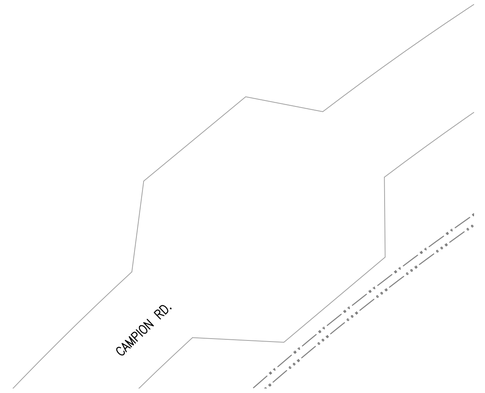
1. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO HAVE ALL UNDERGROUND UTILITIES MARKED PRIOR TO CONSTRUCTION
2. CONNECTORS SHALL BE BY THE SAME MANUFACTURER AS THOSE ON THE MODULES.
3. CONDUIT RUNS SHOWN ARE INDICATIVE OF PATH AND CONVEY ORIGIN AND TERMINATION. CONTRACTOR TO DETERMINE BEST ROUTE PER FIELD CONDITIONS. FINAL CONDUIT PATH SHALL BE APPROVED WITH CONTRACTOR SITE SUPERVISOR PRIOR TO INSTALLATION.
4. CONTRACTOR SHALL ENSURE THE EXACT OUTER DIAMETER OF THE PROVIDED HOME RUN WIRING MEETS CONNECTOR SPECIFICATIONS.
5. ALL DIMENSIONS ARE FOR REFERENCE ONLY. PLEASE REFER TO MANUFACTURERS DRAWINGS TO CONFIRM ALL DIMENSIONS. ALL DIMENSIONS DISPLAYED ON THIS SHEET ARE ROUNDED TO THE NEAREST 1" U.O.N.
6. SEE SOURCE CIRCUIT HOME RUN SCHEDULE AND WIRE SCHEDULE ON E-2.0 FOR CONDUCTOR AND CONDUIT SIZE OPTIONS.

LEGEND

STRING NAMING CONVENTION

A = FREE AIR
B = RACEWAY
A# = # OF STRINGS.

DC WIRE TAG CONVENTION



ELECTRICAL GROUND PLAN

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

0 32' 64'

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CITY OF GALENA SOLAR
GALENA, AK 99741

PROJECT NUMBER: 22-3270C

SCALE
AS SHOWN
ORIGINAL SIZE 24"X36"
SHEET SIZE ARCH "D"
0 ½" 1"

REV	ISSUED	BY	DESCRIPTION
	11/30/22	GK	75% REVIEW SET
	2/1/24	GK	CD IFP - ISSUED FOR PERMIT

SHEET NO. & NAME:
E-1.1
ELECTRICAL GROUND PLAN

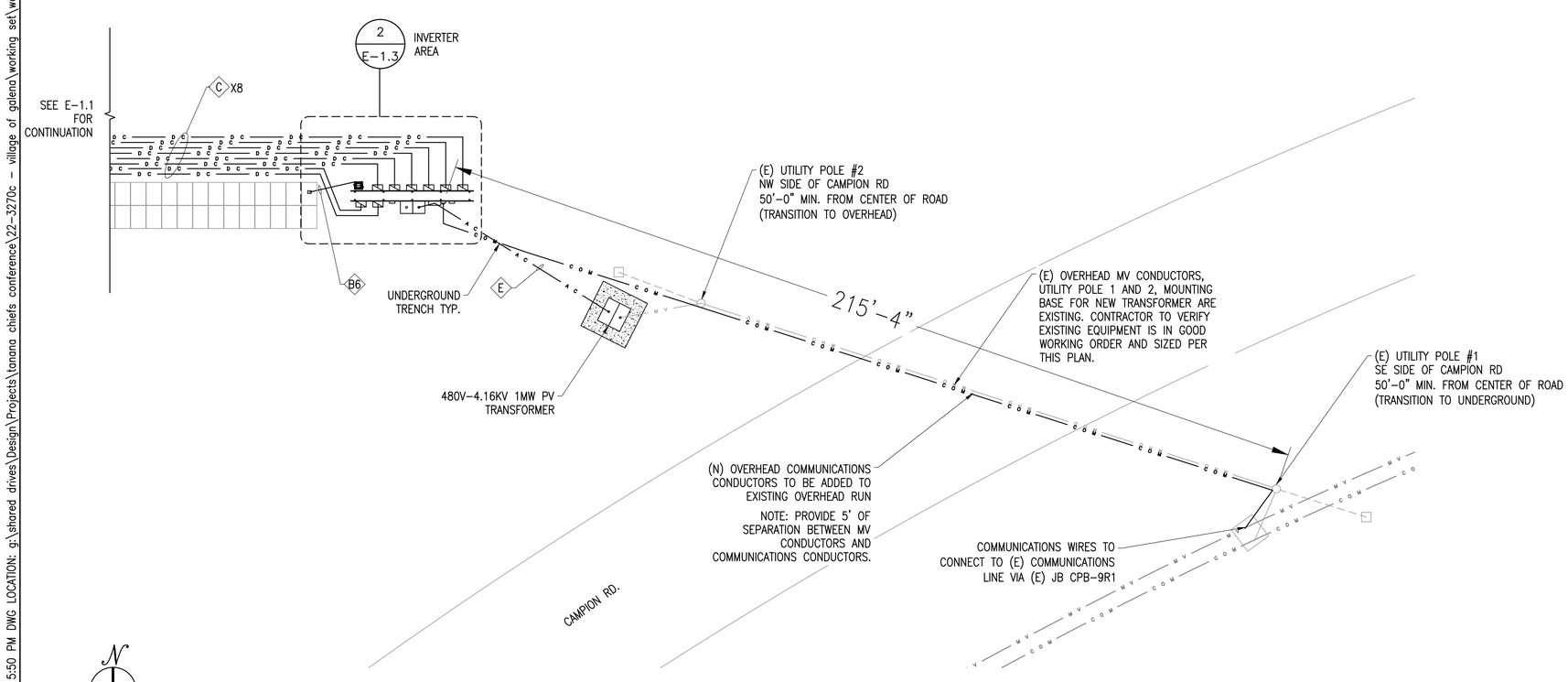
1. ALL EQUIPMENT DIMENSIONS ARE APPROXIMATE, VERIFY ALL DIMENSIONS WITH APPROVED EQUIPMENT RECORD DRAWINGS PRIOR TO POURING CONCRETE PADS.
2. CONDUIT ROUTES SHOWN ARE DIAGRAMMATIC AND DO NOT REFLECT ALL OBSTRUCTIONS. SUBCONTRACTOR TO DETERMINE EXACT ROUTING BASED ON SITE CONDITIONS.
3. CONTRACTOR TO COORDINATE ALL PLANNED CONDUIT ROUTES PRIOR TO INSTALLATION.
4. SEE E-2.1 FOR WIRE SCHEDULE INFORMATION.

NOTE: OVERHEAD MV CONDUCTORS, UTILITY POLE 1 AND 2, MOUNTING BASE FOR NEW TRANSFORMER ARE EXISTING. CONTRACTOR TO VERIFY EXISTING EQUIPMENT IS IN GOOD WORKING ORDER AND SIZED PER THIS PLAN.

EXISTING 125KW INVERTER TO BE DISCONNECTED FROM EXISTING ARRAY AND REPURPOUSED FOR NEW ARRAY. (E) ARRAY TO BE CONNECTED TO (N) 50KW SMA INVERTER.

EXISTING 480:4260V TRANSFORMER TO BE REMOVED, AND TRANPORTED BACK TO POWER HOUSE. IT WILL BE REPLACED WITH NEW 1MW 480:4160V INVERTER.

EXISTING PRODUCTION METER WILL BE REPLACED WITH NEW PRODUCTION METER PER THIS PLAN.



1 SOLAR FIELD EQUIPMENT AREA DETAIL
SCALE: 1/16" = 1'-0"

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SCALE
AS SHOWN
ORIGINAL SIZE 24"X36"
SHEET SIZE ARCH "D"
0 ½" 1"

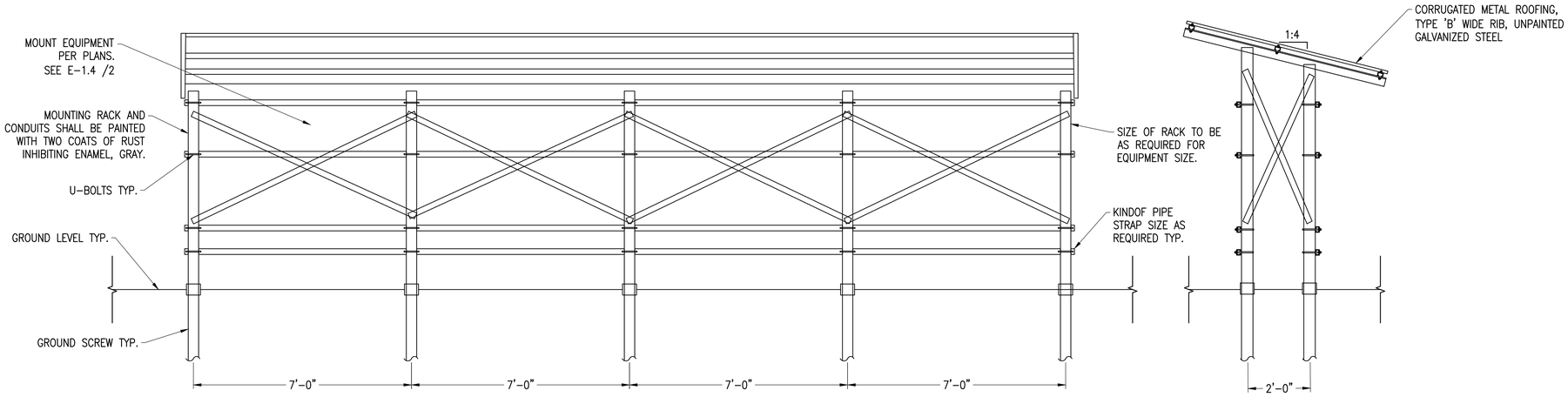
v.1.9

REV	ISSUED	BY	DESCRIPTION
	11/30/22	GK	BB 75% REVIEW SET
	2/1/24	GK	BB CD IFP - ISSUED FOR PERMIT

SHEET NO. & NAME:
E-1.2
PLAN DETAILS

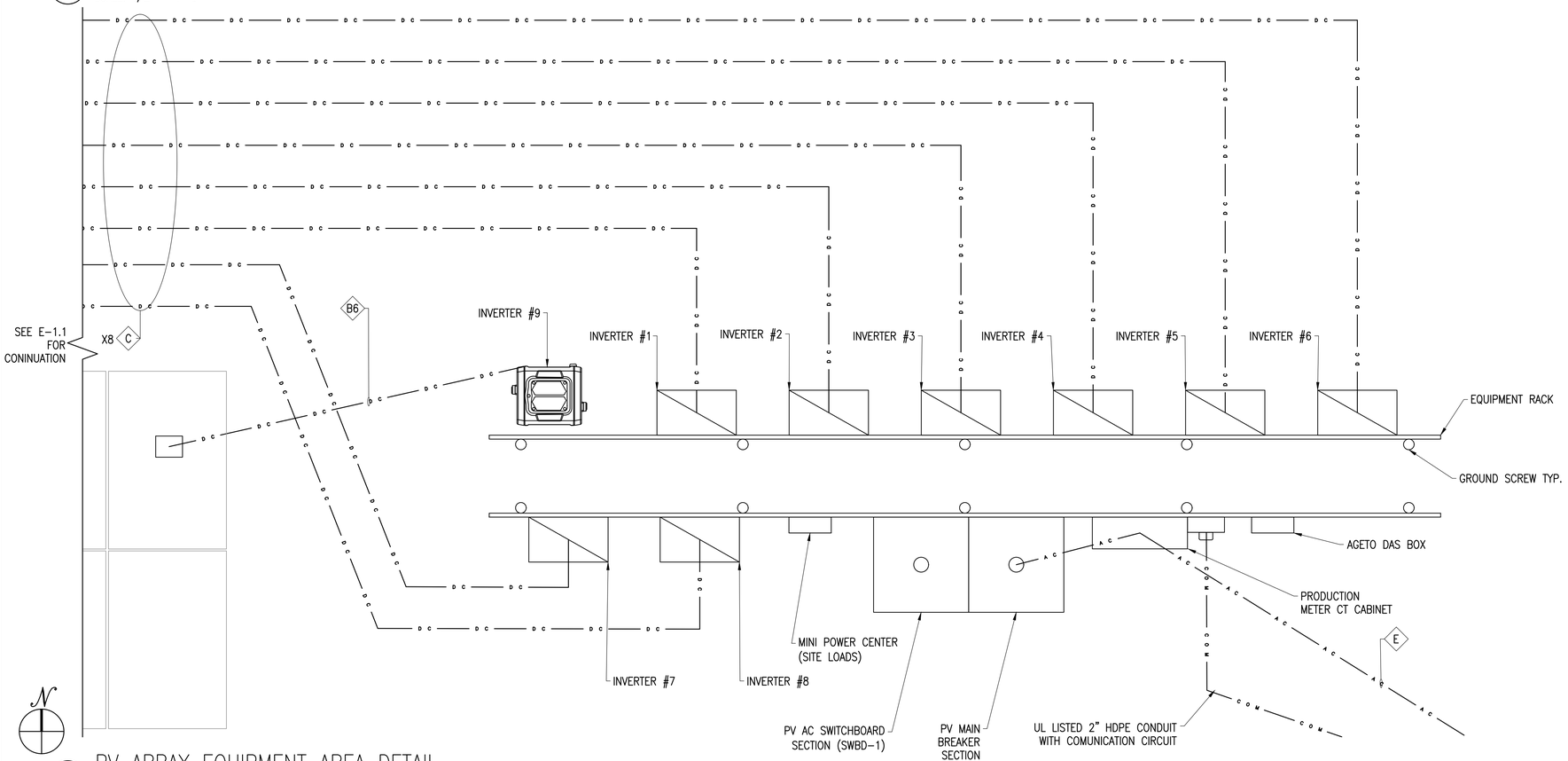
SHEET NOTES

1. ALL EQUIPMENT DIMENSIONS ARE APPROXIMATE, VERIFY ALL DIMENSIONS WITH APPROVED EQUIPMENT RECORD DRAWINGS PRIOR TO POURING CONCRETE PADS.
2. CONDUIT ROUTES SHOWN ARE DIAGRAMMATIC AND DO NOT REFLECT ALL OBSTRUCTIONS. SUBCONTRACTOR TO DETERMINE EXACT ROUTING BASED ON SITE CONDITIONS.
3. CONTRACTOR TO COORDINATE ALL PLANNED CONDUIT ROUTES PRIOR TO INSTALLATION.
4. SEE E-2.1 FOR WIRE SCHEDULE INFORMATION.



1 PV ARRAY EQUIPMENT RACK ELEVATION

SCALE: 1/2" = 1'-0"



2 PV ARRAY EQUIPMENT AREA DETAIL

SCALE: 1/2" = 1'-0"

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541.754.2001

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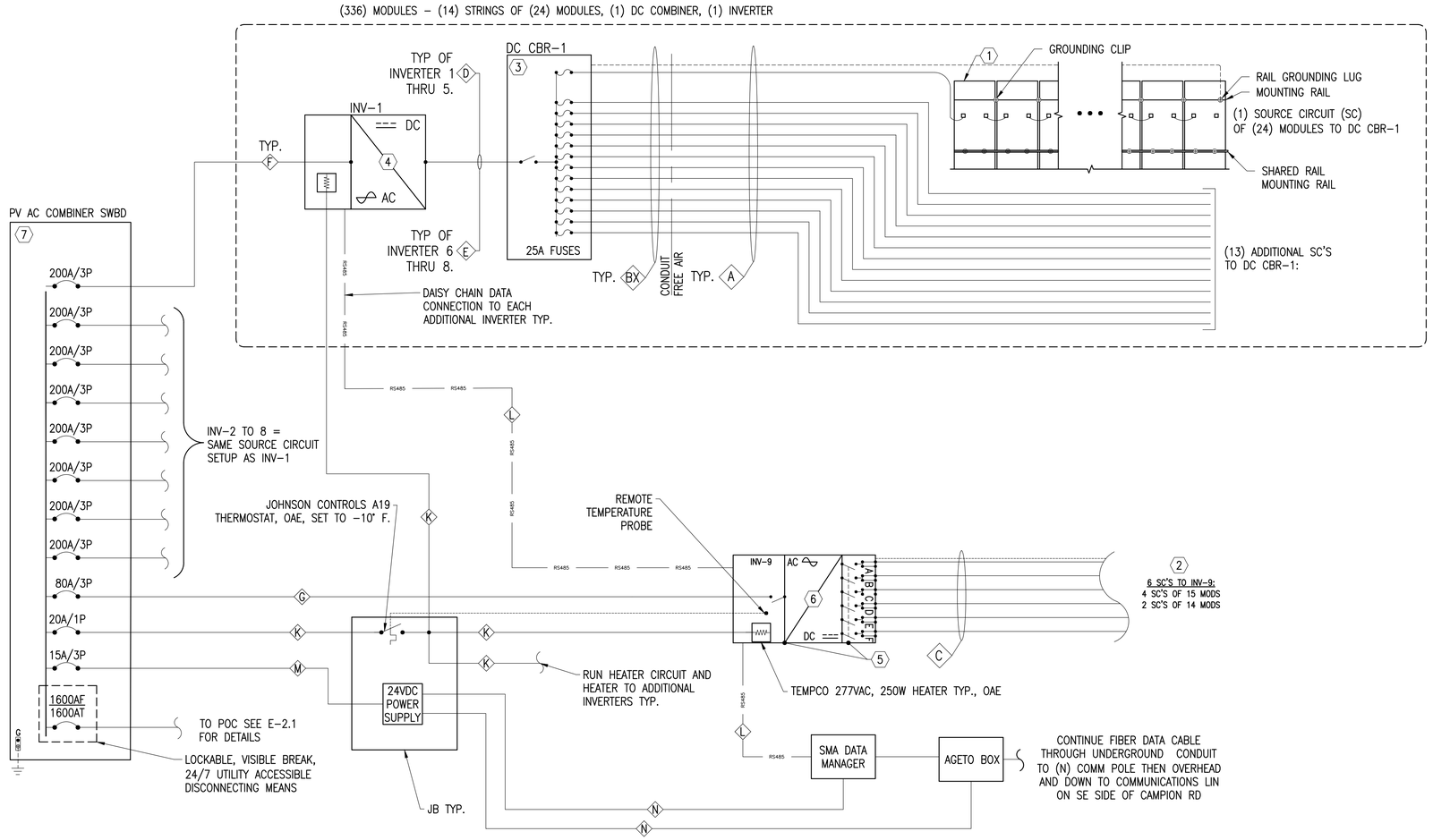
PROJECT NUMBER: 22-3270C

SCALE
AS SHOWN
ORIGINAL SIZE 24"X36"
SHEET SIZE ARCH "D"
0 ½" 1"

REV	ISSUED	BY	DESCRIPTION
	11/30/22	GK	BB 75% REVIEW SET
	2/1/24	GK	BB CD IFP - ISSUED FOR PERMIT

SHEET NO. & NAME:

E-1.3
PLAN DETAILS



SHEET NOTES

1. CIRCUIT CALCULATIONS ARE SHOWN FOR THE WORST CASE SCENARIO.
2. ALL CONDUCTORS TO BE COPPER (CU) UNLESS NOTED OTHERWISE.
3. ALL CONDUIT TO BE HDPE SCHD 40. EXTERIOR FITTINGS TO BE WATER TIGHT.
4. SMA SUNNY HIGH POWER INVERTERS DO NOT REQUIRE A NEUTRAL ON THE OUTPUT CIRCUIT. THEY THERFORE, MUST HAVE A NEUTRAL TO GROUND BOND JUMPER IN PLACE INSIDE THE INVERTER.
5. DESIGN REFLECTS A FULLY RATED ELECTRICAL SYSTEM
6. SEE SOURCE CIRCUIT HOME RUN SCHEDULE FOR CONDUIT SIZE OPTIONS. SEE E-1.1 FOR PROPOSED QUANTITY OF WIRES.

