

HISTORIC AND DESIGN REVIEW COMMISSION

February 15, 2017

HDRC CASE NO: 2017-053
ADDRESS: 1700 SE MILITARY DR
LEGAL DESCRIPTION: NCB 11175 BLK LOT PART OF 46 "MISSION PARK SOUTH SUBD"
ZONING: C-3,H,RIO-6
CITY COUNCIL DIST.: 3
DISTRICT: Mission Historic District
APPLICANT: Nicole Morales
OWNER: Mission Park - South
TYPE OF WORK: Solar panel installation
REQUEST:

The applicant is requesting a Certificate of Appropriateness for approval to install four solar panel arrays including the following for a total of 224 solar panels:

1. 112 solar panels on the rear slope of the hipped roof.
2. 28 solar panels on the left slope of the right front gable.
3. 42 solar panels on the left slope of the left front gable.
4. 42 solar panels on the flat roof attached garage on the left facade.

APPLICABLE CITATIONS:

Historic Design Guidelines, Chapter 3, Guidelines for Additions

6. Designing for Energy Efficiency

C. SOLAR COLLECTORS

- Location*—Locate solar collectors on side or rear roof pitch of the primary historic structure to the maximum extent feasible to minimize visibility from the public right-of-way while maximizing solar access. Alternatively, locate solar collectors on a garage or outbuilding or consider a ground-mount system where solar access to the primary structure is limited.
- Mounting (sloped roof surfaces)*—Mount solar collectors flush with the surface of a sloped roof. Select collectors that are similar in color to the roof surface to reduce visibility.
- Mounting (flat roof surfaces)*—Mount solar collectors flush with the surface of a flat roof to the maximum extent feasible. Where solar access limitations preclude a flush mount, locate panels towards the rear of the roof where visibility from the public right-of-way will be minimized.

FINDINGS:

- The structure is a contemporary, one-story commercial structure facing the interior of the lot. It has two front gables and a rear hipped roof with composition shingles and stucco siding. It is a non-contributing structure in the Mission Historic District.
- The structure has two front gables and a rear hipped roof form. The structure has composition shingles. The proposed first array will include 112 solar panels installed flush on the rear slope of the hipped roof. The proposed second array will include 28 solar panels installed flush on the left slope of the front right gable. The proposed third array will include 42 solar panels installed flush on the left slope of the front left gable. The proposed fourth array will include 42 solar panels installed flush on the flat roof of the attached garage on the left facade.
- According to the Guidelines for Additions 6.C., installations should be in locations that minimize visibility from the public right-of-way.
- Staff made a site visit on February 3, 2017, and found the structure faces the interior of the lot and is set back far from SE Military (approximately 230 feet) and Mission Road (approximately 130 feet). Staff found that array #2 and #3 could be seen from the parking lot and that array #1 of 112 solar panels could be seen from Mission Road. Staff finds since the arrays appropriate as the structure is set back significantly, and they cannot be seen from the San Antonio River, the panels will not have a negative impact on the public right-of-way as they are set to the rear of the property. However, staff finds that a lighter color in panel would be more appropriate to match the roof color more closely.
- The proposed panels will be mounted flush with the pitched and flat roofs. According to the Guidelines for

Additions 6.C.ii, solar collectors should be flush with the roof surface. Staff finds that the panels be installed that 5 inches or less from the roof slope would be appropriate. Staff finds the proposal consistent with the guidelines.

RECOMMENDATION:

Staff recommends approval based on findings a through e with the following stipulations:

1. That the panels are installed less than 5 inches from the roof slope.
2. That the panels match the gray composition shingles roof color more closely.

CASE MANAGER:

Lauren Sage



Flex Viewer

Powered by ArcGIS Server

Printed: Feb 02, 2017

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VIEW FROM ENTRANCE



VIEW FROM PARKING ALONG SE MILITARY DR



FRONT -RIGHT CORNER
FRONT FACES LEFT TOWARD INTERIOR OF THE LOT



FRONT



FRONT



FRONT



FRONT LEFT



LEFT (FACES AWAY FROM SE MILITARY)



REAR - FACES MISSION RD



REAR - FACES MISSION RD



REAR - FACES MISSION RD





RIGHT FACADE - FACES SE MILITARY DR



VIEW FROM STREET

RIGHT

REAR









VIEW FROM REAR OF STRUCTURE, TOWARD MISSION ROAD







REAR



REAR



CONSTRUCTION SUMMARY

- (224) (SUNPOWER SPR-E20-327-COM) SOLAR MODULES, 73.2 kW DC STC
MODULE DIMENSIONS = 41.2" X 61.4" X 1.81"
- (02) (SMA STP30000TL-US-10 PV INVERTERS @ 60.0 kW AC
COMBINED INVERTER OUTPUT = 60.0 kW AC.
- (1596) (114 X 14') LINEAR FEET 14' IRONRIDGE XR100
- (14) 10' UNISTRUT RAIL ON PURLINS ROOF ATTACHMENTS (GARAGE)
- (324) QUICKMOUNT ROOF ATTACHMENTS (ASPHALT SHINGLE ROOF)

