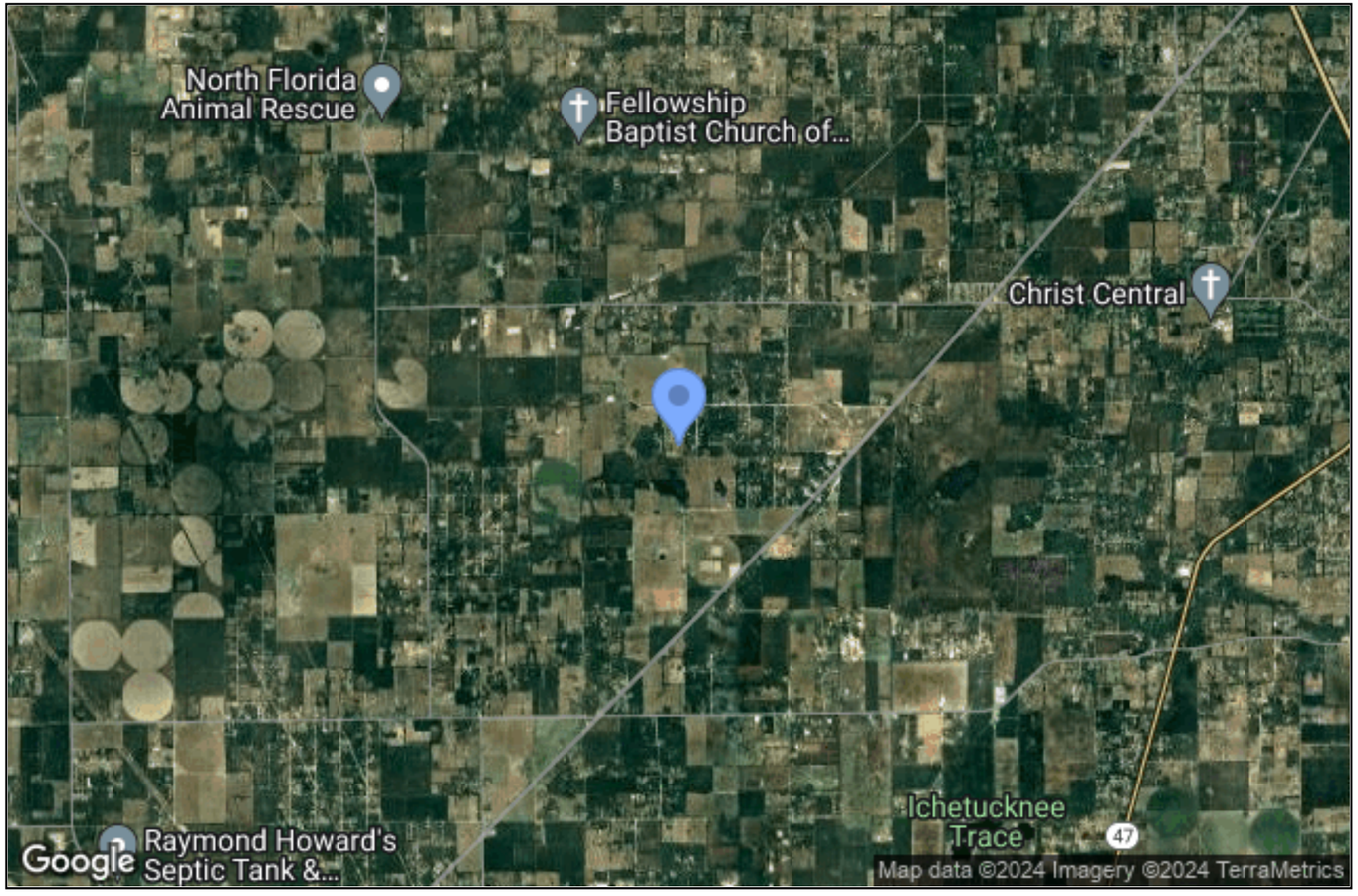
MARSHALL GARNER

481 SOUTHWEST HORSE WAY LAKE CITY FLORIDA 32024 UNITED STATES

30.0979467,-82.7792620

SYSTEM TIER (UTILITY): TIER 1 (11.6 KWDC*0.85 = 9.86 KWAC)
SCOPE OF WORK: INSTALLATION OF SOLAR PANELS AND ASSOCIATED ELECTRICAL EQUIPMENT.



01 VICINITY

02 AERIAL

PROJECT INFORMATION

DISTRICTS
COUNTY: COLUMBIA COUNTY
JURISDICTION: UN-INCORPORATED COLUMBIA

DESIGN SPECS
WIND EXPOSURE: B
RISK CATEGORY: II
WIND SPEED (MPH): 130
SNOW LOAD (PSF): 0

GOVERNING CODES
BUILDING: FBC 2023/ASCE 7-22
ELECTRICAL: NEC 2020
FIRE: FFPC, 8th ed. (2023)/NFPA 1 2021 ed.

SYSTEM
SIZE (KWDC): 11.6
EST KWH/YR: 16650
PANELS: 29
PANEL: TXI10-400
INVERTER(S): IQ8PLUS-72-2-US
VOLTAGE (V): 240

SHEET INDEX

MARSHALL GARNER

481 SOUTHWEST HORSE WAY LAKE CITY FLORIDA 32024 UNITED STATES

PROJECT ID: 8212024-481

CONTRACTOR: -

FLORIDA STATE ENERGY

6901 TPC DRIVE STE 650, ORLANDO, FL 32822

(407) 718-9980

ENGINEER: CA33343

ECUIP ENGINEERING

1646 W SNOW AVE 9 TAMPA, FL 33606

Ryan S Gittens 2024.08.21 19:41:24 -04'00'

RYAN GITTENS PE90605

DATE	BY	VER	DESCRIPTION
08.21.24	BF	1	INITIAL DESIGN

T1

PAPER: ARCHB

SCALE:

SOLAR DESIGN LAB

GENERAL

1.1 THE PROJECT IS DESIGNED IN GENERAL ACCORDANCE WITH FBC 2023/ASCE 7-22 AND OTHER REFERENCED CODES.
1.2 ABBREVIATIONS OTHER THAN AS PROVIDED ARE INDUSTRY STANDARD.
1.3 CONDITION AND CONSTRUCTION OF ROOF ASSEMBLY SHALL BE VERIFIED BY PHYSICAL INSPECTION AND ACCEPTED BY CONTRACTOR PRIOR TO COMMENCEMENT.
1.4 WORK TO BE COMPLETED SHALL BE VERIFIED BY INSTALLER AND ELECTRICIAN PRIOR TO COMMENCEMENT AND MATERIAL ORDER.
1.5 ALL CONTRACTORS AND SUB-CONTRACTORS SHALL INSPECT THE SITE AND ALL RESPECTIVE BUILDINGS IMMEDIATELY BEFORE PREPARING ANY BID AND BEFORE ORDERING ANY MATERIALS, AND SHALL PROVIDE CONTRACTOR WRITTEN NOTICE OF ANY DISCREPANCY BETWEEN FIELD CONDITIONS AND THE PLANS.
1.6 REQUIRED PLAN DIMENSIONS NOT PROVIDED SHALL BE CONFIRMED WITH ENGINEER OF RECORD. DIMENSIONS IN PARENTHESES ARE FOR ENGINEERING REFERENCE ONLY.
1.7 UNPLANNED ALTERATION OF STRUCTURAL ROOF OR WALL FRAMING SHALL REQUIRE WRITTEN APPROVAL BY THE EOR AND OWNER; PLANS SHALL BE SO REVISED.
1.8 BEST MANAGEMENT PRACTICES SHALL BE EXERCISED AT ALL TIMES TO MAINTAIN A SAFE AND CLEAN JOBSITE IN COORDINATION WITH PROPERTY OWNER AS APPLIES TO PARKING, TRASH REMOVAL, STORAGE, SOUND, UTILITIES AND TIMES OF WORK.
1.9 NO WORK SHALL BE PERFORMED IN RIGHT-OF-WAY OR EASEMENTS WITHOUT WRITTEN PERMISSION FROM THE APPROPRIATE PERMITTING AGENCY AND OWNER.
1.10 IN THE EVENT OF WEATHER AND OTHER CIRCUMSTANCES THAT COULD MATERIALLY AFFECT BUILDING CONDITIONS OR INSTALLATION, CONTRACTOR SHALL PERFORM A RE-INSPECTION AS REQUIRED THEN ADJUST PROJECT SCHEDULE TO INCLUDE RESPECTIVE PLAN REVISIONS.
1.11 INTERIOR FINISHES INCLUDING DRYWALL, FLOORING, PAINT, AND TRIM WORK SHALL BE REPAIRED IF MODIFIED OR DAMAGED DURING INSTALLATION PROCESS.

ROOF FIRE SAFETY

2.1 FIRE PROTECTION PROCEDURES SHALL BE FOLLOWED IN ACCORDANCE WITH FFPC, 8th ed. (2023)/NFPA 1 2021 ed.. WORK SHALL BE INSPECTED PRIOR TO COVER BY BUILDING INSPECTOR, AND EOR UPON REQUEST.
2.2 ACCESS POINT FOR FIRE DEPT. LADDER(S) SHALL BE CLEAR OF OPENINGS/OBSTRUCTIONS.
2.3 WORK SHALL BE PERFORMED IN ACCORDANCE WITH ROOF SAFETY RATING (CLASS A). (UL 790/ASTM E108)

NOTE TO INSTALLER

3.1 ALL PANELS SHALL BE ATTACHED TO EXISTING ROOF STRUCTURE USING THE REQUIRED NUMBER OF ATTACHMENTS IN THE PROPER CONFIGURATION AS DEFINED IN THIS PLAN SET.
3.2 ALL PANELS SHALL BE FULLY OUTSIDE OF ANY ROOF AREAS DEFINED AS FIRE SETBACK IN THIS SITE PLAN. FIRE SETBACKS ARE DEFINED BY THE DIMENSIONS IN RED AND ARE CONSIDERED ABSOLUTE.
3.3 ANY DIMENSIONS NOTED AS "MAX" SHALL BE BE UNDERSTOOD TO BE ABSOLUTE REQUIREMENTS WITH A TOLERANCE OF +-0.0"
3.4 ANY DIMENSIONS NOTED AS "MIN SHALL BE BE UNDERSTOOD TO BE ABSOLUTE REQUIREMENTS WITH A TOLERANCE OF +-0.0"
3.5 STANDARD DIMENSIONS (NOT INCLUDING FIRE SETBACKS) SHALL BE UNDERSTOOD TO BE REQUIREMENTS WITH A TOLERANCE OF +-2.0"
3.6 ANY DIMENSIONS NOTED AS APPROX SHALL BE UNDERSTOOD TO BE APPROXIMATE IN NATURE AND SHOULD BE USED AS A GUIDE. EXACT PLACEMENT OF THE PANELS RELATIVE TO THESE DIMENSIONS ARE LEFT TO THE INSTALLERS DISCRETION ASSUMING THAT ALL OTHER DEFINED REQUIREMENTS ARE MET.
3.7 ANY DIMENSIONS IN PARENTHESES () ARE FOR ENGINEERING REFERENCE ONLY AND ARE NOT NEEDED FOR INSTALLATION.
3.8 IT IS THE CONTRACTOR RESPONSIBILITY TO INSTALL THE SYSTEM AND ITS SUPPORTS AS INDICATED IN THESE PLANS. THE CONTRACTOR SHALL CONTACT THE ENGINEER OF RECORD IF SITE CONDITIONS DIFFER FROM WHAT IS DEPICTED ON PLANS.

ATTACHMENT SYSTEM

4.1 ATTACHMENT SYSTEM AND FLASHING METHOD SHALL BE CONSTRUCTED ACCORDING MANUFACTURER'S INSTALLATION MANUAL AND AS SPECIFIED BY EOR.

01 GENERAL NOTES

ELECTRICAL CERTIFICATION

1.1 PER FL STATUTE 377.705: I RYAN GITTENS PE#: PE90605 AN ENGINEER LICENSED PURSUANT TO CHAPTER 471, CERTIFY THAT THE PV ELECTRICAL SYSTEM AND ELECTRICAL COMPONENTS ARE DESIGNED AND APPROVED USING THE STANDARDS CONTAINED IN THE MOST RECENT VERSION OF THE FLORIDA BUILDING CODE, FBC 107

STRUCTURAL CERTIFICATION

2.1 PER FL STATUTE 377.705: I RYAN GITTENS PE#: PE90605 AN ENGINEER LICENSED PURSUANT TO CHAPTER 471, CERTIFY THAT THE INSTALLATION OF THE SOLAR MODULES IS IN COMPLIANCE WITH FBC 2023 8TH EDITION, CHAPTER 3. BUILDING STRUCTURE WILL SAFELY ACCOMMODATE WIND LATERAL AND UPLIFT FORCES, AND EQUIPMENT DEAD LOADS

STRUCTURAL EVALUATION

3.1 THE EXISTING STRUCTURE APPEARS TO BE BUILT TO INDUSTRY STANDARDS AND IS IN ORIGINAL CONDITION. IF STRUCTURALLY SOUND, THE EXISTING ROOF STRUCTURE IS CAPABLE OF ITS CODE REQUIRED LOADS. THE ADDITIONAL LOADS SUPERIMPOSED BY THE PHOTOVOLTAIC SYSTEM ARE NEGLIGIBLE AND WILL HAVE NO EFFECT ON ROOF PERFORMANCE. INSTALLERS/INSPECTORS MUST ENSURE THAT THE EXISTING ROOF FRAMING SYSTEM IS UNDAMAGED OR NOT DEFECTIVE IN ANYWAY PRIOR TO INSTALLATION OF THE ROOF MOUNTED SOLAR SYSTEM TO VERIFY THAT THE EXISTING ROOF IS CAPABLE OF SUPPORTING THE ADDITIONAL LOADS.

