

PHOTOVOLTAIC GROUND MOUNT SYSTEM

42 MODULES-GROUND MOUNTED - 16.800 kWDC, 12.180 kWAC

2397 NC 55, DUNN, NC 28334, USA



202 NORTH DIXON AVENUE,
CARY, NC 27513 USA
PHONE: 919-804-1490
LICENSE: 67356

SYSTEM SUMMARY:

- (N) 42 - HANWHA Q CELLS Q.PEAK DUO BLK ML-G10+ (400W) MODULES
- (N) 42 - ENPHASE ENERGY IQ8PLUS-72-2-US MICRO-INVERTERS
- (N) JUNCTION BOX
- (E) 200A MAIN SERVICE PANEL WITH (E) 200A MAIN BREAKER
- (N) 100A FUSED AC DISCONNECT
- (N) ENPHASE IQ COMBINER BOX 4

DESIGN CRITERIA:

- GROUND SNOW LOAD : - 10 PSF
- WIND SPEED :- 109 MPH
- WIND EXPOSURE:- C
- RISK CATEGORY:- I

GOVERNING CODES:

- THIS PROJECT SHALL COMPLY WITH THE FOLLOWING CODE
- 2018 NORTH CAROLINA RESIDENTIAL CODE
 - 2018 NORTH CAROLINA ENERGY CONSERVATION CODE
 - 2018 NORTH CAROLINA ADMINISTRATIVE CODE
 - 2018 NORTH CAROLINA BUILDING CODE
 - 2009 ICC ANSI A117.1, ACCESSIBLE AND USABLE BUILDINGS
 - 2018 NORTH CAROLINA PLUMBING CODE
 - 2018 NORTH CAROLINA MECHANICAL CODE
 - 2018 NORTH CAROLINA FUEL GAS CODE
 - 2018 NORTH CAROLINA FIRE PREVENTION CODE
 - 2020 NATIONAL ELECTRICAL CODE

SHEET INDEX

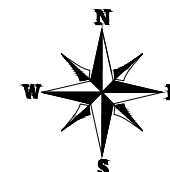
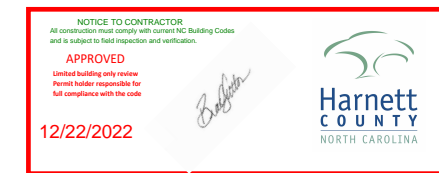
PV-0	COVER SHEET
PV-1	SITE PLAN WITH GROUND MOUNT PLAN
PV-2	GROUND MOUNT PLAN WITH MODULES
PV-3	ATTACHMENT DETAILS
PV-3.1	ATTACHMENT DETAILS
PV-4	ELECTRICAL LINE DIAGRAM WITH CALCULATION
PV-5	PLACARD & WARNING LABELS
PV-6+	EQUIPMENT SPEC SHEETS

GENERAL NOTES

- THE CONTRACTOR/INSTALLER OF THE SOLAR PV SYSTEM OVER EXISTING ROOF SHALL CONFORM TO OSHA REQUIREMENTS DURING THE CONSTRUCTION PHASE. JOB SAFETY AND CONSTRUCTION PROCEDURES ARE THE SOLE RESPONSIBILITY OF THE CONTRACTOR/INSTALLER.
- REFER TO ELECTRICAL DRAWING PV-4 FOR PANEL DETAILED INFORMATION.
- IN CASE OF CONFLICT BETWEEN STRUCTURAL DRAWINGS AND ELECTRICAL DRAWINGS, THE MOST RIGID REQUIREMENTS SHALL GOVERN.
- THE CONTRACTOR/INSTALLER SHALL VERIFY ALL EXISTING BUILDING INFORMATION SHOWN (DIMENSIONS, ROOF TOP PROJECTIONS, ETC.) AND NOTIFY THE ENGINEER OF ANY DISCREPANCIES PRIOR TO INSTALLATIONS OF PV SYSTEM.
- THE CONTRACTOR/INSTALLER SHALL VERIFY AND COORDINATE EXISTING OPENINGS, ROOF TOP UNITS, VENT PIPES, ETC. SHOWN ON DRAWINGS. IF THERE IS A DISCREPANCY BETWEEN DRAWINGS, IT IS THE CONTRACTORS/INSTALLER'S RESPONSIBILITY TO NOTIFY ENGINEER PRIOR TO PERFORMING THE WORK.
- ALL CONSTRUCTION IS TO BE PERFORMED IN STRICT CONFORMANCE WITH ALL APPLICABLE TOWN, COUNTY & STATE REGULATIONS AND/OR ANY OTHER GOVERNING BODIES.
- DO NOT SCALE THESE DRAWINGS, USE DIMENSIONS. CONTRACTOR MUST CONDUCT ROOF SURVEY TO VERIFY DIMENSIONS SHOWN ON PLAN PRIOR TO INSTALLATION. IF THERE IS A DISCREPANCY IT IS CONTRACTOR/INSTALLER'S RESPONSIBILITY TO NOTIFY THE ENGINEER IMMEDIATELY.

ELECTRICAL NOTES

- 1.) ALL EQUIPMENT TO BE LISTED BY UL OR OTHER NRTL, AND LABELED FOR ITS APPLICATION.
- 2.) ALL CONDUCTORS SHALL BE COPPER, RATED FOR 600 V AND 90 & 75 DEGREE C WET ENVIRONMENT.
- 3.) WIRING, CONDUIT, AND RACEWAYS MOUNTED ON ROOFTOPS SHALL BE ROUTED DIRECTLY TO, AND LOCATED AS CLOSE AS POSSIBLE TO THE NEAREST RIDGE, HIP, OR VALLEY.
- 4.) WORKING CLEARANCES AROUND ALL NEW AND EXISTING ELECTRICAL EQUIPMENT SHALL COMPLY WITH NEC 110.26.
- 5.) DRAWINGS INDICATE THE GENERAL ARRANGEMENT OF SYSTEMS. CONTRACTOR SHALL FURNISH ALL NECESSARY OUTLETS, SUPPORTS, FITTINGS AND ACCESSORIES TO FULFILL APPLICABLE CODES AND STANDARDS.
- 6.) WHERE SIZES OF JUNCTION BOXES, RACEWAYS, AND CONDUITS ARE NOT SPECIFIED, THE CONTRACTOR SHALL SIZE THEM ACCORDINGLY.
- 7.) ALL WIRE TERMINATIONS SHALL BE APPROPRIATELY LABELED AND READILY VISIBLE.
- 8.) MODULE GROUNDING CLIPS TO BE INSTALLED BETWEEN MODULE FRAME AND MODULE SUPPORT RAIL, PER THE GROUNDING CLIP MANUFACTURER'S INSTRUCTION.
- 9.) MODULE SUPPORT RAIL TO BE BONDED TO CONTINUOUS COPPER E.G.C. VIA WEEB LUG OR ILSCO GBL-4DBT LAY-IN LUG.
- 10.) THE POLARITY OF THE GROUNDED CONDUCTORS IS NEGATIVE



