

PV PROJECT - 10.95kWdc

PHOTOVOLTAIC SYSTEM SPECIFICATIONS:

SYSTEM SIZE:	10.95kWdc
MODULE TYPE :	(30) Q CELLS Q.PEAK DUO BLK-G10+ 365W
MODULE DIMENSIONS:	(L/W/H) 67.60"/41.14"/1.26"
INVERTER:	(14) CHILICON CP-720 MICRO-INVERTERS (02) CHILICON CP-250 MICRO-INVERTERS
INTERCONNECTION METHOD:	LINE SIDE TAP

GOVERNING CODES:

ALL WORK SHALL CONFORM TO THE FOLLOWING CODES

- 2020 FL BUILDING CODE - 7TH EDITION
- 2020 FL PLUMBING CODE - 7TH EDITION
- 2020 FL MECHANICAL CODE - 7TH EDITION
- 2020 FL FIRE PREVENTION CODE - 7TH EDITION
- 2017 NATIONAL ELECTRICAL CODE
- ANY OTHER LOCAL AMENDMENTS

SHEET INDEX:

PV 01 :	COVER PAGE
PV 02 :	ROOF PLAN & PV LAYOUT
PV 03 :	RACKING PLAN
PV 04 :	MOUNTING DETAILS
PV 05 :	LINE DIAGRAM
PV 06 :	WARNING LABELS
DS 01 + :	DATA SHEETS

DESIGN SPECS:

WIND EXPOSURE:	C
RISK CATEGORY:	II
WIND SPEED:	120 MPH
PZ2 (a):	4 FT
BLDG HGT:	< 15 FT
ROOF PITCH:	14.04°
ROOF TYPE:	METAL SHEET
RAFTER SPACING:	2"X4"@24" C.C.
AHJ:	*COLUMBIA COUNTY.
UTILITY:	FPL.



1 AERIAL VIEW

PV 01

CALE: NTS



2 VICINITY VIEW

SALE: NTS

Design:



PROJECT ADDRESS

ALVIN BELL RESIDENCE
3050 SE COUNTRY CLUB ROAD,
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File Name:

01_COVER_DWG

Chad E Widup

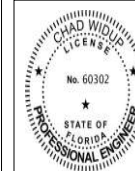
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PV01 - COVER