02 CERTIFICATIONS

EQUIPMENT NOTES

1.1 NEW EQUIPMENT CLEARANCES: 36" (FRONT), 30" (WORK AROUND), 6 FT (OH) (NEC 110.26)
1.2 NEW EQUIPMENT AND COMPONENTS SHALL BE CERTIFIED BY A NATIONAL LABORATORY.
1.3 EQUIPMENT SHALL BE INSTALLED AND USED ACCORDING TO INSTALLATION MANUAL OR SPECIFICATIONS, AND SHALL BE RATED FOR OUTDOOR USE IF INSTALLED OUTSIDE

GENERAL NOTES

2.1 INSTALLER SHALL FURNISH ALL LABOR, MATERIALS AND EQUIPMENT NECESSARY FOR THE INSTALLATION OF A COMPLETE ELECTRICAL SYSTEM PURSUANT TO THE PLANS IN ACCORDANCE WITH THE BUILDING CODE, OSHA AND ALL OTHER APPLICABLE CODES AND ORDINANCES.
2.2 ELECTRICAL WORK AND RESPECTIVE PREPARATION WORK SHALL BE PERFORMED BY PROPERLY LICENSED SUBCONTRACTORS.
2.3 MATERIALS SHALL BE INCLUDED IN THE PLANS AND ANY NECESSARY EQUIVALENT SUBSTITUTIONS SHALL BE APPROVED BY THE EOR
2.4 CONDUCTORS SHALL BE COPPER OF 98% CONDUCTIVITY. CABLES SHALL BE RATED FOR APPLICABLE VOLTAGE, SINGLE-CONDUCTOR IN THERMOPLASTIC INSULATION SUITABLE FOR CONTINUOUS OPERATION AT 75° C. INSULATION SHALL BE COLOR-CODED #6 AND SMALLER. COLOR-CODED TAPE SHALL BE USED ON #4 AND LARGER.
2.5 CONDUCTORS SHALL BE RUN IN CONDUIT WHEN NOT BENEATH MODULES. EXPOSED CONDUIT IS PERMITTED IN GARAGES OR OTHER AREAS ACCEPTABLE TO OWNER AND AS APPROVED BY EOR.
2.6 FLEXIBLE CONDUIT SHALL BE USED FOR VIBRATING EQUIPMENT AND RECESSED MOUNTED FIXTURES AND SHALL BE SEALED WITH LIQUID TIGHT IF EXPOSED TO WEATHER WITH GREEN BOND CONDUCTOR INSTALLED TOGETHER AT CIRCUIT CONDUCTORS. GALVANIZED EMT WITH SET-SCREW MAY BE USED FOR INTERIOR LOCATIONS. PVC WITH GREEN BOND CONDUCTOR (NEC 250) MAY BE USED IN UG LOCATIONS.
2.7 FOR PIERCING TAPS, THE TOTAL AREA OF ALL CONDUCTORS, SPLICES, AND TAPS INSTALLED AT ANY CROSS SECTION OF THE WIRING SPACE SHALL NOT EXCEED 75 PERCENT OF THE CROSS-SECTIONAL AREA OF THAT SPACE (NEC 312.8.A).
2.8 PV AC DISCONNECT SHALL BE SERVICE ENTRANCE RATED IF CONNECTED TO SUPPLY SIDE OF SERVICE
2.9 ALL FUSES SHALL BE (R) RATED AND SHALL HAVE APPROPRIATE REJECTION CLIPS
2.10 HVAC CONDUCTORS, CIRCUIT BREAKERS AD FUSES SHALL BE REPLACED AS NECESSARY TO COMPLY WITH MANUFACTURER'S RECOMMENDED OVER-CURRENT PROTECTION. CONDUIT AND BREAKERS SHALL BE COORDINATED WITH THE EQPT. NAMEPLATE. OTHER CIRCUITS PULLING 208-240V SHALL BE INSPECTED FOR COMPLIANCE WITH CONDUCTOR AND OVER-CURRENT PROTECTION REQUIREMENTS. REPLACEMENT SHALL BE THE RESPONSIBILITY OF THE OWNER AND PERFORMED BEFORE CONTRACTOR PERFORMS INITIAL SYSTEM TESTING.
2.11 THE SUGGESTED EQUIPMENT MOUNTING LOCATION MAY BE ADJUSTED AT INSTALLER'S DISCRETION SO LONG AS LOCAL AHJ REQUIREMENTS ARE ADHERED TO

CONDUIT NOTES

3.1 PVC SCH 40 OR SCH 80 MAY BE USED AS REQUIRED FOR ADDITIONAL SAFETY OR FOR RUNS <= FT WITH UPSIZE ACCORDING TO FILL TABLE.
3.2 ELECTRICAL METALLIC TUBING (EMT) NEC Art. 358:
3.3 1. EMT SHALL BE FASTENED EVERY 10 FT & FROM BOX, FITTING, TERMINAL POINT.
3.4 2. BENDS BETWEEN PULL POINTS SHALL COMBINE LESS THAN OR EQUAL TO 360°.
3.5 3. CONNECTORS SHALL BE CORROSION RESISTANT.
3.6 4. GASKETS SHALL BE WATERTIGHT.
3.7 5. COUPLINGS AND CONNECTORS SHALL BE RAIN-TIGHT OR RAIN-TIGHT/INSULATED. NEC FILL TABLES
3.8 RIGID PVC CONDUIT TABLE: SCHEDULE 80-C10/40-C11
3.9 FLEXIBLE METALLIC CONDUIT-TABLE C3
3.10 LIQUIDTIGHT FLEXIBLE CONDUIT TABLE-METALLIC C7/NON-METALLIC (FNMC-B)-CS

ELECTRICIAN NOTES:

4.1 1. CONFIRM GROUND CONDUCTOR (EGC) & EXISTING GROUNDING ELECTRODE (GE)
4.2 2. CONFIRM BUSBAR RATINGS & FEEDERS. IF ACTUAL CONDITIONS DIFFER, NOTIFY EOR.
4.3 3. CONDUCTORS MAY BE COMBINED USING RATED JUNCTIONS BOXES/CONDUIT UP-SIZE.
4.4 EXPANSION NOTE: FITTINGS SHALL BE INSTALLED BETWEEN SECURELY-MOUNTED ELBOWS AND TERMINATION POINTS (NOT INCL. WYES). IF JOINT IS VERTICAL, OPEN-END SHALL BE SECURELY FASTENED IN DOWN POSITION W/COUPLING INSTALLED CLOSE TO TOP OF RUN W/ BARREL ALSO DOWN AND LOWER END SECURED AT BOTTOM TO ALLOW UPWARD MOVEMENT. (SEC. 352.44 NEC)

BONDING & GROUNDING NOTE:

5.1 1. MODULES SHALL BE BONDED BY BONDING MID-CLAMPS ACCORDING TO INSTALLATION MANUAL MODULES WHICH CAN NOT BE FULLY BONDED SHALL BE PROPERLY GROUND USING GROUNDING LUG WIRED DIRECTLY TO SYSTEM GROUND WIRE. ALTERNATIVES REQUIRE A CUSTOMIZED PLAN FROM EOR.
5.2 2. (2) ROD AND PIPE ELECTRODES REQUIRED. ROD AND PIPE ELECTRODES SHALL NOT BE LESS THAN 2.44 M (8 FT) IN LENGTH AND SHALL CONSIST OF THE FOLLOWING MATERIALS: COPPER, GALVANIZED STEEL, STAINLESS STEEL
5.3 3. GROUNDING ELECTRODES OF PIPE OR CONDUIT SHALL NOT BE SMALLER THAN METRIC DESIGNATOR 21 (TRADE SIZE 3/4) AND, WHERE OF STEEL, SHALL HAVE THE OUTER SURFACE GALVANIZED OR OTHERWISE METAL-COATED FOR CORROSION PROTECTION.
5.4 4. ROD-TYPE GROUNDING ELECTRODES OF STAINLESS STEEL AND COPPER OR ZINC-COATED STEEL SHALL BE AT LEAST 15.87 MM (5/8 IN.) IN DIAMETER, UNLESS LISTED.
5.5 5. THE METAL WATER PIPING SYSTEM SHALL BE BONDED AS REQUIRED PER NEC 250.104
5.6 6. INTERSYSTEM BONDING REQUIRED PER NEC 250.94

SMOKE ALARM NOTES:

6.1 INTERCONNECTED SMOKE ALARMS SHALL BE INSTALLED THROUGHOUT THE DWELLING, INCLUDING IN ROOMS, ATTACHED GARAGES, AND AREAS IN WHICH ESS ARE INSTALLED IN COMPLIANCE WITH LOCAL BUILDING CODE. WHERE ESS ARE INSTALLED IN AN ATTACHED GARAGE OR AREA IN WHICH SMOKE ALARMS CANNOT BE INSTALLED IN ACCORDANCE WITH THEIR LISTING, AN INTERCONNECTED LISTED HEAT ALARM SHALL BE INSTALLED AND BE CONNECTED TO THE SMOKE ALARM SYSTEM REQUIRED BY THE LOCAL BUILDING CODE PER NFPA 855 EDITION 2020 15.9.2.

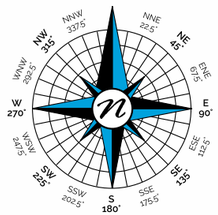
SURGE PROTECTION NOTE:

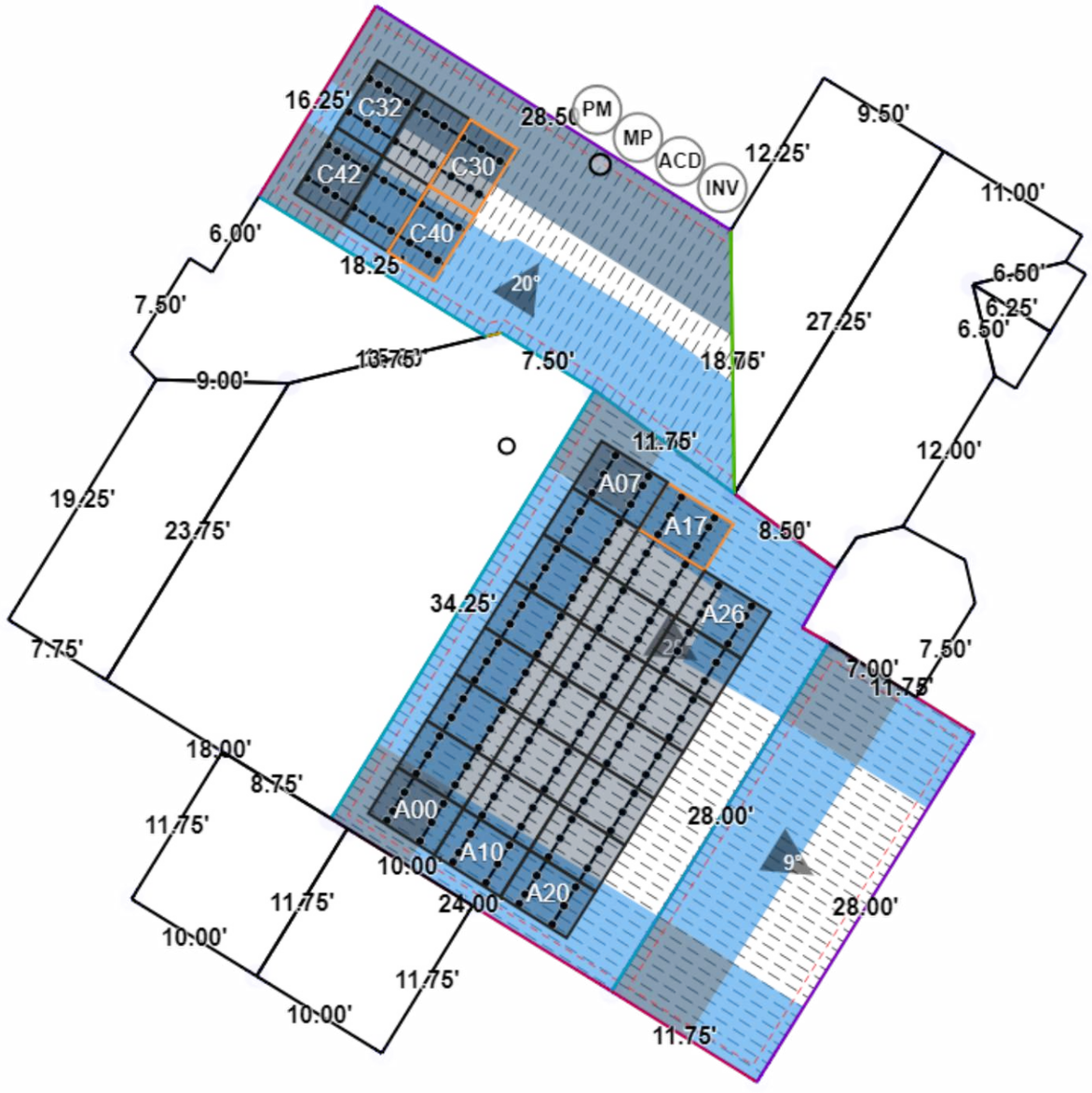
7.1 PER NEC 230.67(D) WHERE SERVICE EQUIPMENT IS REPLACED, A SURGE-PROTECTIVE DEVICE (SPD) SHALL BE PROVIDED TO NEW SERVICE EQUIPMENT

03 ELECTRICAL NOTES

MARSHALL GARNER	CONTRACTOR: -	ENGINEER: CA33343	Ryan S Gittens 2024.08.21 19:41:24 -04'00' RYAN GITTENS PE90605	DATE	BY	VER	DESCRIPTION	G1
	FLORIDA STATE ENERGY	ECUIP ENGINEERING		08.21.24	BF	1	INITIAL DESIGN	
481 SOUTHWEST HORSE WAY LAKE CITY FLORIDA 32024 UNITED STATES	6901 TPC DRIVE STE 650, ORLANDO, FL 32822	1646 W SNOW AVE 9 TAMPA, FL 33606						PAPER: ARCHB
	(407) 718-9980							SCALE:
PROJECT ID: 8212024-481								

SOLAR DESIGN LAB





01 PLAN VIEW

EQUIPMENT LEGEND

- PM -POWER METER
- MP -MAIN PANEL
- ACD -AC DISCONNECT
- INV -INVERTER/COMBINER

ZONE WIDTHS

PITCHED:

- < NA' > -1
- < 6' > -2
- < 6' > -3

ROOF TYPE 1
MATERIAL: METAL
ATTACHMENT: (158) S5!-PROTEA
RAIL: (217') IRONRIDGE-XR10
MAX POINT DEADLOAD: 11 lbs
MAX DIST DEADLOAD: 2.88 psf
MAX ANCHOR LOAD: -74 lbf
MIN SAFETY FACTOR: 7.48

RELEVANT DIMS
LEAST HORIZ DIM: 60'
ROOF HEIGHT(S), h/EXPOSED DIST, d1: 15'/7.5'
ZONE WIDTH, a: 6'

ARRAY(S)
MODULES: (29) TXI10-400
ARRAY AREA: 610 SQFT

02 SYSTEM SUMMARY

GENERAL

1.1 EXISTING VENTS, SKYLIGHTS OR EXHAUST OUTLETS SHALL NOT BE COVERED BY THE SOLAR PV SYSTEM.
1.2 MODULES SHALL NOT OVERHANG ANY RIDGE, HIP OR ROOF EDGE.
1.3 CONTRACTOR SHALL NOTIFY ENGINEER/DESIGNER OF ANY CHANGES.
1.4 PANELS SHALL BE A MINIMUM OF 10IN AWAY FROM ROOF EDGE.