VERSION		
DESCRIPTION	DATE	REV
INITIAL RELEASE	11-29-2022	UR

PROJECT NAME

WOLF RESIDENCE
2397 NC 55,
DUNN, NC 28334, USA
APN# 071509004401
UTILITY: DUKE ENERGY
AHJ: HARNETT COUNTY

SHEET NAME

COVER SHEET

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

PV-0

VERSION		
DESCRIPTION	DATE	REV
INITIAL RELEASE	11-29-2022	UR

PROJECT NAME

WOLF RESIDENCE
2397 NC 55,
DUNN, NC 28334, USA
APN# 071509004401
UTILITY: DUKE ENERGY
AHJ: HARNETT COUNTY

SHEET NAME
**SITE PLAN WITH
GROUND MOUNT PLAN**

SHEET SIZE
**ANSI B
11" X 17"**

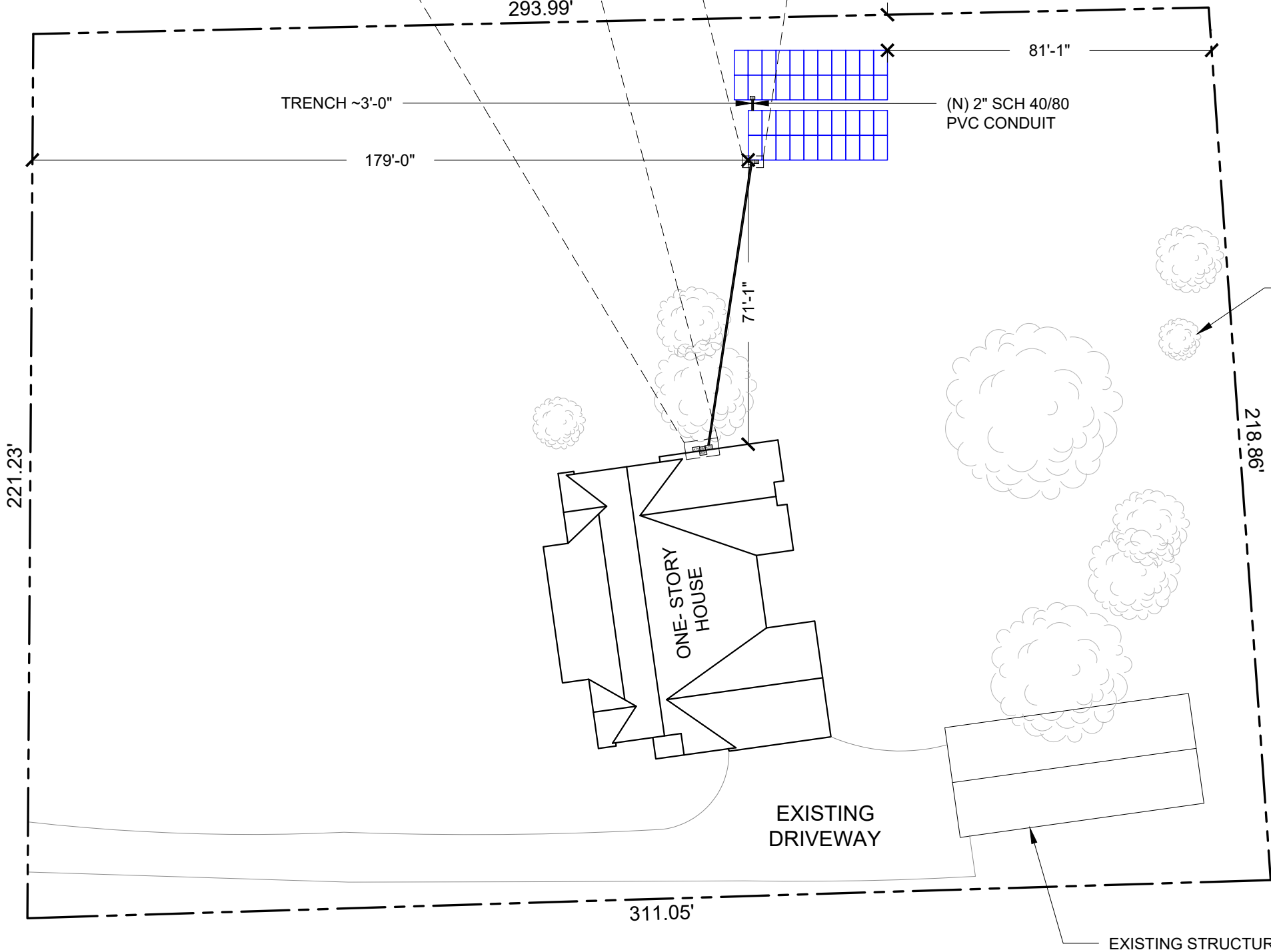
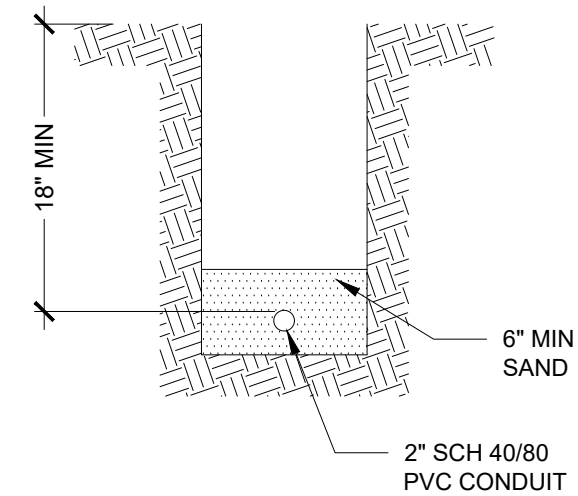
SHEET NUMBER
PV-1

TRENCH ~85'-0"
(N) 2" SCH 40/80 PVC CONDUIT

ATSUM/ACD
MSP

CB JB

TRENCH DETAIL



EXISTING TREES. (TYP)

LEGEND

UM	UTILITY METER
MSP	200A MAIN SERVICE PANEL WITH (E) 200A MAIN BREAKER
ACD	100A FUSED AC DISCONNECT
CB	ENPHASE IQ COMBINER 4
JB	JUNCTION BOX
ATS	AUTOMATIC TRANSFER SWITCH
====	TRENCH
----	CONDUIT
-----	PROPERTY LINE
🌳	TREES

NC 55

221.23'

311.05'

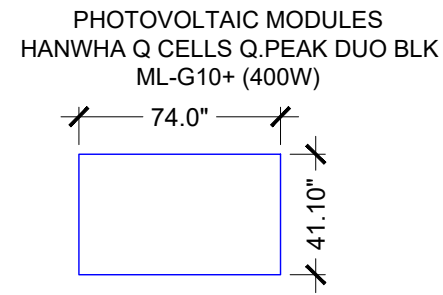


1 SITE PLAN WITH GROUND MOUNT PLAN

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

MODULE TYPE, DIMENSIONS & WEIGHT

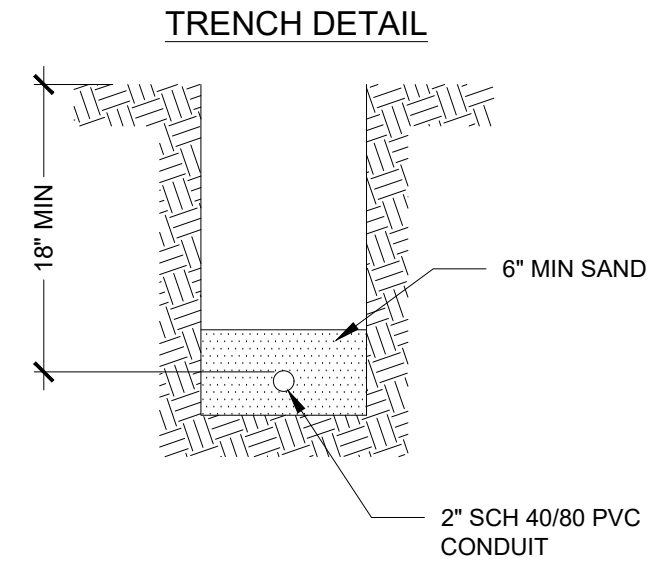
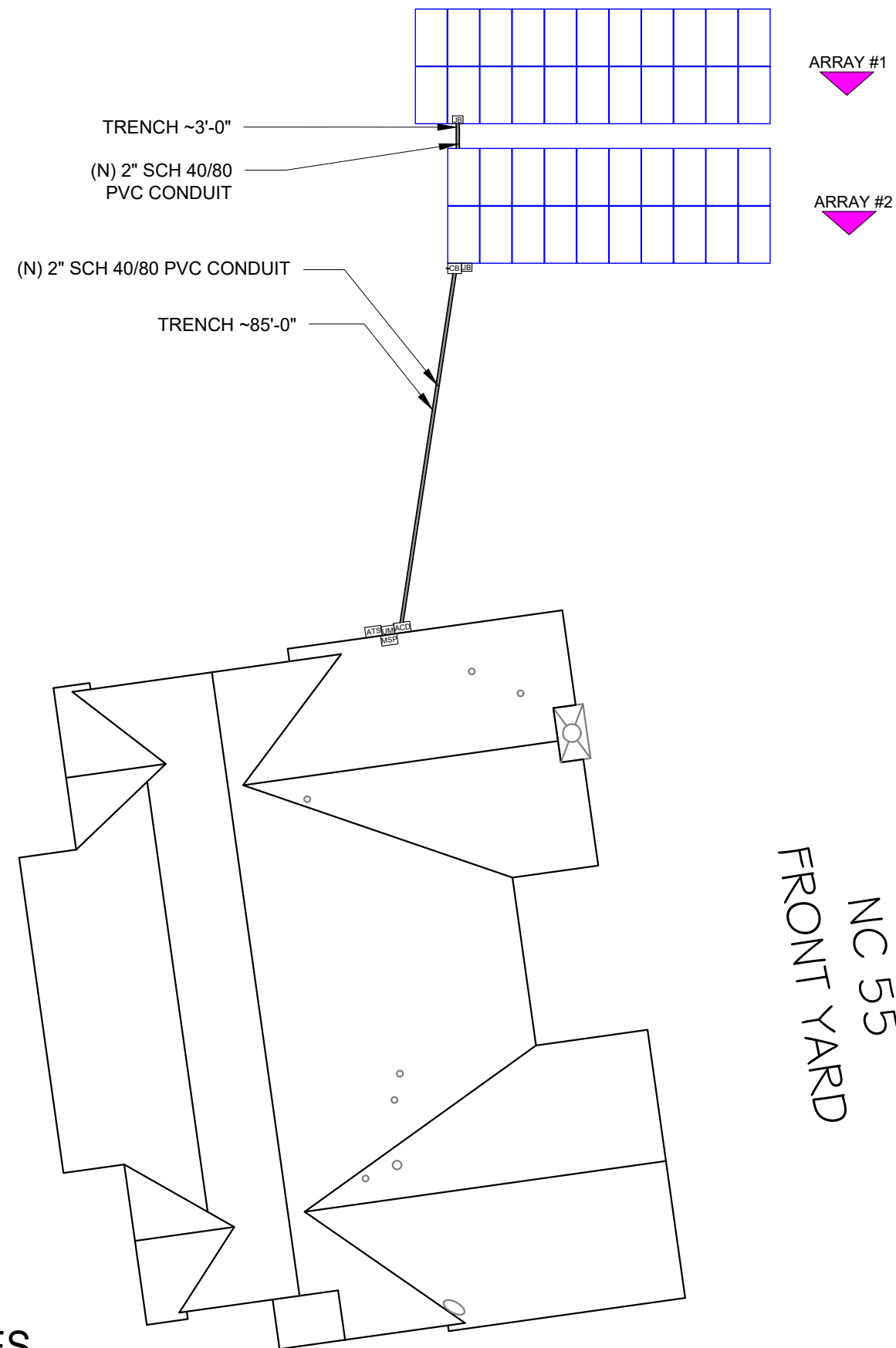
NUMBER OF MODULES = 42 MODULES
 MODULE TYPE = HANWHA Q CELLS Q.PEAK DUO BLK ML-G10+ (400W) MODULES
 MODULE WEIGHT = 48.5 LBS / 22.0 KG.
 MODULE DIMENSIONS = 74.0" X 41.10" = 21.12 SF
 UNIT WEIGHT OF ARRAY = 2.30 PSF