SITE DETAILS

ROOF TYPE: R-CHANNEL METAL
ARRAY #1 - TILT = 20°, AZIMUTH = 270°
ARRAY #2 - TILT = 20°, AZIMUTH = 180°
ARRAY #3 - TILT = 10°, AZIMUTH = 180°

PV SYSTEM SUMMARY:
SOLAR ARRAY - 73.2 kW DC STC
(224) (SUNPOWER E20-327-COM) MODULES TOTAL
CONNECTED TO (2)(SMA STP30000TL-US) INVERTERS
(112) MODULES CONNECTED TO EACH INVERTER
(4) PARALLEL STRINGS OF (14) MODULES CONNECTED TO INPUT A
(4) PARALLEL STRINGS OF (14) MODULES CONNECTED TO INPUT B

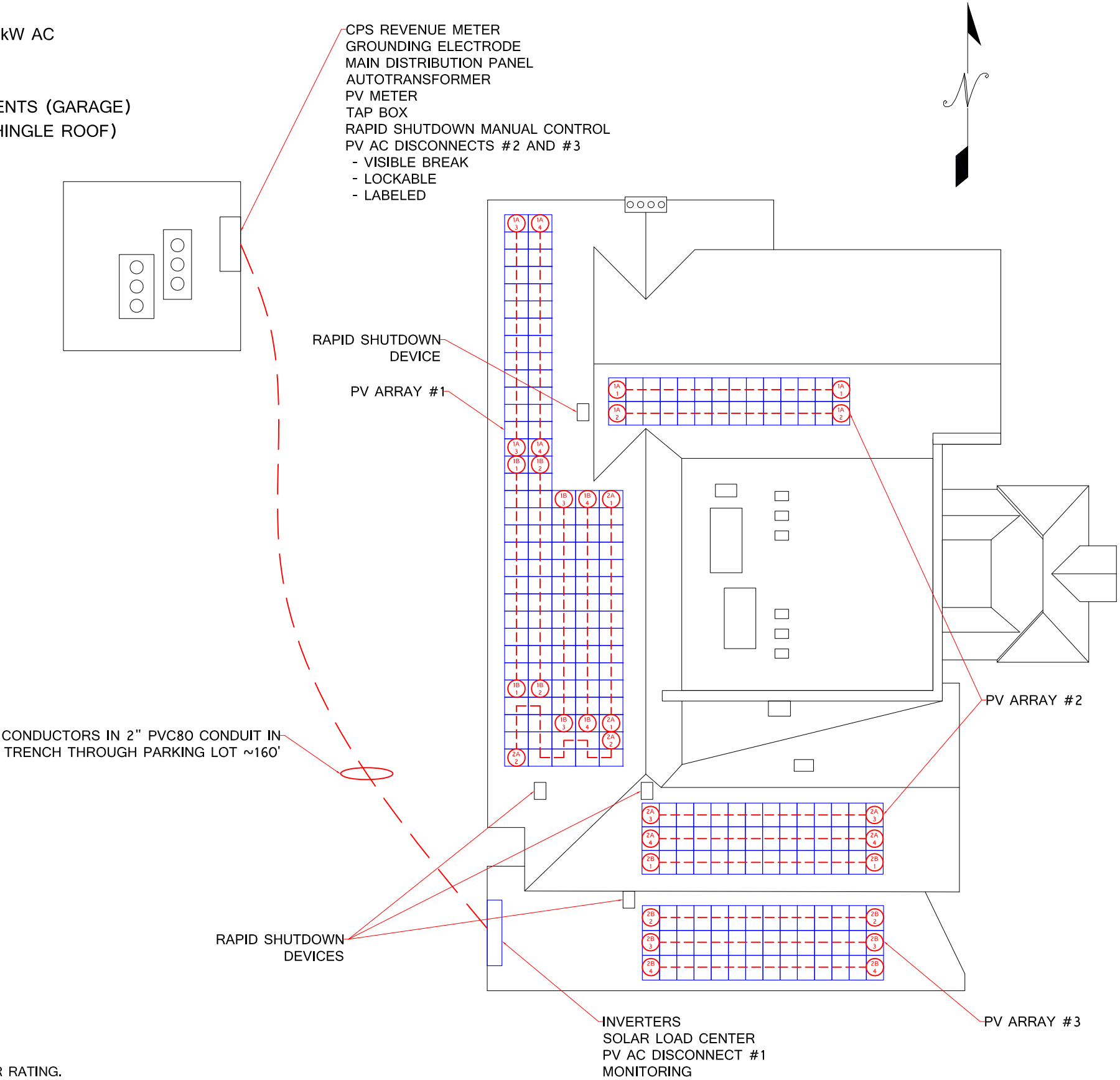
PRECAUTION: MAXIMUM MODULES IN A STRING = 14

NOTE: PORTIONS OF THE ROOF ARE TWO STORY
TALL LADDER MAY BE REQUIRED



CONSTRUCTION NOTES

- 1.) ALL EQUIPMENT SHALL BE INSTALLED IN ACCORDANCE WITH THE
MANUFACTURER'S INSTALLATION INSTRUCTIONS.
- 2.) ALL OUTDOOR EQUIPMENT SHALL BE RAINLIGHT WITH MINIMUM NEMA 3R RATING.
- 3.) ALL LOCATIONS ARE APPROXIMATE AND REQUIRE FIELD VERIFICATION.