03 NOTES

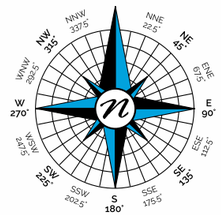
BASED ON OUR REVIEW, THE EXISTING MEMBERS COMPLY WITH FBC 2023/ASCE 7-22 DESIGN SPAN RATINGS WITH SUFFICIENT CAPACITY TO SUPPORT THE NEW LOADS IMPOSED BY THE PROPOSED SOLAR ARRAY.

THE SPECIFICATIONS SHOWN IN THIS CONSTRUCTION PLAN WERE DESIGNED PER FBC 2023/ASCE 7-22 FOR A WIND SPEED OF 130 MPH, EXPOSURE CATEGORY B FOR RISK CATEGORY II BUILDING WITH 0 PSF SNOW LOAD.

04 STRUC. EVALUATION/CERTIFICATION

MARSHALL GARNER	CONTRACTOR: -	ENGINEER: CA33343	Ryan S Gittens 2024.08.21 19:41:24 -04'00'	DATE	BY	VER	DESCRIPTION	S1
481 SOUTHWEST HORSE WAY LAKE CITY FLORIDA 32024 UNITED STATES	FLORIDA STATE ENERGY 6901 TPC DRIVE STE 650, ORLANDO, FL 32822 (407) 718-9980	ECUIP ENGINEERING 1646 W SNOW AVE 9 TAMPA, FL 33606	RYAN GITTENS PE90605	08.21.24	BF	1	INITIAL DESIGN	PAPER: ARCHB
PROJECT ID: 8212024-481								SCALE: 1"=9.62'

SOLAR DESIGN LAB



ARRAY OFFSETS

PANEL ID	SIDE	DIM (in)
A00	T	24
A00	L	19.32
A10	L	18.6
A17	R	22.92
A17	B	91.8
A07	T	26.28
A07	R	27.6
A20	B	54.24
A20	L	18
A26	R	62.88
A26	B	53.64
C32	R	24.36
C32	B	37.32
C42	T	17.52
C42	R	24
C30	B	37.32
C30	L	228.84
C40	T	16.68
C40	L	270

01 LOCATIONS PLAN

MARSHALL GARNER	CONTRACTOR: -	ENGINEER: CA33343	Ryan S Gittens 2024.08.21 19:41:24 -04'00'	DATE	BY	VER	DESCRIPTION	SL1
	FLORIDA STATE ENERGY	ECUIP ENGINEERING		08.21.24	BF	1	INITIAL DESIGN	
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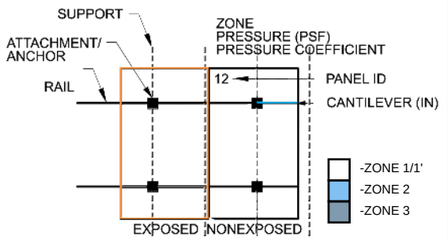


LEGEND

ARRAY
MODULE: (23) TXI10-400
TOTAL AREA: 483.52 SQFT

HARDWARE
RAIL: 172' IRONRIDGE-XR10
ATTACHMENT: (122) S5!-PROTEA
ANCHORAGE: RIB/SEAM

FRAMING
SIZE: MIN. 2X4
SPACING: 24" OC

ROOF
MEAN HEIGHT: 15'
MATERIAL: METAL (9" OC RIBS/SEAMS)
SHAPE: GABLE

GEOGRAPHY
EXPOSURE CAT: B
WIND SPEED: 130 MPH
GND SNOW LOAD: 0 PSF

PARAMETERS

DEAD LOAD CALC
LOADS:
Panel = 46.3lbs
Anchors = 1.2lbs
Rail = 0.72lbs/ft
Misc = 1.6lbs/panel

DEADLOAD PER ROW, Fdr:
Fdr = (lbs/panel*#panels/row) + (lbs/ft-rail*ft-rail/row)*2 + (lbs/anchor*#anchors/row) + (misc-lbs/panel*#panels/row) (lbf)

DIST DEADLOAD, Fdd:
Fdd = Fdr/(area/panel*#panels/row) (psf)

DEADLOAD PER ANCHOR, Fda:
Fda = Fdr/(#anchors/row) (lbs)

PANELS PARALLEL TO SURFACE, 29.4.4
CRITERIA:
- Panels parallel to roof surface (within 2 deg)
- Max height of panel above roof, h1 & h2 OF 10"
- Min panel gap of 0.25"
- Min edge distance 2*h2
- Max panel chord length of 6.7'

UPLIFT ON ONE PANEL, Fup = P*A (lbf)
Per ASCE 2.4, 26.10.2 & 29.4.4
P = pasd = 0.6*p = 0.6*qh*(GCp)*(YE)*(Ya), A = load area

UPLIFT PER ROW, Fur = SUM(Fup(0):Fup(n)) (lbf)
Where Fup(0):Fup(n) = loads from first to last panel in row

UPLIFT PER ANCHOR, Fua = Fur/(#ANCHORS/ROW) (lbf)

LOAD PER ANCHOR, Fa = 0.6*Fda + Fua (lbf)

SAFETY FACTOR, SF = Ftest/Fa

VELOCITY PRESSURE qh = 0.00256*Kz*Kzt*Kd*Ke*V^2 = 21 (lb/sqft)
Where Kz = 0.57, Kzt = 1, Kd = 0.85, Ke = 1, V = 130

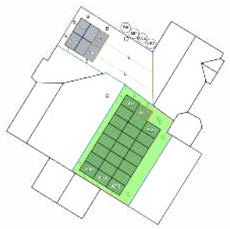
EXT PRESSURE COEFFICIENT, GCp:
GCp varies per roof & zone, 30.3-2A-I to 30.3.7: Aeff = 21.02 sqft (1 panel)

EXPOSURE FACTOR, YE:
YE = 1.5 for uplift loads on panels that are exposed and within a distance 2*h2 from the end of a row at an exposed edge of the array; YE = 1.0 elsewhere for uplift loads and for all downward loads, as illustrated in Fig. 29.4-7. A panel is defined as exposed if d1 to the roof edge > 0.5h and one of the following applies: 1. d1 to the adjacent array > 2*h2 or 2. d2 to the next adjacent panel > 2*h2.

PRESSURE EQUALIZATION FACTOR, Ya:
Ya is given as 0.59 per 29.4.4, 29.4-8 with h2 = 5"+ & panel gap = 0.37"

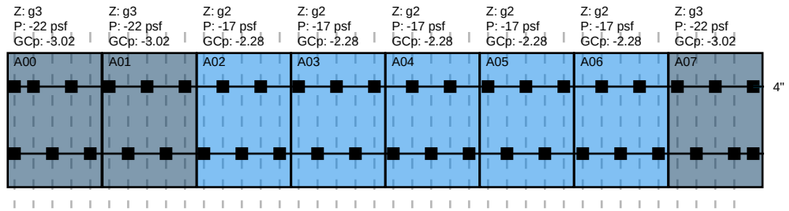
LOAD CALCS PER FBC 2023/ASCE 7-22

ZONES
f0: 1' (Flat)
f1: 1 (Flat)
f2: 2 (Flat)
f3: 3 (Flat)
g1: 1 (Gable)
g2: 2 (Gable)
g3: 3 (Gable)
h1: 1 (Hip)
h2: 2 (Hip)
h3: 3 (Hip)

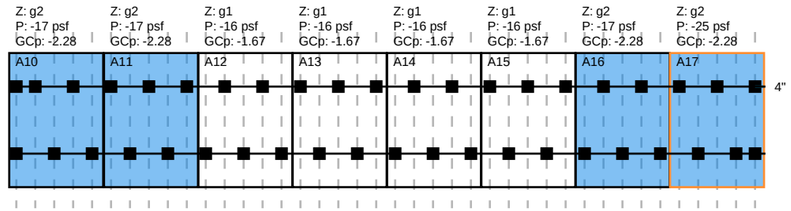


PLANE A | AZ: 122° | P: 20° | TOF: 94%

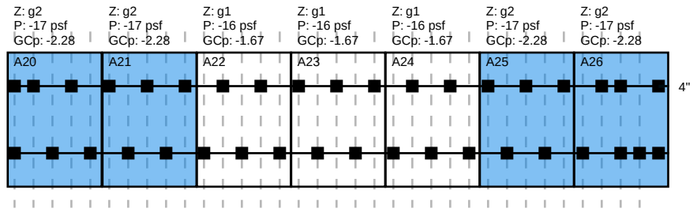
ROW: 0 (8 MODS)
NOM SPAN: 18"
MAX SPAN: 18"
MAX CANTILEVER: 26"
UPLIFT/ROW, Fur: -3173 lbf
#ANCHORS: 42
LOAD/ANCHOR, Fa: -69 lbf
TEST LOAD/ANCHOR: -550 lbf
SF: 8
DIST LOAD, Fdd: 2.83 psf
POINT LOAD, Fda: 11.35 lbs
ROOF PITCH: 07-20 deg
PANEL TILT: 0 deg
AZIMUTH: 122 deg



ROW: 1 (8 MODS)
NOM SPAN: 18"
MAX SPAN: 18"
MAX CANTILEVER: 26"
UPLIFT/ROW, Fur: -2937 lbf
#ANCHORS: 42
LOAD/ANCHOR, Fa: -63 lbf
TEST LOAD/ANCHOR: -550 lbf
SF: 8.72
DIST LOAD, Fdd: 2.83 psf
POINT LOAD, Fda: 11.35 lbs
ROOF PITCH: 07-20 deg
PANEL TILT: 0 deg
AZIMUTH: 122 deg



ROW: 2 (7 MODS)
NOM SPAN: 18"
MAX SPAN: 18"
MAX CANTILEVER: 26"
UPLIFT/ROW, Fur: -2423 lbf
#ANCHORS: 38
LOAD/ANCHOR, Fa: -57 lbf
TEST LOAD/ANCHOR: -550 lbf
SF: 9.62
DIST LOAD, Fdd: 2.84 psf
POINT LOAD, Fda: 11.02 lbs
ROOF PITCH: 07-20 deg
PANEL TILT: 0 deg
AZIMUTH: 122 deg



01 ATTACHMENT PLAN

MARSHALL GARNER

481 SOUTHWEST HORSE WAY LAKE CITY FLORIDA 32024
UNITED STATES

PROJECT ID: 8212024-481

CONTRACTOR: -
FLORIDA STATE ENERGY
6901 TPC DRIVE STE 650,
ORLANDO, FL 32822
(407) 718-9980

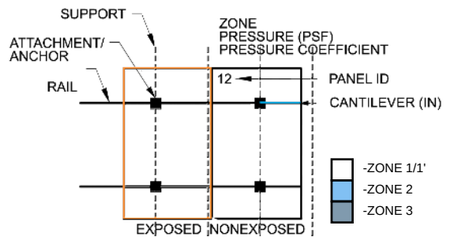
ENGINEER: CA33343
ECUIP ENGINEERING
1646 W SNOW AVE 9 TAMPA, FL 33606

Ryan S Gittens 2024.08.21 19:41:24 -04'00'
RYAN GITTENS
PE90605

DATE	BY	VER	DESCRIPTION
08.21.24	BF	1	INITIAL DESIGN

SP1
PAPER: ARCHB
SCALE:

SOLAR DESIGN LAB



LEGEND

ARRAY
MODULE: (6) TXI10-400
TOTAL AREA: 126.14 SQFT

HARDWARE
RAIL: 45' IRONRIDGE-XR10
ATTACHMENT: (36) S5!-PROTEA
ANCHORAGE: RIB/SEAM

FRAMING
SIZE: MIN. 2X4
SPACING: 24" OC

ROOF
MEAN HEIGHT: 15'
MATERIAL: METAL (9" OC RIBS/SEAMS)
SHAPE: MIXED

GEOGRAPHY
EXPOSURE CAT: B
WIND SPEED: 130 MPH
GND SNOW LOAD: 0 PSF

PARAMETERS

DEAD LOAD CALC
LOADS:
Panel = 46.3lbs
Anchors = 1.2lbs
Rail = 0.72lbs/ft
Misc = 1.6lbs/panel

DEADLOAD PER ROW, Fdr:
Fdr = (lbs/panel*#panels/row) + (lbs/ft-rail*ft-rail/row)*2 + (lbs/anchor*#anchors/row) + (misc-lbs/panel*#panels/row) (lbf)

DIST DEADLOAD, Fdd:
Fdd = Fdr/(area/panel*#panels/row) (psf)

DEADLOAD PER ANCHOR, Fda:
Fda = Fdr/(#anchors/row) (lbs)

PANELS PARALLEL TO SURFACE, 29.4.4
CRITERIA:
- Panels parallel to roof surface (within 2 deg)
- Max height of panel above roof, h1 & h2 OF 10"
- Min panel gap of 0.25"
- Min edge distance 2*h2
- Max panel chord length of 6.7'

UPLIFT ON ONE PANEL, Fup = P*A (lbf)
Per ASCE 2.4, 26.10.2 & 29.4.4
P = pasd = 0.6*p = 0.6*qh*(GCp)*(YE)*(Ya), A = load area

UPLIFT PER ROW, Fur = SUM(Fup(0):Fup(n)) (lbf)
Where Fup(0):Fup(n) = loads from first to last panel in row

UPLIFT PER ANCHOR, Fua = Fur/(#ANCHORS/ROW) (lbf)

LOAD PER ANCHOR, Fa = 0.6*Fda + Fua (lbf)

SAFETY FACTOR, SF = Ftest/Fa

VELOCITY PRESSURE qh = 0.00256*Kz*Kzt*Kd*Ke*V^2 = 21 (lb/sqft)
Where Kz = 0.57, Kzt = 1, Kd = 0.85, Ke = 1, V = 130

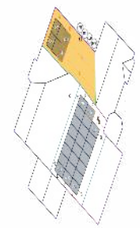
EXT PRESSURE COEFFICIENT, GCp:
GCp varies per roof & zone, 30.3-2A-I to 30.3.7: Aeff = 21.02 sqft (1 panel)

EXPOSURE FACTOR, YE:
YE = 1.5 for uplift loads on panels that are exposed and within a distance 2*h2 from the end of a row at an exposed edge of the array; YE = 1.0 elsewhere for uplift loads and for all downward loads, as illustrated in Fig. 29.4-7. A panel is defined as exposed if d1 to the roof edge > 0.5h and one of the following applies: 1. d1 to the adjacent array > 2*h2 or 2. d2 to the next adjacent panel > 2*h2.