WIRING SCHEDULE

TAG	CIRCUIT TYPE	DESCRIPTION
A	PV SOURCE CIRCUIT (DC, CU, PVWIRE 2K)	(28) #8, (1) #6 EGC, FREE AIR
B	PV SOURCE CIRCUIT (DC, CU, PVWIRE 2K)	(VARIES) #8, (1) #8 EGC, (1) CONDUIT (SEE NOTE 6)
C	PV OUTPUT CURCUIT (DC, AL, PVWIRE 2K)	(12) #8, (1) #8 EGC, (1) 2" CONDUIT
D	PV OUTPUT CIRCUIT (DC, AL, XHHW-2)	2X PARALLEL SETS, 1 SET PER RACEWAY: (2) 500, (1) #1 EGC, (1) 2-1/2" CONDUIT
E	PV OUTPUT CIRCUIT (DC, AL, XHHW-2)	(2) 500, (1) #1 EGC, (1) 2-1/2" CONDUIT
F	INVERTER OUTPUT CIRCUIT (AC, CU, XHHW-2)	(3) 3/0, (1) #6 EGC, (1) 2" CONDUIT
G	INVERTER OUTPUT CIRCUIT (AC, CU, XHHW-2)	(3) #4, (1) #8 EGC, (1) 1" CONDUIT
K	HEATER CIRCUIT (AC, CU, XHHW-2)	(1) #12, (1) #12 NEU, (1) #12 EGC, (1) 3/4" CONDUIT
L	COMMUNICATIONS CIRCUIT	RS-485 (BELDEN 3106A, OAE) (1) 1" CONDUIT
M	POWER SUPPLY CIRCUIT (AC, CU, THWN-2)	(3) #12, (1) #12 EGC, (1) 3/4" CONDUIT
N	24VDC CIRCUIT (DC, CU, THWN-2)	(2) #12, (1) #12 EGC, (1) 3/4" CONDUIT

ELECTRICAL EQUIPMENT SCHEDULE

TAG	QTY.	DESCRIPTION
1	2688	SEG SEG-550-BMA-TB 550WDC SOLAR MODULE
2	88	HANWHA QCELL Q.PEAK DUO XL-G11 575, 575 WATT MODULE
3	8	TERRASMART (OR EQUIVALENT) DC DISCONNECT COMBINER (CBR-1), 400A, 14 INPUT, 25A FUSES, NEMA 4X
4	9	SMA AMERICA SUNNY HIGH POWER 125-US-20 125 KVA STRING-INVERTER, 480VAC, 151.00AAC, 3PH, 3W, NEMA 4X
5	1	INTEGRATED AC AND DC DISCONNECT, 2 INPUTS PER MPPT
6	1	SMA AMERICA SUNNY TRI POWER 50-US-41 50KVA STRING-INVERTER, 480VAC, 64.00AAC, 3PH, 3W, NEMA 4X
7	1	PV AC SWITCHBOARD (SWBD-1), 480Y/277V, 3 PHASE, 4 WIRE, 1600A, 1600A MAIN BREAKER, NEMA 3R

DC SINGLE LINE DIAGRAM

SCALE:

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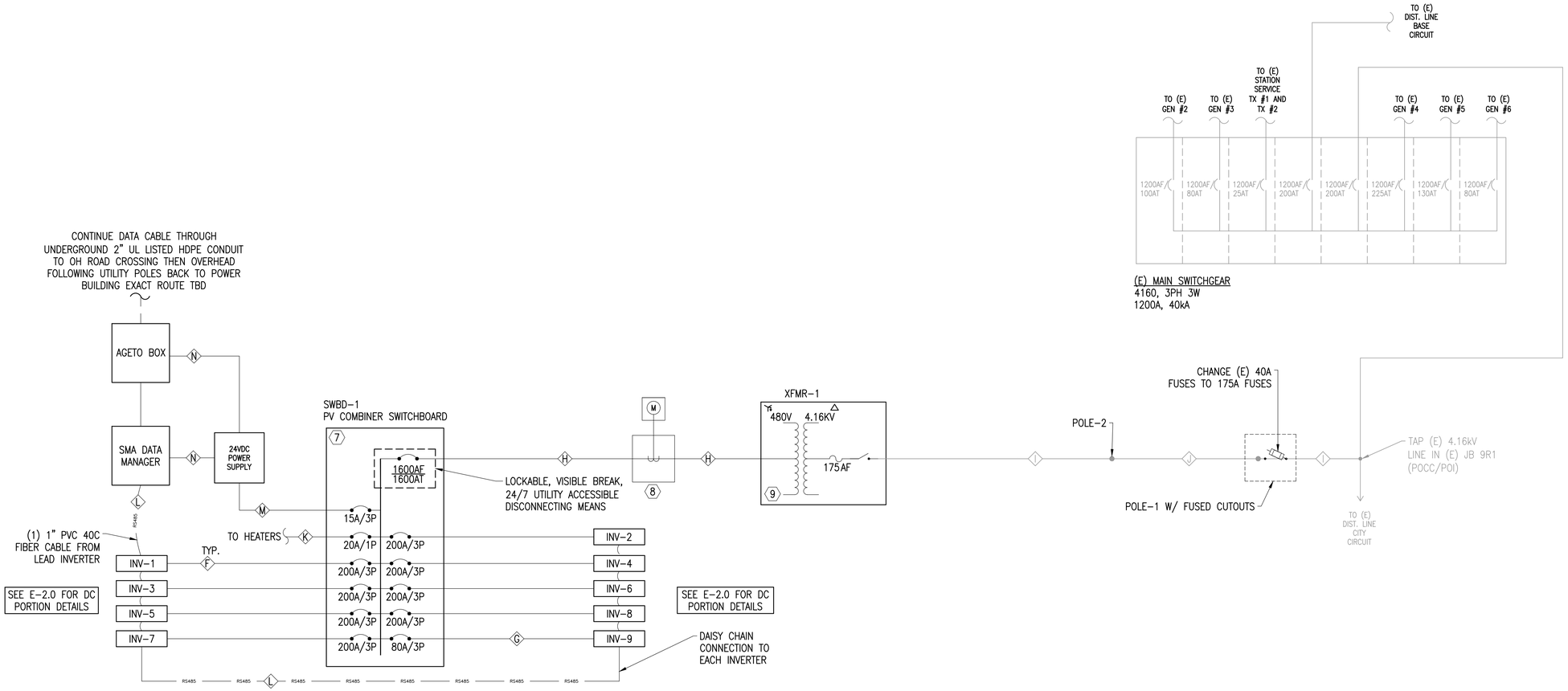
PROJECT NUMBER: 22-3270C

SCALE: NTS
ORIGINAL SIZE 24"X36" SHEET SIZE ARCH "D"
0 ½" 1"

REV	ISSUED	BY	DESCRIPTION
	11/30/22	GK	75% REVIEW SET
	2/1/24	GK	CD IFP - ISSUED FOR PERMIT

SHEET NO. & NAME:
E-2.0
DC SINGLE LINE DIAGRAM



ELECTRICAL EQUIPMENT SCHEDULE		
TAG	QTY.	DESCRIPTION
7	1	PV AC SWITCHBOARD (SWBD-1), 480Y/277V, 3 PHASE, 4 WIRE, 1600A, 1600A MAIN BREAKER, NEMA 3R
8	1	PRODUCTION METER, REVENUE GRADE, BI-DIRECTIONAL, 480V, 3 PHASE, 4 WIRE, CT RATIO TBD
9	1	PV PAD MOUNT TRANSFORMER (XFMR-1), 480 WYE-4.160KV DELTA, 1000KVA, NEMA 3R

WIRING SCHEDULE		
TAG	CIRCUIT TYPE	DESCRIPTION
F	INVERTER OUTPUT CIRCUIT (AC, CU, XHHW-2)	(3) 3/0, (1) #6 EGC, (1) 2" CONDUIT
G	INVERTER OUTPUT CIRCUIT (AC, CU, XHHW-2)	(3) #4, (1) #8 EGC, (1) 1" CONDUIT
H	PV COMBINED OUTPUT CIRCUIT (AC, AL, XHHW-2)	6X PARALLEL SETS, 1 SET PER RACEWAY: (3) 400, (1) 3/0 NEU, (1) 350 EGC, (1) 4" CONDUIT
I	TRANSFORMER OUTPUT CIRCUIT (AC, CU, URO-J)	(3) 2/0, (1) 4" CONDUIT
J	PV MV OVERHEAD CIRCUIT (AC, AL, ASCR)	(3) #2, FREE AIR
K	HEATER CIRCUIT (AC, CU, XHHW-2)	(1) #12, (1) #12 NEU, (1) #12 EGC, (1) 3/4" CONDUIT
L	COMMUNICATIONS CIRCUIT	RS-485 (BELDEN 3106A, OAE) (1) 1" CONDUIT
M	POWER SUPPLY CIRCUIT (AC, CU, THWN-2)	(3) #12, (1) #12 EGC, (1) 3/4" CONDUIT
N	24VDC CIRCUIT (DC, CU, THWN-2)	(2) #12, (1) #12 EGC, (1) 3/4" CONDUIT

AC SINGLE LINE DIAGRAM

SCALE: NTS

Mayfield Renewables
2210 NW Hayes Ave
Corvallis, OR 97333
541.754.2001

STAMP:

NOT FOR CONSTRUCTION

CITY OF GALENA SOLAR
GALENA, AK 99741

PROJECT NUMBER: 22-3270C

SCALE: NTS

ORIGINAL SIZE 24"X36" SHEET SIZE ARCH "D"

0 ½" 1"

v.1.9

REV	ISSUED	BY	DESCRIPTION
	11/30/22	GK	75% REVIEW SET
	2/1/24	GK	CD IFP - ISSUED FOR PERMIT

SHEET NO. & NAME:

E-2.1
AC SINGLE LINE DIAGRAM

SITE SPECIFIC INFORMATION:
SITE LOCATION: GALENA, AK 99741
TEMPERATURE DESIGN LOCATION: GALENA AP
ASHRAE 2% HIGH TEMPERATURE: 25.0°C
ASHRAE LOWEST EXPECTED TEMPERATURE: −46.2°C

MODULE TYPE #1 INFORMATION:
SEG, SEG−550−BMA−TB, 550WDC (STC)
CELL TYPE: PERC MONO
Voc: 49.70VDC (59.25VDC AT −46.2°C)
Vmp: 42.05VDC (38.37VDC AT 25.0°C)
Isc: 14.00ADC
Imp: 13.80ADC
SERIES FUSE RATING: 25ADC
Voc CORRECTION (%/°C): −0.270%
Vmp CORRECTION (%/°C): −0.350%
MODULE DIMENSIONS: 89.69" X 44.65" X 1.38"

INVERTER TYPE #1 INFORMATION:
SMA AMERICA, SUNNY HIGH POWER 125−US−20,
STRING−INVERTER, 480V, 3ϕ
CEC WEIGHTED EFFICIENCY (PTC): 98.5%
START VOLTAGE: 710VDC
MPPT MINIMUM VOLTAGE: 710VDC
MPPT MAXIMUM VOLTAGE: 1425VDC
MAXIMUM DC INPUT VOLTAGE: 1500VDC
NOMINAL POWER INPUT: 187500WDC
MAXIMUM POWER OUTPUT: 125000WAC
MAXIMUM CURRENT OUTPUT: 151.00AAC
AC NOMINAL VOLTAGE OUTPUT: 480VAC
MAX. AC OVERCURRENT PROTECTION ALLOWED: 200AAC

ARRAY SPECIFICATIONS
MODULES: 2688
INVERTERS: 9
(14) SOURCE CIRCUITS OF 24 MODULES EACH INVERTER

ARRAY ELECTRICAL SPECIFICATIONS
(VALUES BASED ON 24 MODULES PER STRING MAX., 14 STRING(S) IN PARALLEL MAX.)
MAXIMUM SYSTEM VOLTAGE: 1422.10VDC @ −46.2°C
RATED MAX POWER POINT VOLTAGE: 1009.20VDC
ADJ. VMP OF ARRAY AT 25.0°C HIGH TEMP (BASED ON 24 MODULES IN SERIES): 920.90VDC
RATED ISC OF ARRAY: 196.00ADC
MAXIMUM SHORT CIRCUIT CURRENT: 245.00ADC
RATED MAX POWER POINT CURRENT: 193.20ADC

VOLTAGE CALCULATIONS: NEC 690.7
LOW TEMPERATURE FOR DESIGN (ASHRAE LOW TEMP) = −46.2°C
ARRAY Voc AT STC: 49.70VDC X 24 MODULE IN SERIES = 1192.80VDC
TEMPERATURE ADJUSTED Voc:
[1192.80VDC X (1 + ((−46.2°C − 25°C) X (−0.270%)))] = 1422.10VDC
MAX. Voc PER INVERTER MANUFACTURER REQ. = 1500VDC
1422.10VDC ≤ 1500VDC (OK)

MODULE TYPE #2 INFORMATION:
QCELL, Q.PEAK DUO XL−G11 575, 575WDC (STC)
CELL TYPE: MONOCRYSTALLINE
Voc: 53.53VDC (63.94VDC AT −46.2°C)
Vmp: 44.66VDC (46.60VDC AT 25.0°C)
Isc: 13.52ADC
Imp: 12.87ADC
SERIES FUSE RATING: 25ADC
Voc CORRECTION (%/°C): −0.270%
Vmp CORRECTION (%/°C): −0.34%
MODULE DIMENSIONS: 95.1" X 44.6" X 1.38"

INVERTER TYPE #2 INFORMATION:
SMA AMERICA, SUNNY TRI POWER CORE1 50−US,
STRING−INVERTER, 480V, 3ϕ
CEC WEIGHTED EFFICIENCY (PTC): 97.5%
START VOLTAGE: 150VDC
MPPT MINIMUM VOLTAGE: 500VDC
MPPT MAXIMUM VOLTAGE: 800VDC
MAXIMUM SYSTEM VOLTAGE: 1000VDC
NOMINAL POWER INPUT: 75000WDC
MAXIMUM POWER OUTPUT: 50000WAC
MAXIMUM CURRENT OUTPUT: 64AAC
NOMINAL VOLTAGE OUTPUT: 480VAC
OVERCURRENT PROTECTION: 80AAC

ARRAY SPECIFICATIONS
MODULES: 88
INVERTERS: 6
(4) SOURCE CIRCUITS OF 15 AND
(2) CIRCUITS OF MODULES

ARRAY ELECTRICAL SPECIFICATIONS
(VALUES BASED ON 15 MODULES PER STRING MAX., 1 STRING(S) IN PARALLEL MAX.)
MAXIMUM SYSTEM VOLTAGE: 959.1VDC @ −46.2°C
RATED MAX POWER POINT VOLTAGE: 669.9VDC
ADJ. VMP OF ARRAY AT 25.0°C HIGH TEMP (BASED ON 14 MODULES IN SERIES): 652.4VDC
RATED ISC OF ARRAY: 13.52ADC
MAXIMUM SHORT CIRCUIT CURRENT: 16.9ADC
RATED MAX POWER POINT CURRENT: 12.87ADC

VOLTAGE CALCULATIONS: NEC 690.7
LOW TEMPERATURE FOR DESIGN (ASHRAE LOW TEMP) = −46.2°C
ARRAY Voc AT STC: 63.94VDC X 15 MODULE IN SERIES = 959.1VDC
TEMPERATURE ADJUSTED Voc:
[802.95VDC X (1 + ((−46.2°C − 25°C) X (−0.270%)))] = 959.1VDC
MAX. Voc PER INVERTER MANUFACTURER REQ. = 1000VDC
959.1VDC ≤ 1000VDC (OK)

1 ELECTRICAL SPECIFICATIONS
SCALE: NTS

SWITCHBOARD SCHEDULE

PV AC SWBD−1, 1600AMP — 1600A MAIN CIRCUIT BREAKER — 480VAC, 3ϕ, 4W & GND

INTERRUPTING CAPACITY: TBD kA RMS SYMMETRICAL — SURFACE MOUNT

LOAD DESCRIPTION	KVA LOAD ϕA	KVA LOAD ϕB	KVA LOAD ϕC	CB/ PHASE	CKT. NO.	ϕ	CKT. NO.	CB/ PHASE	KVA LOAD ϕA	KVA LOAD ϕB	KVA LOAD ϕC	LOAD DESCRIPTION
DAS POWER SUPPLY	4.15			20/3P	1	A	2					INTENTIONALLY LEFT BLANK
		4.15			3	B	4					
			4.15		5	C	6					
INV−1	42			200/3P	7	A	8	200/3P	42			INV−2
		42			9	B	10			42		
			42		11	C	12				42	
INV−3	42			200/3P	13	A	14	200/3P	42			INV−4
		42			15	B	16			42		
			42		17	C	18				42	
INV−5	42			200/3P	19	A	20	200/3P	42			INV−6
		42			21	B	22			42		
			42		23	C	24				42	
INV−7	42			200/3P	25	A	26	200/3P	42			INV−8
		42			27	B	28			42		
			42		29	C	30				42	
INV−9	17			80/3P	31	A	32					
		17			33	B	34					
			17		35	C	36					
	189	189	189	SUB−TOTAL					168	168	168	

PHASE A 357 KVA
PHASE B 357 KVA — TOTAL LOAD 1071 KVA
PHASE C 357 KVA

3 ELECTRICAL SWITCHBOARD SCHEDULES
SCALE: NTS

INVERTER STRING SCHEDULE

SHP 125−US−20 − INV−1 TO INV−8

STR #	MOD QTY		WATTS
1	24		13,200
2	24		13,200
3	24		13,200
4	24		13,200
5	24		13,200
6	24		13,200
7	24		13,200
8	24		13,200
9	24		13,200
10	24		13,200
11	24		13,200
12	24		13,200
13	24		13,200
14	24		13,200
# OF STR	MOD QTY		WATTS/INV
INV TOTALS	336		184,800
		ILR%	147.84%
		ILR% MAX	150%

INVERTER STRING SCHEDULE

STP 50−US−41 INV−9

STR #	MOD QTY		WATTS
1	15		8625
2	15		8625
3	15		8625
4	15		8625
5	14		8050
6	14		8050
# OF STR	MOD QTY		WATTS/INV
INV TOTALS	88		50,600
		ILR%	1.01%
		ILR% MAX	150%

4 INVERTER STRING SCHEDULE
SCALE: NTS

CONDUCTOR CALCULATION SUMMARY

TAG	DESCRIPTION	VOLTAGE	CIRCUIT AMPERAGE	MIN. OCPD AMPACITY	STD OCPD SIZE	PARALLEL SETS	CCC SIZE	NEU SIZE	EGC SIZE	CONDUCTOR MATERIAL	WIRE TEMP RATING	TYPE	CONDUIT SIZE OR BUNDLED	TYPE	FILL %	AMPACITY (75 DEG C)	LENGTH (FT)	AMPACITY (90 DEG C)	QTY CCC	QTY NEU	QTY EGC	FILL DERATE NEC 310.15(C)(1)	TEMP DERATE NEC 310.15(B)(1)	DERATED AMPACITY	VOLTAGE DROP
A	PV SOURCE CIRCUIT	1422VDC	17.5	21.88	25	1	#8	N/A	#6	CU	90	PV WIRE	FREE AIR	FREE AIR	−	70	90	80	28	0	1	0.45	1.05	37.8	0.27%
B	PV SOURCE CIRCUIT	1422VDC	17.5	21.88	25	1	#6	N/A	#6	CU	90	PV WIRE	2"	HDPE	37.79%	65	378	75	12	0	1	0.5	1.05	39.375	0.71%
C	PV SOURCE CIRCUIT	959VDC	16.9	21.13	25	1	#8	N/A	#8	CU	90	PV WIRE	2"	HDPE	30.21%	50	40	55	12	0	1	0.5	1.05	28.875	0.21%
D	PV OUTPUT CIRCUIT	1422VDC	245	306.25	350	2	500	N/A	#1	AL	90	XHHW−2	2−1/2"	HDPE	28.79%	310	676	350	2	0	1	1	1.05	367.5	0.86%
E	PV OUTPUT CIRCUIT	1422VDC	245	306.25	350	1	500	N/A	#1	AL	90	XHHW−2	2−1/2"	HDPE	28.79%	310	391	350	2	0	1	1	1.05	367.5	0.88%
F	INVERTER OUTPUT CIRCUIT	480VAC	151	188.75	200	1	3/0	N/A	#6	CU	90	XHHW−2	2"	HDPE	22.49%	170	30	225	3	0	1	1	1.05	236.25	0.12%
G	INVERTER OUTPUT CIRCUIT	480VAC	64	80.00	80	1	#4	N/A	#8	CU	90	XHHW−2	1"	PVC SCH.40	31.06%	184	30	95	3	0	1	1	1.05	99.75	0.21%
H	PV COMBINED OUTPUT CIRCUIT	480VAC	1272	1590.00	1600	6	400	3/0	350	AL	90	XHHW−2	4"	HDPE	27.46%	270	30	305	3	1	1	1	1.05	320.25	0.12%
I	TRANSFORMER OUTPUT CIRCUIT	4160VAC	140	175.00	175	1	2/0	N/A	N/A	CU	90	URO−J	4"	HDPE	36.51%	175	80	195	3	0	0	1	1.05	204.75	0.08%
J	PV MV OVERHEAD CIRCUIT	4160VAC	140	175.00	175	1	#2	N/A	N/A	AL	90	ASCR	FREE AIR	HDPE	−−	135	115	150	3	0	0	1	1.05	157.5	0.22%
K	HEATER CIRCUIT	277VAC	16	20.00	20	1	#12	#12	#12	CU	90	XHHW−2	3/4"	HDPE	7.49%	25	30	30	1	1	1	1	1.05	31.5	NA
L	COMUNICATIONS CIRCUIT	NA	16	20.00	20	1	#12	#12	#12	CU	90	XHHW−2	3/4"	HDPE	10.67%	25	30	30	2	1	1	1	1.05	31.5	0.40%

2 ELECTRICAL CONDUCTOR SCHEDULES
SCALE: NTS

Mayfield Renewables
2210 NW Hayes Ave
Corvallis, OR 97333
541.754.2001

STAMP:

NOT FOR CONSTRUCTION

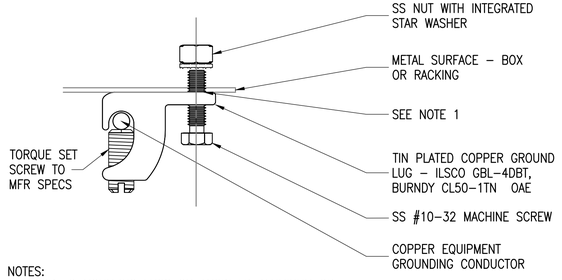
CITY OF GALENA SOLAR
GALENA, AK 99741

PROJECT NUMBER: 22−3270C

SCALE
NTS
ORIGINAL SIZE 24"X36"
SHEET SIZE ARCH "D"
0 ½" 1"

REV	ISSUED	BY	DESCRIPTION
	11/30/22	GK	75% REVIEW SET
	2/1/24	GK	BB CD IFP − ISSUED FOR PERMIT

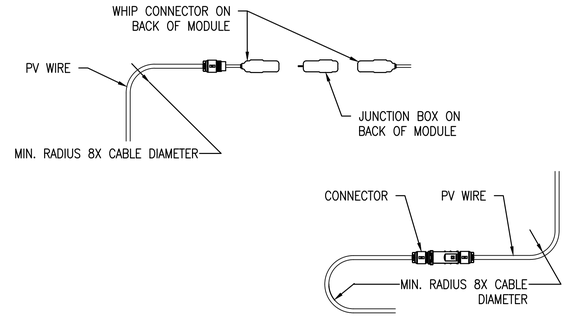
SHEET NO. & NAME:
E−2.2
ELECTRICAL SPECIFICATIONS



NOTES:
1. PRIOR TO MOUNTING LUGS ON ANODIZED ALUMINUM OR PAINTED METAL SURFACES, THE SURFACE MUST BE STRIPPED AND THEN COVERED WITH BURNDY PENETROX A–13 ANTI–OXIDANT COMPOUND BELOW THE LUG TO ENSURE CONDUCTIVITY.
2. ON ANODIZED AL SURFACES, THE ANODIZATION SHALL BE GROUND OFF.
3. ON PAINTED SURFACES, THE PAINT LAYER SHALL BE GROUND OR SCRATCHED OFF.