DESIGN & DRAFTING BY:
GORDON GUNN, PE, NABCEP

REVISIONS		
DESCRIPTION	DATE	REV
ORIGINAL	10/05/2016	A

CONTRACTOR



FREEDOM SOLAR POWER
4111 TODD LN, STE 100
AUSTIN, TX 78744
TECL # 28621

PROJECT NAME

MISSION PARK - SOUTH,
1700 SE MILITARY DRIVE
SAN ANTONIO, TX, 78214

SHEET NAME

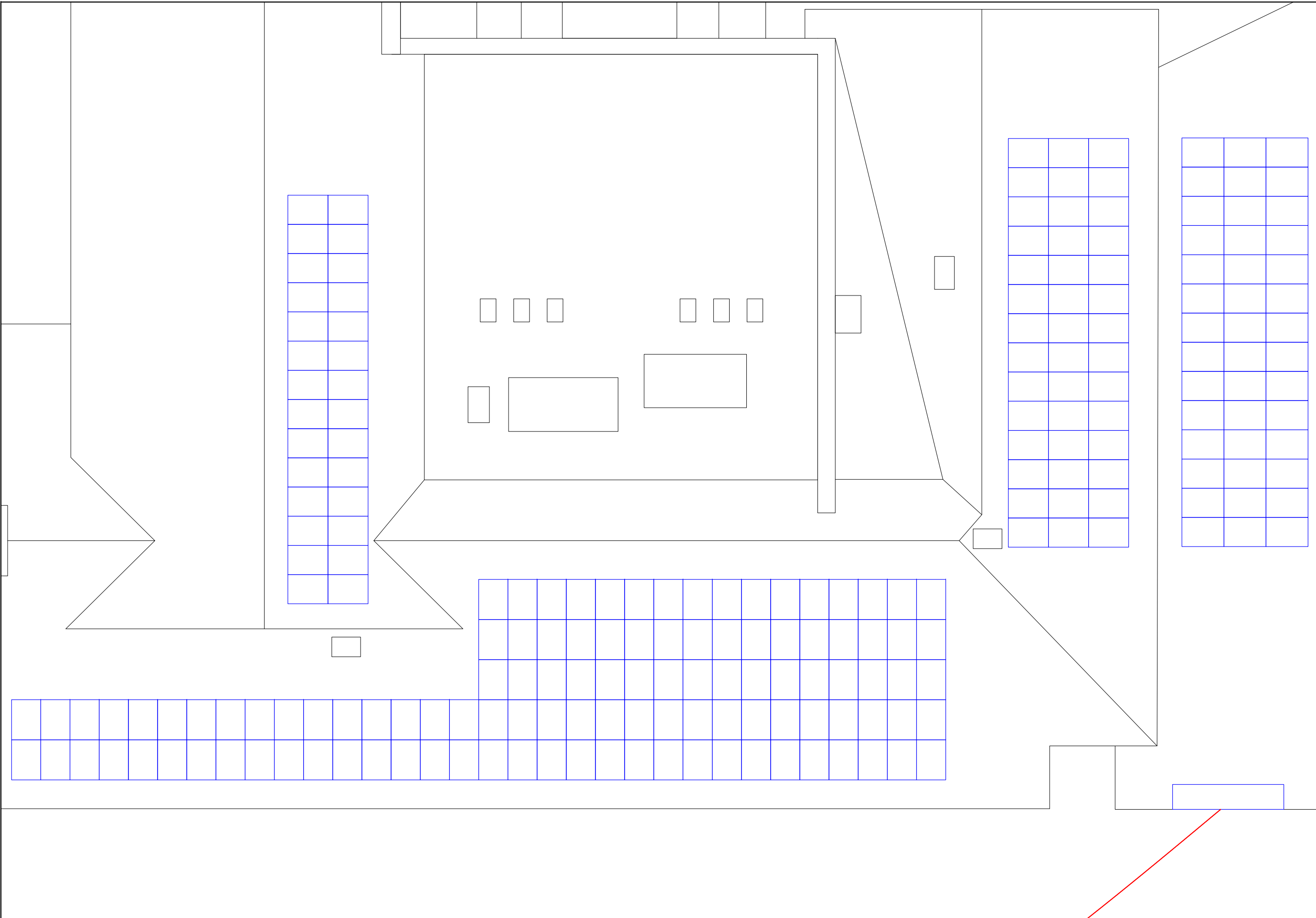
SITE MAP &
PV LAYOUT

SHEET SIZE

ANSI B
11" x 17"