PRESSURE EQUALIZATION FACTOR, Ya:
Ya is given as 0.59 per 29.4.4, 29.4-8 with h2 = 5"+ & panel gap = 0.37"

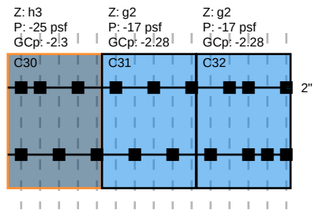
LOAD CALCS PER FBC 2023/ASCE 7-22

ZONES
f0: 1' (Flat)
f1: 1 (Flat)
f2: 2 (Flat)
f3: 3 (Flat)
g1: 1 (Gable)
g2: 2 (Gable)
g3: 3 (Gable)
h1: 1 (Hip)
h2: 2 (Hip)
h3: 3 (Hip)

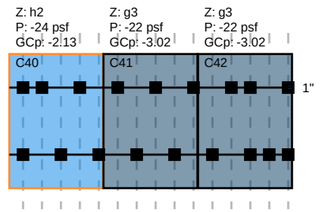


PLANE C | AZ: 32° | P: 20° | TOF: 76%

ROW: 3 (3 MODS)
NOM SPAN: 18"
MAX SPAN: 18"
MAX CANTILEVER: 26"
UPLIFT/ROW, Fur: -1243 lbf
#ANCHORS: 18
LOAD/ANCHOR, Fa: -63 lbf
TEST LOAD/ANCHOR: -550 lbf
SF: 8.73
DIST LOAD, Fdd: 2.88 psf
POINT LOAD, Fda: 10.08 lbs
ROOF PITCH: 07-20 deg
PANEL TILT: 0 deg
AZIMUTH: 32 deg

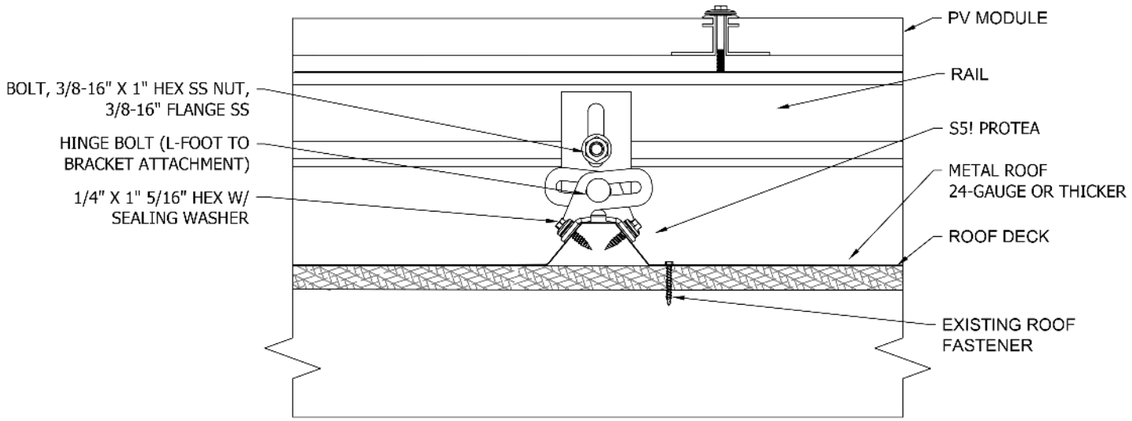


ROW: 4 (3 MODS)
NOM SPAN: 18"
MAX SPAN: 18"
MAX CANTILEVER: 26"
UPLIFT/ROW, Fur: -1432 lbf
#ANCHORS: 18
LOAD/ANCHOR, Fa: -74 lbf
TEST LOAD/ANCHOR: -550 lbf
SF: 7.48
DIST LOAD, Fdd: 2.88 psf
POINT LOAD, Fda: 10.08 lbs
ROOF PITCH: 07-20 deg
PANEL TILT: 0 deg
AZIMUTH: 32 deg



01 ATTACHMENT PLAN

MARSHALL GARNER	CONTRACTOR: -	ENGINEER: CA33343	Ryan S Gittens 2024.08.21 19:41:24 -04'00'	DATE	BY	VER	DESCRIPTION	SP2
	FLORIDA STATE ENERGY	ECUIP ENGINEERING		08.21.24	BF	1	INITIAL DESIGN	
481 SOUTHWEST HORSE WAY LAKE CITY FLORIDA 32024 UNITED STATES	6901 TPC DRIVE STE 650, ORLANDO, FL 32822	1646 W SNOW AVE 9 TAMPA, FL 33606	RYAN GITTENS PE90605					PAPER: ARCHB
PROJECT ID: 8212024-481	(407) 718-9980							SCALE:



01 ANCHORAGE DETAIL

ACCORDING TO APA E830E T3 GUIDELINES FOR METAL-TO-PLYWOOD CONNECTIONS, THE ULTIMATE WITHDRAWAL LOAD FROM 1/2" PLYWOOD USING TYPICAL #10 WOOD/SHEET METAL SCREWS IS 275 LBF. CONSIDERING A WORST-CASE SCENARIO WITH A SAFETY FACTOR OF 2 AND A DURATION FACTOR OF 1.6, THE ALLOWABLE WITHDRAWAL LOAD PER ANCHOR IS CALCULATED TO BE 220 LBF.

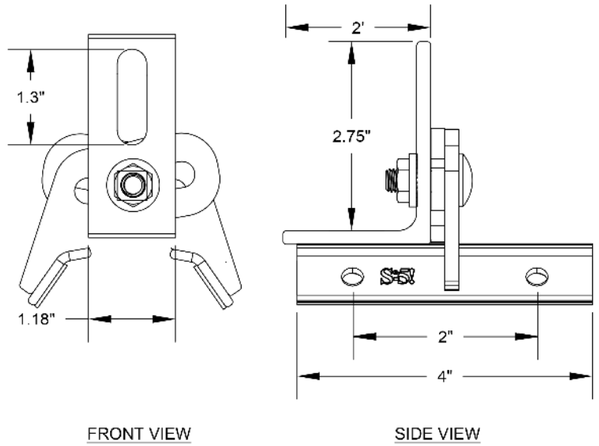
ADDITIONALLY THE SMALL GAP BETWEEN SOLAR PANELS AND THE ROOF DECK MEANS NO ADDITIONAL WIND UPLIFT OR ROTATIONAL EFFECTS WILL BE IMPOSED ON THE ROOF. THE WIND IMPACT REMAINS CONSISTENT WITH THE EXISTING ROOF C&C DESIGN AND DUE TO THE MINIMAL CLEARANCE, NO ADDITIONAL ROTATIONAL EFFECTS ARE TRANSFERRED TO THE ROOF. IN HIGH-WIND AREAS, WHERE ATTACHMENTS ARE SPACED CLOSELY, THE WIND IMPACT IS ASSUMED TO BE UNIFORMLY DISTRIBUTED ACROSS THE ROOF THROUGH THE PANELS AND ATTACHMENTS.

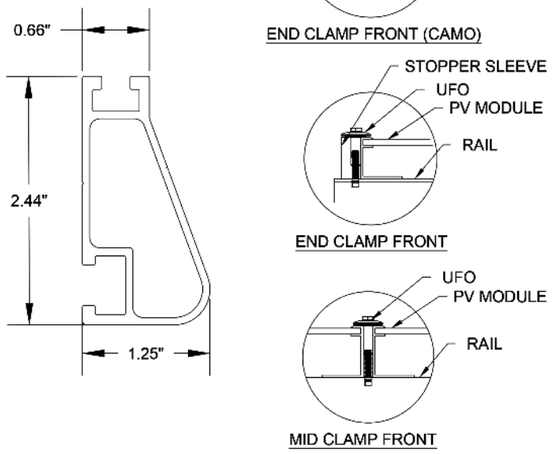
02 DECK CONNECTION NOTE

03 NOTES

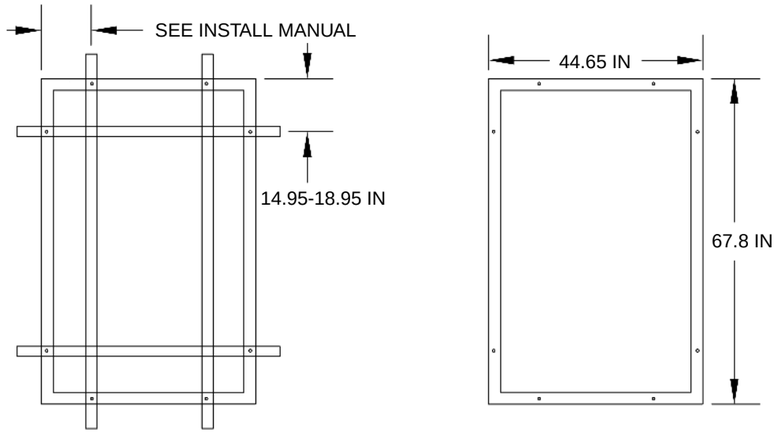
GENERAL

1.1 DESIGNED PER FBC 2023/ASCE 7-22 MINIMUM DESIGN LOADS FOR BUILDING AND OTHER STRUCTURES.
1.2 CONTRACTOR IS RESPONSIBLE FOR INSTALLING PV MODULES, RACKING & RACKING SUPPORTS IN ACCORDANCE WITH THE MANUFACTURER INSTALLATION INSTRUCTIONS NOT SHOWN IN THIS PLAN.
1.3 WITHDRAWAL VALUES GIVEN PER NDS BASED ON SG OF 0.5 WHERE APPLICABLE OR MANUFACTURER SUPPLIED 3RD PARTY UPLIFT TESTING REPORTS WITH APPLICABLE SAFETY FACTORS.
1.4 ALL PENETRATIONS SHALL BE FLASHED OR SEALED IN A MANNER THAT PREVENTS MOISTURE FROM ENTERING THE WALL AND ROOF USING ASTM C920 COMPLAINT SEALANT IN PILOT HOLES AND AROUND FASTENERS.
1.5 THE SUPPORTING ROOF STRUCTURE SHALL BE CONVENTIONAL WOOD FRAMED OR METAL CONSTRUCTION WITH PRE-ENGINEERED TRUSSES OR ROOF FRAMING MEMBERS.
1.6 EXISTING STRUCTURE IS ASSUMED TO BE IN COMPLIANCE WITH APPLICABLE BUILDING CODES AT THE TIME OF CONSTRUCTION.
1.7 CONTRACTOR SHALL NOTIFY ENGINEER OF ANY CONDITION CHANGES.





IRONRIDGE XR-10 RAIL AND CLAMPS



MSOLAR TXI10-400

04 ANCHOR DETAIL

05 RACK & CLAMPS DETAIL

06 MODULE DETAILS

MARSHALL GARNER	CONTRACTOR: -	ENGINEER: CA33343	Ryan S Gittens 2024.08.21 19:41:24 -04'00'	DATE	BY	VER	DESCRIPTION	SA1
	FLORIDA STATE ENERGY	ECUIP ENGINEERING		08.21.24	BF	1	INITIAL DESIGN	
481 SOUTHWEST HORSE WAY LAKE CITY FLORIDA 32024 UNITED STATES	6901 TPC DRIVE STE 650, ORLANDO, FL 32822	1646 W SNOW AVE 9 TAMPA, FL 33606	RYAN GITTENS PE90605					PAPER: ARCHB
								SCALE:
PROJECT ID: 8212024-481	(407) 718-9980							

GENERAL

1.1 CONTRACTOR IS RESPONSIBLE FOR COMPLYING WITH FBC 2023/ASCE 7-22 AND NEC 2020 REQUIREMENTS AND EQUIPMENT INSTALLATION INSTRUCTIONS NOT SHOWN IN THIS PLAN.
1.2 ALL EQUIPMENT SHALL BE LISTED PER NEC 690.4(B).
1.3 PV SOURCE CONDUCTORS ARE SIZED BE EXPOSED TO DIRECT SUNLIGHT WHEN INSTALLED IN RACEWAYS 7/8" OR LESS ABOVE ROOF. ADJUSTMENTS ARE BASED ON MAX CURRENT OF 16A, 35C AMBIENT TEMP, NEC 310.15(B)(2) AND T310.15(B)(1).
1.4 ALL EQUIPMENT SHALL BE RATED FOR INSTALL LOCATION. ROOF & OUTDOOR JUNCTION BOXES SHALL BE OUTDOOR RATED
1.5 INTERCONNECTION EQUIPMENT SHALL BE RATED FOR AVAILABLE FAULT CURRENT.

SYSTEM

2.1 THE ENPHASE SYSTEM IS NON-ISOLATED AND UNGROUNDED. NEITHER THE NEGATIVE NOR POSITIVE CONDUCTOR IS GROUNDED AND HAS A COMMON AC AND DC EQUIPMENT GROUNDING TERMINAL THEREFORE NO DC GEC IS REQUIRED.
2.2 ENPHASE IQ SERIES MICROINVERTERS REQUIRE NO GROUND OR GROUNDED CONDUCTOR BECAUSE THE DC CIRCUIT IS ISOLATED AND INSULATED FROM GROUND.
2.3 THE INVERTER IS EQUIPPED WITH A RAPID SHUTDOWN FEATURE WHICH CONFORMS TO NEC 690.12.
2.4 INTERCONNECTION SHALL BE MADE BY LINE-SIDE-TAP PER ARTICLE 705.11 USING CONNECTORS UL LISTED FOR THIS PURPOSE. TAP CONDUCTORS SHALL BE NO MORE THAN 10FT IF INSIDE BUILDING PER 705.11(C). TAP & ENCLOSURE SHALL COMPLY WITH NEC 312.8(A) (CROSS SECTIONAL AREA FILL).
2.5 NO MORE THAN 4 BRANCHES (OR 8 CONDUCTORS) SHALL BE RUN IN A SINGLE CONDUIT USING #10 WIRE. USE MULTIPLE CONDUITS/JBOX AS REQUIRED TO SATISFY THIS LIMIT.