4 GROUNDING METAL BOXES / RACKING

SCALE: NTS
XD_ELEC_GROUNDING METAL BOXES OR RACKING 2023–02–28

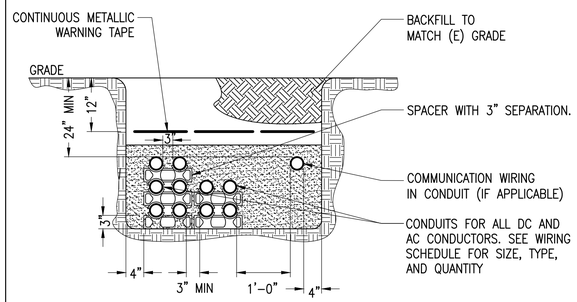


NOTES:
1. OBSERVE MIN. BENDING RADIUS REQUIREMENTS WHEN BUNDLING AND SECURING SOURCE CIRCUIT CONDUCTORS TO MODULES AND RACKING.
2. SEE MODULE SPEC SHEET OR CABLE SPECIFICATIONS FOR CABLE DIAMETER.

1 PV WIRE BENDING REQUIREMENTS

GREATER THAN 600V

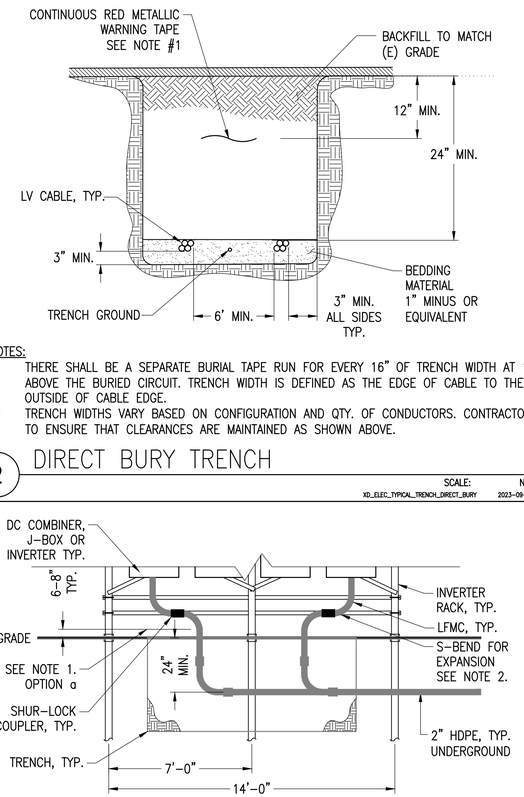
SCALE: NTS
XD_ELEC_PV WIRE BENDING REQUIREMENTS_GREATER THAN 600V 2023–02–28



NOTES:
1. MAINTAIN A MINIMUM DISTANCE OF 1' BETWEEN CONDUIT WITH COMMUNICATION WIRING AND ANY CONDUIT WITH ELECTRIC POWER CONDUCTORS. POWER AND DATA CONDUITS MAY CROSS AND THE 1' MIN. MAY BE REDUCED FOR TRENCH SECTIONS LESS THAN 10' AND NEAR EQUIPMENT STUB–UPS.
2. DIAGRAM SHOWN ABOVE DOES NOT REFLECT EXACT CONDUITS IN EACH TRENCH AND SHALL BE USED AS A TEMPLATE FOR SPACING CONSTRAINTS AND TO BE VERIFIED ON SITE BY CONTRACTOR AND APPROVED BY OWNER.

5 TYPICAL TRENCH

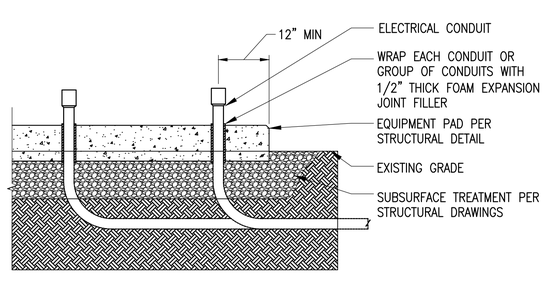
SCALE: NTS
XD_ELEC_TYPICAL_TRENCH 2023–03–07



NOTES:
1) THERE SHALL BE A SEPARATE BURIAL TAPE RUN FOR EVERY 16" OF TRENCH WIDTH AT 12" ABOVE THE BURIED CIRCUIT. TRENCH WIDTH IS DEFINED AS THE EDGE OF CABLE TO THE OUTSIDE OF CABLE EDGE.
2) TRENCH WIDTHS VARY BASED ON CONFIGURATION AND QTY. OF CONDUCTORS. CONTRACTOR TO ENSURE THAT CLEARANCES ARE MAINTAINED AS SHOWN ABOVE.

2 DIRECT BURY TRENCH

SCALE: NTS
XD_ELEC_TYPICAL_TRENCH_DIRECT_BURY 2023–09–07



NOTES:
1. CODE COMPLIANT BEND RADIUS OF CONDUIT SHALL BE MAINTAINED. CONDUIT FOR PRIMARY 15KV CABLES SHALL USE A 36" BEND RADIUS WHERE POSSIBLE FROM THE UNDERGROUND SYSTEM TO THE PAD.
2. CONDUIT "STUB UP" LOCATIONS SHALL BE VERIFIED IN THE FIELD ACCORDING TO MANUFACTURER SPECIFICATIONS.
3. CONDUIT SWEEPS SHALL BE PVC

6 EQUIPMENT PAD CONDUIT INSTALLATION

SCALE: NTS
XD_ELEC_EQUIPMENT PAD CONDUIT INSTALLATION 2023–05–01

NOTES:
1. WHERE HDPE MEETS GRADE, PROVIDE ADDITIONAL PROTECTION FOR THE FIRST 12" ABOVE GRADE BY THE MEANS BELOW.
   a. HDPE SHALL BE SECURELY FASTENED IN PLACE BY AN APPROVED MEANS WITHIN 6–8" OF EACH BOX, CABINET, CONDUIT BODY, OR OTHER CONDUIT TERMINATION AND SHALL BE SUPPORTED AND SECURED AT INTERVALS NOT TO EXCEED 4.5'. LISTED CABLE TIES ARE PERMITTED TO BE USED FOR SECUREMENT AND SUPPORT.
2. WHERE MORE THAN 4 QUARTER (360°) BENDS ARE MADE BETWEEN PULL POINTS, CONTRACTOR SHALL INSTALL CONDUIT BODIES AND OR TRANSITION BOXES WHERE NECESSARY.
3. HDPE SHALL BE INSTALLED WHERE IT IS NOT SUBJECT TO PHYSICAL DAMAGE AND CAN BE USED IN EXPOSED AND OR CONCEALED LOCATIONS.

3 CONDUIT DETAIL

APPROX. SCALE: NTS
XD_ELEC_CONDUIT DETAIL 2023–09–07

Mayfield Renewables
2210 NW Hayes Ave
Corvallis, OR 97333
541.754.2001

STAMP:

NOT FOR CONSTRUCTION

CITY OF GALENA SOLAR
GALENA, AK 99741

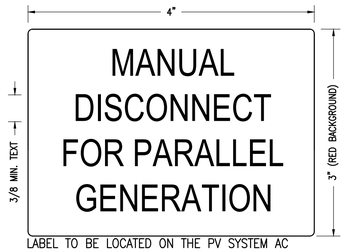
PROJECT NUMBER: 22–3270C

SCALE
AS SHOWN
ORIGINAL SIZE 24"X36"
SHEET SIZE ARCH "D"
0 ½" 1"

v.1.9

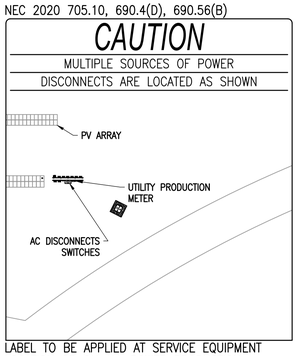
REV	ISSUED	BY	DESCRIPTION
	11/30/22	GK	75% REVIEW SET
	2/1/24	BB	CD IFP – ISSUED FOR PERMIT

SHEET NO. & NAME:
E–3.0
ELECTRICAL DETAILS



LABEL TO BE LOCATED ON THE PV SYSTEM AC DISCONNECT. LABEL TO BE ENGRAVED PLASTIC. (2) TOTAL

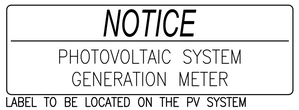
NEC 2020 705.10, 690.4(D), 690.56(B)



LABEL TO BE APPLIED AT SERVICE EQUIPMENT LOCATION OR ON ALL POWER PRODUCTION SOURCES CAPABLE OF BEING INTERCONNECTED. (1) TOTAL

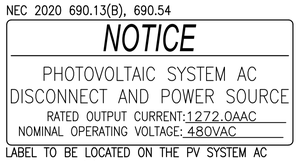
NEC 2020 690.31(D)(2)

LABEL SHALL BE LOCATED ON ALL EXPOSED RACEWAYS, CABLE TRAYS, OTHER WIRING METHODS, COVERS OR ENCLOSURES OF PULL BOXES AND JUNCTION BOXES AND ON CONDUIT BODIES IN WHICH ANY OF THE AVAILABLE CONDUIT OPENINGS ARE UNUSED. LABEL SHALL BE REFLECTIVE, AND ALL LETTERS CAPITALIZED AND SHALL BE MINIMUM HEIGHT OF 3/8" IN WHITE ON A RED BACKGROUND. SPACING BETWEEN LABELS OR MARKINGS, OR BETWEEN A LABEL AND MARKING, SHALL NOT BE MORE THAN 10FT.



LABEL TO BE LOCATED ON THE PV SYSTEM GENERATION METER. (1) TOTAL

NEC 2020 690.13(B), 690.54

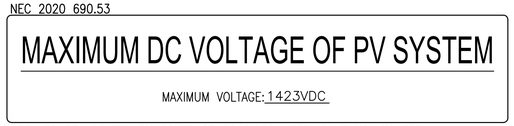


LABEL TO BE LOCATED ON THE PV SYSTEM AC DISCONNECT. (1) TOTAL

NEC 2020 705.12(B)(3)(3)

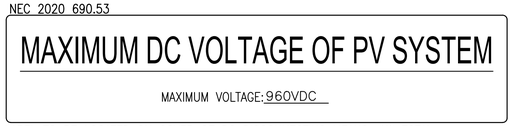
PERMANENT WARNING LABEL SHALL BE APPLIED TO DISTRIBUTION EQUIPMENT WHERE THE PV SYSTEM INTERCONNECTS. (2) TOTAL

NEC 2020 690.53



LABEL TO BE LOCATED ON COVER OF DC DISCONNECTING MEANS. (8) TOTAL

NEC 2020 690.53



LABEL TO BE LOCATED ON COVER OF DC DISCONNECTING MEANS. (1) TOTAL

Mayfield Renewables
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541.754.2001

STAMP:

NOT FOR CONSTRUCTION

CITY OF GALENA SOLAR
GALENA, AK 99741

PROJECT NUMBER:
22-3270C

SCALE
NTS
ORIGINAL SIZE 24"X36"
SHEET SIZE ARCH "D"
0 ½" 1"

v.1.9

REV	ISSUED	BY	✓	DESCRIPTION
	11/30/22	GK	BB	75% REVIEW SET
	2/1/24	GK	BB	CD IFP - ISSUED FOR PERMIT

SHEET NO. & NAME:
E-4.0
LABELS & MARKINGS

Q.PEAK DUO XL-G11 SERIES

qcells

570-585 Wp | 156 Cells
21.4 % Maximum Module Efficiency

MODEL Q.PEAK DUO XL-G11.3/BFG

Bifacial energy yield gain of up to 20 %
Bifacial Q.ANTUM solar cells make efficient use of light shining on the module rear-side for radically improved LCOE.

Low electricity generation costs
Q.ANTUM DUO Z combines cutting edge cell separation and innovative wiring with Q.ANTUM Technology for higher yield per surface area, lower BOS costs, higher power classes, and an efficiency rate of up to 21.4%.

A reliable investment
Double glass module design enables extended lifetime with 12-year product warranty and improved 30-year performance warranty[1].

Enduring high performance
Long-term yield security with Anti LeTID and Anti PID Technology[2], Hot-Spot Protect.

Frame for versatile mounting options
High-tech aluminum alloy frame protects from damage, enables use of a wide range of mounting structures and is certified regarding IEC for high snow (5400 Pa) and wind loads (2400 Pa).

Innovative all-weather technology
Optimal yields, whatever the weather with excellent low-light and temperature behavior.

[1] See data sheet on rear for further information.
[2] APT test conditions according to IEC/TS 62804-1:2015 method B (−1500 V, 168 h) including post treatment according to IEC 61215-1-1 Ed. 2.0 (CD)

The ideal solution for:
Ground mounted solar panels

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SEG SOLAR

YUKON Series

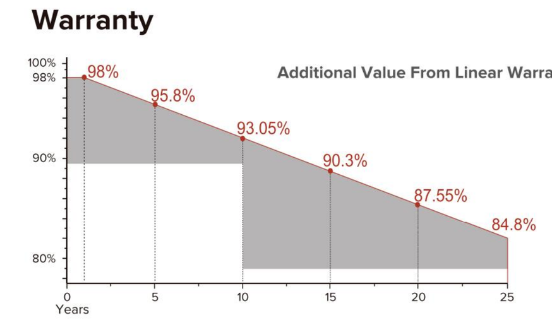
Half-Cell
Transparent Backsheet Module

540-555W Module Power Output | **21.48%** Max Efficiency

Key Features

- High module conversion efficiency
- Better temperature coefficient
- Super multi busbar technology
- Low attenuation long warranty
- Superior load capacity
- Higher bifacially
- USA based liability insurance
- Houston, Texas based company

Warranty



15 <Years> Guarantee on product material and workmanship
25 <Years> Linear power output warranty

Product Certification

IEC61215:2016; IEC 61730:2016;	UL1703; UL61730/ETL/CEC
IEC62804	PID
IEC61701	Salt Mist
IEC62716	Ammonia Resistance
IEC60068	Dust and Sand
IEC61215	Hailstone
Fire Type (UL61730):Type1	
ISO14001:2015; ISO9001:2015; ISO45001:2018	

About SEG Solar

SEG Solar is a leading manufacturer of high-performance solar panels for residential, commercial, and utility applications. The company, headquartered in Houston,Texas, is committed to providing cost-effective and reliable solar solutions that help customers reduce their energy costs and carbon footprint.

Download Datasheet

SMA

SUNNY HIGHPOWER PEAK3 125-US / 150-US

Cost effective
- Modular architecture reduces BOS and maximizes system uptime
- Compact design and high power density maximize transportation and logistical efficiency

Maximum flexibility
- Scalable 1,500 VDC building block with best-in-class performance
- Flexible architecture creates scalability while maximizing land usage

Simple install, commissioning
- Ergonomic handling and simple connections enable quick installation
- Centralized commissioning and control with SMA Data Manager

Highly innovative
- SMA Smart Connected reduces O&M costs and simplifies field-service
- Powered by award winning ennexOS cross sector energy management platform

SUNNY HIGHPOWER PEAK3 125-US / 150-US

A superior modular solution for utility power plants

The new Sunny Highpower PEAK3 is SMA's latest addition to a comprehensive portfolio of utility solutions. This 1,500 VDC inverter offers high power density in a modular architecture that achieves a cost-optimized solution for utility-scale PV integrators. With fast, simple installation and commissioning, the Sunny Highpower PEAK3 is accelerating the path to energization. SMA has also brought its field-proven Smart Connected technology to the PEAK3, which simplifies O&M and contributes to lower lifetime service costs. The PEAK3 utility system solution is powered by the ennexOS cross sector energy management platform, 2018 winner of the Intersolar smarter E AWARD.

SMA

/ STP 33-US-41 / STP 50-US-41 / STP 62-US-41

Sunny Tripower CORE1-US

33 / 50 / 62

It stands on its own

/ New! Complies with IEEE 1547-2018 and UL 1741 SB standards

SMA Smart Connected | SMA ShadeFix | c UL us

Fully integrated
- No additional racking required for rooftop installation
- Integrated DC and AC disconnects and overvoltage protection
- 12 direct string inputs for reduced labor and material costs
- Up to 60% faster commercial PV system installation

Increased power, flexibility
- Six MPP trackers for flexible stringing and maximum power production
- ShadeFix, SMA's proprietary shade management solution, optimizes at the string level
- Intelligent string monitoring to pinpoint array performance issues

Enhanced safety, reliability
- Integrated SunSpec PLC signal for module-level rapid shutdown
- DC AFCI arc-fault protection certified to Standard UL 1699B Ed. 1

Smart monitoring, control, service
- I-V curve diagnostic function to visualize and document PV string electrical characteristics
- Increased ROI with SMA ennexOS cross sector energy management platform
- SMA Smart Connected proactive O&M solution reduces time spent diagnosing and servicing in the field

The Sunny Tripower CORE1 is the world's first free-standing PV inverter for commercial rooftops, carports, ground mount and repowering legacy solar projects.

From distribution to construction to operation, the Sunny Tripower CORE1 enables logistical, material, labor and service cost reductions, and is the most versatile, cost-effective commercial solution available. Integrated SunSpec PLC for rapid shutdown and enhanced DC AFCI arc-fault protection ensure compliance to the latest safety codes and standards. With Sunny Tripower CORE1 and SMA's ennexOS cross sector energy management platform, system integrators can deliver comprehensive commercial energy solutions for increased ROI.

SunSpec Modbus for 1547 CERTIFIED | Rapid Shutdown CERTIFIED | UL 3741 LISTED PV Hazard Control

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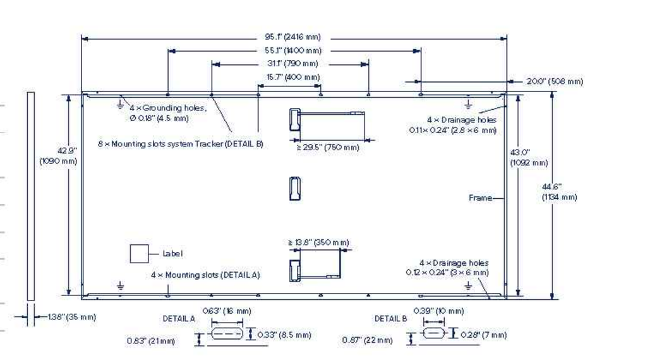
Q.PEAK DUO XL-G11 SERIES

Mechanical Specification

Format	95.1 in × 44.7 in × 1.38 in (including frame) (2416 mm × 1134 mm × 35 mm)
Weight	75.8 lbs (34.4 kg)
Front Cover	0.08 in (2 mm) thermally pre-stressed glass with anti-reflection technology
Back Cover	0.08 in (2 mm) semi-tempered glass
Frame	Anodised aluminium
Cell	6 × 26 monocrystalline Q.ANTUM solar half cells
Junction box	2.09-3.98 × 1.26-2.36 × 0.59-0.71 in (53-101 mm × 32-60 mm × 15-18 mm), Protection class IP67, with bypass diodes
Cable	4 mm² Solar cable; (+) ≥ 29.5 in (750 mm), (−) ≥ 13.8 in (350 mm)
Connector	Stäubli MC4; Stäubli MC4-Evo2; - IP68



Electrical Characteristics

POWER CLASS			570		575		580		585	
MINIMUM PERFORMANCE AT STANDARD TEST CONDITIONS, STC[1] (POWER TOLERANCE +5 W / −0 W)				BSTC*		BSTC*		BSTC*		BSTC*
Power at MPP[1]	P_{MPP}	[W]	570	623.5	575	629.0	580	634.4	585	639.9
Short Circuit Current[1]	I_{SC}	[A]	13.50	14.77	13.52	14.80	13.55	14.83	13.57	14.86
Open Circuit Voltage[1]	V_{OC}	[V]	53.50	53.69	53.53	53.72	53.56	53.75	53.59	53.78
Current at MPP	I_{MPP}	[A]	12.83	14.03	12.87	14.09	12.92	14.14	12.97	14.19
Voltage at MPP	V_{MPP}	[V]	44.44	44.43	44.66	44.65	44.88	44.87	45.10	45.09
Efficiency[1]	η	[%]	≥ 20.8		≥ 21.0		≥ 21.2		≥ 21.4	

(Minimum)

Bifaciality of P_{MPP} and I_{SC} 70 % ± 5 % • Bifaciality given for rear side irradiation on top of STC (front side) • According to IEC 60904-1-2

[1] Measurement tolerances P_{MPP} ± 3 %; I_{SC}, V_{OC} ± 5 % at STC: 1000 W/m²; *at BSTC: 1000 W/m² + φ × 135 W/m², φ = 70 % ± 5 %, 25 ± 2 °C, AM 1.5 according to IEC 60904-3

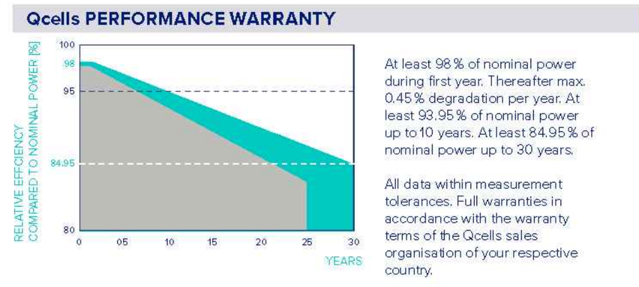
MINIMUM PERFORMANCE AT NORMAL OPERATING CONDITIONS, NMOT[2]

			570	575	580	585
Power at MPP	P_{MPP}	[W]	429.1	432.9	436.6	440.4
Short Circuit Current	I_{SC}	[A]	10.87	10.89	10.91	10.93
Open Circuit Voltage	V_{OC}	[V]	50.60	50.63	50.66	50.68
Current at MPP	I_{MPP}	[A]	10.09	10.14	10.18	10.22
Voltage at MPP	V_{MPP}	[V]	42.51	42.71	42.89	43.08

(Minimum)

[2] 800 W/m², NMOT, spectrum AM 1.5

Qcells PERFORMANCE WARRANTY

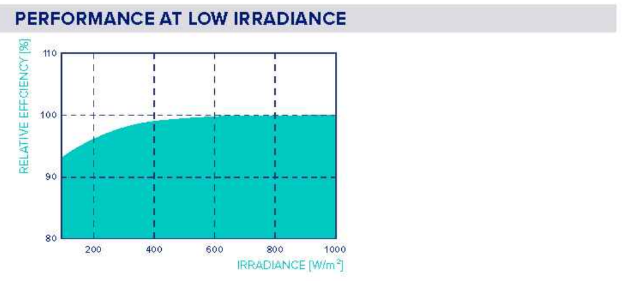


At least 98 % of nominal power during first year. Thereafter max. 0.45 % degradation per year. At least 93.95 % of nominal power up to 10 years. At least 84.95 % of nominal power up to 30 years.