ARRAY DESCRIPTION			
ARRAY	# OF MODULES	ARRAY TILT	AZIMUTH
#1	22	30°	180°
#2	20	30°	180°



202 NORTH DIXON AVENUE,
 CARY, NC 27513 USA
 PHONE: 919-804-1490
 LICENSE: 67356



VERSION		
DESCRIPTION	DATE	REV
INITIAL RELEASE	11-29-2022	UR

PROJECT NAME

WOLF RESIDENCE
 2397 NC 55,
 DUNN, NC 28334, USA
 APN# 071509004401
 UTILITY: DUKE ENERGY
 AHJ: HARNETT COUNTY

LEGEND

UM	UTILITY METER
MSP	200A MAIN SERVICE PANEL WITH (E) 200A MAIN BREAKER
ACD	100A FUSED AC DISCONNECT
CB	ENPHASE IQ COMBINER 4
ATS	AUTOMATIC TRANSFER SWITCH
JB	JUNCTION BOX
○ □	VENT, ATTIC FAN (ROOF OBSTRUCTION)
—	CONDUIT
—	TRENCH

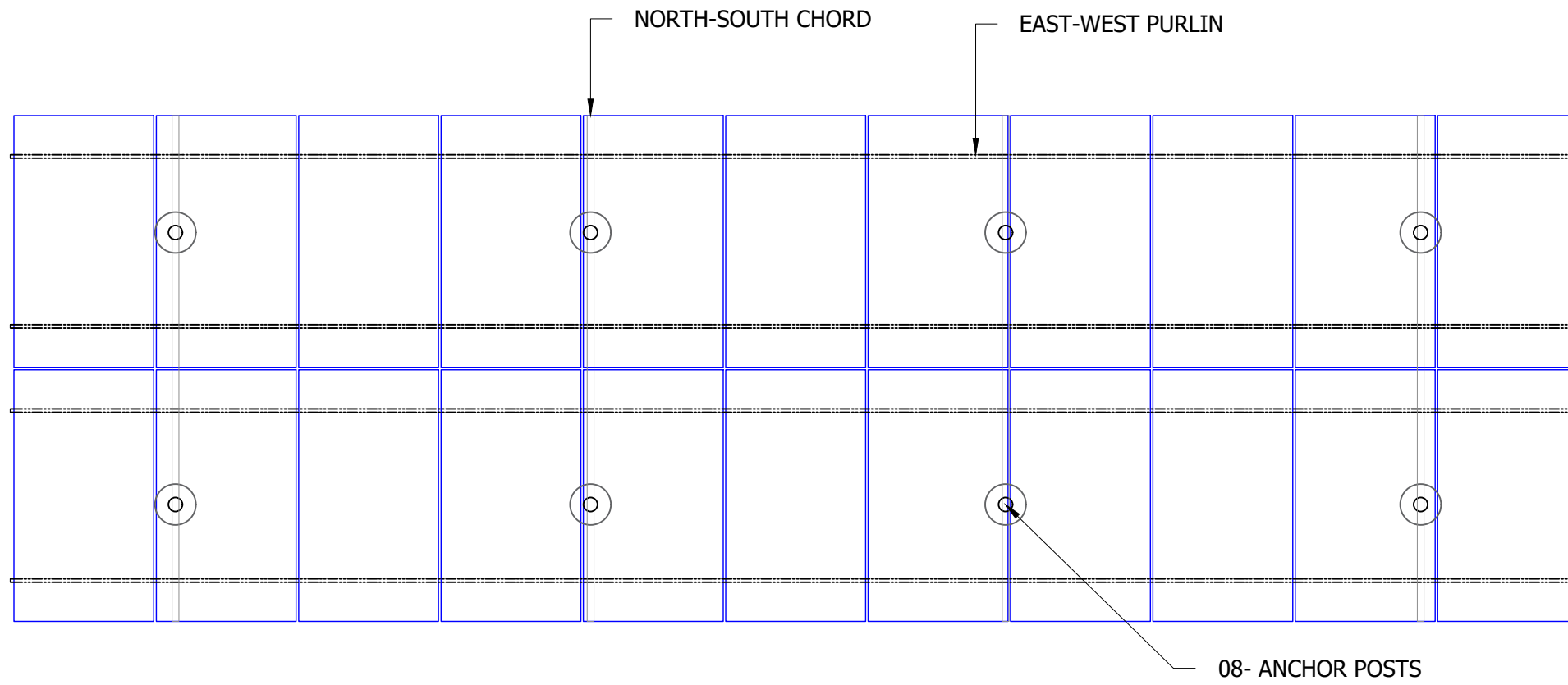
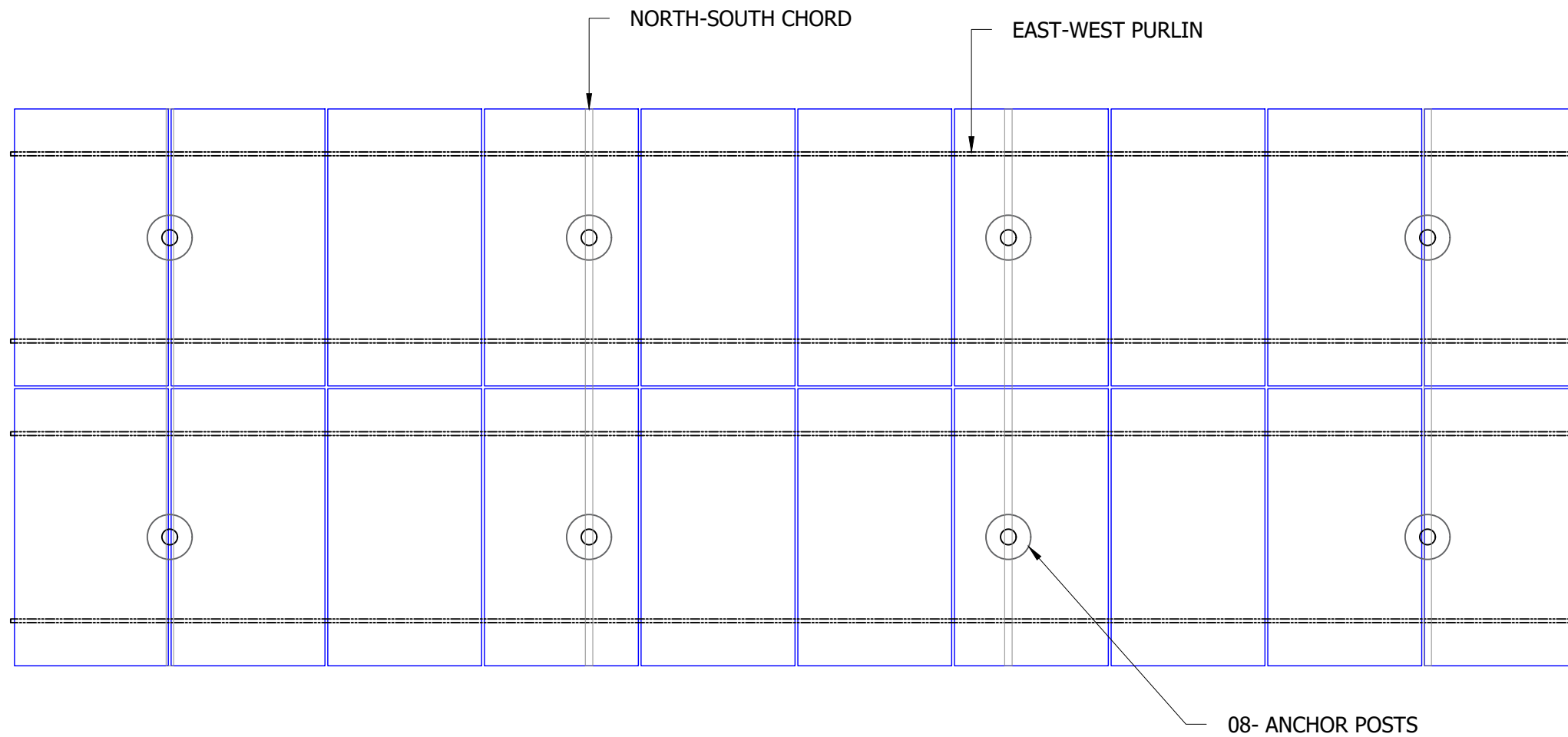
SHEET NAME
GROUND PLAN WITH MODULES