GROUNDING

3.1 ALL EQUIPMENT SHALL BE PROPERLY GROUNDED PER THE REQUIREMENTS OF NEC ARTICLES 250 & 690.
3.2 FRAMED PV MODULES SHALL BE BONDED TOGETHER USING LUGS OR RACKING INTEGRATED GROUNDING CLAMPS.
3.3 EQUIPMENT GROUNDING SHALL BE INSTALLED PER NEC 250.120(C), SIZED PER 690.45 & BE A MINIMUM OF #6 WHEN EXPOSED TO DAMAGE.
3.4 INTERSYSTEM BONDING DEVICE REQUIRED AT SERVICE WHEN COMMUNICATION DEVICES ARE PRESENT PER 250.94.
3.5 EXISTING GROUNDING ELECTRODE SYSTEM (GES) SHALL COMPLY WITH 250.64, 250.53 & 250.62 & BE OF THE TYPES & SIZE LISTED IN 250.52.
3.6 EXISTING GROUNDING ELECTRODE SYSTEM (GES) SHALL BE SIZED PER 250.66 & T250.66: TYP. #4 GEC (FIELD VERIFY).
3.7 METAL WATER PIPES SHALL BE GROUNDED PER 250.104(A)

01 NOTES

ID	RUN	VOLTS(V)	CURRENT(A)	VD(%)	LEN(FT)	CONDUCTOR	SIZE	SETS	OHM/KFT	CONDUIT	MIN SIZE	#CCC	EGC	OCPD(A)	TERM(C)	TEMP FAC	FILL FAC	BASE AMP	ADJ AMP
A	BR-JBOX	240	15.73	1	38.53	Q-CABLE	#12	1	1.98	FREE AIR	3/4"	2	#6	20	75	1	1	25	25
B	JBOX-COMB	240	15.73	1	61.52	THHN/THWN-2	#10	1	1.24	PVC/EMT	3/4"	6	#10	20	75	1	0.8	35	32
C	COMB-DISC	240	35.09	1	43.96	THHN/THWN-2	#8	1	0.778	PVC/EMT/FMC/NMLT	3/4"	3	#10	50	75	1	1	50	50
D	DISC-PCC	240	35.09	1	69.65	THHN/THWN-2	#6	1	0.491	PVC/EMT/FMC/NMLT	3/4"	3	NA	NA	75	1	1	65	65

02 MODULE RATINGS

MAKE	MSOLAR
MODEL	TXI10-400
RATED POWER (W)	400
MPP VOLTAGE (V)	31.01
MPP CURRENT (A)	12.9
OC VOLTAGE (V)	37.07
SC CURRENT (A)	13.97

03 INVERTER RATINGS

MAKE	ENPHASE
MODEL	IQ8PLUS-72-2-US
MAX INPUT VOLTAGE (V)	60
MAX INPUT SC CURRENT (A)	15
NOM AC VOLTAGE (V)	240
MAX AC CURRENT (A)	1.21
NOM AC POWER (W)	290

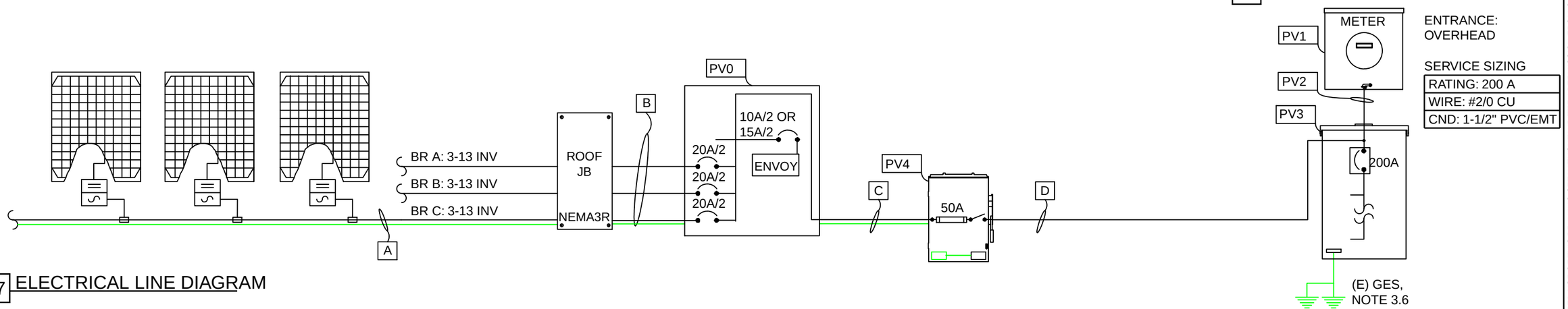
# PV MODULES	29
# BRANCH CIRCUITS	3
# INVERTERS	29
MIN-MAX BR SIZE (INV)	3-13
STC DC RATING (KW)	11.6
AC OUTPUT RATING (KW)	8.41
DC/AC RATIO	1.38

04 SYSTEM

PV0	(N) ENPHASE IQ COMBINER
PV1	(E) MIN 200A METER OR CT CABINET
PV2	(E) 200A SERVICE CONDUCTORS
PV3	(E) 200A MAIN PNL W/ (E) 200A MAIN
PV4	(N) 60A, SERV RATED AC DISC, 50A FUSES

05 CONDUCTOR SCHEDULE

06 EQUIPMENT SCHEDULE



07 ELECTRICAL LINE DIAGRAM

MARSHALL GARNER

481 SOUTHWEST HORSE WAY LAKE CITY FLORIDA 32024
UNITED STATES

PROJECT ID: 8212024-481

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FLORIDA STATE ENERGY

6901 TPC DRIVE STE 650,
ORLANDO, FL 32822

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Ryan S Gittens 2024.08.21 19:41:24 -04'00'

RYAN GITTENS
PE90605

DATE	BY	VER	DESCRIPTION
08.21.24	BF	1	INITIAL DESIGN

E1

PAPER: ARCHB

SCALE:

A

B

C

D

E

F

! WARNING

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

NEC 706.15(C)(4), NEC 690.13(B)
LOCATION(S): 3
Combiner Box/Circuits/Enclosures

! WARNING

TURN OFF PHOTOVOLTAIC AC DISCONNECT PRIOR TO WORKING INSIDE PANEL

NEC 110.27(C), OSHA 1910.145(f)(7)
LOCATION(S): 3, 5
Combiner Box/Circuits/Enclosures

! WARNING

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

NEC 690.13(B)
LOCATION(S): 4, 3
DC Disconnect

PHOTOVOLTAIC
DC DISCONNECT

NEC 690.13(B)
LOCATION(S): 4, 3
DC Disconnect

MAXIMUM DC VOLTAGE
60
OF PV SYSTEM

NEC 690.13(B)
LOCATION(S): 4, 3
DC Disconnect

SOLAR PV DC CIRCUIT

NEC 690.31(D)(2)
LOCATION(S): 1, 2
Conduit Raceways

PHOTOVOLTAIC POWER SOURCE

NEC 690.31(D)(2)
LOCATION(S): 4, 3
Conduit Raceways

PHOTOVOLTAIC
AC DISCONNECT

NEC 690.13(B)
LOCATION(S): 4, 5
AC Disconnect/Breaker/POC

! WARNING

DUAL POWER SOURCE
SECOND POWER SOURCE IS PV SYSTEM

NEC 705.12(D)(3), NEC 690.59
LOCATION(S): 6
Production/Net Meter

PHOTOVOLTAIC AC DISCONNECT

RATED AC OUTPUT CURRENT	35.09
NOMINAL OPERATING AC VOLTAGE	240

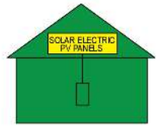
NEC 690.54
LOCATION(S): 3, 4
Inverter/POC/Breaker Panel/Pull Boxes

PV SYSTEM DISCONNECT

NEC 690.13(B)
LOCATION(S): 4, 5
Main Service Disconnect

EMERGENCY RESPONDER
THIS SOLAR PV SYSTEM IS EQUIPPED WITH RAPID SHUTDOWN

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



NFPA 1 11.12.2.1.1.1.1, NEC 690.56(C)(1)
LOCATION(S): 5

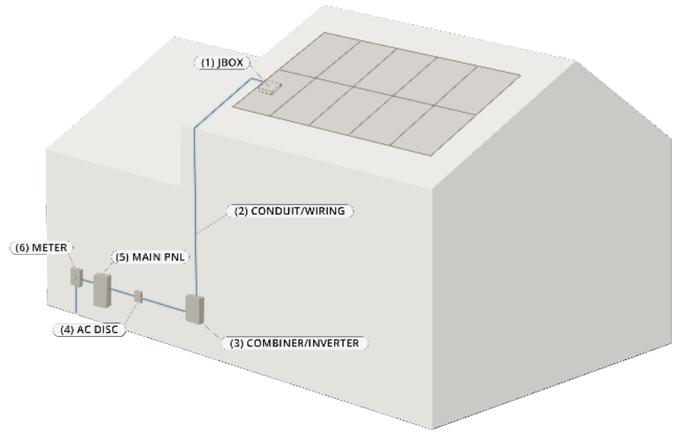
RAPID SHUTDOWN SWITCH FOR SOLAR PV SYSTEM

NFPA 1 11.12.2.1.1.8
LOCATION(S): 4
Rapid Shutdown Switch

EMERGENCY CONTACT

FLORIDA STATE ENERGY
(407) 718-9980

UTILITY REQ'D
LOCATION(S): 4, 6
Main Service Disconnect



GENERAL

1.1 LABEL MATERIALS SHALL BE OF SUFFICIENT DURABILITY TO WITHSTAND THE ENVIRONMENT, NEC 110.21(B)(3).
1.2 EXACT MATERIALS USED ARE SUBJECT TO THE REQUIREMENTS OF THE AUTHORITY HAVING JURISDICTION.
1.3 LABELS SHALL BE A MINIMUM LETTER HEIGHT OF 3/8" AND PERMANENTLY AFFIXED.
1.4 LABELS WILL BE REFLECTIVE AND MEET THE REQUIREMENTS OF NFPA 1-11.12.2.1.1.2

01 LABELS

02 NOTES

MARSHALL GARNER

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UNITED STATES

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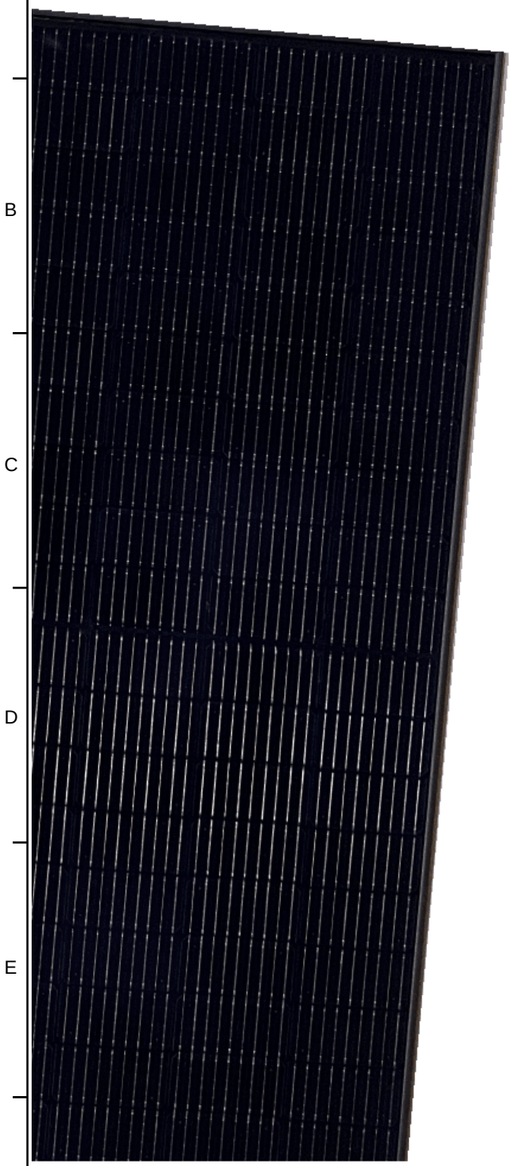
INXEPTION



msolar 108BB 400W HC Series

mSolar 10BB Half-Cell Black
Monocrystalline PERC PV Module

Excellent efficiency
10 busbar technology increases power by decreasing the distance between busbars and the finger grid line

Improved weak illumination response
More power output even in lower light conditions such as overcast days or off-peak sunlight hours

Anti PID
Panels rigorously tested to limit power degradation caused by 'stray' currents

High wind and snow resistance
5,400Pa Snow Load
2,400Pa Wind Load

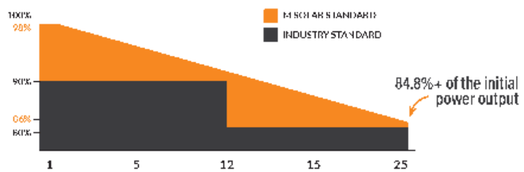
25-year warranty
M Solar modules are guaranteed to retain at least 84.3% of the initial power output

Appealing Aesthetics
Fully black module creates a sleek, uniform array

25-year product warranty,
25-year output warranty

0.5% annual degradation over 25 years

Warranty backed by Mission Solar Energy



CEC

UL 61730 | IEC 61215 | IEC 61730
ISO9001, ISO14001, ISO45001

energy.inxeption.com
888-852-4783

108BB 400W HC Series | msolar 10BB Half-Cell, All-Black Monocrystalline PERC PV Module

msolar

Electrical Characteristics | STC*

Module Type	TXI10-395108BB	TXI10-400108BB	TXI10-405108BB
Nominal Power Watt, Pmax (W)*	395	400	405
Power Output Tolerance Pmax (W)	0~+5	0~+5	0~+5
Maximum Power Voltage Vmp (V)	30.84	31.01	31.21
Maximum Power Current Imp (A)	12.81	12.90	12.98
Open Circuit Voltage (V)	38.98	39.07	39.25
Short Circuit Current Isc (A)	13.70	13.97	13.87
Module Efficiency (%)	20.23	20.46	20.74

*STC (Standard Test Condition): Irradiance 1000W/m², Module Temperature 25°C, AM 1.5
Measurement tolerance: ±

Electrical Characteristics | NMOT*

Maximum Power Watt Pmax (Wp)	298	270	274
Maximum Power Voltage Vmpp (V)	29.08	29.28	29.47
Maximum Power Current Impp (A)	10.25	10.32	10.36
Open Circuit Voltage Voc (V)	34.75	34.88	35.12
Short Circuit Current Isc (A)	10.96	11.03	11.10

*NMOT (Nominal module operating temperature): Irradiance 800W/m², Ambient Temperature 20°C, AM 1.5, Wind Speed 1m/s

Mechanical Data

Solar Cells	Mono PERC, 182mm half cells
Cells orientation	108 (6x9+6x9)
Module dimension	67.80x44.65x1.38 in. (1,722x1,134x35 mm)
Weight	48.50 lb (21.00 kg)
Glass	3.2mm, High Transmission, Low Iron & Semi-Tempered Glass
Junction Box	IP 68, 3 Diodes
Cables	1,200mm
Connectors	MC4 EVO2

Temperature Ratings

NOCT	42°C±2°C
Temperature coefficient of Pmax	-0.350%/°C
Temperature coefficient of Voc	-0.275%/°C
Temperature coefficient of Isc	+0.045%/°C

Working Conditions

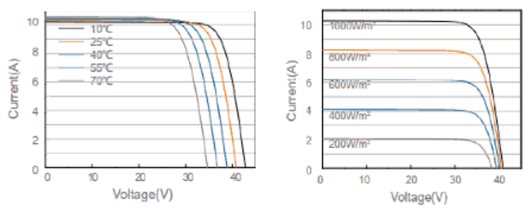
Maximum System Voltage	1500VDC
Operating Temperature	-40°C ~+85°C
Maximum Series Fuse	25A
Maximum Load (Snow/Wind)	5,400Pa / 2,400Pa
Fire Rating	UL Type 1**

*Do not connect fuse in combiner box with two or more strings in parallel connection

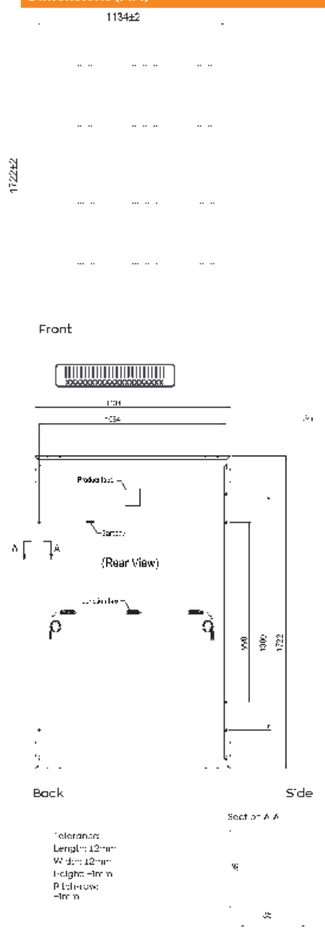
**To access the electrical data in this datasheet, the product reference is a single module and they are not a comprehensive way to compare among different module types.