All data within measurement tolerances. Full warranties in accordance with the warranty terms of the Qcells sales organisation of your respective country.

*Standard terms of guarantee for the 5 PV companies with the highest production capacity in 2021 (February 2021)

PERFORMANCE AT LOW IRRADIANCE



Typical module performance under low irradiance conditions in comparison to STC conditions (25 °C, 1000 W/m²).

TEMPERATURE COEFFICIENTS

Temperature Coefficient of I_{SC}	α	[% / K]	+0.04	Temperature Coefficient of V_{OC}	β	[% / K]	−0.27
Temperature Coefficient of P_{MPP}	γ	[% / K]	−0.34	Nominal Module Operating Temperature	NMOT	[°F]	109 ± 5.4 (43 ± 3 °C)

Properties for System Design

Maximum System Voltage	V_{SYS}	[V]	1500	PV module classification	Class II
Maximum Series Fuse Rating		[A DC]	25	Fire Rating based on ANSI / UL 61730	TYPE 29[4]
Max. Design Load, Push / Pull[3]		[lbs / ft²]	75 (3600 Pa) / 33 (1600 Pa)	Permitted Module Temperature on Continuous Duty	−40 °F up to +185 °F (−40 °C up to +85 °C)
Max. Test Load, Push / Pull[3]		[lbs / ft²]	113 (5400 Pa) / 50 (2400 Pa)		

[3] See Installation Manual
[4] New Type is similar to Type 3 but with metallic frame

Qualifications and Certificates

UL 61730, CE-compliant, IEC 61215:2016, IEC 61730:2016, U.S. Patent No. 9,893,215 (solar cells)

Qcells pursues minimizing paper output in consideration of the global environment.
Note: Installation instructions must be followed. Contact our technical service for further information on approved installation of this product.
Hanwha Q CELLS America Inc. 400 Spectrum Center Drive, Suite 1400, Irvine, CA 92618, USA | TEL +1 949 748 59 96 | EMAIL hqc-inquiry@qcells.com | WEB www.qcells.com

Specifications subject to technical changes © Qcells Q.PEAK_DUO_XL-G11-BFG_series_570-585_2023-02_Rev03_NA

qcells

SEG SOLAR

YUKON Series SEG-XXX-BMA-TB(144Cells)

Electrical Characteristics

Module Type	SEG-540-BMA-TB			SEG-545-BMA-TB			SEG-550-BMA-TB			SEG-555-BMA-TB		
	Front STC	Front NOCT	Back STC	Front STC	Front NOCT	Back STC	Front STC	Front NOCT	Back STC	Front STC	Front NOCT	Back STC
Maximum Power -Pmp(W)	540	406	378	545	409	382	550	414	385	555	418	389
Open Circuit Voltage -Voc(V)	49.50	46.18	49.48	49.60	46.32	49.58	49.70	46.40	49.68	49.80	46.47	49.78
Short Circuit Current -Isc(A)	13.81	11.16	9.74	13.90	11.23	9.80	14.00	11.32	9.87	14.10	11.40	9.94
Maximum Power Voltage -Vmp(V)	41.55	38.39	41.61	41.80	38.41	41.86	42.05	38.58	42.10	42.31	38.75	42.35
Maximum Power Current -Imp(A)	13.00	10.59	9.09	13.04	10.65	9.13	13.08	10.73	9.15	13.12	10.79	9.19
Module Efficiency STC-ηm(%)	20.90			21.10			21.29			21.48		
Power Tolerance(W)	(0, +3%)											
Maximum System Voltage	1500V DC											
Maximum Series Fuse Rating	25 A											

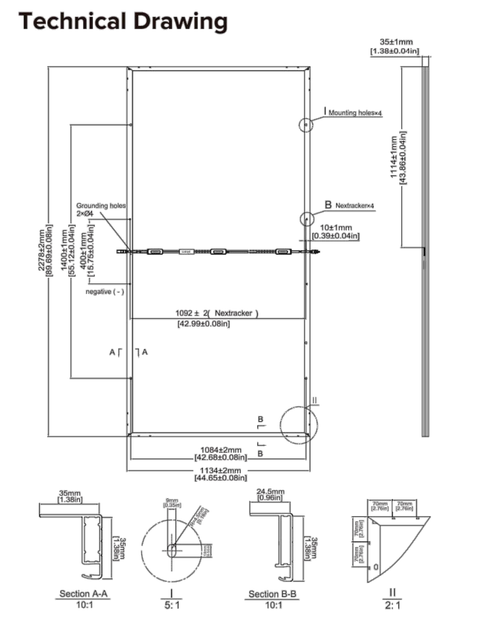
STC: Irradiance 1000 W/m² module temperature 25°C AM=1.5 NOCT: Irradiance 800W/m² ambient temperature 20°C module temperature 45°C wind speed: 1m/s Power measurement tolerance: +/-3%

Mechanical Specifications

External Dimension	2278 x 1134 x 35 mm
Weight	27.0 kg
Solar Cells	PERC Mono 182 x 91mm(144 pcs)
Front Glass	3.2 / mm AR coating tempered glass / low iron
Frame	Anodized aluminium alloy
Junction Box	IP68 / 3 diodes
Connector Type	QC4.10
Cable Type / Length	12 AWG PV Wire（UL）/1200 mm
Mechanical Load(Front)	5400 Pa / 113 psf*
Mechanical Load(Rear)	3600 Pa / 75 psf*

*Refer to SEG installation Manual for details

Technical Drawing

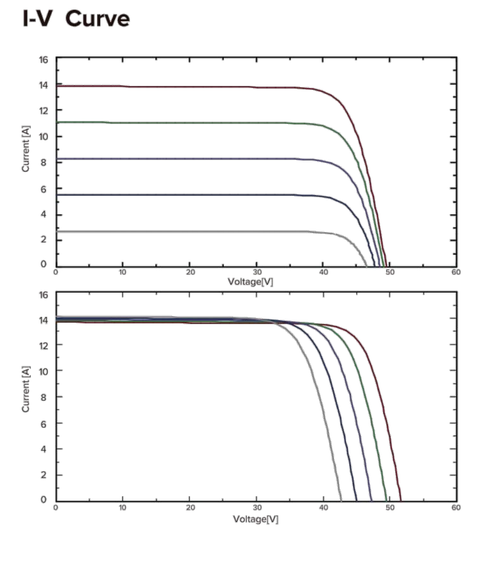


*Refer to SEG installation Manual for details

Packing Configuration

Container	20'GP	40'HQ
Pieces per Pallet	31	31
Pallets per Container	4	20
Pieces per Container	124	620

I-V Curve



Temperature Characteristics

Pmax Temperature Coefficient	-0.35 %/°C
Voc Temperature Coefficient	-0.27 %/°C
Isc Temperature Coefficient	+0.05 %/°C
Operating Temperature	-40°~+85 °C
Nominal Operating Cell Temperature (NOCT)	45±2 °C

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Specifications subject to technical changes © SEG_DS_2023-02_Rev01_EN

Technical Data *	Sunny Highpower PEAK3 125-US	Sunny Highpower PEAK3 150-US
Input (DC)		
Maximum array power	187500 Wp STC	225000 Wp STC
Maximum system voltage	1500 VDC	
MPP voltage range	710 V ... 1425 V	855 V ... 1425 V
MPP trackers	1	
Maximum operating input current	180 A	
Maximum input short-circuit current	325 A	
Output (AC)		
Nominal AC power	125000 W	150000 W
Maximum apparent power	125000 VA	150000 VA
Output phases / line connections	3 / 3-PE	
Nominal AC voltage	480 V	600 V
Compatible transformer winding configuration	Wye-grounded	
Maximum output current	151 A	
Rated grid frequency	60 Hz	
Grid frequency / range	50 Hz, 60 Hz / -6 Hz ... +6 Hz	
Power factor at rated power / adjustable displacement	1 / 0.0 leading ... 0.0 lagging	
Harmonics (THD)	<3%	
Efficiency		
CEC efficiency (preliminary)	98.5 %	98.5 %
Protection and safety features		
Ground fault monitoring: Riso / Differential current	● / ●	
DC reverse polarity protection	●	
AC short circuit protection	●	
Monitored surge protection (Type 2): DC / AC	● / ●	
Protection class / overvoltage category (as per UL 840)	I / IV	
General data		
Device dimensions (W / H / D)	770 / 830 / 444 mm (30.3 / 32.7 / 17.5 in.)	
Device weight	85 kg (185 lbs)	
Operating temperature range	-25°C ... +60°C (-13°F ... +140°F)	
Storage temperature range	-40°C ... +70°C (-40°F ... +158°F)	
Audible noise emission (full power @ 1m and 25°C)	< 65 dB(A)	
Internal consumption at night	< 5 W	
Topology	Transformerless	
Cooling concept	OptiCool (forced convection, variable speed fans)	
Enclosure protection rating	Type 4X (as per UL 50E)	
Maximum permissible relative humidity (non-condensing)	100%	
Additional information		
Mounting	Rack mount	
DC connection	Terminal lugs - up to 600 kcmil CU/AL	
AC connection	Screw terminals - up to 300 kcmil CU/AL	
LED indicators (Status/Fault/Communication)	●	
SMA Speedwire (Ethernet network interface)	● (2 x RJ45 ports)	
Data protocols: SMA Modbus / SunSpec Modbus / Webconnect	● / ● / ●	
OptiTrac Global Peak (shade tolerant MPP tracking)	●	
PID Mitigation Solution	○	
Integrated Plant Control / Q on Demand 24/7	● / ●	
Off-grid capable / SMA Fuel Save Controller compatible	● / ●	
SMA Smart Connected (proactive monitoring and service)	●	
Certifications (pending as of June 2018)		
Certifications and approvals	UL 1741, UL 1998, IEEE 1547, CAN/CSA-C22.2 No.62109	
FCC compliance	FCC Part 15, Class A	
Grid interconnection standards	UL 1741 SA - CA Rule 21, HECO Rule 14H, PRC-024-02	
Advanced grid support capabilities	L/HFRT, L/HVRT, Volt-VAr, Volt-Watt, Frequency-Watt, Ramp Rate Control, Fixed Power Factor	
Warranty		
Standard	5 years	
Optional extensions	10 / 15 / 20 years	
Type designation	SHP 125-US-20	SHP 150-US-20

* Preliminary data as of June 2018 ● Standard features ○ Optional features

SHP_PEAK3-AUS182612 Changes to products and services, including those resulting from country-specific requirements, as well as deviations from technical data are subject to change at any time without notice. SMA assumes no liability for typographical or other errors. Please visit www.SMA-Solar.com for the latest information.

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www.SMA-America.com
SMA America, LLC

Technical data	Sunny Tripower CORE1 33-US	Sunny Tripower CORE1 50-US	Sunny Tripower CORE1 62-US
Input (DC)			
Maximum array power	50000 Wp STC	75000 Wp STC	93750 Wp STC
Maximum system voltage		1000 V	
Rated MPP voltage range	330 V ... 800 V	500 V ... 800 V	550 V ... 800 V
MPPT operating voltage range		150 V ... 1000 V	
Minimum DC voltage / start voltage		150 V / 188 V	
MPP trackers / strings per MPP input		6 / 2	
Maximum usable operating input current / per MPP tracker		120 A / 20 A	
Maximum short circuit current per MPPT / per string input		32 A / 30 A	
Output (AC)			
AC nominal power	33300 W	50000 W	62500 W
Maximum apparent power	33300 VA	53000 VA	66000 VA
Output phases / line connections		3 / 3-(N)-PE	
Nominal AC voltage		480 V / 277 V WYE	
AC voltage range		244 V ... 305 V	
Maximum output current	40 A	64 A	80 A
Rated grid frequency		60 Hz	
Grid frequency / range		50 Hz, 60 Hz / -6 Hz ... +6Hz	
Power factor at rated power / adjustable displacement		1 / 0.0 leading ... 0.0 lagging	
Harmonics THD		<3 %	
Efficiency			
CEC efficiency	97.5%	97.5%	97.5%
Protection and safety features			
Load rated DC disconnect		●	
Load rated AC disconnect		●	
Ground fault monitoring: Riso / Differential current		● / ●	
DC AFCI arc-fault protection		●	
SunSpec PLC signal for rapid shutdown		●	
DC reverse polarity protection		●	
AC short circuit protection		●	
DC surge protection: Type 2 / Type 1+2		○ / ○	
AC surge protection: Type 2 / Type 1+2		○ / ○	
Protection class / overvoltage category (as per UL 840)		I / IV	
General data			
Device dimensions (W / H / D)		621 mm / 733 mm / 569 mm (24.4 in x 28.8 in x 22.4 in)	
Device weight		84 kg (185 lbs)	
Operating temperature range		-25 °C ... +60 °C (-13 °F ... +140 °F)	
Storage temperature range		-40 °C ... +70 °C (-40 °F ... +158 °F)	
Audible noise emissions (full power @ 1m and 25 °C)		65 dB(A)	
Topology		Transformerless	
Cooling concept		OptiCool (forced convection, variable speed fans)	
Enclosure protection rating		Type 4X, 3SX (as per UL 50E)	
Corrosivity classification according to IEC 61701		C3*	
Maximum permissible relative humidity (non-condensing)		100 %	
Additional information			
Mounting		Free-standing with included mounting feet	
DC connection		Amphenol UTX PV or H4Plus connectors	
AC connection		Screw terminals - 4 AWG to 4/0 AWG CU/AL	
LED indicators (Status / Fault / Communication)		●	
Network interfaces: Ethernet / WLAN / RS485		● (2 ports) / ▲ / ○	
Data protocols: SMA Modbus / SunSpec IEEE 1547 Modbus / Webconnect		● / ● / ●	
ShadeFix technology for string level optimization		●	
Intelligent string performance monitoring		●	
I-V curve diagnostic function		●	
Integrated Plant Control / Q on Demand 24/7		● / ●	
SMA Smart Connected (proactive monitoring and service support)		●	
Certifications			
Certifications and approvals		UL 1741, UL 1699B Ed. 1, UL 1998, CSA 22.2 107-1, PV Rapid Shutdown System Equipment, UL 3741	
FCC compliance		FCC Part 15 Class A	
Grid interconnection standards		IEEE 1547-2018, UL 1741 SA/SB - CA Rule 21, HECO SRD V2.0	
Advanced grid support capabilities		L/HFRT, L/HVRT, Volt-VAr, Volt-Watt, Frequency-Watt, Ramp Rate Control, Fixed Power Factor	
Warranty			
Standard		10 years	
Optional extensions		15 / 20 years	
Type designation	STP 33-US-41	STP 50-US-41	STP 62-US-41

○ Optional features ● Standard features – Not available ▲ Subject to availability Data at nominal conditions - status: 08/2023 * ≥ 2 km from the coast

Accessories

- SMA Data Manager M EDMM-US-10
- SMA Sensor Module MD.SEN-US-40
- Universal Mounting System UMS_KIT-10
- AC Surge Protection Module Kit AC_SPD_KIT1-10, AC_SPD_KIT2_T1T2; DC Surge Protection Module Kit DC_SPD_KIT4-10, DC_SPD_KIT5_T1T2

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www.SMA-America.com
SMA America, LLC

Mayfield Renewables
2210 NW Hayes Ave
Corvallis, OR 97333
541.754.2001

STAMP:

NOT FOR CONSTRUCTION

CITY OF GALENA SOLAR
GALENA, AK 99741

PROJECT NUMBER: 22-3270C

SCALE: NTS

ORIGINAL SIZE 24"X36"
SHEET SIZE ARCH "D"
0 ½" 1"

REV	ISSUED	BY	✓	DESCRIPTION
	11/30/22	GK	BB	75% REVIEW SET
	2/1/24	GK	BB	CD IFP – ISSUED FOR PERMIT

SHEET NO. & NAME:
E-5.0
DATA SHEETS

PRINT DATE: 2/8/2024 5:54 PM DWG LOCATION: g:\shared drives\Design\Projects\tanana chiefs conference\22-3270c – village of galena\working set\working set\E-5.0 DATA SHEETS.dwg

TITAN DUO

GALENA

---- GALENA, AK 99741

SOLAR PHOTOVOLTAIC ARRAY

PROJECT NUMBER: 220925

CONSTRUCTION SET

APPROVED

REV: A
2/16/2023

CUSTOMER

Tanana Chiefs Conference

TANANA CHIEFS
122 1ST AVE
FAIRBANKS, AK 99701
(P) 907-452-8251

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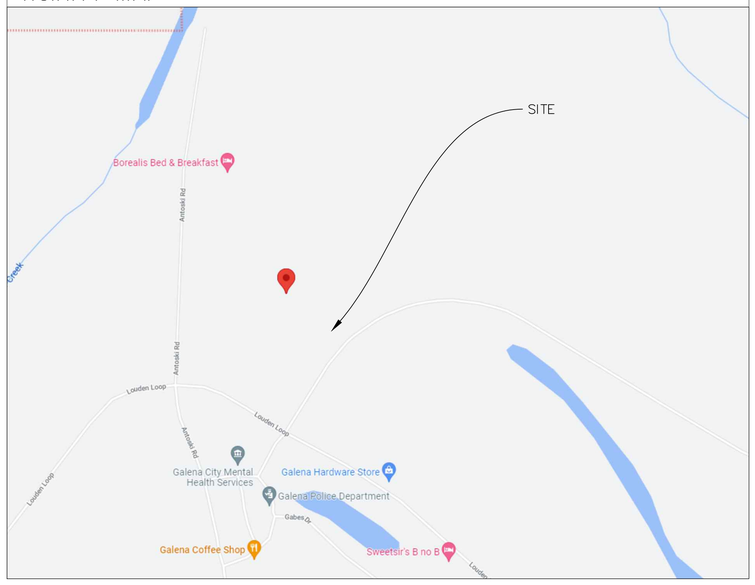
STRUC. ENGINEER OF RECORD

the jdi group
architects & engineers

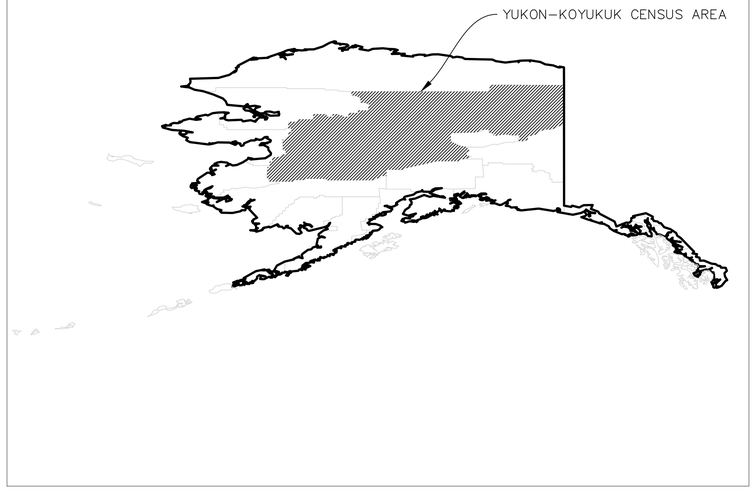
360 W. DUSSEL DR.
MAUMEE, OH 43537
|P| 419.725.7161
|F| 419.725.7160

VICINITY MAP

COORDINATES: 64.753220, -156.876862



COUNTY MAP



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G-100	PROJECT NOTES	A
G-200	PV MODULE SPEC SHEET	A
G-300	RACKING DIMENSIONS	A
G-301	RACKING DIMENSIONS	A
G-302	4-RAIL TRANSVERSE BRACE: 92.5" SPANS	A
LAYOUT		
L-100	SITE LAYOUT	A
L-150	ROW TECHNICAL DATA	A
L-200	SITE FOUNDATIONS: OVERVIEW	A
L-300	SITE TABLES: OVERVIEW	A
L-400	SITE TRANSVERSE BRACES: OVERVIEW	A
L-500	SITE CABLES: OVERVIEW	A

FOUNDATION EMBEDMENT DATA	
HELIX SIZE	EMBEDMENT DEPTH
3" X 110"	104"

PROJECT SPECIFICATIONS	
GENERAL	
SOLAR PANEL	Q CELLS
PANEL WATTAGE	575 W
PANEL STYLE	156 CELL
PANEL QTY	88
SITE WATTAGE (KW)	50.60
TILT ANGLE	40°
FRONT LIP CLEARANCE	36"

SITE PLAN

AERIAL MAP PROVIDED FOR REFERENCE ONLY

DRAWING NUMBER: G-000

GENERAL NOTES

1. VERIFY ONSITE CONDITIONS, TO VERIFY CONFORMANCE TO CONSTRUCTION DOCUMENTATION. VERIFY ALL FIELD DIMENSIONS AND THE SHAPES AND SIZES OF STRUCTURAL MEMBERS TO ENSURE THE PROPER STRENGTH, FIT, AND LOCATION OF THE STRUCTURAL WORK. CONDITIONS WHICH MAY PREVENT THE PROPER EXECUTION AND COMPLETION OF THE WORK MUST BE REPORTED TO APA SOLAR, IN WRITING, BEFORE RESUMING WORK.
2. APA SOLAR IS NOT RESPONSIBLE FOR WORK CONDUCTED BY OTHER CONTRACTORS OR FIRMS, EXCEPT WHERE SPECIFICALLY CONTRACTED BY APA SOLAR. THIS INCLUDES WORK WITHIN THE SCOPE OF APA SOLAR CONTRACT, BUT CONDUCTED BY OTHERS WITHOUT THE EXPLICIT APPROVAL BY APA SOLAR.
3. WORK DONE BY OTHERS INCLUDE, EXCEPT WHERE EXPLICITLY CONTRACTED TO DO SO WITHIN THE CONTRACT DOCUMENTS.
   - 3.1. SITE WORK AND DEVELOPMENT, INCLUDING BUT NOT LIMITED TO GRADING, CONSTRUCTION ROADS, FENCING, SEEDING, EROSION CONTROL.
   - 3.2. ALL ELECTRICAL WORK.
   - 3.3. ALL GROUNDING AND BONDING.
   - 3.4. ALL SHADING AND PRODUCTION ANALYSIS.
4. THE APA SOLAR CONSTRUCTION SET IS DESIGNED FROM PV MODULE DATA SHEETS PROVIDED BY THE CUSTOMER. CUSTOMER IS RESPONSIBLE FOR VERIFYING THAT THE PV MODULES DELIVERED TO SITE MATCH DATA SHEETS PROVIDED TO APA SOLAR. APA SOLAR IS NOT RESPONSIBLE FOR PV MODULE DISCREPANCIES DUE TO MISMATCH BETWEEN PROVIDED SPEC SHEETS AND ACTUAL MODULES.
5. SEE MANUFACTURER'S DRAWINGS AND INSTALLATION MANUAL FOR ADDITIONAL INFORMATION ON THE RACK ASSEMBLIES.
6. INSTALLATION CONTRACTOR RESPONSIBLE FOR ALL CONSTRUCTION EQUIPMENT, METHODS, AND SEQUENCES.
7. CUSTOMER IS RESPONSIBLE FOR VERIFYING CORROSION COMPATIBILITY WITH FOUNDATION POSTS.