SHEET SIZE
**ANSI B
 11" X 17"**

SHEET NUMBER
PV-2



1 GROUND PLAN WITH MODULES
 SCALE: 1/16" = 1'-0"

ARRAY #1

ARRAY #2


VERSION		
DESCRIPTION	DATE	REV
INITIAL RELEASE	11-29-2022	UR

PROJECT NAME

WOLF RESIDENCE
 2397 NC 55,
 DUNN, NC 28334, USA
 APN# 071509004401
 UTILITY: DUKE ENERGY
 AHJ: HARNETT COUNTY

SHEET NAME

ATTACHMENT
DETAIL

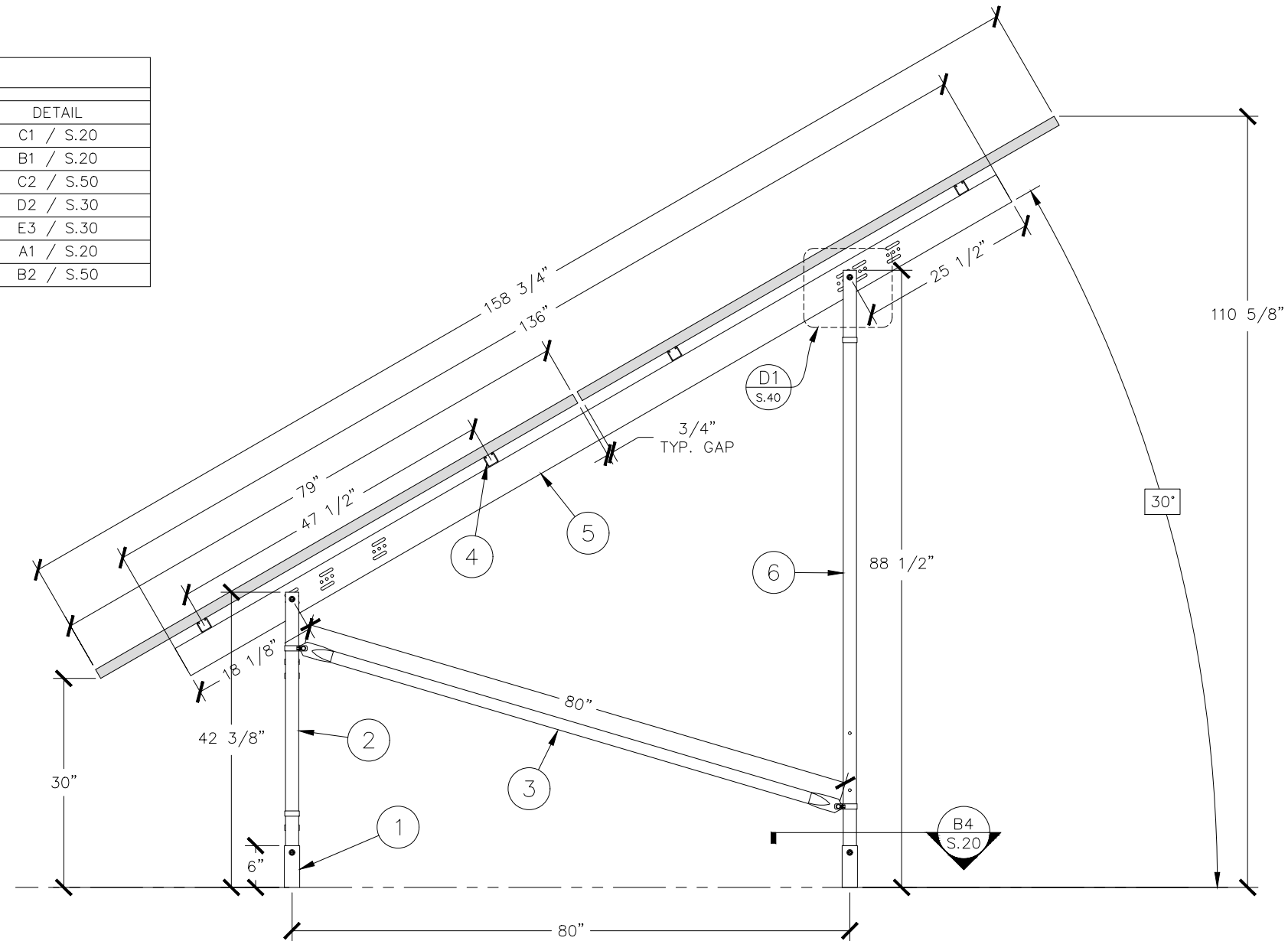
SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

PV-3

PARTS LIST				
ITEM	DESCRIPTION	SHAPE	DIMENSIONS (IN.)	DETAIL
1	LOWER ANCHOR	PIPE	2.2	C1 / S.20
2	UPPER ANCHOR – FRONT	PIPE	1.9	B1 / S.20
3	HARD BRACE	PIPE	1.66	C2 / S.50
4	EAST/WEST PURLIN	STRUT	1.625 x 1.625	D2 / S.30
5	NORTH/SOUTH CHORD	CEE	4.5 x 1.188	E3 / S.30
6	UPPER ANCHOR – REAR	PIPE	1.9	A1 / S.20
7	CABLE BRACE – FRONT/REAR	CABLE	0.156	B2 / S.50



VERSION		
DESCRIPTION	DATE	REV
INITIAL RELEASE	11-29-2022	UR

PROJECT NAME

WOLF RESIDENCE
2397 NC 55,
DUNN, NC 28334, USA
APN# 071509004401
UTILITY: DUKE ENERGY
AHJ: HARNETT COUNTY

SHEET NAME
**ATTACHMENT
DETAIL**

SHEET SIZE
**ANSI B
11" X 17"**

SHEET NUMBER
PV-3.1

SOLAR MODULE SPECIFICATIONS

MANUFACTURER / MODEL #	VMP	IMP	VOC	ISC	TEMPERATURE COEFFICIENT OF Voc	# OF MODULES
HANWHA Q CELLS Q.PEAK DUO BLK ML-G10+ (400W)	37.13	10.77	45.30	11.14	-0.27%/°C	42
MODULE DIMENSION	74.0" L x 41.10" W x 1.26" D					

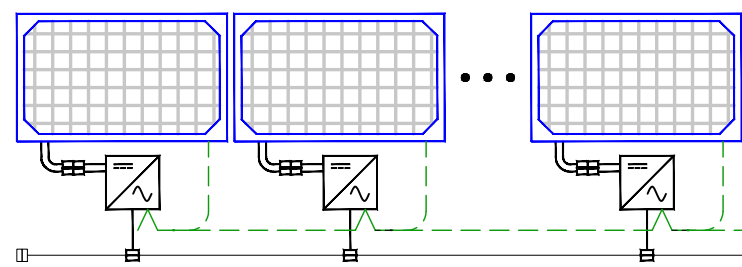
INVERTER SPECIFICATIONS

MANUFACTURER / MODEL #	QUANTITY	NOMINAL OUTPUT VOLTAGE	NOMINAL OUTPUT CURRENT
ENPHASE ENERGY IQ8PLUS-72-2-US (290W)	42	240 VAC	1.21A

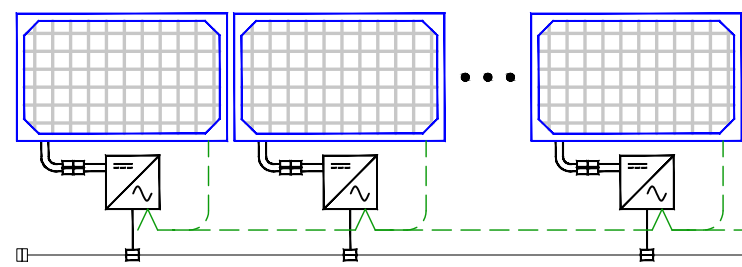
AMBIENT TEMPERATURE SPECIFICATIONS

RECORD LOW TEMP	AMBIENT TEMP (HIGH TEMP 2%)	CONDUCTOR TEMPERATURE RATE
-10°	35°	90°

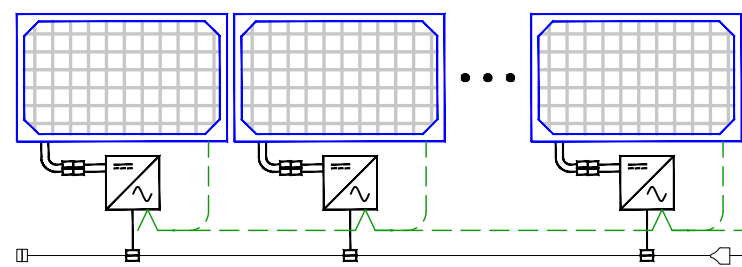
11 MICRO-INVERTERS IN BRANCH CIRCUIT #1



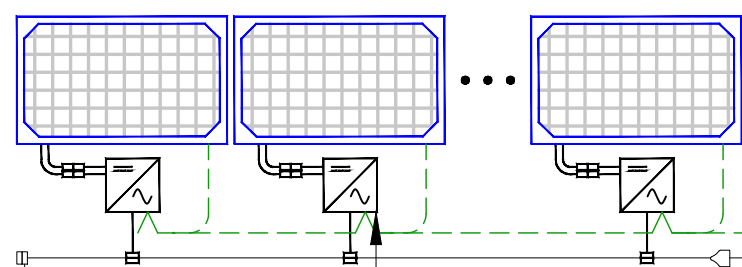
11 MICRO-INVERTERS IN BRANCH CIRCUIT #2



10 MICRO-INVERTERS IN BRANCH CIRCUIT #3



10 MICRO-INVERTERS IN BRANCH CIRCUIT #4



TERMINATOR CAP ON LAST CABLE CONNECTOR AC TRUNK CABLE (TYP)
ENPHASE ENERGY IQ8PLUS-72-2-US, 240V, MICRO-INVERTERS

(N) JUNCTION BOX

(N) ENPHASE IQ COMBINER BOX 4

IQ GATEWAY

10A/15A
20A
20A
20A

(N) AC DISCONNECT 100A FUSED, 240 VAC

70A FUSED

G

BI-DIRECTIONAL UTILITY METER
1-PHASE, 3-W, 120V/240V, 60Hz
METER NO:-099525972

LINE SIDE TAP

ATS
N.O.
N.C.