***Please note, the fire class rating is described for the IEC test. To install in US, system, electrical, building inspector to the module, the type of mounting system, portable roof composition

I-V Curves of PV Module (365W)



Dimensions (MM)



Packaging Details

31 Panels per pallet	Pallet Stack Weight	Truck Weight
26 Pallets per truck	2,934 lbs. (1341.98 kg)	38,461.2 lbs. (17,445.7 kg)

INXEPTION
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MARSHALL GARNER	CONTRACTOR: -	ENGINEER: CA33343	Ryan S Gittens 2024.08.21 19:41:24 -04'00'	DATE	BY	VER	DESCRIPTION	D1
481 SOUTHWEST HORSE WAY LAKE CITY FLORIDA 32024 UNITED STATES	FLORIDA STATE ENERGY 6901 TPC DRIVE STE 650, ORLANDO, FL 32822 (407) 718-9980	ECUIP ENGINEERING 1646 W SNOW AVE 9 TAMPA, FL 33606	RYAN GITTENS PE90605	08.21.24	BF	1	INITIAL DESIGN	PAPER: ARCHB
PROJECT ID: 8212024-481								SCALE:

IQ8 and IQ8+ Microinverters

INPUT DATA (DC)		IQ8-60-2-US	IQ8PLUS-72-2-US
Commonly used module pairings[1]	W	235 - 350	235 – 440
Module compatibility		60-cell/120 half-cell	60-cell/120 half-cell and 72-cell/144 half-cell
MPPT voltage range	V	27 – 37	29 – 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[2] [module Isc]	A	15	
Overvoltage 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**
Peak output power	VA	245	300
Max continuous output power	VA	240	290
Nominal (L-L) voltage/range[3]	V	240 / 211 – 264	
Max continuous output current	A	1.0	1.21
Nominal frequency	Hz	60	
Extended frequency range	Hz	50 – 68	
Max units per 20 A (L-L) branch circuit[4]		16	13
Total harmonic distortion		<5%	
Overvoltage 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
CEC weighted efficiency	%	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	
Acoustic noise at 1 m		<60 dBA	
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/IEEE1547, FCC Part 15 Class B, ICES-0003 Class B, CAN/CSA-C22.2 NO. 107.1-01 This product is UL Listed as PV Rapid Shut Down Equipment and conforms with NEC 2014, NEC 2017, and NEC 2020 section 690.12 and C22.1-2018 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according to manufacturer's instructions.	

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

IQ8SP-DS-0002-01-EN-US-2021-10-19

MARSHALL GARNER

481 SOUTHWEST HORSE WAY LAKE CITY FLORIDA 32024
UNITED STATES

PROJECT ID: 8212024-481

CONTRACTOR: -

FLORIDA STATE ENERGY

6901 TPC DRIVE STE 650,
ORLANDO, FL 32822

(407) 718-9980

ENGINEER: CA33343

ECUIP ENGINEERING

1646 W SNOW AVE 9 TAMPA, FL 33606

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D2

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ENPHASE

DATA SHEET

X-IQ-AM1-240-5
X-IQ-AM1-240-5C

IQ Combiner 5/5C

The IQ Combiner 5/5C consolidates interconnection equipment into a single enclosure and streamlines IQ Series Microinverters and IQ Gateway installation by providing a consistent, pre-wired solution for residential applications. IQ Combiner 5/5C uses wired control communication and is compatible with IQ System Controller 3/3G and IQ Battery 5P.

The IQ Combiner 5/5C, IQ Series Microinverters, IQ System Controller 3/3G, and IQ Battery 5P provide a complete grid-agnostic Enphase Energy System.

IQ Series Microinverters
The high-powered smart grid-ready IQ Series Microinverters (IQ6, IQ7, and IQ8 Series) simplify the installation process.

IQ System Controller 3/3G
Provides microgrid interconnection device (MID) functionality by automatically detecting grid failures and seamlessly transitioning the home energy system from grid power to backup power.

IQ Battery 5P
Fully integrated AC battery system. Includes six field-replaceable IQ8D-BAT Microinverters.

IQ Load Controller
Helps prioritize essential appliances during a grid outage to optimize energy consumption and prolong battery life.

Enphase 5 year limited warranty

NOM

UL CERTIFIED SAFETY US/CA SÛRETÉ US/CA E341166

5-year limited warranty

*For country-specific warranty information, see the https://enphase.com/installers/resources/warranty page.

Smart

- Includes IQ Gateway for communication and control
- Includes Enphase Mobile Connect (CELLMODEM-M1-06-SP-05), only with IQ Combiner 5C
- Supports flexible networking: Wi-Fi, Ethernet, or cellular
- Provides production metering (revenue grade) and consumption monitoring

Easy to install

- Mounts to one stud with centered brackets
- Supports bottom, back, and side conduit entries
- Supports up to four 2-pole branch circuits for 240 VAC plug-in breakers (not included)
- 80 A total PV branch circuits
- Bluetooth-based Wi-Fi provisioning for easy Wi-Fi setup

Reliable

- Durable NRTL-certified NEMA type 3R enclosure
- 5-year limited warranty
- 2-year labor reimbursement program coverage included for both the IQ Combiner SKUs[1]
- UL1741 Listed

IQ Combiner 5/5C

MODEL NUMBER	
IQ Combiner 5 (X-IQ-AM1-240-5)	IQ Combiner 5 with IQ Gateway printed circuit board for integrated revenue-grade PV production metering (ANSIC12.20 ±0.5%), consumption monitoring (±2.5%), and IQ Battery monitoring (±2.5%). Includes a silver solar shield to deflect heat.
IQ Combiner 5C (X-IQ-AM1-240-5C)	IQ Combiner 5C with IQ Gateway printed circuit board for integrated revenue-grade PV production metering (ANSI C12.20 ±0.5%), consumption monitoring (±2.5%) and IQ Battery monitoring (±2.5%). Includes Enphase Mobile Connect cellular modem (CELLMODEM-M1-06-SP-05)[1]. Includes a silver solar shield to deflect heat.
WHAT'S IN THE BOX	
IQ Gateway printed circuit board	IQ Gateway is the platform for total energy management for comprehensive, remote maintenance, and management of the Enphase Energy System
Busbar	80 A busbar with support for one IQ Gateway breaker and four 20 A breaker for installing IQ Series Microinverters and IQ Battery 5P
IQ Gateway breaker	Circuit breaker, 2-pole, 10 A/15 A
Production CT	Pre-wired revenue-grade solid-core CT, accurate up to ±0.5%
Consumption CT	Two consumption metering clamp CTs, shipped with the box, accurate up to ±2.5%
IQ Battery CT	One battery metering clamp CT, shipped with the box, accurate up to ±2.5%
CTRL board	Control board for wired communication with IQ System Controller 3/3G and the IQ Battery 5P
Enphase Mobile Connect (only with IQ Combiner 5C)	4G-based LTE-M1 cellular modem (CELLMODEM-M1-06-SP-05) with a 5-year T-Mobile data plan
Accessories kit	Spare control headers for the COMMS-KIT-02 board
ACCESSORIES AND REPLACEMENT PARTS (NOT INCLUDED, ORDER SEPARATELY)	
CELLMODEM-M1-06-SP-05	4G-based LTE-M1 cellular modem with a 5-year T-Mobile data plan
CELLMODEM-M1-06-AT-05	4G-based LTE-M1 cellular modem with a 5-year AT&T data plan
Circuit breakers (off-the-shelf)	Supports Eaton BR2XX, Siemens Q2XX and GE/ABB THQL21XX Series circuit breakers (XX represents 10, 15, 20, 30, 40, 50, or 60). Also supports Eaton BR220B, BR230B, and BR240B circuit breakers compatible with the hold-down kit.
Circuit breakers (provided by Enphase)	BRK-10A-2-240V, BRK-15A-2-240V, BRK-20A-2P-240V, BRK-15A-2P-240V-B, and BRK-20A-2P-240V-B (more details in the "Accessories" section)
XA-SOLARSHIELD-ES	Replacement solar shield for IQ Combiner 5/5C
XA-ENV2-PCBA-5	IQ Gateway replacement printed circuit board (PCB) for IQ Combiner 5/5C
X-IQ-NA-HD-125A	Hold-down kit compatible with Eaton BR-B Series circuit breakers (with screws)
XA-COMMS2-PCBA-5	Replacement COMMS-KIT-02 printed circuit board (PCB) for IQ Combiner 5/5C
ELECTRICAL SPECIFICATIONS	
Rating	80 A
System voltage and frequency	120/240 VAC, 60 Hz
Busbar rating	125 A
Fault current rating	10 kAIC
Maximum continuous current rating (input from PV/storage)	64 A
Branch circuits (solar and/or storage)	Up to four 2-pole Eaton BR, Siemens Q, or GE/ABB THQL Series distributed generation (DG) breakers only (not included)
Maximum total branch circuit breaker rating (input)	80 A of distributed generation/95 A with IQ Gateway breaker included
IQ Gateway breaker	10 A or 15 A rating GE/Siemens/Eaton included
Production metering CT	200 A solid core pre-installed and wired to IQ Gateway
Consumption monitoring CT (CT-200-CLAMP)	A pair of 200 A clamp-style current transformers is included with the box
IQ Battery metering CT	200 A clamp-style current transformer for IQ Battery metering, included with the box

[1] A plug-and-play industrial-grade cell modem for systems of up to 60 microinverters. Available in the United States, Canada, Mexico, Puerto Rico, and the US Virgin Islands, where there is adequate cellular service in the installation area.

IQC-5-5C-DSH-00007-4.0-EN-US-2024-06-13

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PROJECT ID: 8212024-481								SCALE:

4701 Creek Road, Suite 110
Cincinnati, Ohio 45242
nVent.com/ILSCO

nVent ILSCO Insulation Piercing Connector: First in the Industry to Meet New NEC Requirement for Service Entrance Connections

nVent is excited to announce that **nVent ILSCO Insulation Piercing Copper Connector, IPC-250-4/0** is now UL Listed as suitable for use on the line side of service equipment. It **meets the 2020 NEC 230.46 requirement** that went into effect on January 1, 2023, requiring pressure connectors installed on service entrance splices and taps be listed and marked "suitable for use on the line side of service equipment." nVent ILSCO connectors were tested to UL 486A-486B Annex H which is the test standard required to meet 2020 NEC 230.46.

nVent ILSCO is the first manufacturer to meet the NEC 230.46 requirement. This is the second announcement by nVent ILSCO regarding its product performance and ability to meet this important standard. nVent ILSCO now offers its customers **293 SKUs** of pressure connectors, parallel tap connectors and insulation piercing connector for the 2020 NEC 230.46 requirement:

NIMBUS DOUBLE SIDE ENTRY		NIMBUS SINGLE SIDE ENTRY		CLEARTAP DOUBLE SIDE		CLEARTAP SINGLE SIDE ENTRY	
PBTD-3-1/0-SR	PBTD-3-600-SR	PBTS-3-1/0-SR	PBTS-3-600-SR	ECTD-3-1/0-SR	ECTD-3-600-SR	ECTS-3-1/0-SR	ECTS-3-600-SR
PBTD-4-1/0-SR	PBTD-4-600-SR	PBTS-4-1/0-SR	PBTS-4-600-SR	ECTD-4-1/0-SR	ECTD-4-600-SR	ECTS-4-1/0-SR	ECTS-4-600-SR
PBTD-5-1/0-SR	PBTD-5-600-SR	PBTS-5-1/0-SR	PBTS-5-600-SR	ECTD-5-1/0-SR	ECTD-5-600-SR	ECTS-5-1/0-SR	ECTS-5-600-SR
PBTD-6-1/0-SR	PBTD-6-600-SR	PBTS-6-1/0-SR	PBTS-6-600-SR	ECTD-6-1/0-SR	ECTD-6-600-SR	ECTS-6-1/0-SR	ECTS-6-600-SR
PBTD-7-1/0-SR	PBTD-7-600-SR	PBTS-7-1/0-SR	PBTS-7-600-SR	ECTD-7-1/0-SR	ECTD-7-600-SR	ECTS-7-1/0-SR	ECTS-7-600-SR
PBTD-8-1/0-SR	PBTD-8-600-SR	PBTS-8-1/0-SR	PBTS-8-600-SR	ECTD-8-1/0-SR	ECTD-8-600-SR	ECTS-8-1/0-SR	ECTS-8-600-SR
PBTD-9-1/0-SR	PBTD-9-600-SR	PBTS-9-1/0-SR	PBTS-9-600-SR	ECTD-9-1/0-SR	ECTD-9-600-SR	ECTS-9-1/0-SR	ECTS-9-600-SR
PBTD-10-1/0-SR	PBTD-10-600-SR	PBTS-10-1/0-SR	PBTS-10-600-SR	ECTD-10-1/0-SR	ECTD-10-600-SR	ECTS-10-1/0-SR	ECTS-10-600-SR
PBTD-11-1/0-SR	PBTD-11-600-SR	PBTS-11-1/0-SR	PBTS-11-600-SR	ECTD-11-1/0-SR	ECTD-11-600-SR	ECTS-11-1/0-SR	ECTS-11-600-SR
PBTD-12-1/0-SR	PBTD-12-600-SR	PBTS-12-1/0-SR	PBTS-12-600-SR	ECTD-12-1/0-SR	ECTD-12-600-SR	ECTS-12-1/0-SR	ECTS-12-600-SR
PBTD-13-1/0-SR	PBTD-13-600-SR	PBTS-13-1/0-SR	PBTS-13-600-SR	ECTD-13-1/0-SR	ECTD-13-600-SR	ECTS-13-1/0-SR	ECTS-13-600-SR
PBTD-14-1/0-SR	PBTD-14-600-SR	PBTS-14-1/0-SR	PBTS-14-600-SR	ECTD-14-1/0-SR	ECTD-14-600-SR	ECTS-14-1/0-SR	ECTS-14-600-SR
PBTD-3-3/0-SR	PBTD-3-750-SR	PBTS-3-3/0-SR	PBTS-3-750-SR	ECTD-3-3/0-SR	ECTD-3-750-SR	ECTS-3-3/0-SR	ECTS-3-750-SR
PBTD-4-3/0-SR	PBTD-4-750-SR	PBTS-4-3/0-SR	PBTS-4-750-SR	ECTD-4-3/0-SR	ECTD-4-750-SR	ECTS-4-3/0-SR	ECTS-4-750-SR
PBTD-5-3/0-SR	PBTD-5-750-SR	PBTS-5-3/0-SR	PBTS-5-750-SR	ECTD-5-3/0-SR	ECTD-5-750-SR	ECTS-5-3/0-SR	ECTS-5-750-SR
PBTD-6-3/0-SR	PBTD-6-750-SR	PBTS-6-3/0-SR	PBTS-6-750-SR	ECTD-6-3/0-SR	ECTD-6-750-SR	ECTS-6-3/0-SR	ECTS-6-750-SR
PBTD-7-3/0-SR	PBTD-7-750-SR	PBTS-7-3/0-SR	PBTS-7-750-SR	ECTD-7-3/0-SR	ECTD-7-750-SR	ECTS-7-3/0-SR	ECTS-7-750-SR
PBTD-8-3/0-SR	PBTD-8-750-SR	PBTS-8-3/0-SR	PBTS-8-750-SR	ECTD-8-3/0-SR	ECTD-8-750-SR	ECTS-8-3/0-SR	ECTS-8-750-SR
PBTD-9-3/0-SR	PBTD-9-750-SR	PBTS-9-3/0-SR	PBTS-9-750-SR	ECTD-9-3/0-SR	ECTD-9-750-SR	ECTS-9-3/0-SR	ECTS-9-750-SR
PBTD-10-3/0-SR	PBTD-10-750-SR	PBTS-10-3/0-SR	PBTS-10-750-SR	ECTD-10-3/0-SR	ECTD-10-750-SR	ECTS-10-3/0-SR	ECTS-10-750-SR
PBTD-11-3/0-SR	PBTD-11-750-SR	PBTS-11-3/0-SR	PBTS-11-750-SR	ECTD-11-3/0-SR	ECTD-11-750-SR	ECTS-11-3/0-SR	ECTS-11-750-SR
PBTD-12-3/0-SR	PBTD-12-750-SR	PBTS-12-3/0-SR	PBTS-12-750-SR	ECTD-12-3/0-SR	ECTD-12-750-SR	ECTS-12-3/0-SR	ECTS-12-750-SR
PBTD-13-3/0-SR	PBTD-13-750-SR	PBTS-13-3/0-SR	PBTS-13-750-SR	ECTD-13-3/0-SR	ECTD-13-750-SR	ECTS-13-3/0-SR	ECTS-13-750-SR
PBTD-14-3/0-SR	PBTD-14-750-SR	PBTS-14-3/0-SR	PBTS-14-750-SR	ECTD-14-3/0-SR	ECTD-14-750-SR	ECTS-14-3/0-SR	ECTS-14-750-SR
PBTD-3-250-SR	PBTD-3-350-SR	PBTS-3-250-SR	PBTS-3-350-SR	ECTD-3-250-SR	ECTD-3-350-SR	ECTS-3-250-SR	ECTS-3-350-SR
PBTD-4-250-SR	PBTD-4-350-SR	PBTS-4-250-SR	PBTS-4-350-SR	ECTD-4-250-SR	ECTD-4-350-SR	ECTS-4-250-SR	ECTS-4-350-SR
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PBTD-10-250-SR	PBTD-10-350-SR	PBTS-10-250-SR	PBTS-10-350-SR	ECTD-10-250-SR	ECTD-10-350-SR	ECTS-10-250-SR	ECTS-10-350-SR
PBTD-11-250-SR	PBTD-11-350-SR	PBTS-11-250-SR	PBTS-11-350-SR	ECTD-11-250-SR	ECTD-11-350-SR	ECTS-11-250-SR	ECTS-11-350-SR
PBTD-12-250-SR	PBTD-12-350-SR	PBTS-12-250-SR	PBTS-12-350-SR	ECTD-12-250-SR	ECTD-12-350-SR	ECTS-12-250-SR	ECTS-12-350-SR
PBTD-13-250-SR	PBTD-13-350-SR	PBTS-13-250-SR	PBTS-13-350-SR	ECTD-13-250-SR	ECTD-13-350-SR	ECTS-13-250-SR	ECTS-13-350-SR
PBTD-14-250-SR	PBTD-14-350-SR	PBTS-14-250-SR	PBTS-14-350-SR	ECTD-14-250-SR	ECTD-14-350-SR	ECTS-14-250-SR	ECTS-14-350-SR
RUN TAP CONNECTORS	GTA-250-250 | GTA-250-250-W/C | GTA-250-0 | GTA-250-0-W/C						
INSULATION PIERCING	IPC 250 4/0						

Please contact nVent ILSCO for your next power connections project's need. To learn more, visit www.nVent.com/ILSCO.

MARSHALL GARNER	CONTRACTOR: -	ENGINEER: CA33343	Ryan S Gittens 2024.08.21 19:41:24 -04'00'	DATE	BY	VER	DESCRIPTION	D4
	FLORIDA STATE ENERGY	ECUIP ENGINEERING		08.21.24	BF	1	INITIAL DESIGN	
481 SOUTHWEST HORSE WAY LAKE CITY FLORIDA 32024 UNITED STATES	6901 TPC DRIVE STE 650, ORLANDO, FL 32822	1646 W SNOW AVE 9 TAMPA, FL 33606	RYAN GITTENS PE90605					PAPER: ARCHB
	(407) 718-9980							SCALE:
PROJECT ID: 8212024-481								

S-5!®

The Right Way!™

ProteaBracket™

A versatile bracket for mounting solar PV to trapezoidal roof profiles

ProteaBracket™ is now made in aluminum. Still the most versatile trapezoidal metal roof attachment solution on the market, the S-5! ProteaBracket just got better!

The bracket features an adjustable attachment base and module attachment options to accommodate different roof profile dimensions and mounting options.

Our pre-applied EPDM gasket with peel and stick adhesive makes installation a snap, ensuring accurate and secure placement the first time.

With no messy sealants, faster installation, and a weather-proof fit, ProteaBracket offers you the most versatile solar attachment solution available.

ProteaBracket* can be used for rail mounting or "direct-attach" with S-5! PVKIT™

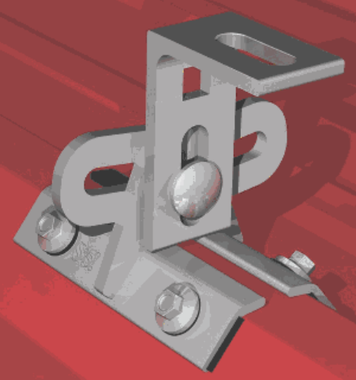
*When ProteaBracket is used in conjunction with the S-5! PVKIT, an additional nut is required during installation.

The right way to attach solar PV to trapezoidal roof profiles!

NEW

NOW AVAILABLE IN ALUMINUM

ProteaBracket™



Features and Benefits

- 34% lighter - saves on shipping
- Stronger L-Foot™
- Load-tested for engineered application
- Corrosion-resistant materials
- Adjustable - Fits rib profiles up to 3"
- Peel-and-Stick prevents accidental shifting during installation
- Fully pre-assembled
- 25-year warranty*

*See www.S-5.com for details.

888-825-3432 | www.S-5.com |

MADE IN THE USA

S-5!®

The Right Way!™

ProteaBracket™ is the perfect solar attachment solution for most trapezoidal rib, exposed-fastened metal roof profiles!

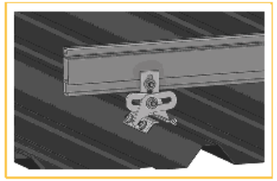
ProteaBracket™ is compatible with common metal roofing materials and comes with a pre-applied EPDM gasket on the base.

Note: All four pre-punched holes must be used to achieve tested strength. Fasteners are provided.

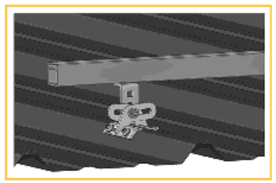
For design assistance, ask your distributor, or visit **www.S-5.com** for the independent lab test data that can be used for load-critical designs and applications. Also, please visit our website for more information including metallurgical compatibilities and specifications.

S-5!® holding strength is unmatched in the industry.

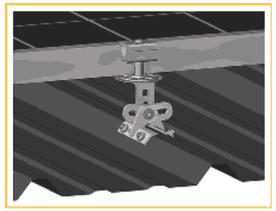
Multiple Attachment Options:



Side Mount Rail



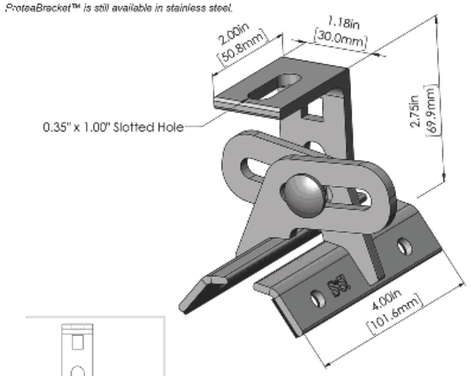
Bottom Mount Rail

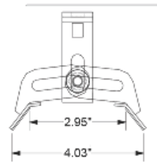


w/ S-5! PVKIT™ (rail-less)

ProteaBracket™

ProteaBracket™ is still available in stainless steel.

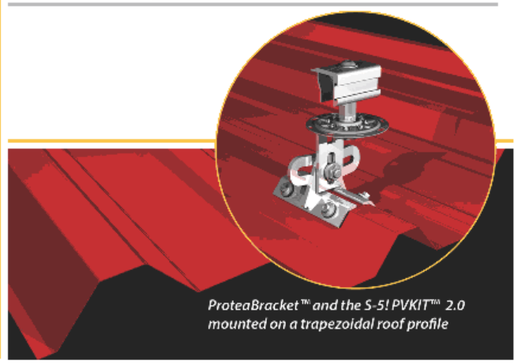




ProteaBracket fits profiles up to 3 inches

INSTALLATION:

No surface preparation needed. (1) Wipe away excess oil and debris. **(2)** Peel off adhesive release paper. **(3)** Align and mount bracket directly onto crown of panel. **(4)** Secure ProteaBracket through pre-punched holes, using piercing-point S-5! screws.



ProteaBracket™ and the S-5! PVKIT™ 2.0 mounted on a trapezoidal roof profile

S-5!® Warning! Please use this product responsibly!

Products are protected by multiple U.S. and foreign patents. For published data regarding holding strength, bolt torque, patents, and trademarks, visit the S-5! website at www.S-5.com.

Distributed by

MARSHALL GARNER	CONTRACTOR: -	ENGINEER: CA33343	Ryan S Gittens 2024.08.21 19:41:24 -04'00'	DATE	BY	VER	DESCRIPTION	D5
481 SOUTHWEST HORSE WAY LAKE CITY FLORIDA 32024 UNITED STATES	FLORIDA STATE ENERGY 6901 TPC DRIVE STE 650, ORLANDO, FL 32822 (407) 718-9980	ECUIP ENGINEERING 1646 W SNOW AVE 9 TAMPA, FL 33606	RYAN GITTENS PE90605	08.21.24	BF	1	INITIAL DESIGN	PAPER: ARCHB
PROJECT ID: 8212024-481								SCALE:

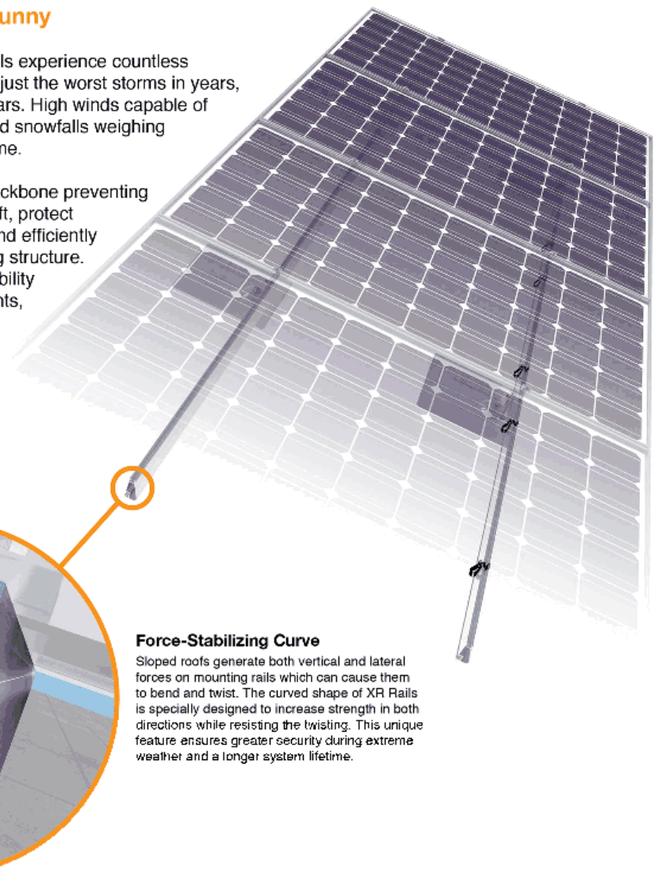
IRONRIDGE

XR Rail Family

Solar Is Not Always Sunny

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

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



Force-Stabilizing Curve

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

Compatible with Flat & Pitched Roofs

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

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

Corrosion-Resistant Materials

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

XR Rail Family

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

XR10

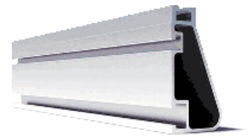
XR10 is a sleek, low-profile mounting rail, designed for regions with light or no snow. It achieves 6 foot spans, while remaining light and economical.

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

XR100

XR100 is the ultimate residential mounting rail. It supports a range of wind and snow conditions, while also maximizing spans up to 8 feet.