ADDITIONAL DOCUMENTATION

ADDITIONAL ENGINEERING DOCUMENTATION DEVELOPED FOR THIS PROJECT & GENERAL DOCUMENTATION INTENDED TO BE USED ON THIS PROJECT:

1. HELICAL FOUNDATION TEST REPORT
2. PV MODULE INSTALLATION MANUAL, (PROVIDED BY CUSTOMER)
3. APA RACKING INSTALLATION MANUAL
4. APA FIELD SIGN OFF AND QA CHECKLIST

CONSTRUCTION

1. LOCATION OF UNDERGROUND UTILITIES SHALL BE VERIFIED PRIOR TO START OF WORK.
2. INSTALLATION CONTRACTORS ARE RESPONSIBLE FOR REVIEWING, UNDERSTANDING, AND FOLLOWING ALL DIRECTIONS, MEASUREMENTS, AND GUIDELINES CONTAINED IN THIS DRAWING PACKET AND IN ANY DOCUMENTATION INTENDED TO BE USED IN CONJUNCTION WITH THIS PACKET.
3. GOOD INDUSTRY PRACTICES ARE EXPECTED TO BE USED IN THE ASSEMBLY OF ALL STRUCTURAL COMPONENTS OF THIS PROJECT.
4. ALL WORK TO BE DONE IN A WORKMAN-LIKE MANNER.
5. ALL AREAS SHOULD BE CLEANED BEFORE LEAVING. REFER TO THE CONTRACT DOCUMENTS FOR PROJECT SPECIFIC OBLIGATIONS.
6. ALL INSTALLATION CONTRACTORS MUST COMPLY WITH APPLICABLE SAFETY REQUIREMENTS WHILE ON THE WORK SITE.
7. CARE SHOULD BE USED WHEN HANDLING PV MODULES. ANY PANELS EXPOSED TO SUNLIGHT SHOULD BE TREATED AS IF IT IS FULLY CHARGED. MOST PANELS ARE CAPABLE OF PRODUCING 600VDC DURING DAYLIGHT HOURS.
8. FOUNDATION POST TOLERANCES
   - 8.1. ± 1" VARIATION IN HEIGHT.
   - 8.2. ± 1" VARIATION IN NORTH-SOUTH DIRECTION.
   - 8.3. ± 1" VARIATION IN EAST-WEST DIRECTION.
   - 8.4. ± 2° VARIATION IN POST PLUMBNESS.
9. ACCURATELY LOCATE AND INSTALL FOUNDATION POSTS BY SUCH METHODS AND EQUIPMENT SO AS NOT TO IMPAIR THE FOUNDATION STRENGTH OR DAMAGE FOUNDATIONS OR ADJACENT CONSTRUCTION.
6. INSTALLATION CONTRACTOR RESPONSIBLE FOR ALL CONSTRUCTION EQUIPMENT, METHODS, AND SEQUENCES.
7. DISTURBED GALVANIZED SURFACES SHALL BE TOUCHED UP WITH AN APPROVED COLD GALVANIZING COMPOUND.
8. GOOD INDUSTRY PRACTICE SHALL BE USED IN THE ASSEMBLY OF ALL STRUCTURAL COMPONENTS OF THIS PROJECT.

STEEL

1. ALL FASTENERS SHALL BE THE TYPE AND SIZE INDICATED ON THE DRAWINGS.
2. ALL BOLTS, WASHERS, AND NUTS SHALL BE STAINLESS STEEL OR CORROSION-RESISTANT EQUIVALENT.
3. STRUCTURAL SHAPES, TUBING, AND COLD-FORMED SHAPES SHALL CONFORM TO THE ASTM GUIDELINES INDICATED WITHIN THE STAMPED STRUCTURAL PERMIT PACKAGE.
4. ALL STRUCTURAL MATERIALS SHALL HAVE ADEQUATE CORROSION PROTECTION FOR THE ENVIRONMENT. ABOVE GRADE STRUCTURAL STEEL SHALL BE HOT DIPPED GALVANIZED PER ASTM A123 OR AN APPROVED EQUIVALENT SHALL BE EVALUATED BY THE ENGINEER.
5. SEE CONNECTIONS PRINT FOR FASTENER TORQUE VALUES.

BRACING

1. BRACING SHALL BE INSTALLED BETWEEN EVERY SET (NORTH/SOUTH) OF FOUNDATION POSTS.
2. CABLE BRACING SHALL BE INSTALLED IN AN CROSSING FORMATION BETWEEN ADJACENT REAR POSTS (EAST/WEST) AT A MINIMUM OF THE FIRST TWO AND LAST TWO BAYS OF EACH ROW.
3. ADDITIONAL BRACING MAY BE REQUIRED BY THE ENGINEER, PER THE STRUCTURAL PERMIT PACKET.
4. REFER TO STRUCTURAL PERMIT PACKAGE FOR TYPICAL END OF ROW CONDITIONS REGARDING CABLE BRACING.
5. CABLE BRACING SHALL BE INSTALLED TAUT. IT IS A MOTION LIMITING ELEMENT.

FOUNDATION POSTS

1. STRUCTURAL PRINTS CONTAIN ONLY MAXIMUM ALLOWABLE SPANS. FOR FIELD CONSTRUCTION FOUNDATION SPACING, REFER TO DIMENSIONS IN CONSTRUCTION SET.
2. CUSTOM FOUNDATION SPACING MAY BE PRESENT AT ENDS OF ROW, DEPENDENT ON ROW LENGTH.
3. START OVERHANG DIMENSIONS MEASURED FROM PANEL END TO FIRST FOUNDATION SET.
4. ANY/ALL CUSTOM FOUNDATION SPACING AND CUSTOM FOUNDATION CABLES SHALL BE TO THE FAR EAST AND/OR FAR WEST, AS INDICATED IN CONSTRUCTION SET.

SITE SURVEYING

1. CUSTOMER SHALL ENSURE COMPLETION OF NECESSARY EXCAVATION AND FURNISH SURVEY POINTS, LINES, AND/OR LEVELS AS REQUIRED TO INSTALL FOUNDATIONS AT THEIR INDICATED LOCATIONS.
2. SURVEY POINTS SHALL MARK FOUNDATION LOCATIONS, TO FOLLOW THE SITE SPECIFIC NEEDS FOR THE SYSTEM BEING INSTALLED. NORTH AND SOUTH LOCATIONS WHEN APPLICABLE.
3. SURVEY POINTS ARE RELATIVE TO EACH OTHER. ANY ABSOLUTE SURVEY REQUIREMENTS (GPS, ETC.) OR POINTS RELATIVE TO FEATURES NOT INDICATED BY APA SOLAR (DISTANCE FROM EASEMENTS, OR FENCELINES) ARE THE RESPONSIBILITY OF THE CUSTOMER.
4. IT IS THE RESPONSIBILITY OF THE CUSTOMER TO VERIFY EASEMENTS, SETBACK, FIRE LANES, AND OTHER DISTANCES REQUIRED BY THE AHJ. FAILURE TO PROPERLY VERIFY AND MARK SUCH DISTANCES MAY RESULT IN PROJECT DELAYS AND ADDITIONAL COSTS TO BE COVERED BY THE CUSTOMER.
5. UNDER SPECIFIC CIRCUMSTANCES, TERRAIN AND SITE PROPERTIES MAY INDICATE TO PROJECT ENGINEERS THE NEED FOR ADDITIONAL SURVEY POINTS.
6. CAD DATA IS MASTER, UNLESS OTHERWISE NOTED.

ELECTRICAL

1. UNLESS SPECIFIED BY CONTRACT DOCUMENTS, APA SOLAR IS NOT RESPONSIBLE FOR ANY WORK CONCERNING THE ELECTRICAL SYSTEMS OR COMPONENTS, INCLUDING BUT NOT LIMITED TO, ELECTRICAL INSTALLATION AS THEY PERTAIN TO THE RACKING HARDWARE, PV MODULES, OR THE SITE.
2. APA SOLAR ALSO NOT RESPONSIBLE FOR GROUNDING AND BONDING COMPONENTS, REQUIREMENTS AND INSTALLATION METHODS.
3. ELECTRICAL COMPONENTS, INCLUDING THOSE FOR BONDING, GROUNDING, AND WIRE MANAGEMENT, PROVIDED BY APA SOLAR (GRATIS OR PAID), ARE PROVIDED AS COMPONENTS ONLY. APA SOLAR IS NOT RESPONSIBLE FOR THEIR USAGE OR INSTALLATION AND PROVIDE NO GUARANTEE TO THEIR LIFE OR ADHERENCE TO APPLICABLE BUILDING CODES.
4. ANY DRAWING, NOTE, OR DOCUMENTATION PROVIDED BY APA SOLAR, REFERENCING ANY ELECTRICAL, GROUNDING, OR BONDING COMPONENT OR INSTALLATION IS PROVIDED AS REFERENCE ONLY, AND SHALL NOT BE TAKEN AS PROOF OF APA SOLAR RESPONSIBILITIES OR LIABILITY, EXCEPT WHERE EXPLICITLY DEFINED IN THE CONTRACT DOCUMENTS.
5. MOUNTING OF ELECTRICAL EQUIPMENT TO APA SOLAR RACKING, WHEN NOT EXPLICITLY PREAPPROVED BY APA SOLAR, IS FORBIDDEN. SUCH MOUNTING MAY BE APPROVED BY APA SOLAR, UPON REQUEST AND WRITTEN APPROVAL BY AP ALTERNATIVE ENGINEERS.

SPECIAL INSPECTION

SPECIAL INSPECTIONS ARE NOT REQUIRED BY APA SOLAR OR THE STRUCTURAL ENGINEER OF RECORD, THE JDI GROUP. WHERE REQUIRED BY OWNER, CUSTOMER, AND/OR AUTHORITY HAVING JURISDICTION, MINIMUM INSPECTION SHALL INCLUDE THE FOLLOWING NOTES AND TABLE BELOW.

1. ALL SPECIAL INSPECTORS SHALL BE RETAINED BY OWNER/CUSTOMER. THE EXTENT OF THE INSPECTION SHALL COMPLY WITH THE CONTRACT DOCUMENTS, THE BUILDING CODE REQUIREMENTS, AND LOCAL JURISDICTION. IT IS THE OWNER/CUSTOMER'S RESPONSIBILITY TO GIVE PROPER NOTIFICATION TO THE SPECIAL INSPECTOR AND PROCEED WITH THE WORK ONLY AFTER THE SPECIAL INSPECTOR'S APPROVAL.
2. FAILURE TO NOTIFY THE SPECIAL INSPECTOR MAY RESULT IN OWNER/CUSTOMER HAVING TO REMOVE WORK FOR THE PURPOSE OF INSPECTION AT THE OWNER'S/CUSTOMERS EXPENSE.
3. SPECIAL INSPECTORS SHALL KEEP RECORDS OF ALL INSPECTIONS. RECORDS SHALL BE FURNISHED TO THE OWNER, ENGINEER OF RECORD, AND LOCAL JURISDICTION AS REQUIRED.

SPECIAL INSPECTION & TESTING SCHEDULE		
	CONTINUOUS	PERIODIC
STRUCTURAL STEEL FABRICATION		
MATERIAL IDENTIFICATION		X
HIGH STRENGTH BOLTS – MATERIAL IDENTIFICATION OF BOLTS, NUTS, & WASHERS		X
WELD FILLER MATERIALS – IDENTIFICATION AND CONFIRMATION OF COMPLIANCE WITH DESIGN DOCUMENTS		X
STRUCTURAL STEEL ERECTION		
MATERIAL IDENTIFICATION		X
INSTALLATION OF HIGH STRENGTH BOLTS		X
WELDED CONNECTIONS		X
MEMBER SIZES AND PLACEMENT		X
GENERAL CONFORMANCE WITH DESIGN DOCUMENTS		X
DRIVEN DEEP FOUNDATION ELEMENTS		
VERIFY ELEMENT MATERIALS, SIZE, LENGTHS COMPLY WITH DESIGN DOCUMENTS	X	
DETERMINE CAPACITIES OF TEST ELEMENTS & CONDUCT ADDITIONAL LOAD TESTS, AS REQ.	X	
OBSERVE DRIVING OPERATIONS, MAINTAIN RECORDS	X	
VERIFY PLACEMENT LOCATIONS & PLUMBNESS	X	

THIS TABLE PER IBC 2012, TABLE 1705

ABBREVIATIONS

ADMOD	ADVANCED MODULAR GROUND MOUNT
AHJ	AUTHORITY HAVING JURISDICTION
ALT	ALTERNATE, ALTERNATIVE
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
APA	APA SOLAR, LLC
APPD	APPROVED
APPROX	APPROXIMATE
ASTM	AMERICAN SECTION OF THE INTERNATIONAL ASSOCIATION FOR TESTING MATERIALS
AZ	AZIMUTH
BLDG	BUILDING
CAD	COMPUTER AIDED DESIGN
CMB	COMBINER BOX
DC	DIRECT CURRENT
DIA	DIAMETER
DWG	DRAWING
(E)	EXISTING
EOR	ENGINEER OF RECORD
EW	EAST TO WEST
G.C.	GENERAL CONTRACTOR
G,GND	GROUND
GALV	GALVANIZED
IBC	INTERNATIONAL BUILDING CODE
ID	INSIDE DIAMETER
KW	KILOWATT
MFG	MANUFACTURER
MIN	MINIMUM
MISC	MISCELLANEOUS
MTD	MOUNTED
MW	MEGAWATT
(N)	NEW
NEC	NATIONAL ELECTRIC CODE
NO	NUMBER
NS	NORTH TO SOUTH
OD	OUTSIDE DIAMETER
PE	PROFESSIONAL ENGINEER
PV	PHOTOVOLTAIC
REV	REVISION
SCH	SCHEDULE
SF	SQUARE FOOT/FEET
SHCS	SOCKET HEAD CAP SCREW
SPEC	SPECIFICATION
SS	STAINLESS STEEL
STD	STANDARD
TBD	TO BE DETERMINED
TYP	TYPICAL
UL	UNDERWRITERS LABORATORIES
VDC	VOLTS DIRECT CURRENT
W	WATT

LEGEND

FENCELINE
EASEMENT
PROPERTY LINE
CARTRIDGE (2 PV MODULES)
FOUNDATION POST (FOUNDATION)
CABLE BRACING
SURVEY POINTS
REVISION CLOUD
REVISION ID TAG
COMPRESSION TEST LOCATION
TENSION TEST LOCATION
DRIVABILITY TEST LOCATION
FOUNDATION POST NUMBER
ROW NUMBER

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122 1ST AVE
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(P) 419.267.5280
(F) 419.267.5214
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RACKING TYPE

TITAN DUO

STRUCTURAL ENGINEER OF RECORD

the jdi group
architects & engineers
360 W. DUSSEL DR.
MAUMEE, OH 43537
|P| 419.725.7161 |F| 419.725.7160

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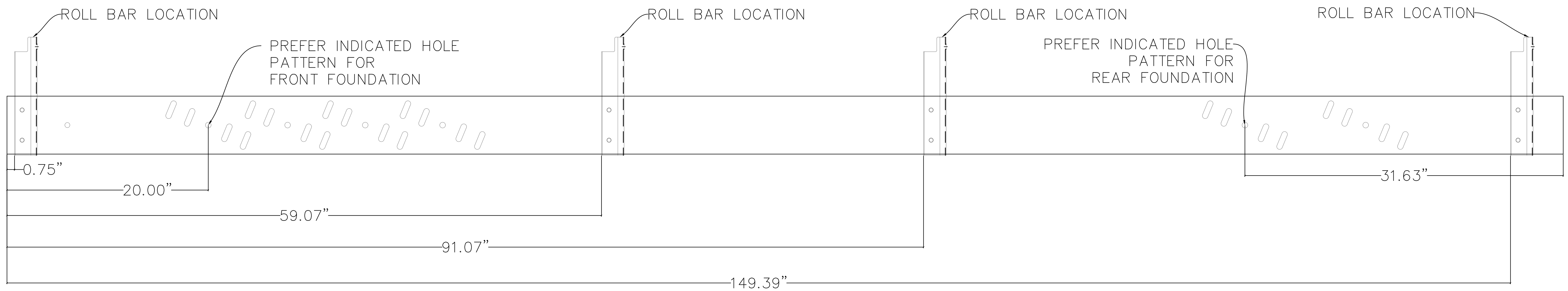
REV.	DESCRIPTION	DATE
A	INITIAL RELEASE	2/16/2023