SHEET NUMBER

PV-1



DESIGN & DRAFTING BY:
GORDON GUNN, PE, NABCEP

REVISIONS		
DESCRIPTION	DATE	REV
ORIGINAL	10/05/2016	A

CONTRACTOR



FREEDOM
SOLAR POWER

FREEDOM SOLAR POWER
4111 TODD LN, STE 100
AUSTIN, TX 78744
TECL # 28621

PROJECT NAME

MISSION PARK - SOUTH,
1700 SE MILITARY DRIVE
SAN ANTONIO, TX, 78214

SHEET NAME

STRING MAP
&
MONITORING
LAYOUT

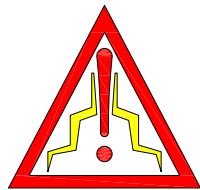
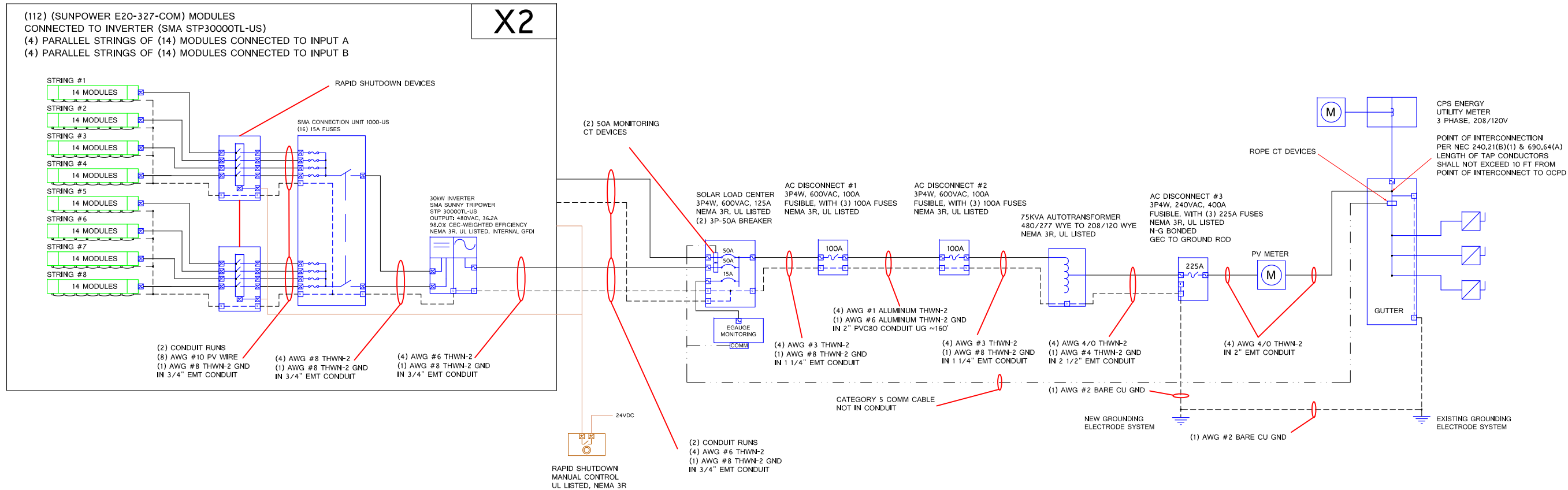
SHEET SIZE

ANSI B
11" x 17"

SHEET NUMBER

PV-2

SOLAR ARRAY - 73.2 kW DC STC
(224) (SUNPOWER E20-327-COM) MODULES TOTAL
CONNECTED TO (2)(SMA STP30000TL-US) INVERTERS



R.S.D.

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°C WET ENVIRONMENT UNLESS OTHERWISE NOTED.
- 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 G.E.C. VIA WEEB LUG OR ILSCO GBL-4DBT LAY-IN LUG.
- 10.) THE DC SIDE OF THE PV SYSTEM IS UNGROUNDED AND SHALL COMPLY WITH NEC 690.35.