(E) AUTOMATIC TRANSFORMER SWITCH

200A
(E) 200A MAIN SERVICE PANEL WITH (E) 200A MAIN BREAKER

EXISTING GROUNDING SYSTEM

SYSTEM SIZE:- 42 x 400W = 16.800 kWDC
SYSTEM SIZE:- 42 x 290VA = 12.180 kWAC

VERSION		
DESCRIPTION	DATE	REV
INITIAL RELEASE	11-29-2022	UR

PROJECT NAME

WOLF RESIDENCE
2397 NC 55,
DUNN, NC 28334, USA
APN# 071509004401
UTILITY: DUKE ENERGY
AHJ: HARNETT COUNTY

Wire Tag	Conduit	Wire Qty	Wire Gauge	Wire Type	Temp. Rating	Wire Ampacity (A)	Temp. Derate	Conduit Fill Derate	Derated Ampacity (A)	Inverter Qty	NOC (A)	Design Current (A)	Ground Size	Ground Wire Type
A	OPEN AIR	4	10 AWG	Q Cable	90°C	40	0.96	1.0	38.40	11	1.21	13.31	6 AWG	BARE CU
B	3/4" EMT	8	10 AWG	THWN-2	90°C	40	0.96	0.70	26.88	11	1.21	13.31	10 AWG	THWN-2
C	2" SCH 40 PVC (~85'-00" TRENCH)	3	4 AWG	THWN	90°C	95	0.96	1.0	91.20	42	1.21	50.82	8 AWG	THWN
D	3/4" EMT	3	6 AWG	THWN	90°C	75	0.96	1.0	72.00	42	1.21	50.82	8 AWG	THWN

1 ELECTRICAL LINE DIAGRAM WITH CALCULATION
SCALE: NTS

SHEET NAME
ELECTRICAL LINE DIAGRAM

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-4

⚠ WARNING
ELECTRICAL SHOCK HAZARD

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

LABEL LOCATION:
 INVERTER(S), AC DISCONNECT(S), AC COMBINER PANEL (IF APPLICABLE).
 PER CODE(S): NEC 2020: NEC 706.15 (C)(4) & NEC 690.13(B)

PHOTOVOLTAIC

AC DISCONNECT

LABEL LOCATION:
 AC DISCONNECT
 NEC 690.13(B)

⚠ WARNING DUAL POWER SOURCE
SECOND SOURCE IS PHOTOVOLTAIC SYSTEM

LABEL LOCATION:
 POINT OF INTERCONNECTION
 PRODUCTION METER
 NEC 705.12(B)(3)(3) & NEC 690.59)

⚠ WARNING
POWER SOURCE OUTPUT CONNECTION
DO NOT RELOCATE THIS OVERCURRENT DEVICE

LABEL LOCATION:
 SERVICE PANEL IF SUM OF BREAKERS EXCEEDS PANEL RATING
 NEC 705.12 (B)(3)(2)

- NOTES AND SPECIFICATIONS:
- SIGNS AND LABELS SHALL MEET THE REQUIREMENTS OF THE 2020 ARTICLE 110.21(B), UNLESS SPECIFIC INSTRUCTIONS ARE REQUIRED BY SECTION 690, OR IF REQUESTED BY THE LOCAL AHJ.
 - SIGNS AND LABELS SHALL ADEQUATELY WARN OF HAZARDS USING EFFECTIVE WORDS, COLORS AND SYMBOLS.
 - LABELS SHALL BE PERMANENTLY AFFIXED TO THE EQUIPMENT OR WIRING METHOD AND SHALL NOT BE HAND WRITTEN.
 - LABEL SHALL BE OF SUFFICIENT DURABILITY TO WITHSTAND THE ENVIRONMENT INVOLVED.
 - SIGNS AND LABELS SHALL COMPLY WITH ANSI Z535.4-2011, PRODUCT SAFETY SIGNS AND LABELS, UNLESS OTHERWISE SPECIFIED.
 - DO NOT COVER EXISTING MANUFACTURER LABELS.

PHOTOVOLTAIC AC DISCONNECT
 MAXIMUM AC OPERATING CURRENT: 50.82 AMPS
 NOMINAL OPERATING AC VOLTAGE: 240 VAC

LABEL LOCATION:
 AC DISCONNECT(S), PHOTOVOLTAIC SYSTEM POINT OF INTERCONNECTION.
 PER CODE(S): NEC 2020: 690.54

PHOTOVOLTAIC POWER SOURCE

LABEL LOCATION:
 EMT/CONDUIT RACEWAYS
 (PER CODE: NEC690.31(D)(2)

MAIN PHOTOVOLTAIC SYSTEM DISCONNECT

LABEL LOCATION:
 MAIN SERVICE DISCONNECT / UTILITY METER
 (PER CODE: NEC 690.13(B))

⚠ WARNING

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

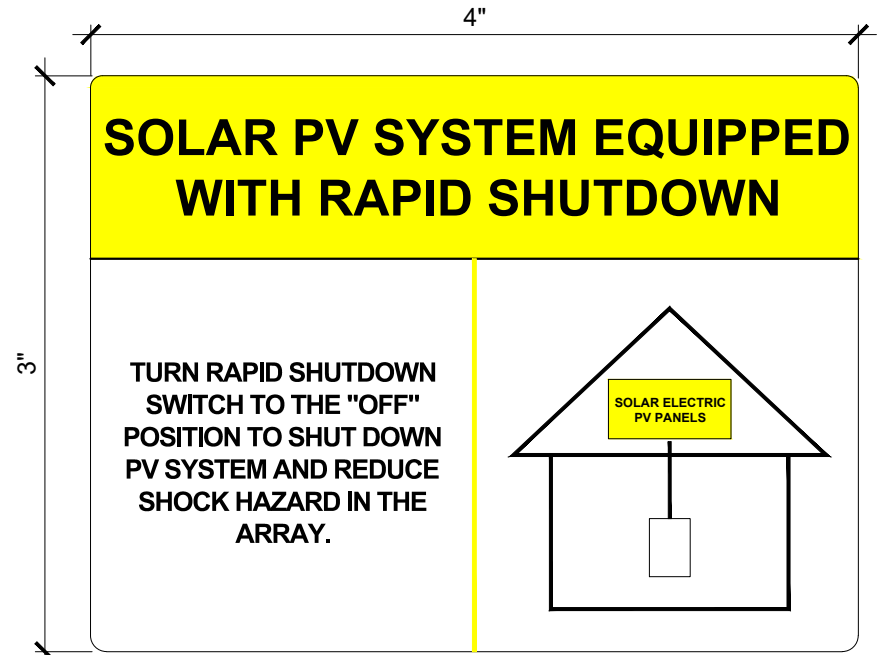
LABEL LOCATION:
 POINTS OF CONNECTION/BREAKER
 CODE: NEC 705.12(B)(3)(3)

RAPID SHUTDOWN FOR SOLAR PV SYSTEM

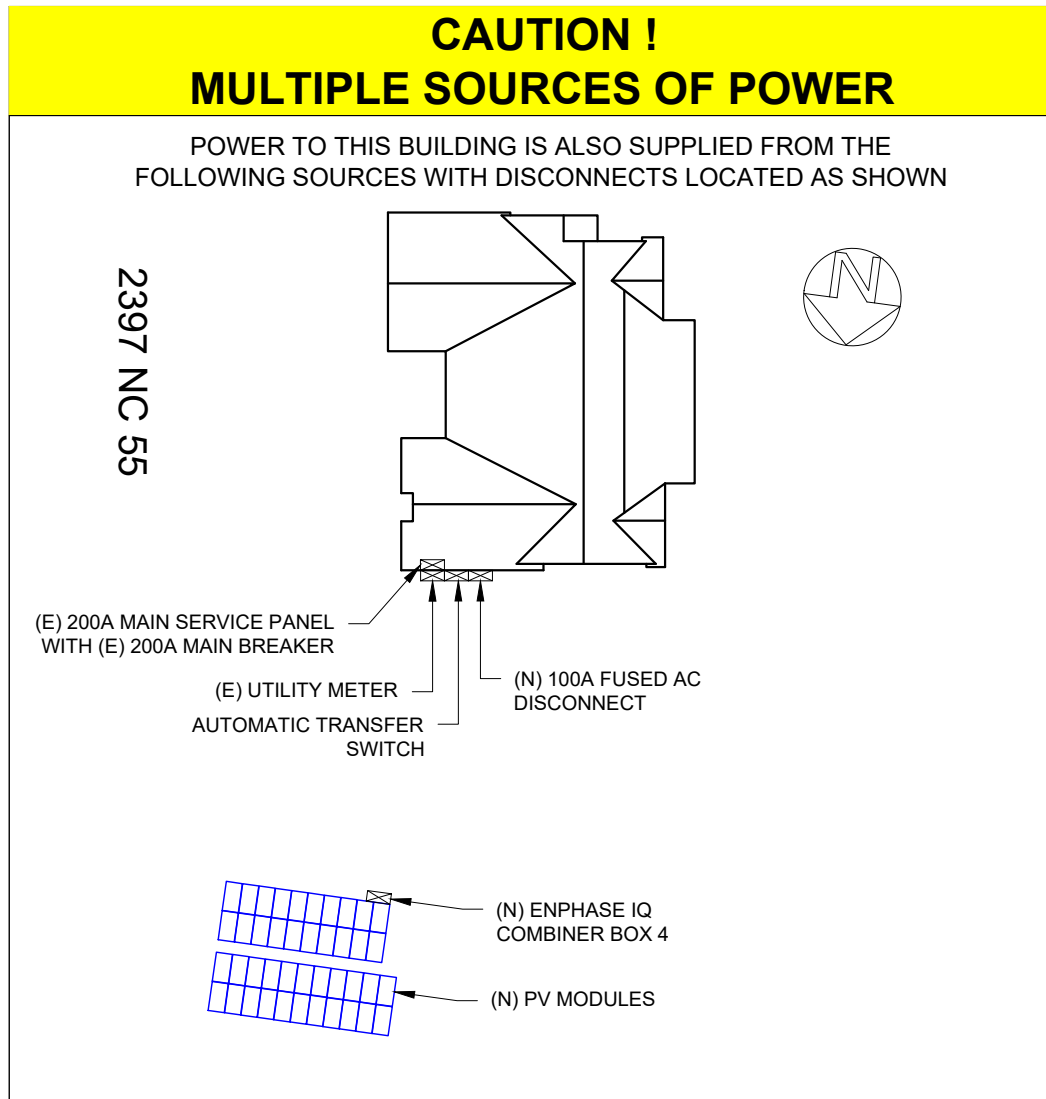
LABEL LOCATION:
 UTILITY SERVICE ENTRANCE/METER, INVERTER/DC DISCONNECT IF REQUIRED BY LOCAL AHJ, OR OTHER LOCATIONS AS REQUIRED BY LOCAL AHJ.
 PER CODE(S): NEC 2020: 690.56(C)(2)