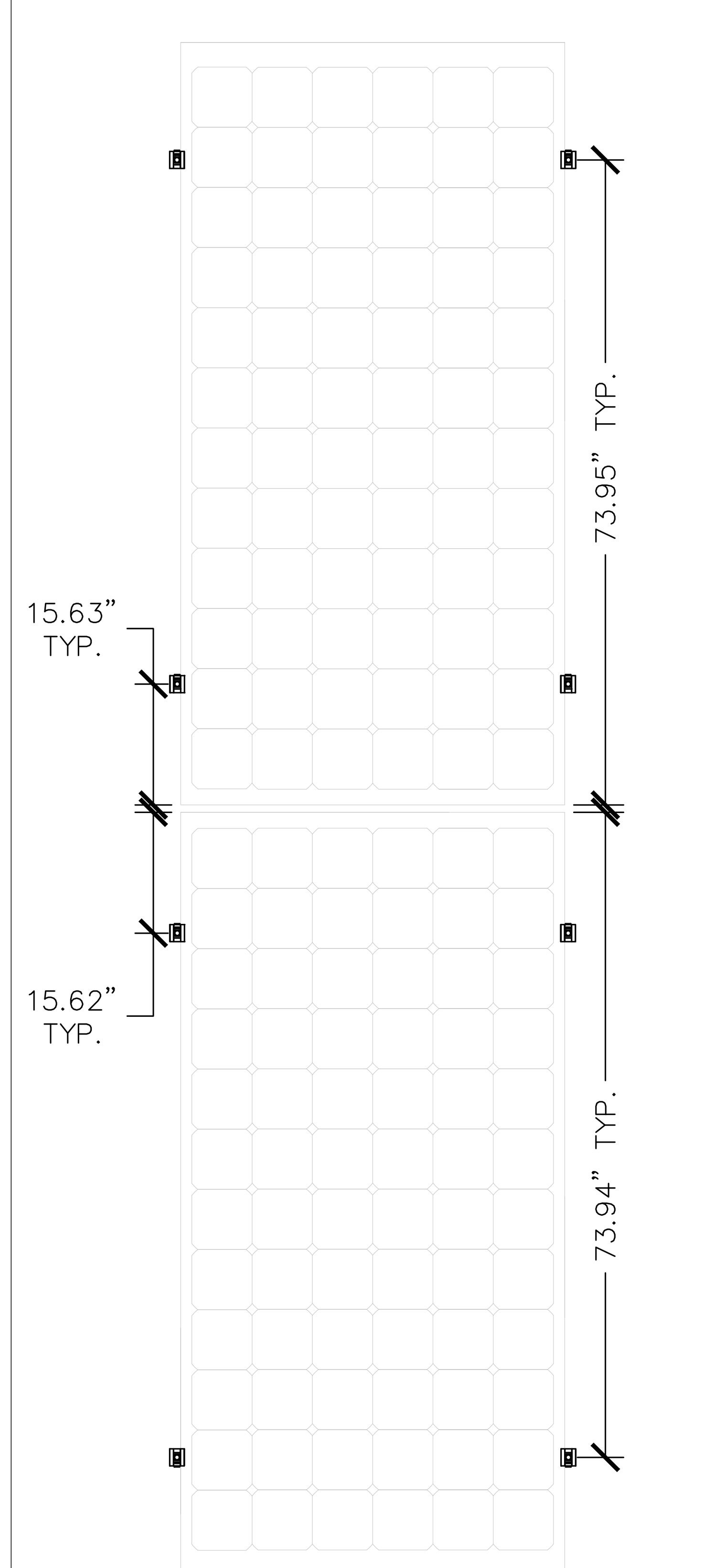
APPROVED

DRAWN	REVIEWED	APPROVED	SIZE
AB	MR	JR	D

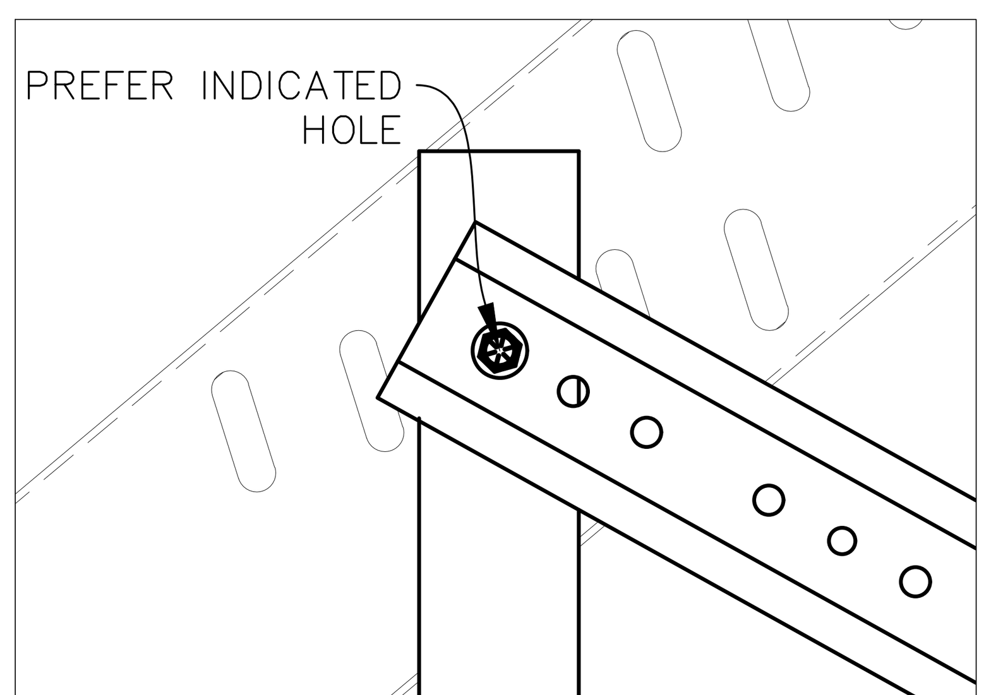
SHEET NAME: PROJECT NOTES
PROJECT NUMBER: 220925
DRAWING NUMBER: G-100
REV.: A



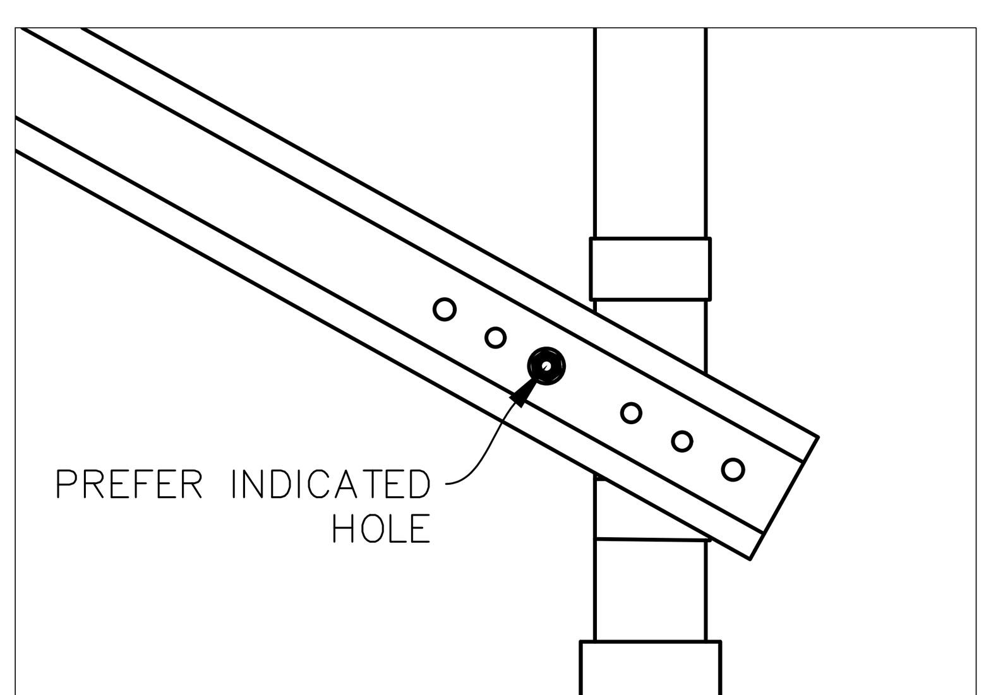
D1 CHORD CONNECTION POINTS



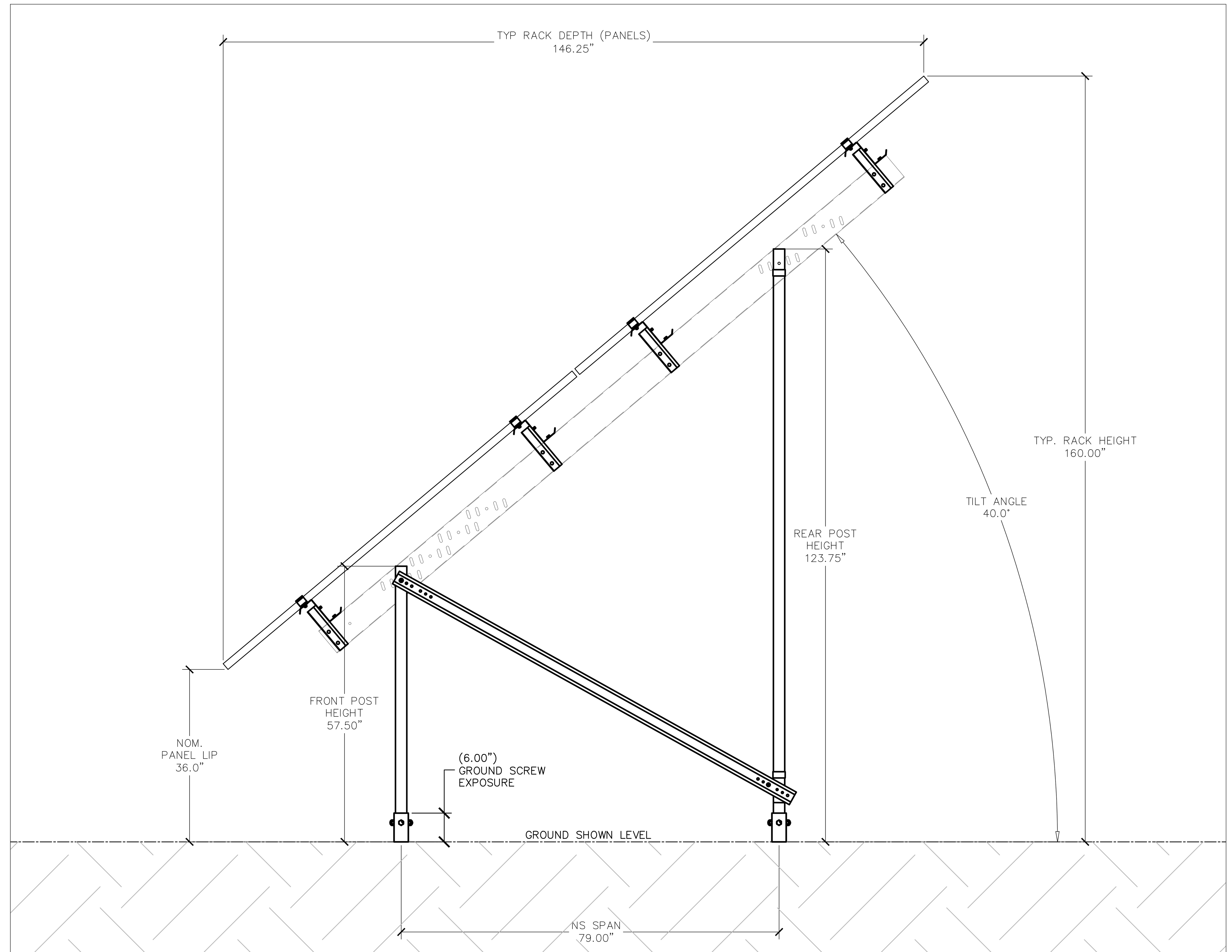
A2 PANEL SET CLAMP LOCATIONS



B3 KNEE BRACE / FRONT FOUNDATION



A3 KNEE BRACE / TUBE CLAMP HOLE



A4 RACK SETUP DIMENSIONS

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the jdi group
architects & engineers

360 W. DUSSEL DR.
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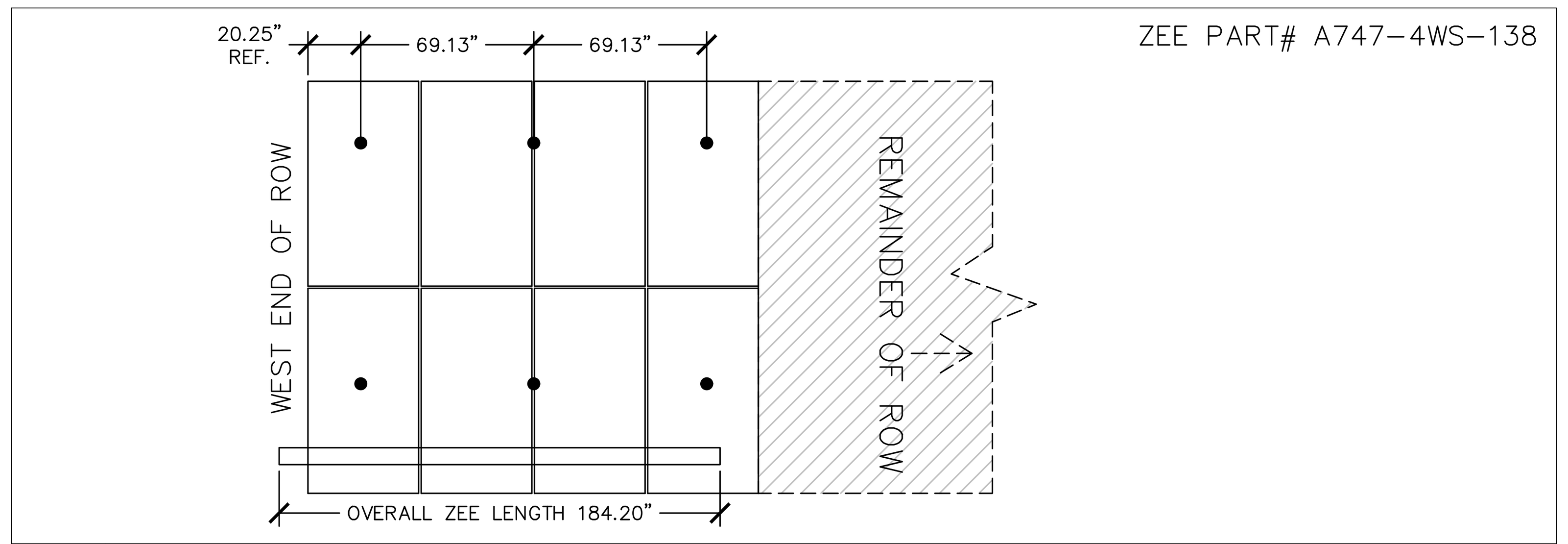
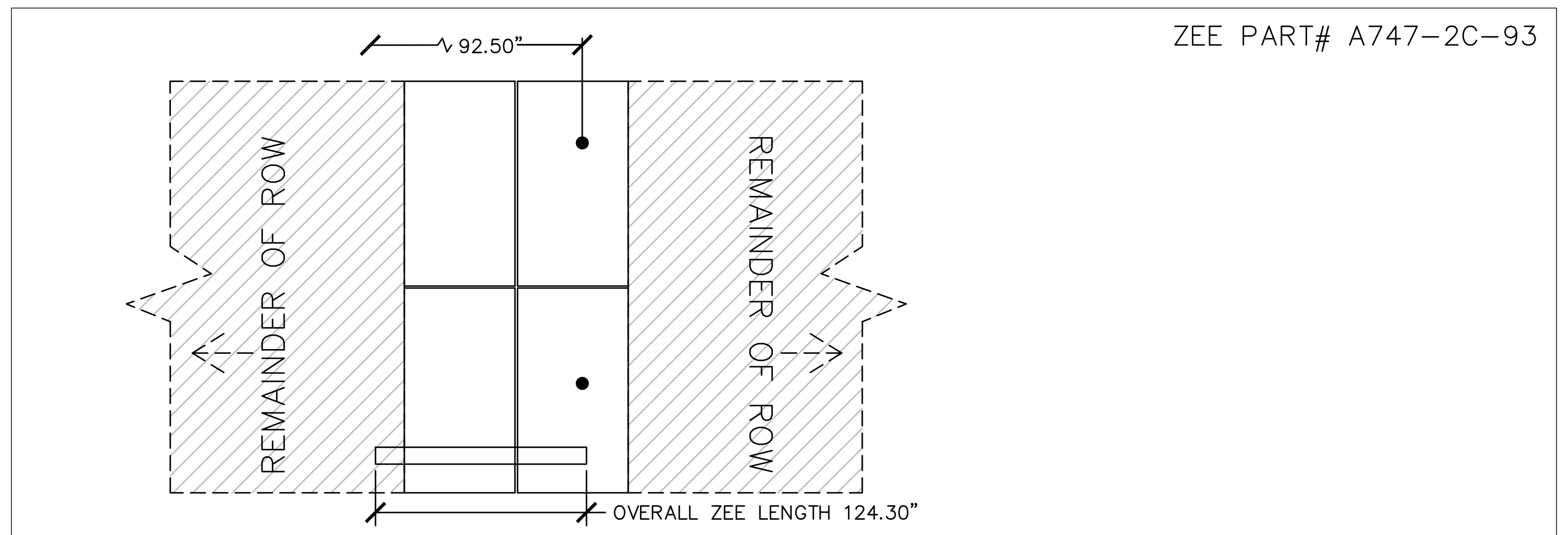
SHEET NAME
RACKING DIMENSIONS

PROJECT NUMBER
220925

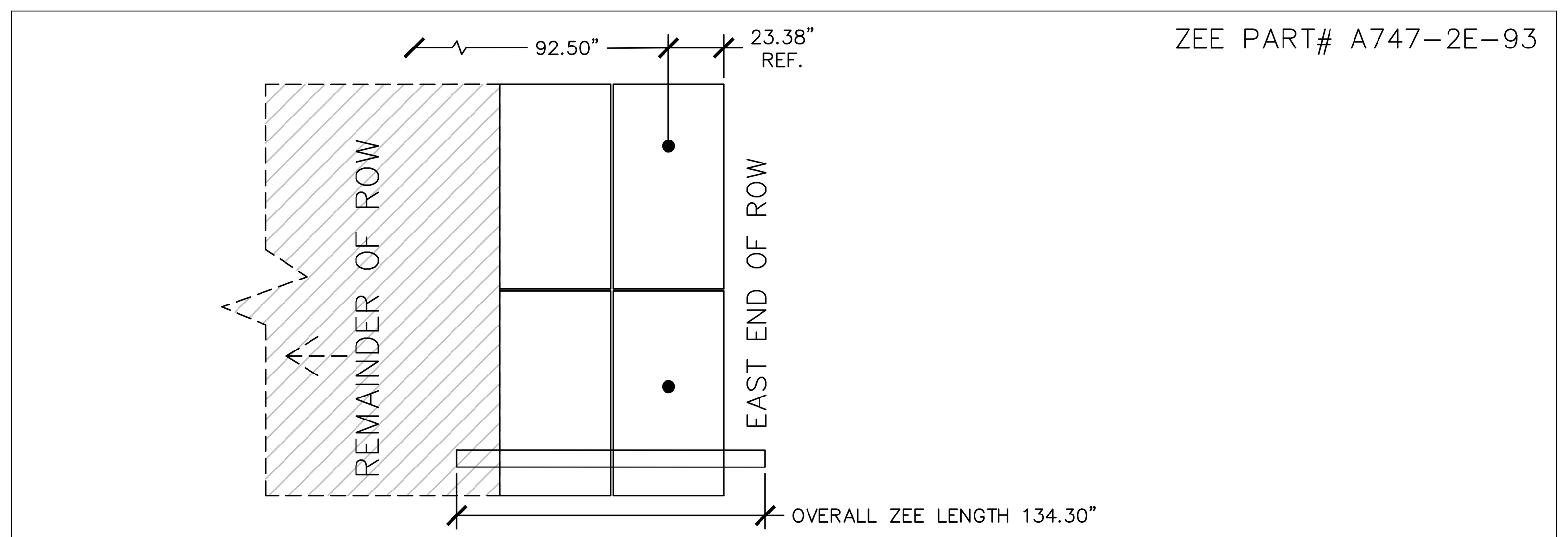
DRAWING NUMBER: G-300
REV.: A



E1 TABLE DIMENSIONS: 4WS



D1 TABLE DIMENSIONS: 2C



C1 TABLE DIMENSIONS: 2E

NOTES

1. PLACE END CLAMPS AT ALL ZEE SPLICES.
2. TABLE NUMBERS INDICATE HOW MANY MODULE SETS ARE BETWEEN END CLAMPS.
3. THE TABLE NUMBER IS WITHIN THE ZEE PURLIN PART NUMBER.

REF.EXAMPLE: ZEE PART# A747-(2C)-93

TABLE NUMBER

PROJECT BRACE DIMENSIONS

	SHORT E/W (SE69)	LONG E/W (SE93)
LENGTH	116.50"	131.25"
DIAMETER	1/8"	1/8"
PART #	A354-495	A354-510
COLOR CODE	YELLOW	RED
SPAN	69.13" E/W	92.50" E/W

1. E/W CROSS BRACING REAR FOUNDATIONS ONLY
2. BRACE ALL EW SPANS CROSSING CABLE BRACES.
3. PLACE KNEE BRACE BETWEEN EVERY NORTH-SOUTH FOUNDATION SPAN.
4. SEE ROW TECHNICAL DATA SHEETS L-150 AND BRACING PLAN L-500 FOR EXACT BRACING LOCATIONS.

A4 BRACING LENGTHS/USEAGE

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STRUCTURAL ENGINEER OF RECORD

the jdi group
architects & engineers

360 W. DUSSEL DR.
MAUMEE, OH 43537
|P| 419.725.7161 |F| 419.725.7160

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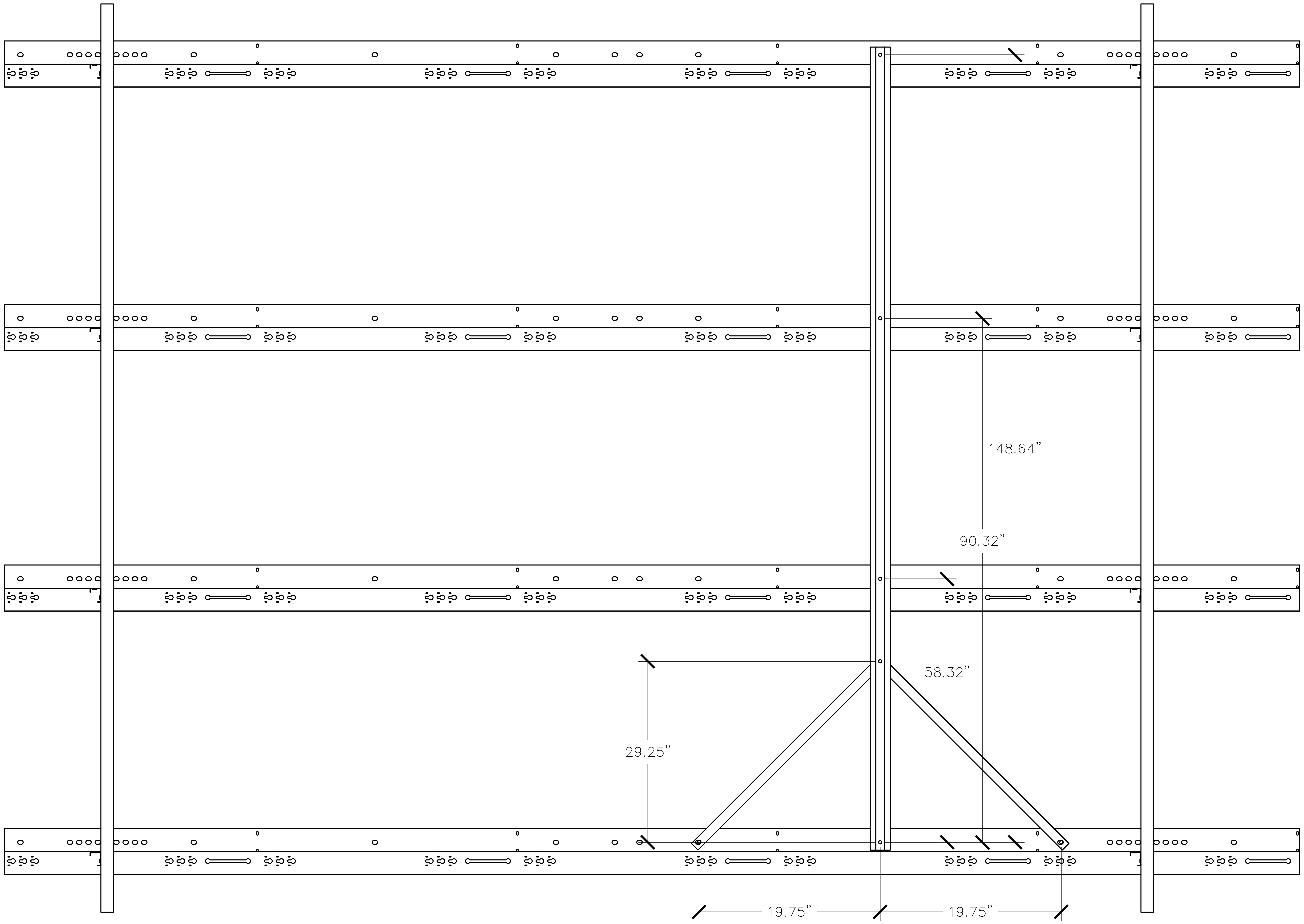
SHEET NAME: RACKING DIMENSIONS

PROJECT NUMBER: 220925

DRAWING NUMBER: G-301 REV. A



A1 TRANSVERSE BRACE ATTACHMENT

VIEW SHOWN FROM UNDERNEATH RACK

FOR 92.50" SPANS: ALIGN FRONT TRANSVERSE BRACE HOLE TO INDICATED HOLE ON THE ZEE. THEN ATTACH STRAPS TO THE HOLES 19.75" FROM THE INDICATED HOLE ON THE ZEE. THEN ATTACH BOTH STRAPS TO THE TRANSVERSE BRACE HOLE 29.25" FROM THE FRONT TRANSVERSE BRACE HOLE.