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Project Type - Photovoltaic

PV 01

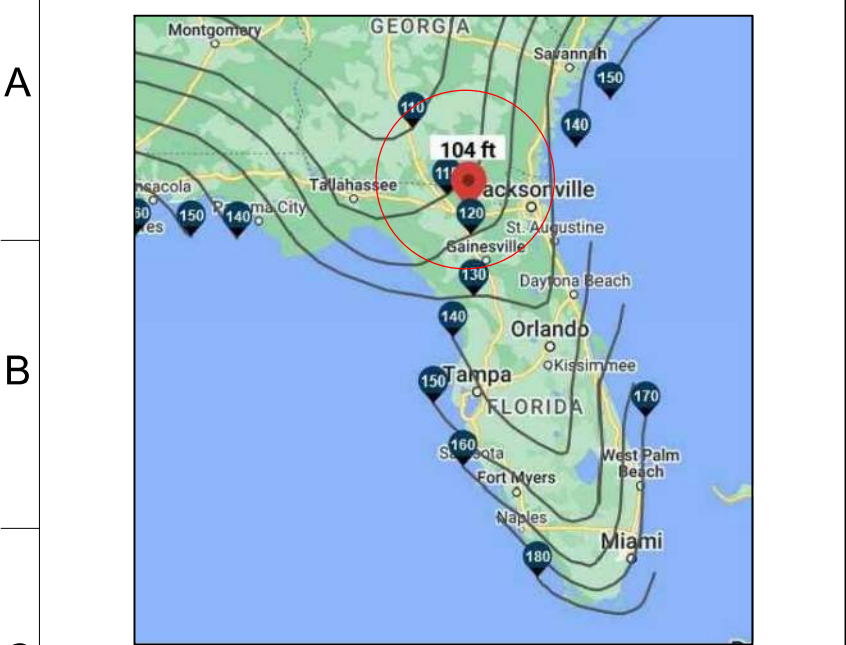
Drawing history

Drawn by	
YR	

Revision

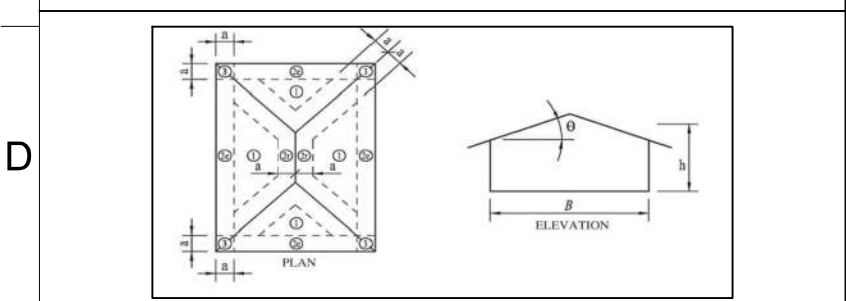
100

* WIND REGION MARKING



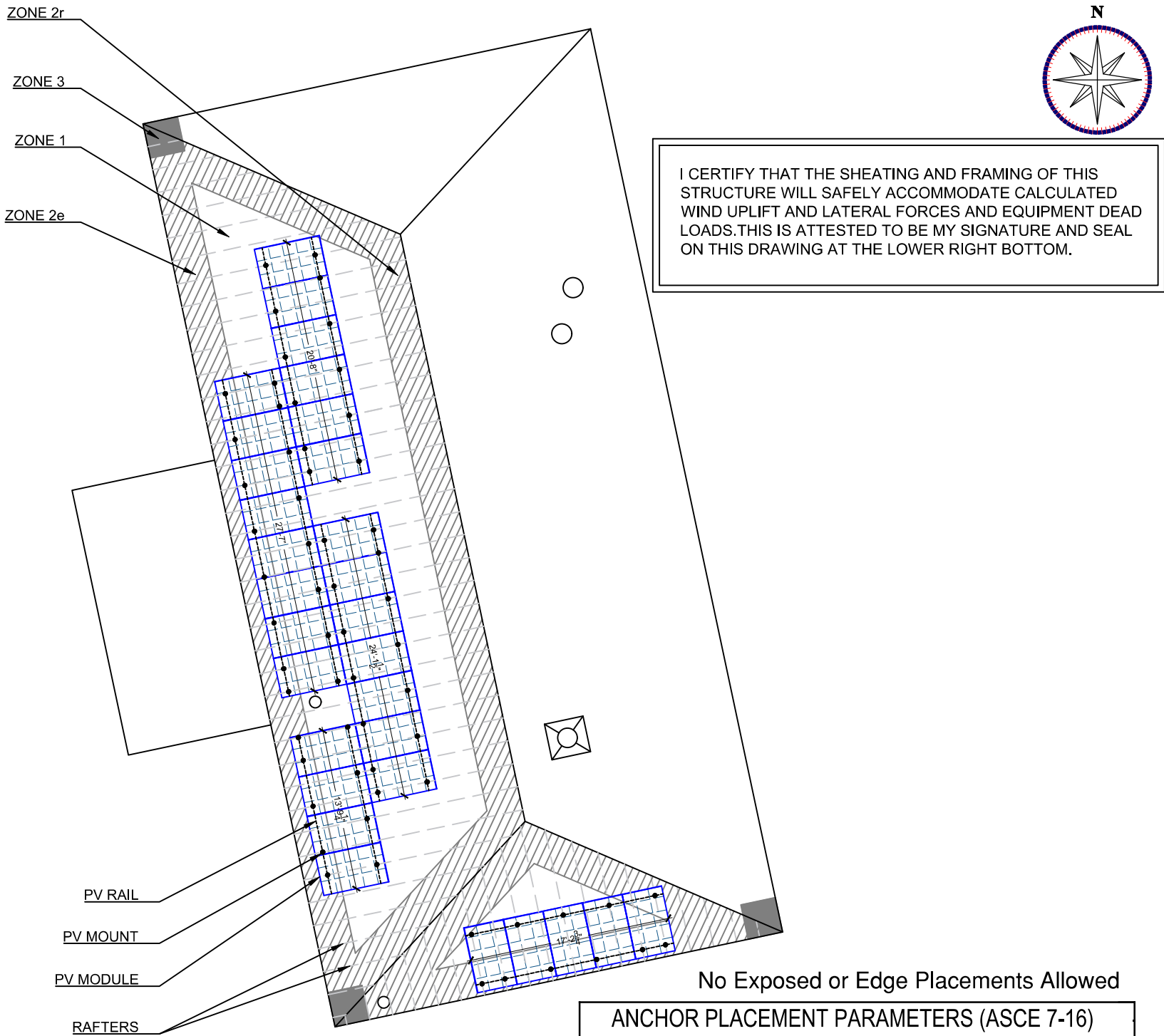
* You are in a wind-borne debris region if you are also within 1 mile of the coastal mean high water line

* ROOF ZONE MARKING PLAN - FOR HIP ROOF



Notes :

- E
- F
1. Values are nominal design 3 - second gust wind speed in miles per hour (m/s) at 33ft (10m) above ground for Exposure C category.
2. Liner interpolation between contours is permitted.
3. Islands and coastal areas outside the last contour shall use the wind speed contour of the coastal area.
4. Mountainous terrain, gorges, ocean promontories, and special wind regions shall be examined for unusual wind conditions.
5. Wind speed correspond to approximately a 7% probability of exceedance in 50 years (Annual Exceedance Probability = 0.00143, MRI = 700 years).



No Exposed or Edge Placements Allowed

ANCHOR PLACEMENT PARAMETERS (ASCE 7-16)

WIND PRESSURE ZONE	MODULE WIND EXPOSURE	MAX. ANCHOR SPACING	MAX. ALLOWABLE CANTILEVER
ZONE 1	NORMAL	48.0IN	16.0IN
ZONES 2r	NORMAL	48.0IN	16.0IN
ZONES 2e, 3	NORMAL	24.0IN	8.0IN

1 PV LAYOUT & MOUNTING DETAIL PLAN

PV 03

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

PV Dead Load		Units
No of Modules	30	
Weight per Module	41	lbs
Array Weight	1236	lbs
PV Rail Weight	209	lbs
Total Weight	1565	lbs
Total Area	579.4	Sqft
Dead Load	2.7	psf
Weight/attachment	25.2	lbs

Module and Racking Specs		Units
Dimensions, LxWxH (in)	67.60"/41.14"/1.26"	
Width	3.43	ft
Length	5.63	ft
Module Area	19.31	Sqft
Dead Load - Rail, Clamps, Mounts	1	lb/ft
Total Rail Length	209	ft