⚠ WARNING
THE DISCONNECTION OF THE GROUNDED CONDUCTOR(S) MAY RESULT IN OVERVOLTAGE ON THE EQUIPMENT

LABEL LOCATION:
 INVERTER
 PER CODE: NEC 690.31(E)



LABEL LOCATION:
 ON OR NO MORE THAT 1 M (3 FT) FROM THE SERVICE DISCONNECTING MEANS TO WHICH THE PV SYSTEMS ARE CONNECTED.
 PER CODE(S): NEC 2020: IFC 690.56(C)



202 NORTH DIXON AVENUE,
 CARY, NC 27513 USA
 PHONE: 919-804-1490
 LICENSE: 67356

VERSION		
DESCRIPTION	DATE	REV
INITIAL RELEASE	11-29-2022	UR

PROJECT NAME

WOLF RESIDENCE
 2397 NC 55,
 DUNN, NC 28334, USA
 APN# 071509004401
 UTILITY: DUKE ENERGY
 AHJ: HARNETT COUNTY

SHEET NAME
 PLACARDS &
 WARNING LABELS

SHEET SIZE
 ANSI B
 11" X 17"

SHEET NUMBER
 PV-5

powered by
Q.ANTUM DUO Z



Q.PEAK DUO BLK ML-G10+

385-405

ENDURING HIGH PERFORMANCE



BREAKING THE 20% EFFICIENCY BARRIER
Q.ANTUM DUO Z Technology with zero gap cell layout boosts module efficiency up to 20.9%.

THE MOST THOROUGH TESTING PROGRAMME IN THE INDUSTRY
Q CELLS is the first solar module manufacturer to pass the most comprehensive quality programme in the industry: The new "Quality Controlled PV" of the independent certification institute TÜV Rheinland.

INNOVATIVE ALL-WEATHER TECHNOLOGY
Optimal yields, whatever the weather with excellent low-light and temperature behavior.

ENDURING HIGH PERFORMANCE
Long-term yield security with Anti LID Technology, Anti PID Technology¹, Hot-Spot Protect and Traceable Quality Tra.Q™.

EXTREME WEATHER RATING
High-tech aluminum alloy frame, certified for high snow (5400 Pa) and wind loads (4000 Pa).

A RELIABLE INVESTMENT
Inclusive 25-year product warranty and 25-year linear performance warranty².

¹ APT test conditions according to IEC/TS 62804-1:2015, method A (-1500V, 96h)
² See data sheet on rear for further information.



6 BUSBAR CELL TECHNOLOGY | 12 BUSBAR CELL TECHNOLOGY

THE IDEAL SOLUTION FOR:

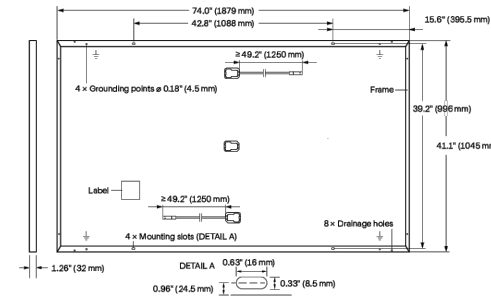


Engineered in Germany



MECHANICAL SPECIFICATION

Format	74.0 in × 41.1 in × 1.26 in (including frame) (1879 mm × 1045 mm × 32 mm)
Weight	48.5 lbs (22.0 kg)
Front Cover	0.13 in (3.2 mm) thermally pre-stressed glass with anti-reflection technology
Back Cover	Composite film
Frame	Black anodized aluminum
Cell	6 × 22 monocrystalline Q.ANTUM solar half cells
Junction Box	2.09-3.98 in × 1.26-2.36 in × 0.59-0.71 in (53-101 mm × 32-60 mm × 15-18 mm), IP67, with bypass diodes
Cable	4 mm ² Solar cable, (+) ≥ 49.2 in (1250 mm), (-) ≥ 49.2 in (1250 mm)
Connector	Stäubli MC4; IP68

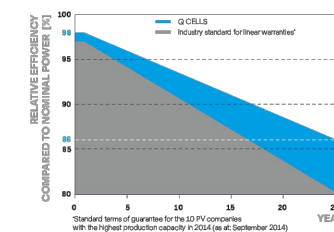


ELECTRICAL CHARACTERISTICS

POWER CLASS		385	390	395	400	405
MINIMUM PERFORMANCE AT STANDARD TEST CONDITIONS, STC¹ (POWER TOLERANCE +5 W / -0 W)						
Power at MPP ²	P _{MPP} [W]	385	390	395	400	405
Short Circuit Current ²	I _{SC} [A]	11.04	11.07	11.10	11.14	11.17
Open Circuit Voltage ²	V _{OC} [V]	45.19	45.23	45.27	45.30	45.34
Current at MPP	I _{MPP} [A]	10.59	10.65	10.71	10.77	10.83
Voltage at MPP	V _{MPP} [V]	36.36	36.62	36.88	37.13	37.39
Efficiency ²	η [%]	≥ 19.6	≥ 19.9	≥ 20.1	≥ 20.4	≥ 20.6
MINIMUM PERFORMANCE AT NORMAL OPERATING CONDITIONS, NMOT²						
Power at MPP	P _{MPP} [W]	288.8	292.6	296.3	300.1	303.8
Short Circuit Current	I _{SC} [A]	8.90	8.92	8.95	8.97	9.00
Open Circuit Voltage	V _{OC} [V]	42.62	42.65	42.69	42.72	42.76
Current at MPP	I _{MPP} [A]	8.35	8.41	8.46	8.51	8.57
Voltage at MPP	V _{MPP} [V]	34.59	34.81	35.03	35.25	35.46

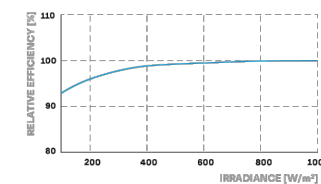
¹ Measurement tolerances P_{MPP} ± 3%; I_{SC}; V_{OC} ± 5% at STC: 1000 W/m², 25 ± 2 °C, AM 1.5 according to IEC 60904-3 - *800 W/m², NMOT, spectrum AM 1.5

Q CELLS PERFORMANCE WARRANTY



At least 98% of nominal power during first year. Thereafter max. 0.5% degradation per year. At least 93.5% of nominal power up to 10 years. At least 86% of nominal power up to 25 years.

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



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]	1000 (IEC)/1000 (UL)	PV module classification	Class II
Maximum Series Fuse Rating [A DC]	20	Fire Rating based on ANSI / UL 61730	TYPE 2
Max. Design Load, Push / Pull ³ [lbs/ft ²]	75 (3600 Pa) / 55 (2660 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/ft ²]	113 (5400 Pa) / 84 (4000 Pa)		

³ See Installation Manual

QUALIFICATIONS AND CERTIFICATES

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



PACKAGING INFORMATION

Horizontal packaging	76.4 in 1940 mm	43.3 in 1100 mm	48.0 in 1220 mm	1656 lbs 751 kg	24 pellets	24 pellets
					24 modules	32 modules

Note: Installation instructions must be followed. See the installation and operating manual or contact our technical service department for further information on approved installation and use 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 inquiry@us.q-cells.com | WEB www.q-cells.us

Specifications subject to technical changes © Q CELLS Q.PEAK DUO BLK ML-G10+_385-405_DA_2022_02_Rev 01_USA

VERSION		
DESCRIPTION	DATE	REV
INITIAL RELEASE	11-29-2022	UR

PROJECT NAME

WOLF RESIDENCE
2397 NC 55,
DUNN, NC 28334, USA
APN# 071509004401
UTILITY: DUKE ENERGY
AHJ: HARNETT COUNTY

SHEET NAME
SPEC SHEETS

SHEET SIZE
**ANSI B
11" X 17"**

SHEET NUMBER
PV-6



IQ8 Series Microinverters

Our newest IQ8 Microinverters are the industry's first microgrid-forming, software-defined microinverters with split-phase power conversion capability to convert DC power to AC power efficiently. The brain of the semiconductor-based microinverter is our proprietary application-specific integrated circuit (ASIC) which enables the microinverter to operate in grid-tied or off-grid modes. This chip is built in advanced 55nm technology with high speed digital logic and has super-fast response times to changing loads and grid events, alleviating constraints on battery sizing for home energy systems.



Part of the Enphase Energy System, IQ8 Series Microinverters integrate with the Enphase IQ Battery, Enphase IQ Gateway, and the Enphase App monitoring and analysis software.



IQ8 Series Microinverters redefine reliability standards with more than one million cumulative hours of power-on testing, enabling an industry-leading limited warranty of up to 25 years.



Connect PV modules quickly and easily to IQ8 Series Microinverters using the included Q-DCC-2 adapter cable with plug-n-play MC4 connectors.



IQ8 Series Microinverters are UL Listed as PV Rapid Shut Down Equipment and conform with various regulations, when installed according to manufacturer's instructions.

Easy to install

- Lightweight and compact with plug-n-play connectors
- Power Line Communication (PLC) between components
- Faster installation with simple two-wire cabling

High productivity and reliability

- Produce power even when the grid is down*
- More than one million cumulative hours of testing
- Class II double-insulated enclosure
- Optimized for the latest high-powered PV modules

Microgrid-forming

- Complies with the latest advanced grid support**
- Remote automatic updates for the latest grid requirements
- Configurable to support a wide range of grid profiles
- Meets CA Rule 21 (UL 1741-SA) requirements

* Only when installed with IQ System Controller 2, meets UL 1741. IQ8H-208V operates only in grid-tied mode.
 ** IQ8 Series Microinverters supports split phase, 240V. IQ8H-208 supports split phase, 208V only.