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(F) 419.267.5214
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STRUCTURAL ENGINEER OF RECORD

the jdi group
architects & engineers

360 W. DUSSEL DR.
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|P| 419.725.7161 |F| 419.725.7160

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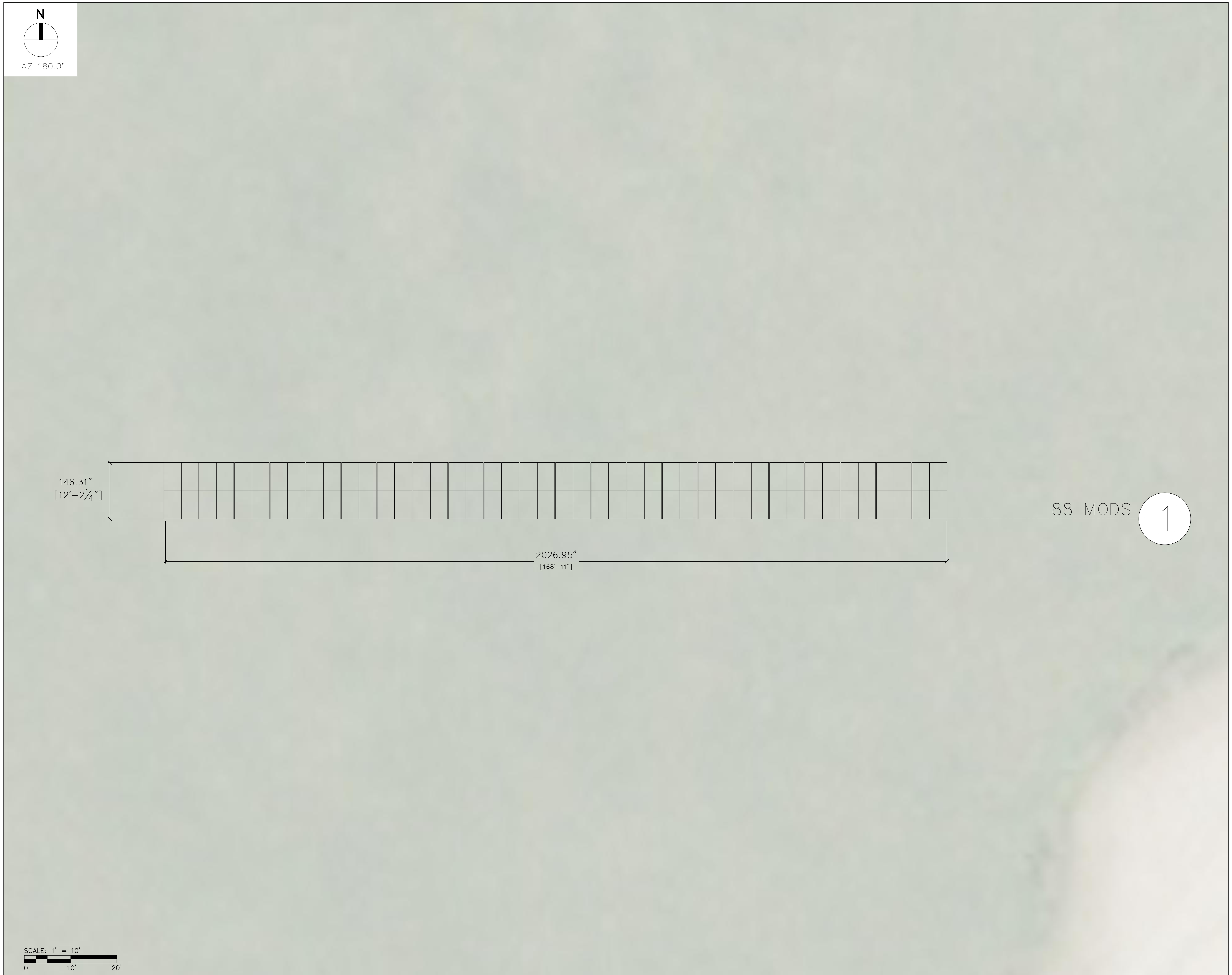
AB	MR	JR	D

SHEET NAME: 4-RAIL TRANSVERSE BRACE: 92.50" SPANS

PROJECT NUMBER: 220925

DRAWING NUMBER: G-302

REV.: A



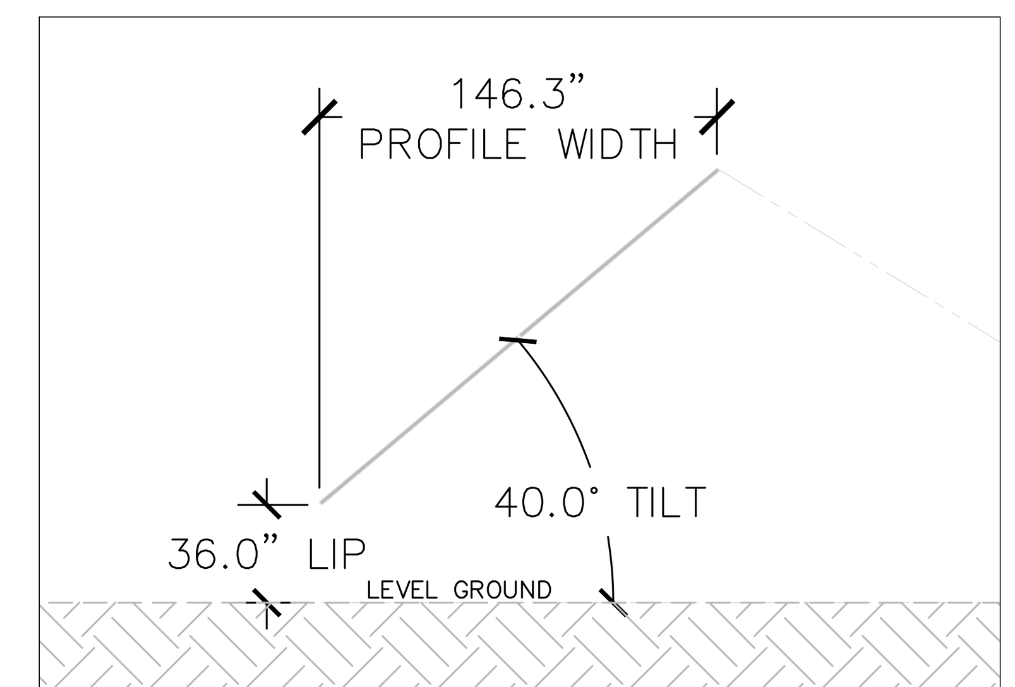
A1 SITE LAYOUT

NOTES

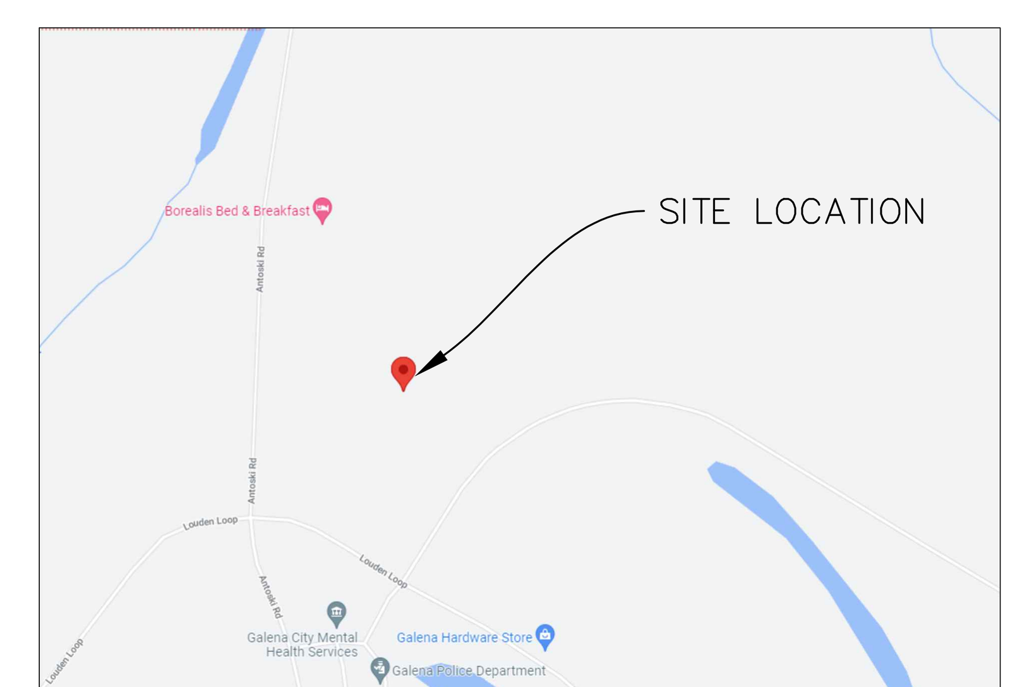
1. ADDITIONAL CLEARANCES, AISLES, OFFSET, FIRE ACCESS ROADS, INVERTORS, & PADS AS REQUIRED
2. ADDITIONAL INFORMATION REQUIRED TO CONSIDER SHADING IN AFFECTED AREAS
3. LOCATION AND VERIFICATION OF SETBACK DESIGNATIONS REQUIRED
4. LOCATION OF PROXIMITY FENCE IN RELATION TO SURVEYED AREA NOT KNOWN
5. TOPOGRAPHICAL FEATURES/CONCERNS, FROST PENETRATION DEPTH, SOIL TYPES/FEATURES NOT KNOWN

PROJECT TOTALS	
TOTAL DC SYSTEM SIZE (KW)	50.60
TOTAL MODULE COUNT	88

PROJECT SUMMARY	
RACKING TILT	40°
RACKING MODEL	TITAN DUO
MODULE MODEL	Q CELLS
MODULE TYPE	156 CELL
MODULE DIMENSIONS	95.12 X 44.65 X 1.38
ARRAY AZIMUTH	180° S
MODULE DC RATING (W)	575
NO. MODULES	88
DC SYSTEM SIZE (KW)	50.60
NO. ROWS	1



B6 RACK PROFILE



A6 KEY MAP

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(P) 419.267.5280
(F) 419.267.5214
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RACKING TYPE

TITAN DUO

STRUCTURAL ENGINEER OF RECORD

the jdi group
architects & engineers

360 W. DUSSEL DR.
MAUMEE, OH 43537
|P| 419.725.7161 |F| 419.725.7160

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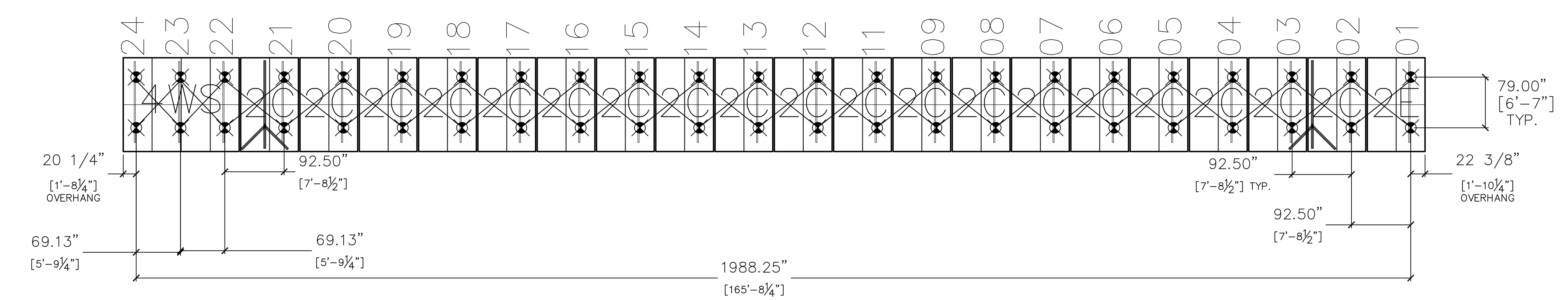
SHEET NAME: SITE LAYOUT

PROJECT NUMBER: 220925

DRAWING NUMBER: L-100 REV. A



C1 88 MODULE ROW KEY / ROWS: 1

ROW BILL OF MATERIALS – TITAN	88 MODS	
ROW	1	
EAST – WEST ZEE RAILS	4	
PV MODULES	88	
FOUNDATION SETS	24	
KNEE BRACE	24	
TRANSVERSE BRACE	2	
CABLE BRACE SHORT 69.13"	4	
CABLE BRACE LONG 92.50"	40	
EAST – WEST ZEE RAILS	4	MODS PER
A747-4W-134	4	8
A747-4C-178	76	4
A747-3C-134	4	4

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architects & engineers

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PROFESSIONAL SEAL/STAMP

SITE NAME: GALENA
SITE ADDRESS: ----
SITE CITY, STATE: GALENA, AK 99741

SHEET REVISIONS

REV.	DESCRIPTION	DATE
A	INITIAL RELEASE	2/16/2023

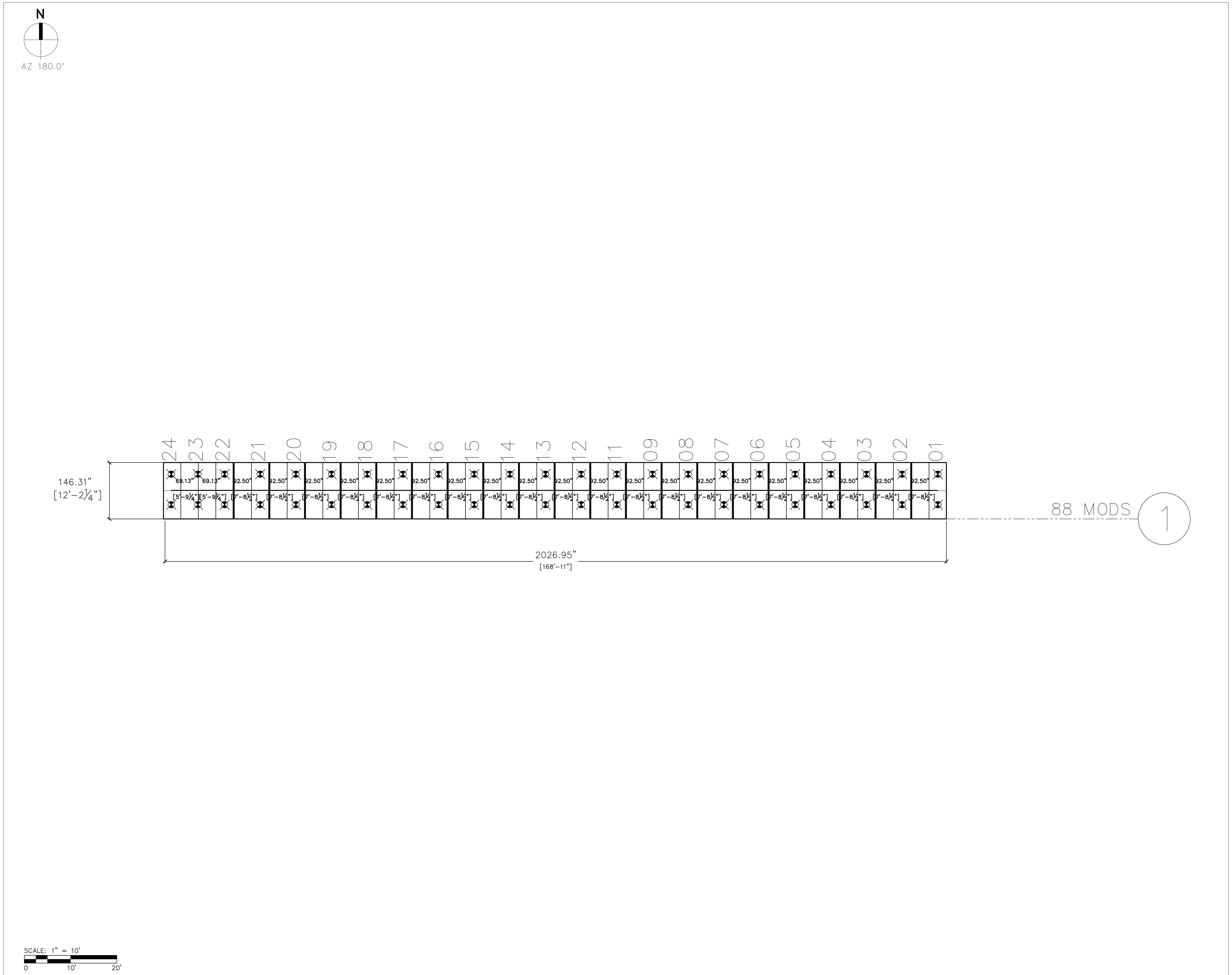
APPROVED

DRAWN	REVIEWED	APPROVED	SIZE
AB	MR	JR	D

SHEET NAME: ROW TECHNICAL DATA

PROJECT NUMBER: 220925

DRAWING NUMBER: L-150 REV. A



A1 SITE FOUNDATION LOCATIONS MAP

ROW TECHNICAL DATA

ROW LABEL	ROW ID	DETAIL
88	1	C1/L-190

CUSTOMER

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SHEET REVISIONS

REV.	DESCRIPTION	DATE
A	INITIAL RELEASE	2/9/2023

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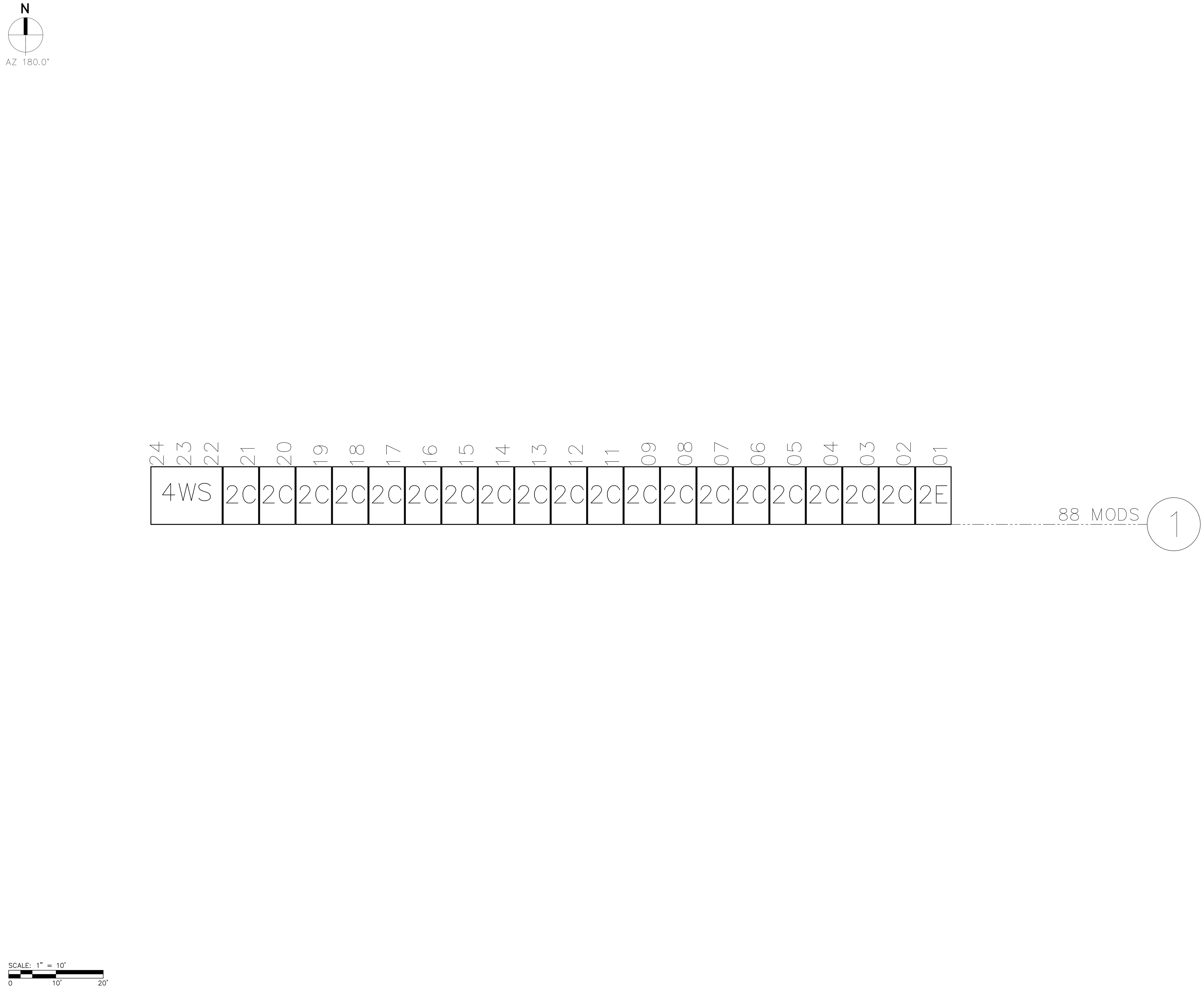
AB	MR	JR	D