CALCULATIONS FOR CURRENT CARRYING CONDUCTORS	CALCULATIONS FOR MAXIMUM DC VOLTAGE
<p>PV SOURCE CIRCUIT WIRE AMPACITY CALCULATION [NEC 690.8(A)(1)]: MODULE STRING MAX DC CURRENT = (1.25)(6.46A) = 8.08A CONTINUOUS USE: AWG #10 75°C DERATED AMPACITY = (0.80)(35.0A) = 28.0 A, 28.0A >8.08A CONDITIONS OF USE: AWG #10 90°C DERATED AMPACITY = (0.71)(0.7)(40.0A) = 19.9A, 19.9 A >8.08A</p> <p>INVERTER OUTPUT WIRE AMPACITY CALCULATION [NEC 690.8(A)(3)]: 36.2A PER INVERTER (SMA STP30000TL-US) CONTINUOUS USE: AWG #8 75°C DERATED AMPACITY = (0.80)(50.0A) = 52.0A, 40.0 A >36.2A CONDITIONS OF USE: AWG #8 90°C DERATED AMPACITY = (0.91)(55.0A) = 50.0A, 50.0A >36.2A, >45A (PROTECTED BY 50A OCPD)</p> <p>COMBINED INVERTER OUTPUT WIRE AMPACITY CALCULATION, 480V SIDE OF TRANSFORMER [NEC 690.8(A)(3)]: 36.2A PER INVERTER @480V (SMA STP30000TL-US), (2)(36.2A) = 72.4A CONTINUOUS USE: AWG #3 75°C DERATED AMPACITY = (0.80)(100A) = 80.0A, 80.0A >72.4A CONDITIONS OF USE: AWG #3 90°C DERATED AMPACITY = (0.91)(115A) = 104A, 104A >72.4A, >90A (PROTECTED BY 100A OCPD)</p> <p>COMBINED INVERTER OUTPUT WIRE AMPACITY CALCULATION, 480V SIDE OF TRANSFORMER, 160' ALUMINUM [NEC 690.8(A)(3)]: 36.2A PER INVERTER @480V (SMA STP30000TL-US), (2)(36.2A) = 72.4A CONTINUOUS USE: AWG #1 ALUMINUM 75°C DERATED AMPACITY = (0.80)(100A) = 80.0A, 80.0A >72.4A CONDITIONS OF USE: AWG #1 ALUMINUM 90°C DERATED AMPACITY = (0.91)(115A) = 104A, 104A >72.4A, >90A (PROTECTED BY 100A OCPD)</p> <p>COMBINED INVERTER OUTPUT WIRE AMPACITY CALCULATION, 208V SIDE OF TRANSFORMER [NEC 690.8(A)(3)]: 83.5A PER INVERTER @208V (SMA STP30000TL-US), (2)(83.5A) = 167A CONTINUOUS USE: AWG 4/0 75°C DERATED AMPACITY = (0.80)(230A) = 184A, 184A >167A CONDITIONS OF USE: AWG #6 90°C DERATED AMPACITY = (0.91)(260A) = 236A, 236A >167A, >200A (PROTECTED BY 225A OCPD)</p>	<p>[NEC 690.7] USING MANUFACTURER TEMPERATURE CORRECTION FACTOR STC Voc = 64.9V Tmin = -10°C VOLTAGE TEMPERATURE COEFFICIENT = -176.6mV/°C ΔV = (-176.6mV/°C)(-10°C - 25°C) = 6.18V MAXIMUM Voc = 6.18V + 64.9V = 71.1V MAXIMUM DC VOLTAGE (STRINGS OF 14) = (14)(71.1V) = 995V, 995V <1000V</p>
CALCULATION OF AC VOLTAGE DROP FOR 160' ALUMINUM CONDUCTORS	
<p>FOR #1 AWG AL CONDUCTORS D = 160', R = (2)(D)(0.250/1000'), I = 76.2A Vd = IR = (2)(160')(0.250/1000')(76.2A) = 5.79V %Vd = (Vd/V)(100%) = (5.79V/480V)(100%) = 1.21%</p>	
CALCULATIONS FOR OVERCURRENT DEVICES	
USE 15A STRING FUSES IN SMA CONNECTION UNIT 1000-US PER MODULE MANUFACTURER	
<p>INVERTER OCPD: 36.2A PER INVERTER @480V (SMA STP30000TL-US) MINIMUM OCPD = (36.2A)(1.25) = 45.3A USE (2) 2P-50A BREAKERS IN SOLAR LOAD CENTER FOR INVERTER OCPD</p> <p>COMBINED INVERTER OCPD: TOTAL RATED CURRENT @480V = (2)(36.2A) = 72.4A MINIMUM OCPD = (72.4A)(1.25) = 90.5A USE (2) 100A FUSES IN AC DISCONNECTS #1 AND #2 FOR COMBINED INVERTER OCPD @480V</p> <p>TOTAL SYSTEM OCPD: TOTAL RATED CURRENT @208V = (2)(36.2A)(480V)/208V = 167A MINIMUM OCPD = (167A)(1.25) = 209A USE (2) 225A FUSES IN AC DISCONNECT #3 FOR SYSTEM OCPD @208V</p>	

DESIGN & DRAFTING BY:
GORDON GUNN, PE, NABCEP

[illegible]

CONTRACTOR



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AUSTIN, TX 78744
TECL # 28621