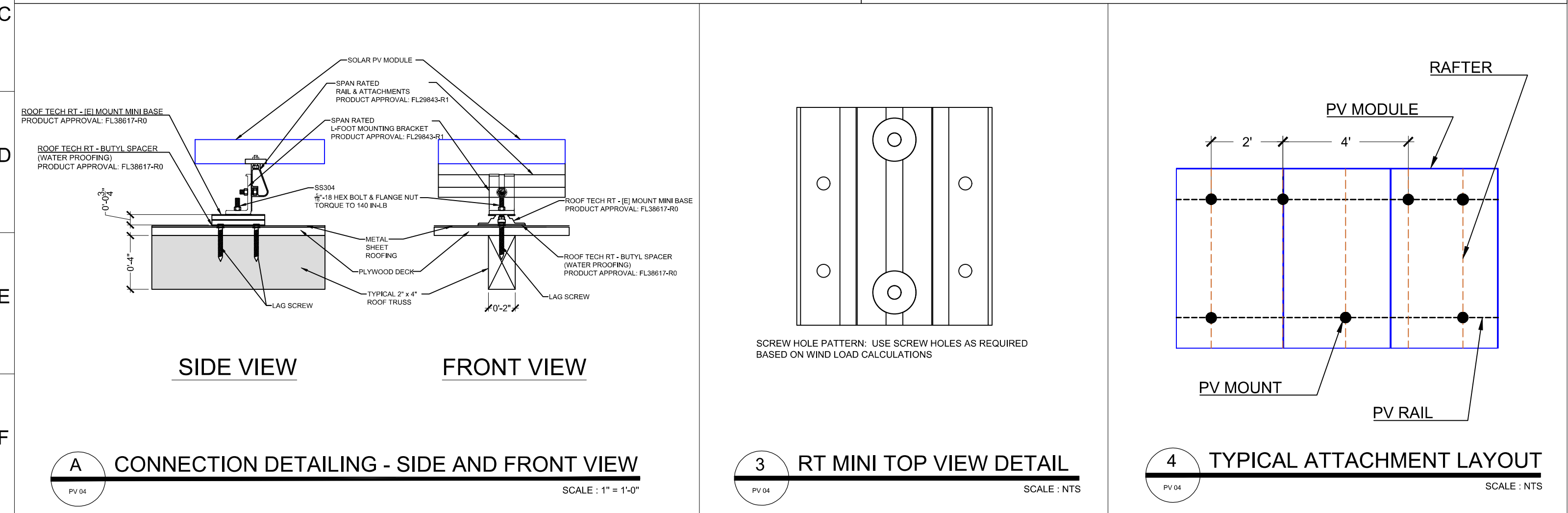
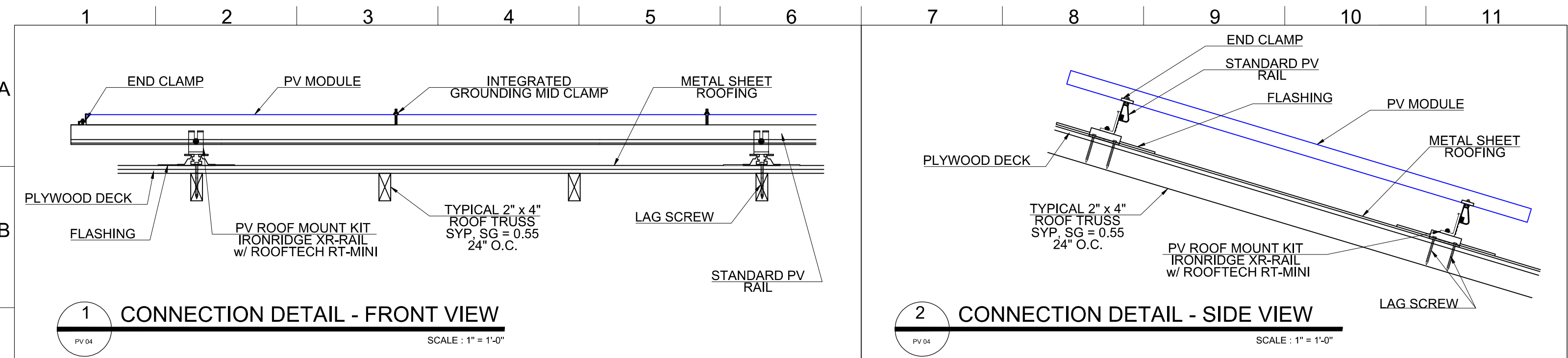
MATERIALS	
MAX ALLOWABLE SPACING BETWEEN ATTACH POINTS	4 ft
MIN. NUMBER OF ATTACHMENT POINTS	62
LENGTH OF RAIL REQUIRED	209 ft
SPLICE BAR	8
MID CLAMPS	50
END CLAMPS	20
GROUND LUGS	5

NOTE:
1. Exposed or Edge Placements Allowed.

SYSTEM LEGEND

*HIP ROOF

- WIND ZONE 1
- WIND ZONE 2r, 2e
- WIND ZONE 3
- PV MOUNT
- RAFTER
- PV RAIL
- PV MODULE



Design:

PROJECT ADDRESS

ALVIN BELL RESIDENCE
3050 SE COUNTRY CLUB ROAD,
LAKE CITY, FL 32025

Parcel Number : 15-4S-17-08360-173 (31031)
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File Name:

04_MOUNTING_DWG

Chad E Widup

Sheet Number and Title:

PV04 - MOUNTING DETAILS

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Project Type - Photovoltaic

PV 04

Drawing history

Drawn by	Revision
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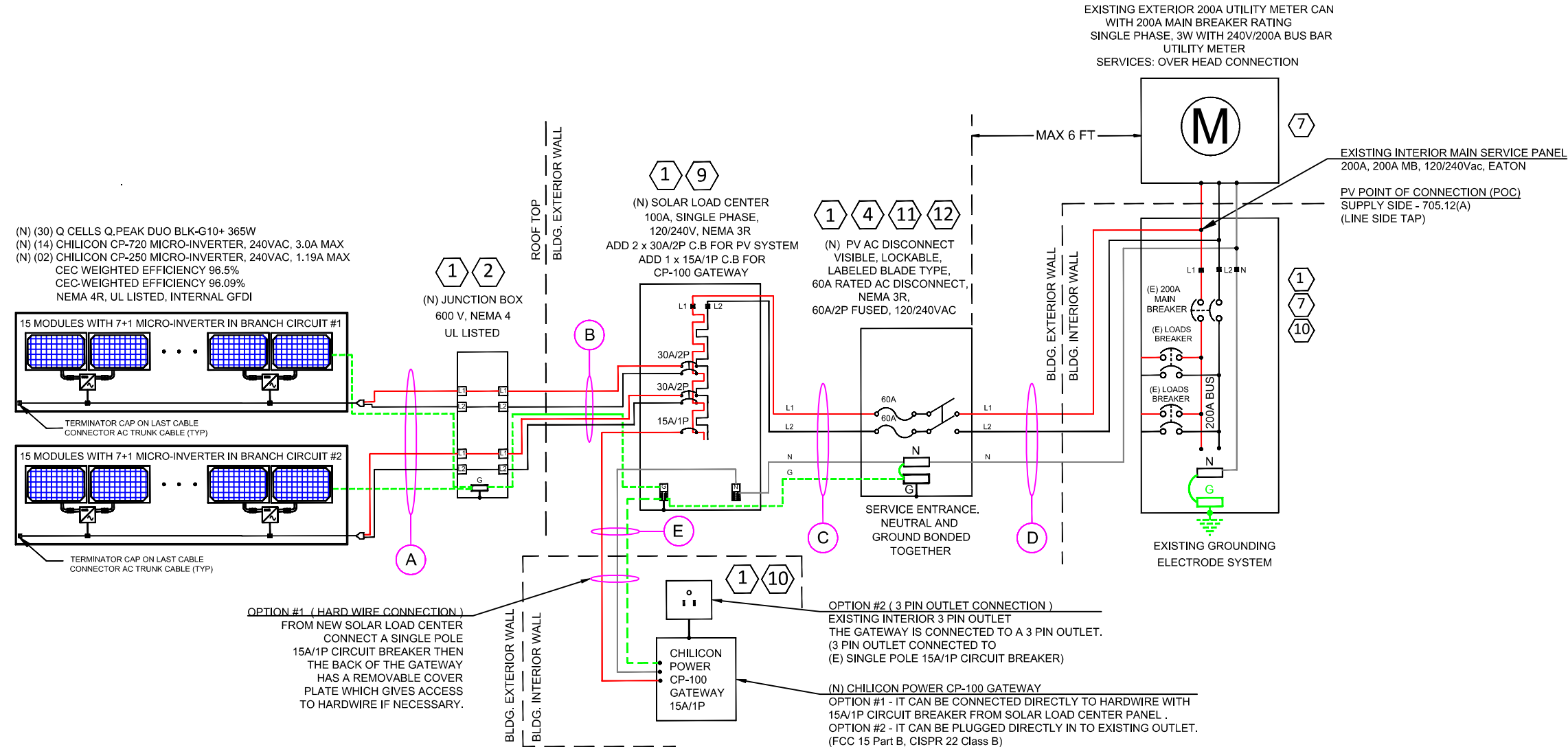
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PV MODULE RATING @ STC	
MANUFACTURER	Q.CELLS Q.PEAK DUO BLK-G10+ 365
MAX. POWER-POINT CURRENT (Imp)	10.56 AMPS
MAX. POWER-POINT VOLTAGE (Vmp)	34.58 VOLTS
OPEN-CIRCUIT VOLTAGE (Voc)	41.21 VOLTS
SHORT-CIRCUIT CURRENT (Isc)	11.07 AMPS
NOM. MAX. POWER AT STC (Pmax)	365 WATT
MAX. SYSTEM VOLTAGE	1000 VDC (UL)
TEMPERATURE COEFFICIENT OF Voc	-0.27 % °C

INVERTER SPECIFICATIONS		
MANUFACTURER	CHILICON CP-720	CHILICON CP-250
MAX. DC VOLT RATING	120 VOLTS	44 VOLTS
MAX. POWER AT 40 C	720 WATTS	220 WATTS
NOMINAL AC VOLTAGE	240V /211V - 264V	240V /211V - 264V
MAX. AC CURRENT	3.0AMPS	1.19AMPS
MAX. OCPD RATING	6.3 AMPS	6.3 AMPS
MAX. PANELS/CIRCUIT	16	15
MAX. INPUT DC SHORT CIRCUIT CURRENT	16 AMPS	21 AMPS
CIRCUIT BREAKER OCPD RATING	30 AMPS	30 AMPS

ELECTRICAL NOTES:

- ALL EQUIPMENT TO BE LISTED BY UL OR OTHER NRTL, AND LABELED FOR ITS APPLICATION.
- 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.
- WORKING CLEARANCES AROUND ALL NEW AND EXISTING ELECTRICAL EQUIPMENT SHALL COMPLY WITH NEC 110.26.
- DRAWINGS INDICATE THE GENERAL ARRANGEMENT OF SYSTEMS. CONTRACTOR SHALL FURNISH ALL NECESSARY OUTLETS, SUPPORTS, FITTINGS AND ACCESSORIES TO FULFILL APPLICABLE CODES AND STANDARDS.
- WHERE SIZES OF JUNCTION BOXES, RACEWAYS, AND CONDUITS ARE NOT SPECIFIED, THE CONTRACTOR SHALL SIZE THEM ACCORDINGLY.
- MODULE GROUNDING CLIPS TO BE INSTALLED BETWEEN MODULE FRAME AND MODULE SUPPORT RAIL, PER THE GROUNDING CLIP MANUFACTURER'S INSTRUCTION.
- MODULE SUPPORT RAIL TO BE BONDED TO CONTINUOUS COPPER G.E.C. VIA WEEB LUG OR ILSKO GBL-4DBT LAY-IN LUG.
- WORKING CLEARANCES AROUND THE EXISTING AND NEW ELECTRICAL EQUIPMENT WILL BE MAINTAINED IN ACCORDANCE WITH NEC ARTICLE 110.26.
- ALL EQUIPMENT INSTALLED SHALL BE LISTED BY A NATIONALLY RECOGNIZED TESTING LABORATORY (NRTL) PER NEC ARTICLE 110.3.
- RACKING CONFORMS TO AND IS LISTED UNDER UL 2703.
- APPROVED USE OF CONDUITS AND THEIR APPLICATIONS: IN AMBIENT TEMPERATURES < 122FAHRENHEIT: PVC (NEC 352.12) AC IN ATTICS: NM-B, AC OR DC IN ATTICS: FNC, FMC, TYPE AC OUTSIDE BUILDINGS: PVC SCH40, LFNC-B, LFMC OUTSIDE BUILDINGS EXPOSED TO DAMAGE: PVC SCH80.