SHEET NAME
SITE FOUNDATIONS: OVERVIEW

PROJECT NUMBER
220925

DRAWING NUMBER
L-200

REV.
A



A1 SITE TABLES MAP

ROW TECHNICAL DATA

ROW LABEL	ROW ID	DETAIL
88	1	C1/L-190

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the jdi group architects & engineers

360 W. DUSSEL DR.
MAUMEE, OH 43537
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PROFESSIONAL SEAL/STAMP

SITE NAME: GALENA

SITE ADDRESS: ---

SITE CITY, STATE: GALENA, AK 99741

SHEET REVISIONS

REV.	DESCRIPTION	DATE
A	INITIAL RELEASE	2/16/2023

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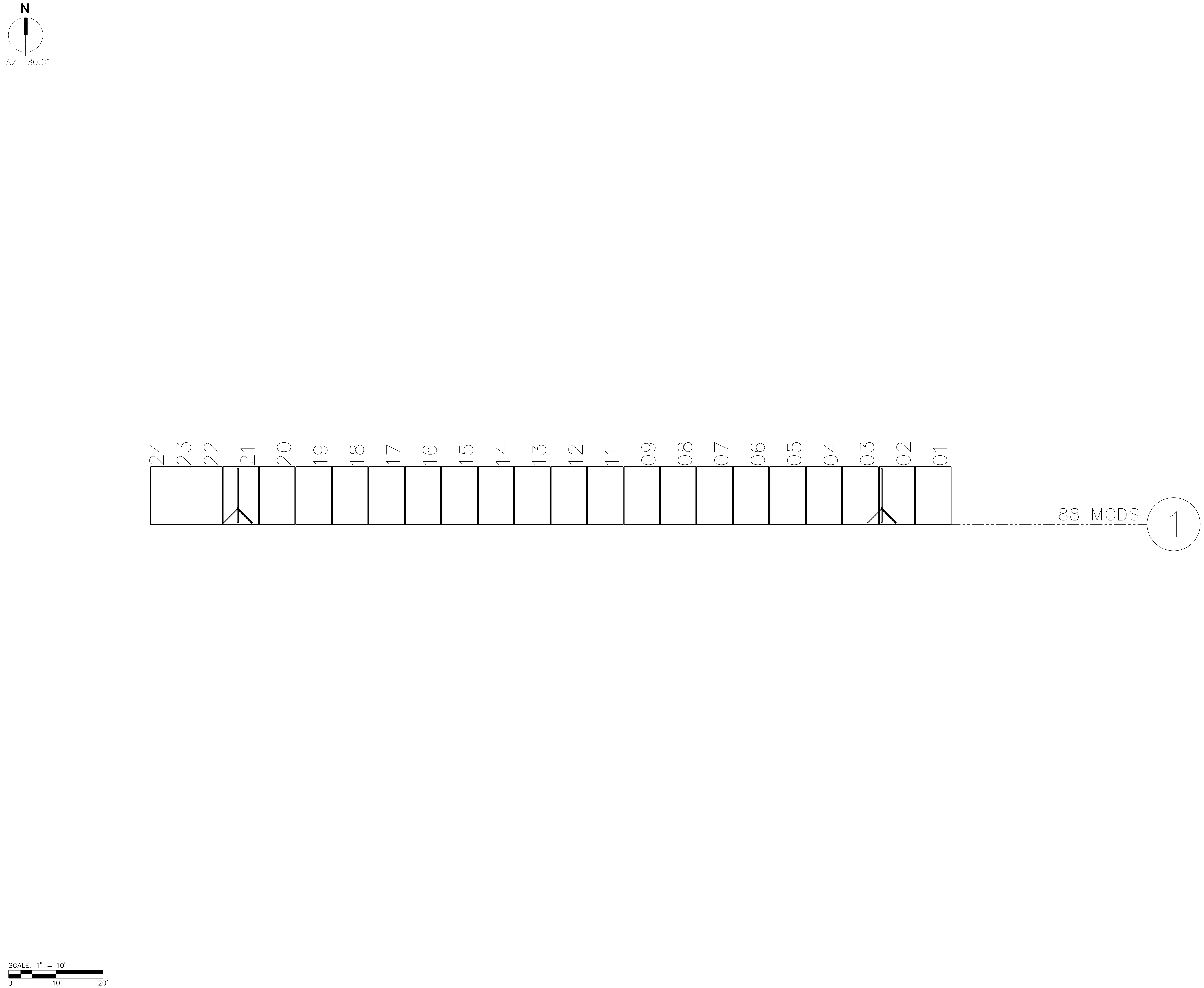
DRAWN	REVIEWED	APPROVED	SIZE
AB	MR	JR	D

SHEET NAME: SITE TABLES: OVERVIEW

PROJECT NUMBER: 220925

DRAWING NUMBER: L-300 REV. A



A1 SITE TRANSVERSE BRACE LOCATIONS MAP

ROW TECHNICAL DATA

ROW LABEL	ROW ID	DETAIL
88	1	C1/L-190

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SITE NAME: GALENA
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SITE CITY, STATE: GALENA, AK 99741

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REV.	DESCRIPTION	DATE
A	INITIAL RELEASE	2/16/2023

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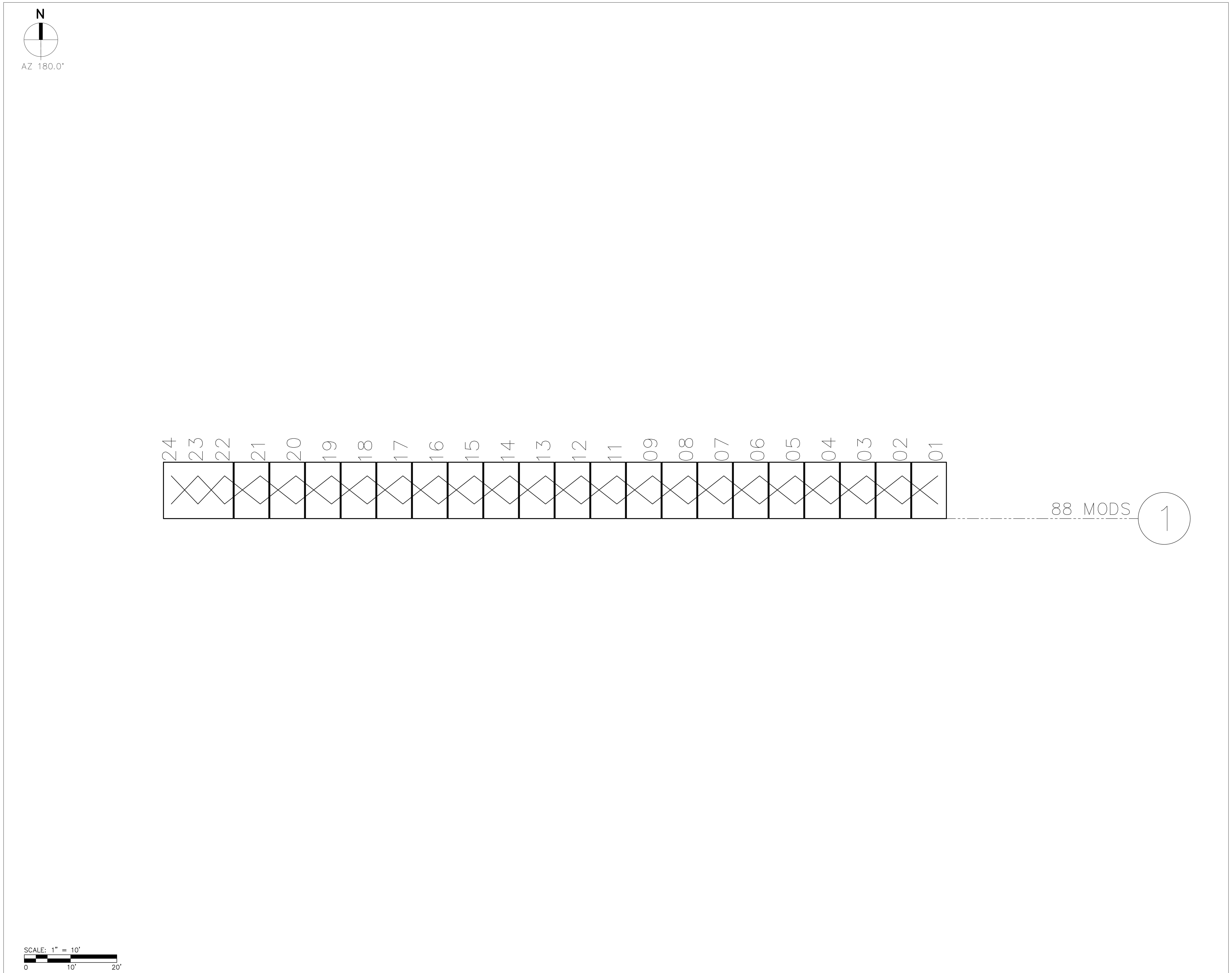
DRAWN	REVIEWED	APPROVED	SIZE
AB	MR	JR	D

SHEET NAME: SITE TRANSVERSE BRACE: OVERVIEW

PROJECT NUMBER: 220925

DRAWING NUMBER: L-400 REV. A



ROW TECHNICAL DATA		
ROW LABEL	ROW ID	DETAIL
88	1	C1/L-190

A1 SITE CABLE LOCATIONS MAP

CUSTOMER

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SITE NAME: GALENA
SITE ADDRESS: - - - -
SITE CITY, STATE: GALENA, AK 99741

SHEET REVISIONS		
REV.	DESCRIPTION	DATE
A	INITIAL RELEASE	2/16/2023

APPROVED

DRAWN	REVIEWED	APPROVED	SIZE
AB	MR	JR	D

SHEET NAME
SITE CABLES: OVERVIEW

PROJECT NUMBER
220925

DRAWING NUMBER: L-500
REV.: A

SEG SOLAR

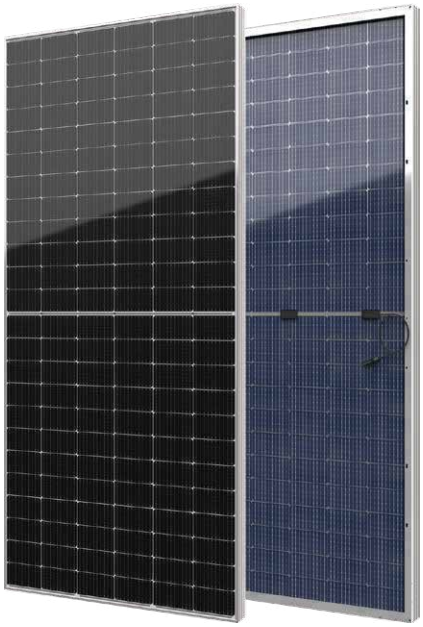
www.segsolar.com

YUKON Series

Half-Cell
Transparent Backsheet Module

540-555W
Module Power Output

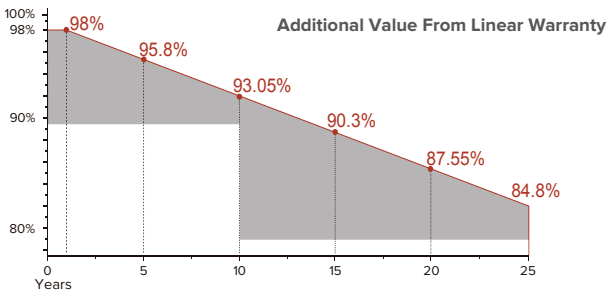
21.48%
Max Efficiency



Key Features

- High module conversion efficiency
- Better temperature coefficient
- Super multi busbar technology
- Low attenuation long warranty
- Superior load capacity
- Higher bifacially
- USA based liability insurance
- Houston, Texas based company

Warranty



15 <Years> Guarantee on product material and workmanship

25 <Years> Linear power output warranty

Product Certification

IEC61215:2016; IEC 61730:2016;	UL1703; UL61730/ETL/CEC
IEC62804	PID
IEC61701	Salt Mist
IEC62716	Ammonia Resistance
IEC60068	Dust and Sand
IEC61215	Hailstone
Fire Type (UL61730):Type1	
ISO14001:2015; ISO9001:2015; ISO45001:2018	

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About SEG Solar

SEG Solar is a leading manufacturer of high-performance solar panels for residential, commercial, and utility applications. The company, headquartered in Houston,Texas, is committed to providing cost-effective and reliable solar solutions that help customers reduce their energy costs and carbon footprint.

Download Datasheet

YUKON Series SEG-XXX-BMA-TB(144Cells)

Electrical Characteristics

Module Type	SEG-540-BMA-TB			SEG-545-BMA-TB			SEG-550-BMA-TB			SEG-555-BMA-TB		
	Front STC	Front NOCT	Back STC	Front STC	Front NOCT	Back STC	Front STC	Front NOCT	Back STC	Front STC	Front NOCT	Back STC
Maximum Power -Pmp(W)	540	406	378	545	409	382	550	414	385	555	418	389
Open Circuit Voltage -Voc(V)	49.50	46.18	49.48	49.60	46.32	49.58	49.70	46.40	49.68	49.80	46.47	49.78
Short Circuit Current -Isc(A)	13.81	11.16	9.74	13.90	11.23	9.80	14.00	11.32	9.87	14.10	11.40	9.94
Maximum Power Voltage -Vmp(V)	41.55	38.39	41.61	41.80	38.41	41.86	42.05	38.58	42.10	42.31	38.75	42.35
Maximum Power Current -Imp(A)	13.00	10.59	9.09	13.04	10.65	9.13	13.08	10.73	9.15	13.12	10.79	9.19
Module Efficiency STC-ηm(%)	20.90			21.10			21.29			21.48		
Power Tolerance(W)	(0, +3%)											
Maximum System Voltage	1500V DC											
Maximum Series Fuse Rating	25 A											

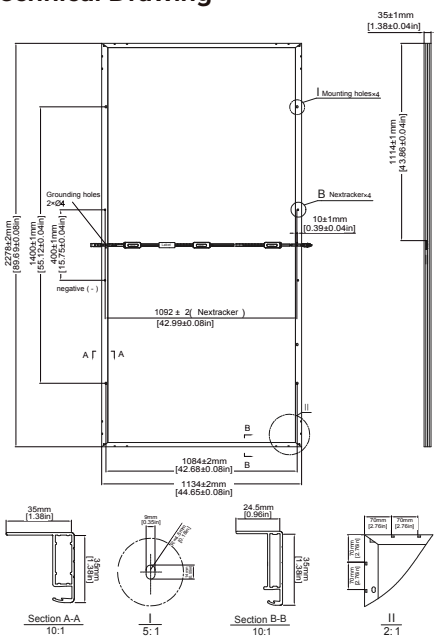
STC: Irradiance 1000 W/m² module temperature 25°C AM=1.5 NOCT: Irradiance 800W/m² ambient temperature 20°C module temperature 45°C wind speed: 1m/s Power measurement tolerance: +/-3%

Mechanical Specifications

External Dimension	2278 x 1134 x 35 mm
Weight	27.0 kg
Solar Cells	PERC Mono 182 x 91mm(144 pcs)
Front Glass	3.2 / mm AR coating tempered glass / low iron
Frame	Anodized aluminium alloy
Junction Box	IP68 / 3 diodes
Connector Type	QC4.10
Cable Type / Length	12 AWG PV Wire（UL）/1200 mm
Mechanical Load(Front)	5400 Pa / 113 psf*
Mechanical Load(Rear)	3600 Pa / 75 psf*

*Refer to SEG installation Manual for details

Technical Drawing



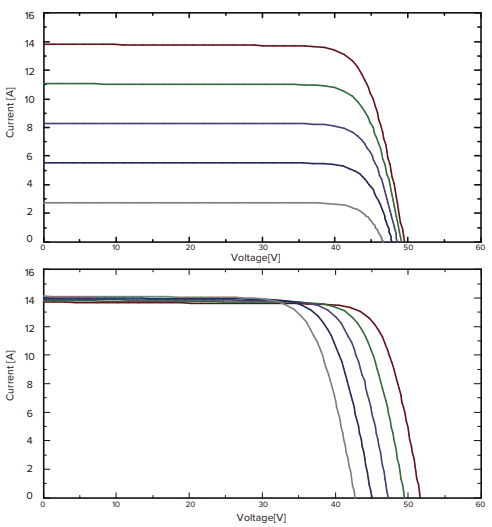
*Refer to SEG installation Manual for details

Packing Configuration

Container	20'GP	40'HQ
Pieces per Pallet	31	31
Pallets per Container	4	20
Pieces per Container	124	620

341kw/container

I-V Curve



Temperature Characteristics

Pmax Temperature Coefficient	-0.35 %/°C
Voc Temperature Coefficient	-0.27 %/°C
Isc Temperature Coefficient	+0.05 %/°C
Operating Temperature	-40~+85 °C
Nominal Operating Cell Temperature (NOCT)	45±2 °C

Cost effective

- Modular architecture reduces BOS and maximizes system uptime
- Compact design and high power density maximize transportation and logistical efficiency

Maximum flexibility

- Scalable 1,500 VDC building block with best-in-class performance
- Flexible architecture creates scalability while maximizing land usage

Simple install, commissioning

- Ergonomic handling and simple connections enable quick installation
- Centralized commissioning and control with SMA Data Manager

Highly innovative

- SMA Smart Connected reduces O&M costs and simplifies field-service
- Powered by award winning ennexOS cross sector energy management platform

SUNNY HIGHPOWER PEAK3 125-US / 150-US

A superior modular solution for utility power plants

The new Sunny Highpower PEAK3 is SMA's latest addition to a comprehensive portfolio of utility solutions. This 1,500 VDC inverter offers high power density in a modular architecture that achieves a cost-optimized solution for utility-scale PV integrators. With fast, simple installation and commissioning, the Sunny Highpower PEAK3 is accelerating the path to energization. SMA has also brought its field-proven Smart Connected technology to the PEAK3, which simplifies O&M and contributes to lower lifetime service costs. The PEAK3 utility system solution is powered by the ennexOS cross sector energy management platform, 2018 winner of the Intersolar smarter E AWARD.

Technical Data *	Sunny Highpower PEAK3 125-US	Sunny Highpower PEAK3 150-US
Input (DC)		
Maximum array power	187500 Wp STC	225000 Wp STC
Maximum system voltage	1500 VDC	
MPP voltage range	710 V ... 1425 V	855 V ... 1425 V
MPP trackers	1	
Maximum operating input current	180 A	
Maximum input short-circuit current	325 A	
Output (AC)		
Nominal AC power	125000 W	150000 W
Maximum apparent power	125000 VA	150000 VA
Output phases / line connections	3 / 3-PE	
Nominal AC voltage	480 V	600 V
Compatible transformer winding configuration	Wye-grounded	
Maximum output current	151 A	
Rated grid frequency	60 Hz	
Grid frequency / range	50 Hz, 60 Hz / -6 Hz ... +6 Hz	
Power factor at rated power / adjustable displacement	1 / 0.0 leading ... 0.0 lagging	
Harmonics (THD)	<3%	
Efficiency		
CEC efficiency (preliminary)	98.5 %	98.5 %
Protection and safety features		
Ground fault monitoring: Riso / Differential current	● / ●	
DC reverse polarity protection	●	
AC short circuit protection	●	
Monitored surge protection (Type 2): DC / AC	● / ●	
Protection class / overvoltage category (as per UL 840)	I / IV	
General data		
Device dimensions (W / H / D)	770 / 830 / 444 mm (30.3 / 32.7 / 17.5 in.)	
Device weight	85 kg (185 lbs)	
Operating temperature range	-25°C ... +60°C (-13°F ... +140°F)	
Storage temperature range	-40°C ... +70°C (-40°F ... +158°F)	
Audible noise emission (full power @ 1m and 25°C)	< 65 dB(A)	
Internal consumption at night	< 5 W	
Topology	Transformerless	
Cooling concept	OptiCool (forced convection, variable speed fans)	
Enclosure protection rating	Type 4X (as per UL 50E)	
Maximum permissible relative humidity (non-condensing)	100%	
Additional information		
Mounting	Rack mount	
DC connection	Terminal lugs - up to 600 kcmil CU/AL	
AC connection	Screw terminals - up to 300 kcmil CU/AL	
LED indicators (Status/Fault/Communication)	●	
SMA Speedwire (Ethernet network interface)	● (2 x RJ45 ports)	
Data protocols: SMA Modbus / SunSpec Modbus / Webconnect	● / ● / ●	
OptiTrac Global Peak (shade tolerant MPP tracking)	●	
PID Mitigation Solution	O	
Integrated Plant Control / Q on Demand 24/7	● / ●	
Off-grid capable / SMA Fuel Save Controller compatible	● / ●	
SMA Smart Connected (proactive monitoring and service)	●	
Certifications (pending as of June 2018)		
Certifications and approvals	UL 1741, UL 1998, IEEE 1547, CAN/CSA-C22.2 No.62109	
FCC compliance	FCC Part 15, Class A	
Grid interconnection standards	UL 1741 SA - CA Rule 21, HECO Rule 14H, PRC-024-02	
Advanced grid support capabilities	L/HFRT, L/HVRT, Volt-VAr, Volt-Watt, Frequency-Watt, Ramp Rate Control, Fixed Power Factor	
Warranty		
Standard	5 years	
Optional extensions	10 / 15 / 20 years	
Type designation	SHP 125-US-20	SHP 150-US-20

* Preliminary data as of June 2018 ● Standard features O Optional features

Toll Free +1 888 4 SMA USA
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