PROJECT NAME

MISSION PARK - SOUTH,
1700 SE MILITARY DRIVE
SAN ANTONIO, TX, 78214

SHEET NAME

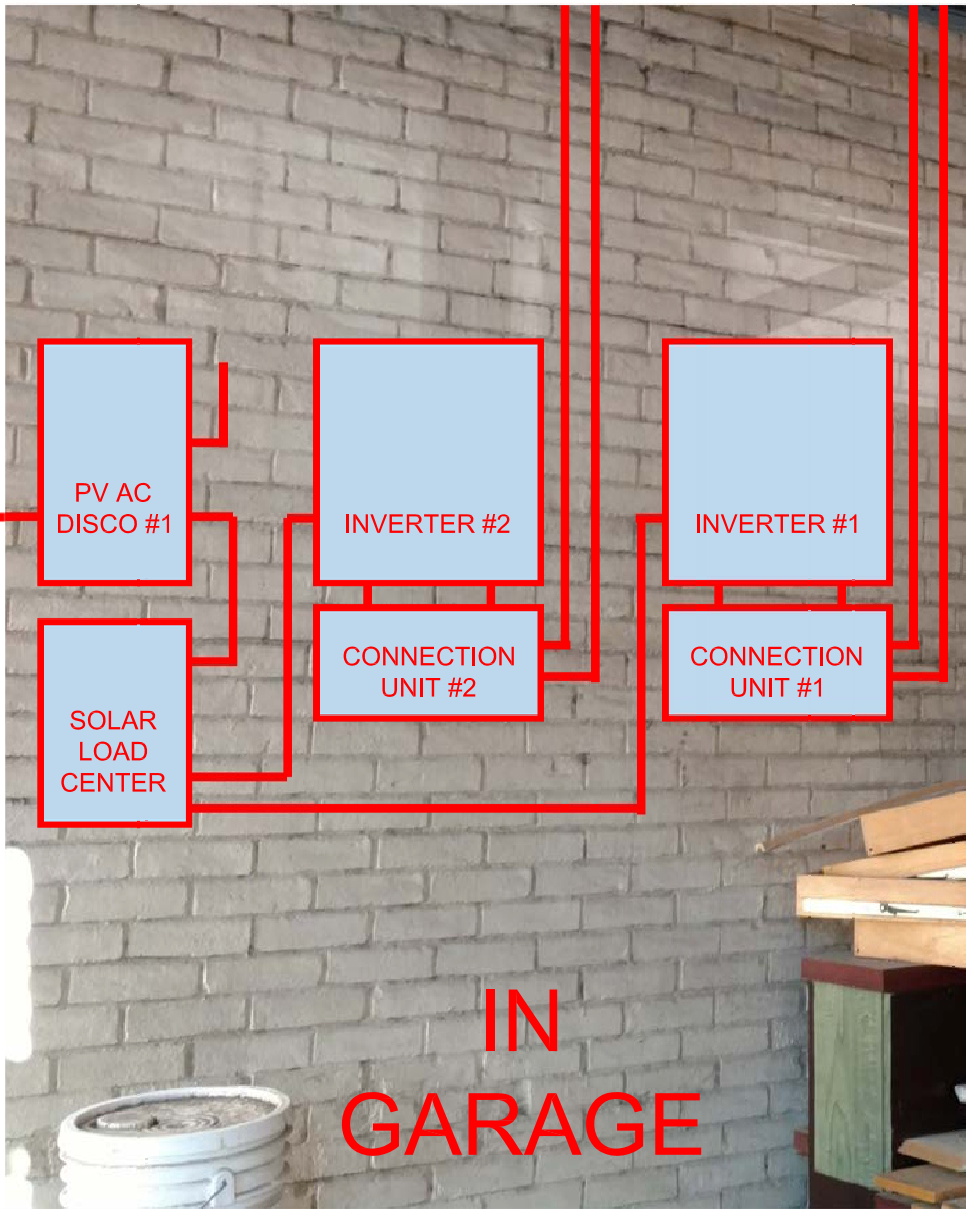
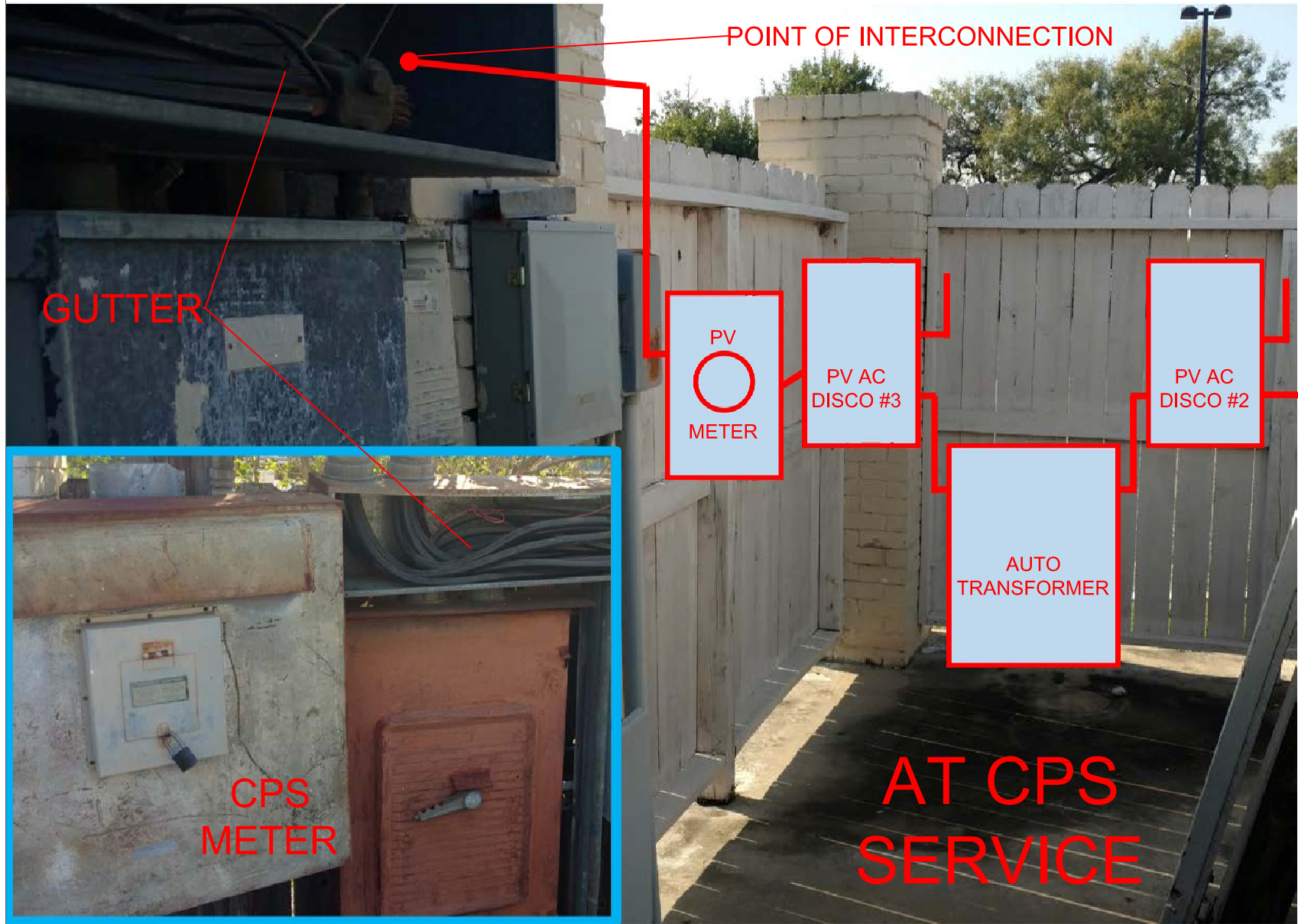
ELECTRICAL DIAGRAM