SYSTEM DETAILS			
INPUTS	BRANCH CIRCUIT CONNECTION IN ENPHASE IQ COMBINER		
# OF CIRCUITS:	2		
LARGEST STRING:	15		
SMALLEST STRING:	15		
TOTAL PV MODULES:	30 x Q CELLS Q.PEAK DUO BLK-G10+ 365W		
TOTAL INVERTERS:	14 x CP-720 & 02 x CP-250		
SYSTEM RATINGS:	10.95kWdc STC		
INDIVIDUAL CIRCUITS:	1	2	
MICRO-INVERTER PER BRANCH CIRCUITS:	07+01	07+01	
OUTPUT CURRENT PER STRING (A):	22.19	22.19	
NEC RULE 125% OF OUTPUT FOR MIN. OCP (A):	27.7375	27.7375	
MIN. BREAKER SIZE (A):	30	30	
MAX. CONTINUOUS LOAD (TOTAL LOAD) (A):	55.475A		
BATTERY RATING:	N/A		

THIS PANEL IS FED BY MULTIPLE SOURCES (UTILITY AND SOLAR)	
AC OUTPUT CURRENT	55.475A
NOMINAL AC VOLTAGE	240V

Notes: LFMC or LFNC can be used as necessary, if "uses permitted" of the current version of the NEC are met.
(G) can be #8AWG THWN-2
For Conduit sizing refer to Chapter 9 Tables, NEC

NEC 690.45-46,
Table 250.66, Table 250.122

CONDUIT AND CONDUCTOR						
WIRE TAG#	WIRE FROM - -	WIRE GAUGE	CONDUIT TYPE	NO OF CONDUCTORS	CONDUIT SIZE	MAX ONE WAY LENGTH IN FT
A	PV ARRAY TO JUNCTION BOX	#10AWG	FREE AIR	(L1 , L2) , G	IQ CABLE	20
B	JUNCTION BOX TO SOLAR LOAD CENTER	#10AWG	*MC CABLE	2 x (L1 , L2) , G	IQ CABLE	40
C	SOLAR LOAD CENTER TO PV AC DISCONNECT	#6AWG	PVC, EMT OR FMC	L1 , L2 , N (#8 G)	3/4"	5
D	PV AC DISCONNECT TO MAIN SERVICE PANEL	#6AWG	PVC, EMT OR FMC	L1 , L2 , N	3/4"	5
E	SOLAR LOAD CENTER TO CP-100 GATEWAY	#10AWG	PVC, EMT OR FMC	L1 , N, (#10 G)	3/4"	5

Design:



PROJECT ADDRESS

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File Name:

05_LINE DIAGRAM_DWG

Chad E Widup


Sheet Number and Title:

PV05 - LINE DIAGRAM

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Date: 2023.04.30
12:41:06 -04'00'

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Project Type - Photovoltaic

PV 05

Drawing history

Drawn by	Revision
YR	---

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Chilicon Power Microinverters

CHILICON POWER CP-720



Maximum Energy Production

Highest Power Density

Enhanced Monitoring

Modular Trunk Cabling

Single SKU All Major Module Types

AC Coupling with Freq-Watt and Volt-Watt Modes



To learn more about Chilicon Power Microinverters, visit chiliconpower.com

CHAD WIDUP
LICENSE
No. 60302
STATE OF FLORIDA
PROFESSIONAL ENGINEER

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Date: 2023.04.30 12:49:07 -04'00'

CP-720-60-72-208/240-MC4 Microinverter Specifications

INPUT DATA (DC)

Recommended input power (STC)	(190 - 420 W) x 2; (380 - 840 W) x 1
Maximum DC input voltage	120 V
MPPT voltage tracking range	52 – 82 V
Operating range	47 – 82 V
Min./Max. start voltage	44 – 96 V
Max. DC input short circuit current	16 A
Max. DC input current	13.5 A
Ground fault protection	Transformer isolated 2000 Vrms input/output/chassis

OUTPUT DATA (AC)

	@ 208 V	@ 240 V
Max. continuous output power	713 W	720 W
Max. continuous output current	3.43 A	3.0 A
Nominal output voltage / range	208 / 183 – 229 V	240 / 211 – 264 V
Extended output voltage range	133 / 150 / 166 – 250 V	153 / 173 / 192 – 288 V
Nominal frequency / range	60.0 / 59.3 – 60.5 Hz	60.0 / 59.3 – 60.5 Hz
Extended frequency range	54.22 – 66.75 Hz	54.22 – 66.75 Hz
Power factor	-0.6 to 0.6 programmable	-0.6 to 0.6 programmable
Maximum units per 30 A branch circuit	7 (14 modules)	8 (16 modules)
Maximum output overcurrent protection	6.3 A	6.3 A