IQ8 Series Microinverters

INPUT DATA (DC)		IQ8-60-2-US	IQ8PLUS-72-2-US	IQ8M-72-2-US	IQ8A-72-2-US	IQ8H-240-72-2-US	IQ8H-208-72-2-US ¹
Commonly used module pairings ²	W	235 – 350	235 – 440	260 – 460	295 – 500	320 – 540+	295 – 500+
Module compatibility		60-cell/120 half-cell, 60-cell/120 half-cell, 66-cell/132 half-cell and 72-cell/144 half-cell					
MPPT voltage range	V	27 – 37	29 – 45	33 – 45	36 – 45	38 – 45	38 – 45
Operating range	V	25 – 48		25 – 58			
Min/max start voltage	V	30 / 48		30 / 58			
Max input DC voltage	V	50		60			
Max DC current ³ [module Isc]	A			15			
Overtoltage class DC port				II			
DC port backfeed current	mA			0			
PV array configuration		1x1 Ungrounded array; No additional DC side protection required; AC side protection requires max 20A per branch circuit					
OUTPUT DATA (AC)		IQ8-60-2-US	IQ8PLUS-72-2-US	IQ8M-72-2-US	IQ8A-72-2-US	IQ8H-240-72-2-US	IQ8H-208-72-2-US ¹
Peak output power	VA	245	300	330	366	384	366
Max continuous output power	VA	240	290	325	349	380	360
Nominal (L-L) voltage/range ⁴	V			240 / 211 – 264		208 / 183 – 250	
Max continuous output current	A	1.0	1.21	1.35	1.45	1.58	1.73
Nominal frequency	Hz	60					
Extended frequency range	Hz	50 – 68					
AC short circuit fault current over 3 cycles	Arms			2		4.4	
Max units per 20 A (L-L) branch circuit ⁵		16	13	11	11	10	9
Total harmonic distortion		<5%					
Overtoltage class AC port		III					
AC port backfeed current	mA	30					
Power factor setting		1.0					
Grid-tied power factor (adjustable)		0.85 leading – 0.85 lagging					
Peak efficiency	%	97.5	97.6	97.6	97.6	97.6	97.4
CEC weighted efficiency	%	97	97	97	97.5	97	97
Night-time power consumption	mW	60					
MECHANICAL DATA							
Ambient temperature range		-40°C to +60°C (-40°F to +140°F)					
Relative humidity range		4% to 100% (condensing)					
DC Connector type		MC4					
Dimensions (HxWxD)		212 mm (8.3") x 175 mm (6.9") x 30.2 mm (1.2")					
Weight		1.08 kg (2.38 lbs)					
Cooling		Natural convection – no fans					
Approved for wet locations		Yes					
Pollution degree		PD3					
Enclosure		Class II double-insulated, corrosion resistant polymeric enclosure					
Environ. category / UV exposure rating		NEMA Type 6 / outdoor					
COMPLIANCE							
Certifications		CA Rule 21 (UL 1741-SA), UL 62109-1, UL1741/IEE1547, FCC Part 15 Class B, ICES-0003 Class B, CAN/CSA-C22.2 NO. 107.1-01					

(1) The IQ8H-208 variant will be operating in grid-tied mode only at 208V AC. (2) No enforced DC/AC ratio. See the compatibility calculator at <https://link.enphase.com/module-compatibility> (3) Maximum continuous input DC current is 10.6A (4) Nominal voltage range can be extended beyond nominal if required by the utility. (5) Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.

VERSION

DESCRIPTION	DATE	REV
INITIAL RELEASE	11-29-2022	UR

PROJECT NAME

WOLF RESIDENCE
 2397 NC 55,
 DUNN, NC 28334, USA
 APN# 071509004401
 UTILITY: DUKE ENERGY
 AHJ: HARNETT COUNTY

SHEET NAME

SPEC SHEETS

SHEET SIZE

ANSI B
 11" X 17"

SHEET NUMBER

PV-7

Enphase IQ Combiner 4/4C

X-IQ-AM1-240-4
X-IQ-AM1-240-4C



X-IQ-AM1-240-4C

X-IQ-AM1-240-4

The **Enphase IQ Combiner 4/4C** with Enphase IQ Gateway and integrated LTE-M1 cell modem (included only with IQ Combiner 4C) consolidates interconnection equipment into a single enclosure and streamlines IQ microinverters and storage installations by providing a consistent, pre-wired solution for residential applications. It offers up to four 2-pole input circuits and Eaton BR series busbar assembly.

Smart

- Includes IQ Gateway for communication and control
- Includes Enphase Mobile Connect cellular modem (CELLMODEM-M1-06-SP-05), included only with IQ Combiner 4C
- Includes solar shield to match Enphase IQ Battery aesthetics and deflect heat
- Flexible networking supports Wi-Fi, Ethernet, or cellular
- Optional AC receptacle available for PLC bridge
- Provides production metering and consumption monitoring

Simple

- Centered mounting brackets support single stud mounting
- Supports bottom, back and side conduit entry
- Up to four 2-pole branch circuits for 240 VAC plug-in breakers (not included)
- 80A total PV or storage branch circuits

Reliable

- Durable NRTL-certified NEMA type 3R enclosure
- Five-year limited warranty
- Two years labor reimbursement program coverage included for both the IQ Combiner SKU's
- UL listed

Enphase IQ Combiner 4/4C

MODEL NUMBER	
IQ Combiner 4 (X-IQ-AM1-240-4)	IQ Combiner 4 with Enphase IQ Gateway printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 +/- 0.5%) and consumption monitoring (+/- 2.5%). Includes a silver solar shield to match the IQ Battery system and IQ System Controller 2 and to deflect heat.
IQ Combiner 4C (X-IQ-AM1-240-4C)	IQ Combiner 4C with Enphase IQ Gateway printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 +/- 0.5%) and consumption monitoring (+/- 2.5%). Includes Enphase Mobile Connect cellular modem (CELLMODEM-M1-06-SP-05), a plug-and-play industrial-grade cell modem for systems up to 60 microinverters. (Available in the US, Canada, Mexico, Puerto Rico, and the US Virgin Islands, where there is adequate cellular service in the installation area.) Includes a silver solar shield to match the IQ Battery and IQ System Controller and to deflect heat.
ACCESSORIES AND REPLACEMENT PARTS (not included, order separately)	
Ensemble Communications Kit COMMS-CELLMODEM-M1-06 CELLMODEM-M1-06-SP-05 CELLMODEM-M1-06-AT-05	- Includes COMMS-KIT-01 and CELLMODEM-M1-06-SP-05 with 5-year Sprint data plan for Ensemble sites - 4G based LTE-M1 cellular modem with 5-year Sprint data plan - 4G based LTE-M1 cellular modem with 5-year AT&T data plan
Circuit Breakers BRK-10A-2-240V BRK-15A-2-240V BRK-20A-2P-240V BRK-15A-2P-240V-B BRK-20A-2P-240V-B	Supports Eaton BR210, BR215, BR220, BR230, BR240, BR250, and BR260 circuit breakers. Circuit breaker, 2 pole, 10A, Eaton BR210 Circuit breaker, 2 pole, 15A, Eaton BR215 Circuit breaker, 2 pole, 20A, Eaton BR220 Circuit breaker, 2 pole, 15A, Eaton BR215B with hold down kit support Circuit breaker, 2 pole, 20A, Eaton BR220B with hold down kit support
EPLC-01	Power line carrier (communication bridge pair), quantity - one pair
XA-SOLARSHIELD-ES	Replacement solar shield for IQ Combiner 4/4C
XA-PLUG-120-3	Accessory receptacle for Power Line Carrier in IQ Combiner 4/4C (required for EPLC-01)
XA-ENV-PCBA-3	Replacement IQ Gateway printed circuit board (PCB) for Combiner 4/4C
X-IQ-NA-HD-125A	Hold down kit for Eaton circuit breaker with screws.
ELECTRICAL SPECIFICATIONS	
Rating	Continuous duty
System voltage	120/240 VAC, 60 Hz
Eaton BR series busbar rating	125 A
Max. continuous current rating	65 A
Max. continuous current rating (input from PV/storage)	64 A
Max. fuse/circuit rating (output)	90 A
Branch circuits (solar and/or storage)	Up to four 2-pole Eaton BR series Distributed Generation (DG) breakers only (not included)
Max. total branch circuit breaker rating (input)	80A of distributed generation / 95A with IQ Gateway breaker included
Production metering CT	200 A solid core pre-installed and wired to IQ Gateway
Consumption monitoring CT (CT-200-SPLIT)	A pair of 200 A split core current transformers
MECHANICAL DATA	
Dimensions (WxHxD)	37.5 x 49.5 x 16.8 cm (14.75" x 19.5" x 6.63"). Height is 21.06" (53.5 cm) with mounting brackets.
Weight	7.5 kg (16.5 lbs)
Ambient temperature range	-40° C to +46° C (-40° to 115° F)
Cooling	Natural convection, plus heat shield
Enclosure environmental rating	Outdoor, NRTL-certified, NEMA type 3R, polycarbonate construction
Wire sizes	• 20 A to 50 A breaker inputs: 14 to 4 AWG copper conductors • 60 A breaker branch input: 4 to 1/0 AWG copper conductors • Main lug combined output: 10 to 2/0 AWG copper conductors • Neutral and ground: 14 to 1/0 copper conductors Always follow local code requirements for conductor sizing.
Altitude	To 2000 meters (6,560 feet)
INTERNET CONNECTION OPTIONS	
Integrated Wi-Fi	802.11b/g/n
Cellular	CELLMODEM-M1-06-SP-05, CELLMODEM-M1-06-AT-05 (4G based LTE-M1 cellular modem). Note that an Enphase Mobile Connect cellular modem is required for all Ensemble installations.
Ethernet	Optional, 802.3, Cat5E (or Cat 6) UTP Ethernet cable (not included)
COMPLIANCE	
Compliance, IQ Combiner	UL 1741, CAN/CSA C22.2 No. 107.1, 47 CFR, Part 15, Class B, ICES 003 Production metering: ANSI C12.20 accuracy class 0.5 (PV production) Consumption metering: accuracy class 2.5
Compliance, IQ Gateway	UL 60601-1/CANCSA 22.2 No. 61010-1