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



XR1000

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

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

Rail Selection

The following table was prepared in compliance with applicable engineering codes and standards. Values are based on the following criteria: ASCE 7-10, Roof Zone 1, Exposure B, Roof Slope of 7 to 27 degrees and Mean Building Height of 30 ft. Visit IronRidge.com for detailed span tables and certifications.

Load		Rail Span					
Snow (PSF)	Wind (MPH)	4'	5' 4"	6'	8'	10'	12'
None	100	XR10		XR100		XR1000	
	120						
	140						
	160						
10-20	100						
	120						
	140						
	160						
30	100						
	160						
40	100						
	160						
50-70	160						
80-90	160						

MARSHALL GARNER	CONTRACTOR: -	ENGINEER: CA33343	Ryan S Gittens 2024.08.21 19:41:24 -04'00'	DATE	BY	VER	DESCRIPTION	D6
	FLORIDA STATE ENERGY	ECUIP ENGINEERING		08.21.24	BF	1	INITIAL DESIGN	
481 SOUTHWEST HORSE WAY LAKE CITY FLORIDA 32024 UNITED STATES	6901 TPC DRIVE STE 650, ORLANDO, FL 32822	1646 W SNOW AVE 9 TAMPA, FL 33606	RYAN GITTENS PE90605					PAPER: ARCHB
PROJECT ID: 8212024-481	(407) 718-9980							SCALE:

Tech Brief

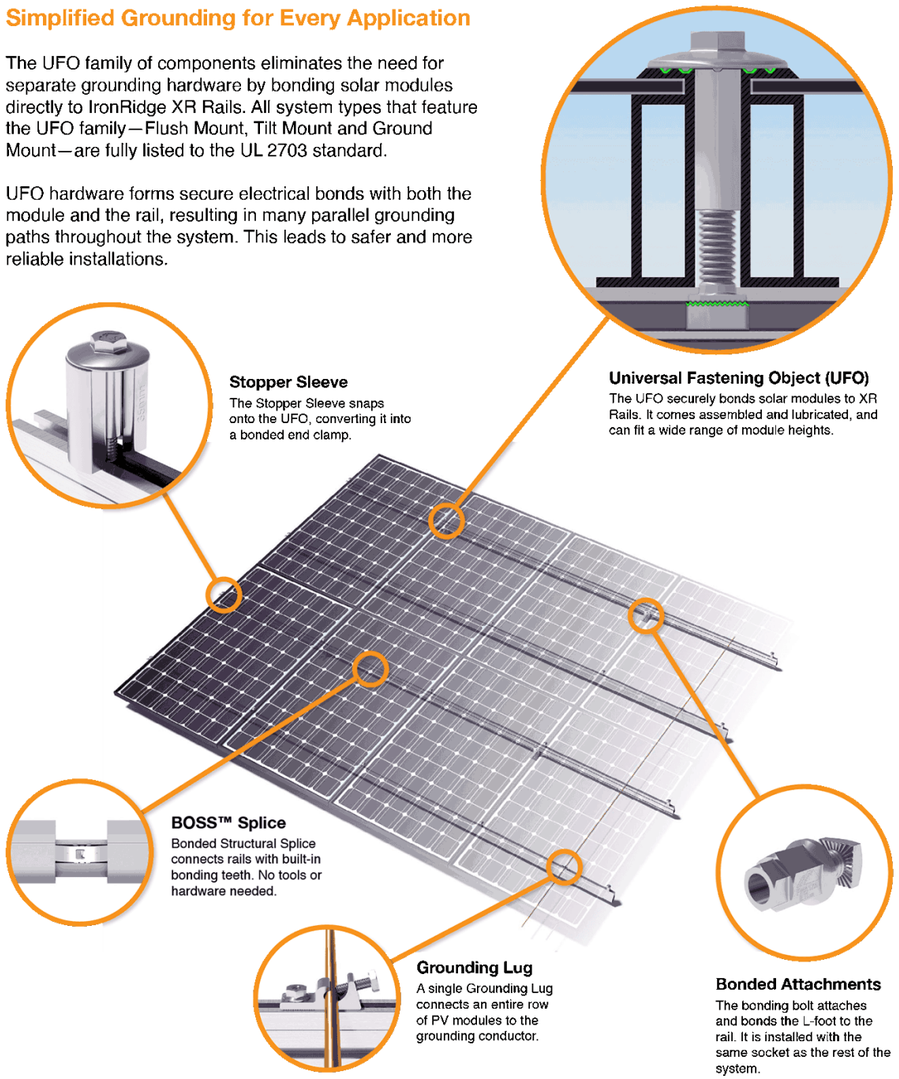
IRONRIDGE

UFO Family of Components

Simplified Grounding for Every Application

The UFO family of components eliminates the need for separate grounding hardware by bonding solar modules directly to IronRidge XR Rails. All system types that feature the UFO family—Flush Mount, Tilt Mount and Ground Mount—are fully listed to the UL 2703 standard.

UFO hardware forms secure electrical bonds with both the module and the rail, resulting in many parallel grounding paths throughout the system. This leads to safer and more reliable installations.



Stopper Sleeve
The Stopper Sleeve snaps onto the UFO, converting it into a bonded end clamp.

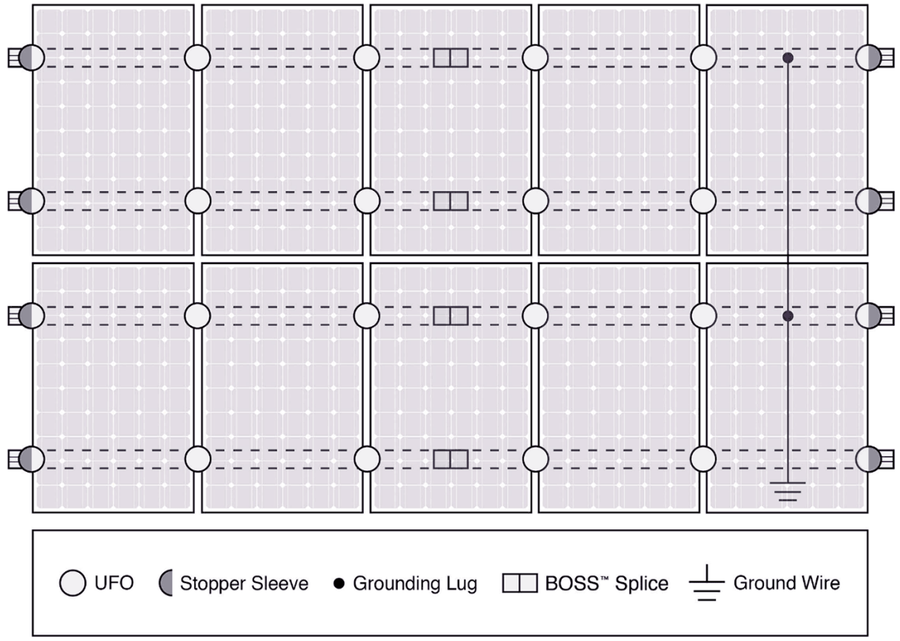
Universal Fastening Object (UFO)
The UFO securely bonds solar modules to XR Rails. It comes assembled and lubricated, and can fit a wide range of module heights.

BOSS™ Splice
Bonded Structural Splice connects rails with built-in bonding teeth. No tools or hardware needed.

Grounding Lug
A single Grounding Lug connects an entire row of PV modules to the grounding conductor.

Bonded Attachments
The bonding bolt attaches and bonds the L-foot to the rail. It is installed with the same socket as the rest of the system.

System Diagram



Approved Enphase microinverters can provide equipment grounding of IronRidge systems, eliminating the need for grounding lugs and field installed equipment ground conductors (EGC). A minimum of two microinverters mounted to the same rail and connected to the same Engage cable is required. Refer to installation manuals for additional details.

UL Certification

The IronRidge Flush Mount, Tilt Mount, and Ground Mount Systems have been listed to UL 2703 by Intertek Group plc.

UL 2703 is the standard for evaluating solar mounting systems. It ensures these devices will maintain strong electrical and mechanical connections over an extended period of time in extreme outdoor environments.

Go to IronRidge.com/UFO

Cross-System Compatibility

Feature	Flush Mount	Tilt Mount	Ground Mount
XR Rails	✔	✔	XR1000 Only
UFO/Stopper	✔	✔	✔
BOSS™ Splice	✔	✔	N/A
Grounding Lugs	1 per Row	1 per Row	1 per Array
Microinverters & Power Optimizers	Enphase - M250-72, M250-60, M215-60, C250-72 Darfon - MIG240, MIG300, G320, G640 SolarEdge - P300, P320, P400, P405, P600, P700, P730		
Fire Rating	Class A	Class A	N/A
Modules	Tested or Evaluated with over 400 Framed Modules Refer to installation manuals for a detailed list.		

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PROJECT ID: 8212024-481							

D7
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SCALE:

SOLAR DESIGN LAB

Rail: XR10 — Gable Roof Flush Mount System Span Table (inches) - Portrait or Landscape Installation

Max Module Length: 67.5", Max Module SF: 21 SF
Exposure B

Wind Speed (mph)	Roof Slope (deg.)	Ground Snow: 0 psf Group 1	Group 2	Group 3	Exposed Mod. Group 1	Group 2	Group 3
90 mph	8-20	89	89	86	86	78	72
	21-27	89	89	89	89	84	79
	28-45	90	90	90	90	90	81
95 mph	8-20	89	88	82	83	73	65
	21-27	89	89	89	89	80	74
	28-45	90	90	90	90	86	76
100 mph	8-20	89	84	79	80	69	61
	21-27	89	89	86	89	75	69
	28-45	90	90	90	89	81	72
105 mph	8-20	89	81	74	77	64	57
	21-27	89	87	83	86	72	65
	28-45	90	90	85	84	77	68
110 mph	8-20	87	78	69	73	60	53
	21-27	89	84	78	83	67	61
	28-45	90	90	81	79	73	64
115 mph	8-20	84	73	65	69	57	50
	21-27	89	81	74	80	64	57
	28-45	90	87	76	75	69	61
120 mph	8-20	81	72	64	66	54	48
	21-27	89	77	72	77	60	54
	28-45	90	83	73	72	66	58
130 mph	8-20	75	64	56	60	48	43
	21-27	85	69	64	72	54	49
	28-45	82	76	67	65	60	53
140 mph	8-20	69	57	50	55	44	40
	21-27	79	64	57	65	49	44
	28-45	76	69	61	60	55	48
150 mph	8-20	64	51	48	51	41	38
	21-27	74	58	51	60	45	41
	28-45	69	64	56	54	50	44
160 mph	8-20	59	48	43	48	39	34
	21-27	69	53	48	56	42	38
	28-45	64	60	51	50	48	41
170 mph	8-20	55	44	40	44	36	30
	21-27	64	49	44	52	40	33
	28-45	60	55	48	48	44	39
175 mph	8-20	53	43	39	43	34	28
	21-27	64	48	43	50	38	32
	28-45	58	54	48	45	42	38
180 mph	8-20	52	42	38	42	32	26
	21-27	60	48	41	49	37	30
	28-45	56	51	45	43	41	37

= min 72 " span = min 64" span = min 48" span REV 12/12/2019
= Shaded cells indicate conditions in which UFO Mid Clamp connection capacity is exceeded.

Rail: XR10 — Hip Roof Flush Mount System Span Table (inches) - Portrait or Landscape Installation

Max Module Length: 67.5", Max Module SF: 21 SF
Exposure B

Wind Speed (mph)	Roof Slope (deg.)	Ground Snow: 0 psf Group 1	Group 2	Group 3	Exposed Mod. Group 1	Group 2	Group 3
90 mph	8-20	89	89	89	89	84	81
	21-27	89	89	89	89	89	80
	28-45	90	90	90	90	90	87
95 mph	8-20	89	89	89	86	80	78
	21-27	89	89	89	89	87	87
	28-45	90	90	90	90	90	82
100 mph	8-20	89	89	88	83	77	73
	21-27	89	89	89	89	83	83
	28-45	90	90	90	90	90	77
105 mph	8-20	89	87	84	80	73	69
	21-27	89	89	89	89	80	80
	28-45	90	90	90	90	87	73
110 mph	8-20	89	84	82	77	69	65
	21-27	89	89	89	89	75	75
	28-45	90	90	87	86	82	69
115 mph	8-20	87	81	79	74	65	61
	21-27	89	87	87	86	72	72
	28-45	90	90	83	81	78	64
120 mph	8-20	84	78	75	72	61	58
	21-27	89	84	84	83	67	67
	28-45	90	90	79	78	73	61
130 mph	8-20	79	72	67	64	56	53
	21-27	89	79	79	78	61	61
	28-45	88	86	72	72	66	54
140 mph	8 20	74	65	64	58	50	48
	21-27	87	73	73	72	56	56
	28-45	82	78	65	65	60	49
150 mph	8-20	69	60	57	54	48	44
	21-27	82	66	66	65	52	52
	28-45	75	72	58	60	54	44
160 mph	8-20	64	54	52	50	43	41
	21-27	77	61	61	60	48	48
	28-45	72	65	53	55	49	41
170 mph	8-20	59	50	48	48	40	39
	21-27	72	57	57	55	44	44
	28-45	65	60	49	51	45	39
175 mph	8-20	57	49	48	45	39	38
	21-27	69	54	54	53	43	43
	28-45	64	58	48	48	44	37
180 mph	8-20	56	48	45	44	38	37
	21-27	66	53	53	52	42	42
	28-45	61	56	45	48	43	35

= min 72" span = min 64" span = min 48" span REV 12/12/2019
= Shaded cells indicate conditions in which UFO Mid Clamp connection capacity is exceeded.

Grouping of ASCE 7-16 Roof Zones (Gable)

Roof Slope	8° - 27°			28° - 45°		
Group	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
ASCE 7-16 Roof Zones	1 2e	2n 2r 3e	3r	1 2e 2r	2n 3r	3e

Grouping of ASCE 7-16 Roof Zones (Hip)

Roof Slope	8° - 20°			21° - 27°			28° - 45°		
Group	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3
ASCE 7-16 Roof Zones	1	2r	2e 3	1	2e 2r	3	1	2e	2r 3

MARSHALL GARNER	CONTRACTOR: -	ENGINEER: CA33343	Ryan S Gittens 2024.08.21 19:41:24 -04'00'	DATE	BY	VER	DESCRIPTION	D8
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481 SOUTHWEST HORSE WAY LAKE CITY FLORIDA 32024 UNITED STATES	6901 TPC DRIVE STE 650, ORLANDO, FL 32822	1646 W SNOW AVE 9 TAMPA, FL 33606						PAPER: ARCHB
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PROJECT ID: 8212024-481								