EFFICIENCY

CEC weighted efficiency	96.5 %
Peak inverter efficiency	97 %
Static MPPT efficiency (EN 50530)	99.5 % - 99.8 %
Night time power consumption	50 mW @ 208V, 100 mW @ 240 V

MECHANICAL DATA

Ambient temperature range	-40°C to +65°C
Dimension (W x H x D) including connectors	12" x 8" x 1.8"
Weight	1.81 kg (4.0 lbs)
Enclosure rating	NEMA 6

FEATURES

Communication	Mesh Networked Power Line (130.2 kHz carrier)
Monitoring	Monitoring via CP-100 gateway and Online Cloud
Certifications	UL1741, IEEE std 1547, IEEE std C62.41.2, CSA C22.2 NO. 107.1 CISPR 22 Class B; HECO Rule14H (Advanced Inverter), HECO Rule 22 (Self-Supply) Rule 21 / UL1741SA
Compatibility (Single SKU)	2 x Series 60/72 Cell Mono or Poly PV modules 2 x Parallel HV Panasonic Modules; 2 x Parallel 96/128 Cell SunPower Modules

To learn more about Chilicon Power Microinverters, visit chiliconpower.com



- Maximum Energy Production
- Reliability by Design
- Enhanced Monitoring
- Simplified Installation
- Safety

7

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Date: 2023.04.30 12:49:34 -04'00'

CP-250-60-208/240-MC4 Microinverter Specifications

INPUT DATA (DC)

Recommended input power (STC)	190 - 300 W
Maximum DC input voltage	44 V
MPPT voltage range	22 – 38.5 V
Operating range	18 – 38.5 V
Min./Max. start voltage	22 – 40 V
Max. DC input short circuit current	21 A
Max. DC input current	12 A
Ground fault protection	Integrated GFD; Transformer isolated 2000 Vrms input/output/chassis

OUTPUT DATA (AC)

	@ 208 V	@ 240 V
Nominal output power	220 W	220 W
Max. continuous output power	285 W	285 W
Max. continuous output current	1.37 A (285 W @ 208 V)	1.19 A (285 W @ 240 V)
Nominal output voltage / range	208 / 183 – 229 V	240 / 211 – 264 V
Extended output voltage range	133 / 150 / 166 – 250 V	153 / 173 / 192 – 288 V
Nominal frequency / range	60.0 / 59.3 – 60.5 Hz	60.0 / 59.3 – 60.5 Hz
Extended frequency range	54.22 – 66.75 Hz	54.22 – 66.75 Hz
Power factor	> 0.95	> 0.95
Maximum units per 20 A branch circuit	13	15
Maximum output fault current & duration	1.6 A peak for > 10% of any cycle	1.6 A peak for > 10% of any cycle
Maximum output overcurrent protection	6.3 A	6.3 A

EFFICIENCY

CEC weighted efficiency	96.09 %
Peak inverter efficiency	96.6 %
Static MPPT efficiency (EN 50530)	99.5 % - 99.8 %
Night time power consumption	40 mW @ 208V, 80 mW @ 240 V

MECHANICAL DATA

Ambient temperature range	-40°C to +65°C
Dimension (W x H x D) including connectors	12" x 8" x 1.8"
Weight	1.55 kg (3.4 lbs)
Enclosure rating	NEMA 4X

FEATURES

Communication	Power line (130.2 kHz carrier)
Monitoring	Free monitoring via gateway or online sof
Compliance	UL1741, IEEE std 1547, IEEE std C62.41.2, CSA C22.2 NO. 107.1 & CISPR 22 Class B
Compatibility	60-cell PV modules compliant with input voltage operating range specification

CHAD WIDUP
LICENSE
No. 60302
STATE OF
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PROFESSIONAL ENGINEER

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Chilicon Power Microinverter System

CHILICON POWER CP-100 GATEWAY



<http://www.chiliconpower.com/resources/videos>

On-Site Array Configuration

PLC, WiFi, Ethernet, and ZWave

Production and Consumption Monitoring

In-Wall or On top of Wall Mounting

Automatic Cloud Monitoring Support

The GATEWAY is a monitoring system for communicating with the inverters in your array that can be cloud interconnected or can run stand-alone. The GATEWAY provides a 7" 800 x 480 LCD Touch Screen making it very informative and easy to use. Setup of your solar array's configuration occurs on the gateway screen and does not require interaction with remote servers or websites.

Powerline communications with the GATEWAY use a sophisticated multi-rate, error-resistant and encrypted powerline communications technology to connect to each microinverter without additional wiring.

In addition to the power line communications interface to inverters, the GATEWAY also has a zWave wireless interface that enables power consumption monitoring via current clamps placed in any utility panel. Cloud communication, if desired, is performed through an Ethernet or integrated Wi-Fi interface.

One GATEWAY can communicate with up to 255 microinverters. For larger commercial installations, multiple GATEWAY devices are used in combination with Line Communications Filters (LCF) to separate networking domains across the site.

CP-Gateway Operating Specifications

INPUT (AC)

120V single phase / 208V 3-phase	L1 and N (CP-100) / or L1,L2,L3,N (CP-100-3)
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MECHANICAL DATA

Ambient temperature range	-40°C to +65°C
Dimension (W x H x D) including connectors	8.5" x 6" x 1.75" (or x 0.2" if flush mount to wall)
Weight	0.63 kg (1.4 lbs)
Enclosure rating	Indoor by default / Outdoor with additional NEMA 4x enc

FEATURES

Communication	Power line (130.2 kHz carrier)
Monitoring	Free monitoring via gateway or online software
Compliance	FCC 15 Part B, CISPR 22 Class B