VERSION

DESCRIPTION	DATE	REV
INITIAL RELEASE	11-29-2022	UR

PROJECT NAME

WOLF RESIDENCE
2397 NC 55,
DUNN, NC 28334, USA
APN# 071509004401
UTILITY: DUKE ENERGY
AHJ: HARNETT COUNTY

SHEET NAME

SPEC SHEETS

SHEET SIZE

ANSI B
11" X 17"

SHEET NUMBER

PV-8



To learn more about Enphase offerings, visit enphase.com



To learn more about Enphase offerings, visit enphase.com

© 2021 Enphase Energy. All rights reserved. Enphase, the Enphase logo, IQ Combiner 4/4C, and other names are trademarks of Enphase Energy, Inc. Data subject to change. 10-21-2021





APALTERNATIVES.COM
WHERE INNOVATION MEETS AUTOMATION

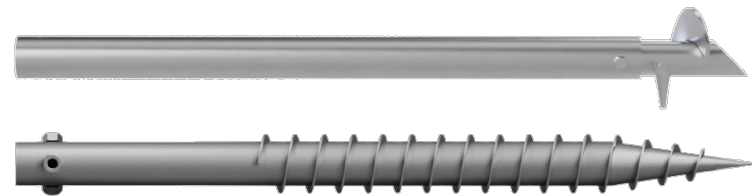


NO MORE CONCRETE

APA's proprietary shallow helical anchors and ground screws allow us to be extremely versatile/flexible in many soil conditions and provide a stable foundation at a cost effective price. Our anchors can be installed in many ways, a skid loader and auger attachment being the most common. Being able to build on the anchor immediately after it's installed drastically reduces project installation times.

CUSTOMIZABLE KITTED SOLUTION

The Pre-Engineered Kit is customizable in two module increments. This allows installers to build a system that matches their project. No need to go out and source additional materials, such as schedule 40 pipe. Our kit includes all racking hardware from the helical anchors to the module clamps and everything in-between. Other foundations with ground screws or ballast are available.



20-345 COUNTY ROAD X P.O. BOX 326 RIDGEVILLE CORNERS, OH 43555

READY RACK PRE-ENGINEERED KIT

The **Pre-Engineered** system is designed specifically for small scale solar installations. The system comes with all the components included and has approved engineering documentation already completed; just pick your site's parameters and go. The hardware design is a simple configuration that allows contractors to install the system lightning fast. Highly engineered Cee Channels are strong and lightweight; they allow for faster connections and reduced parts. Specifically manufactured strut meets our high standards for strength and longevity. Integrated features allow for onsite adjustment and anchors paired with quick-install bracing make this simple system extremely robust.

In business since 2008, APA offers the most versatile line of racking and foundation solutions for projects in even the most challenging environments. With projects nationwide, APA is a trusted quality racking partner.

419.267.5280 SALES@APALTERNATIVES.COM

Racking Material: High Strength Steel
Corrosion Resistance: Galvanized; G90
Higher coatings as required
Snow Load: Up to 100psf
Wind Load: Up to 140mph
Tilt Angle: 20, 25, 30, 35 Degrees
Anchor Depth: Design based on soil type and frost line
Building Code Compliant: IBC 2015
PE Stamped Drawings: APA drawings can be approved for all 50 states and territories, with PE stamped letters

PRE-ENGINEERED

The racking is pre-engineered with PE stamped engineering and manufactured with hole patterns for 20°, 25°, 30°, and 35° tilt angles

INSTALLER FRIENDLY

Sleek and strong, our Cee Channel accommodates varying posts heights, spans, tilts, and allows adjustments in the field

CUSTOMIZABLE ROW LENGTHS

Our racking is capable of accommodating any row length. Solar modules can be added in increments of two modules, allowing you to match the system size to your projects needs



READILY AVAILABLE EQUIPMENT

Our helical anchors are installed with the most common piece of construction equipment, a skid loader



SIMPLE ADAPTER

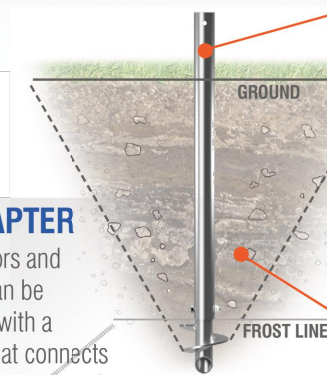
Our helical anchors and ground screws can be installed quickly with a simple adapter that connects to any standard hex or round shaft auger attachment

NO WAIT TIME

Once the helical anchors are installed you can build on them immediately, no waiting for concrete to set up or holes to be inspected

SOIL CONE WEIGHT

Helical anchors create a cone of weight that allows them to resist large pullout forces at shallow depths



419.267.5280 // SALES@APALTERNATIVES.COM



202 NORTH DIXON AVENUE,
CARY, NC 27513 USA
PHONE: 919-804-1490
LICENSE: 67356

VERSION		
DESCRIPTION	DATE	REV
INITIAL RELEASE	11-29-2022	UR

PROJECT NAME

WOLF RESIDENCE
2397 NC 55,
DUNN, NC 28334, USA
APN# 071509004401
UTILITY: DUKE ENERGY
AHJ: HARNETT COUNTY

SHEET NAME
SPEC SHEETS

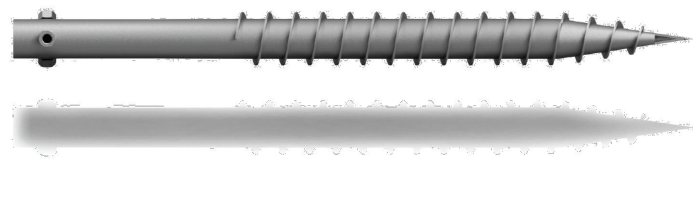
SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-9



ROCKY SOIL CONDITIONS

Our ground screws are designed for sites with rock. The forged tip helps lead the screw straight and plumb. The threads of the screw bite and hold firmly into the soil without getting caught on rocks and cobble. The heavy walled tube and welded connections allow massive amounts of torque and downward pressure to be applied, helping the screw to advance in even the toughest soils.



SIMPLE INSTALL

Several types of equipment can be used to install ground screws. Skid loaders or mini excavators with an auger attachment are among the most common installation equipment. Many drilling contractors can use a simple adapter to drive ground screws without buying new equipment. Most pile driving rigs can be converted to rotary heads with little effort.

GROUND SCREW FOUNDATION

Our ground screws are manufactured for even the most challenging solar sites. We use heavy walled tubing for the main shaft of the screw. The tips of the screw are forged, making them extremely hard, helping them to penetrate into or pass by underground obstructions. The threads are welded with a patented automated welding process to provide a consistent and strong weld along the entire length of the thread. Ground screws come with a durable hot dipped galvanized coating that will protect them from long term corrosion.

In business since 2008, APA offers a versatile line of racking and foundation solutions for projects in even the most challenging environments. With projects nationwide, APA is a trusted racking partner.

WHY USE A GROUND SCREW FOUNDATION?

HARD SOILS

Hard soils are why ground screws were designed. The forged tip and heavy duty steel tube allow for thousands of pounds of downforce and turning torque to be applied to the screw. This amount of torque and downforce allows rocks and cobbles to be pushed out of the way during installation.

SOLID ROCK

Ground screws can be installed into solid rock by utilizing the method of drilling a pilot hole and adding some gravel backfill. The ground screws are securely installed into the pilot hole using the threads of the screw and the gravel backfill then locks them into the solid rock.

SANDY SOILS

The granular structure of sand has poor friction value making it hard for driven piles to perform well. However, the shape and threads of a ground screw displace and compact the sand around it when installed. This helps interlock the sand together and provides excellent holding power of the screw threads.

HEIGHT ADJUSTMENT

Posts can be adjusted to the perfect height by simply raising or lowering the top post in or out of the screw. To secure the post, simply tighten the three set screws.

SHALLOW INSTALL

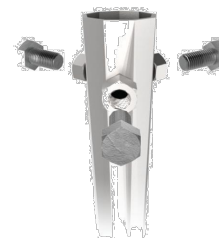
The ground screws can be installed as shallow as 30" depending on the soil. This lessens the chance of hitting underground obstructions.

FROST HEAVE RESISTANCE

The threads of the screw allow the foundation to easily overcome frost jacking forces.

SET SCREW CONNECTION

Using set screws allows the upper post to easily telescope to the correct height on sites with high degrees of topography.



202 NORTH DIXON AVENUE,
CARY, NC 27513 USA
PHONE: 919-804-1490
LICENSE: 67356

VERSION		
DESCRIPTION	DATE	REV
INITIAL RELEASE	11-29-2022	UR

PROJECT NAME

WOLF RESIDENCE
2397 NC 55,
DUNN, NC 28334, USA
APN# 071509004401
UTILITY: DUKE ENERGY
AHJ: HARNETT COUNTY

SHEET NAME
SPEC SHEETS

SHEET SIZE
ANSI B
11" X 17"

SHEET NUMBER
PV-10