To learn more about Chilicon Power Microinverters, visit chiliconpower.com



To learn more about Chilicon Power Microinverters, visit chiliconpower.com



Tech Brief

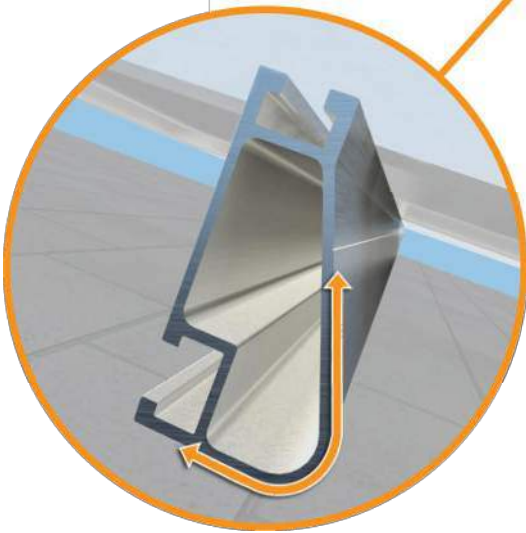
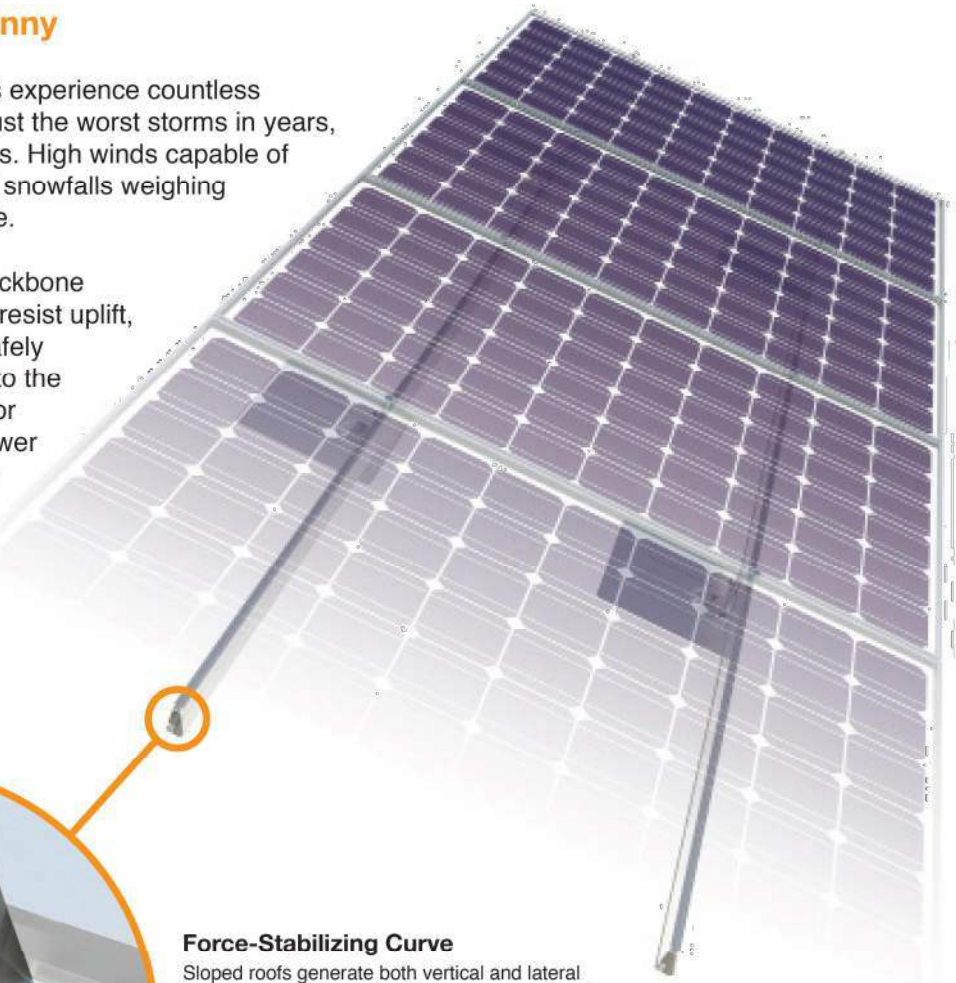


XR Rail® Family

Solar Is Not Always Sunny

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

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



Force-Stabilizing Curve

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

Compatible with Flat & Pitched Roofs



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



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

Corrosion-Resistant Materials

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



XR Rail® Family

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



XR10

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

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



XR100

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

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



XR1000

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

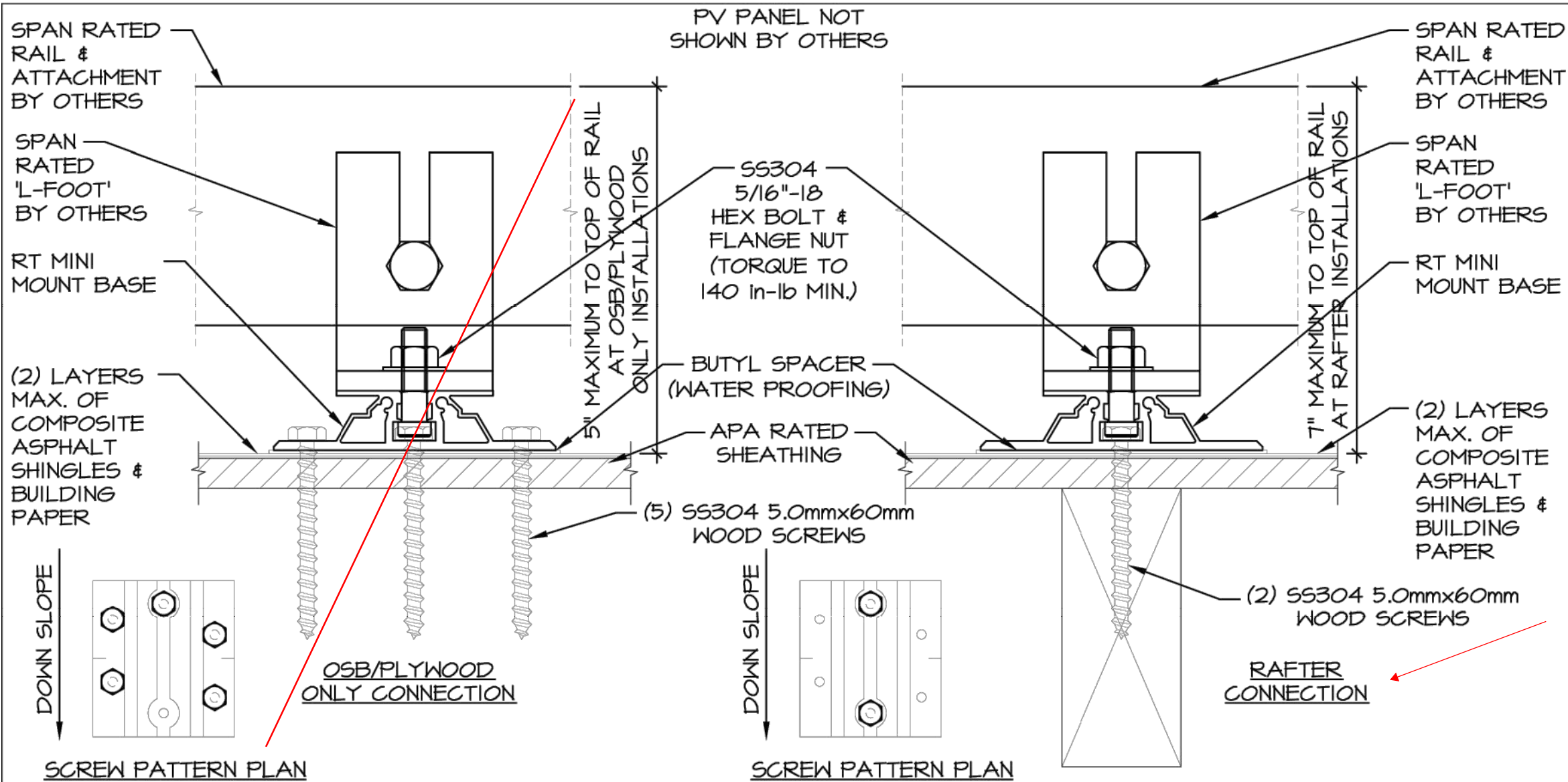
- 12' spanning capability
- Extreme load capability
- Clear anodized finish
- Internal splices available

Rail Selection

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

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

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



I 'RAIL OPTION' - RAIL AND 'L-FOOT' ORIENTATION

SCALE: N.T.S.



Starling Madison Lofquist, Inc.
5224 S. 39th Street
Phoenix, Arizona 85040
(602) 438-2500
fax. (602) 438-2505

DRAWN BY: J.S.
DESIGNED BY: D.H.

DATE: 10-22-19
JOB NO: 471-13

ROOF TECH
RT MINI MOUNT + RAIL
STRUCTURAL ANALYSIS

ROOF TECH, INC.
10620 TREENA ST., SUITE 230
SAN DIEGO, CA 92131

EXHIBIT A
1 OF 4

RT-MINI

Self-flashing base for asphalt & metal roof-top PV mounting systems

RT-MINI is suitable for mounting any rail system with a conventional L-Foot.



Dual bolt design: M8 or 5/16" for L-Foot & 1/4" for EMC



Installation Manual



ICC ESR 3575




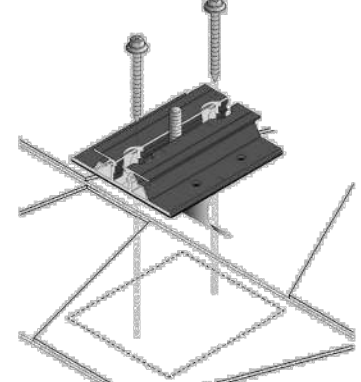
Roof Tech


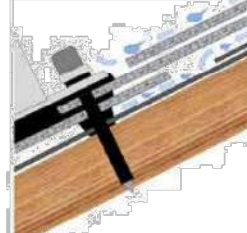
The Standard for Waterproof Flexible Flashing Since 1994
www.roof-tech.us info@roof-tech.us

RT-MINI


Flexible Flashing certified by the International Code Council (ICC)

Engineered to ASTM D 1761 (Standard Test Methods for Mechanical Fasteners in Wood)

Components	Dimensions in (mm)
<p>RT2-00-MINIBK</p>  <p>MINI base : 20 ea. Screw : 40 ea. Extra RT-Butyl : 10 ea.</p> <p>Optional item 5 x 60mm Mounting screw (RT2-04-SD5-60) : 100 ea./Bag 5/16" Hex bolt, washer & nut set (RT-04-BN30SL-US) : 100 ea./Bag RT-Butyl (RT2-04-BUTYLT) : 10 ea./Box</p> <p>RT-Butyl is Roof Tech's flexible flashing used in one-million residential PV systems for the last 26 years. It is the first PV mounting system with Flexible Flashing certified by the ICC. Engineered to withstand wind speeds up to 180 mph and ground snow up to 90 psf.</p>	<p>4 (100)</p>  <p>3 1/2 (90) 2 (50)</p> <p>Rafter installation</p>  <p>Deck installation</p>

Metal Flashing Retrofit	Flexible Flashing
 <p>Shedding water?</p>	 <p>100% Waterproof</p>

ICC ESR-3575 ASTM2140 testing UV testing (7500 hrs.)



P.E. Stamped Letters available at www.roof-tech.us/support.
TAS 100-A on metal and asphalt roof.

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