SHEET SIZE

ANSI B
11" x 17"

SHEET NUMBER

PV-4



DESIGN & DRAFTING BY:
GORDON GUNN, PE, NABCEP

REVISIONS		
DESCRIPTION	DATE	REV
ORIGINAL	10/05/2016	A

CONTRACTOR



**FREEDOM
SOLAR POWER**

FREEDOM SOLAR POWER
4111 TODD LN, STE 100
AUSTIN, TX 78744
TECL # 28621

PROJECT NAME

MISSION PARK - SOUTH,
1700 SE MILITARY DRIVE
SAN ANTONIO, TX, 78214

SHEET NAME

EQUIPMENT
WALL

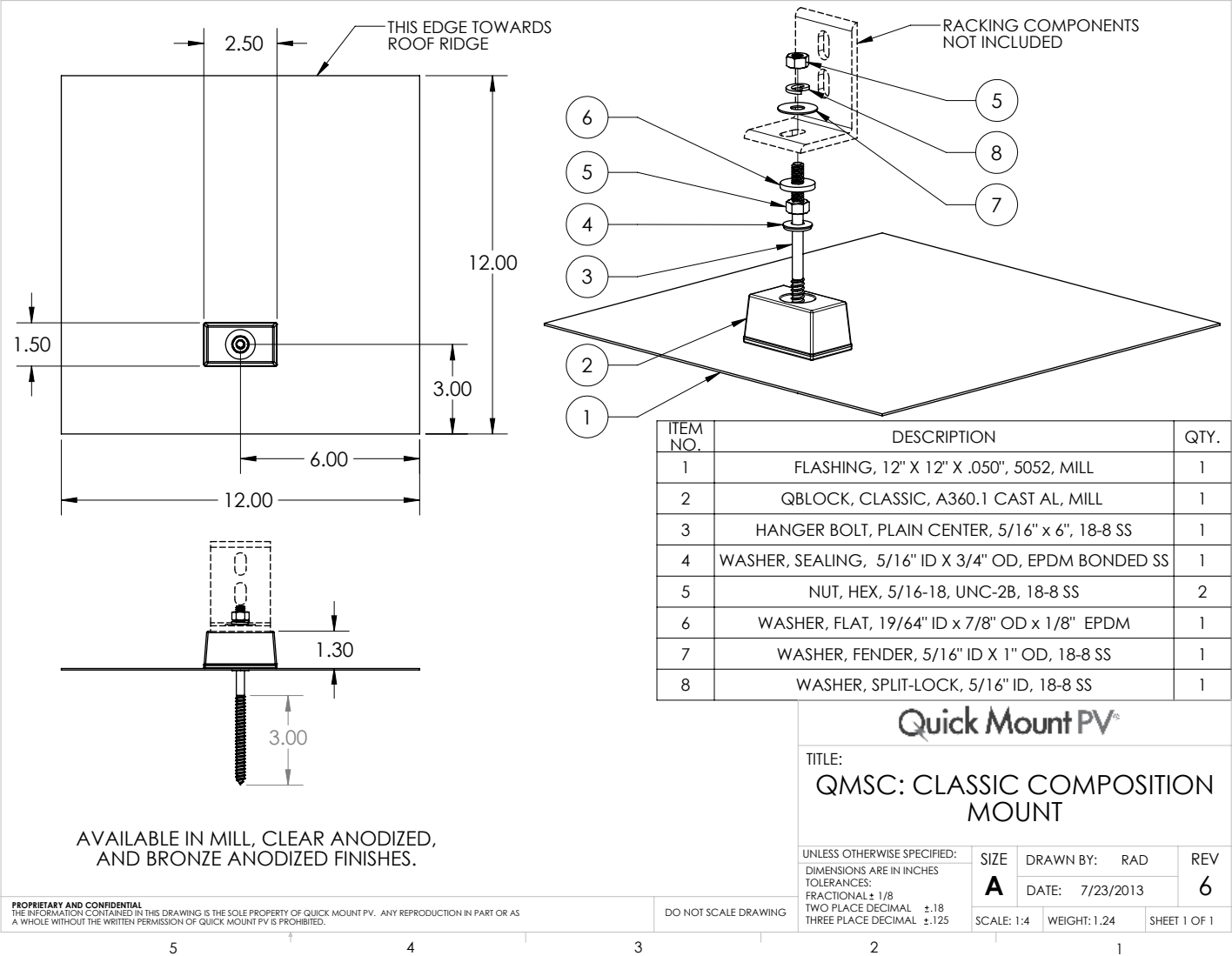
SHEET SIZE

ANSI B
11" x 17"

SHEET NUMBER

PV-5

Classic Composition Mount | QMSC



Lag pull-out (withdrawal) capacities (lbs) in typical lumber:			
	Lag Bolt Specifications		
	Specific Gravity	5/16" shaft per 3" thread depth	5/16" shaft per 1" thread depth
Douglas Fir, Larch	.50	798	266
Douglas Fir, South	.46	705	235
Engelmann Spruce, Lodgepole Pine (MSR 1650 f & higher)	.46	705	235
Hem, Fir	.43	636	212
Hem, Fir (North)	.46	705	235
Southern Pine	.55	921	307
Spruce, Pine, Fir	.42	615	205
Spruce, Pine, Fir (E of 2 million psi and higher grades of MSR and MEL)	.50	798	266

Sources: American Wood Council, NDS 2005, Table 11.2 A, 11.3.2 A

Notes:

- 1) Thread must be embedded in a rafter or other structural roof member.
- 2) See NDS Table 11.5.1C for required edge distances.



Classic Composition Mounting Instructions

Installation Tools Required: tape measure, roofing bar, chalk line, stud finder, caulking gun, sealant compatible with roofing materials, drill with 7/32" long-style bit, drill or impact gun with 1/2" deep socket.

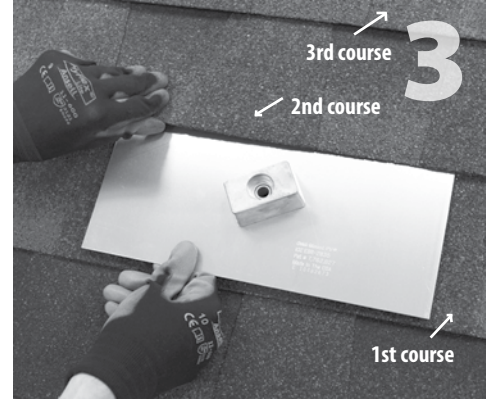
WARNING: Quick Mount PV products are NOT designed for and should NOT be used to anchor fall protection equipment.



1 Locate, choose, and mark centers of rafters to be mounted. Select the courses of shingles where mounts will be placed.



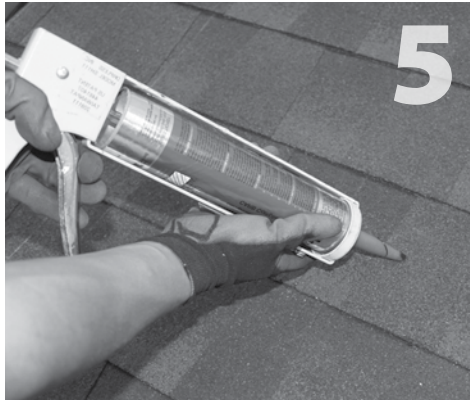
2 Carefully lift composition roof shingle with roofing bar, just above placement of mount. Remove nails as required. See "Proper Flashing Placement" on next page.



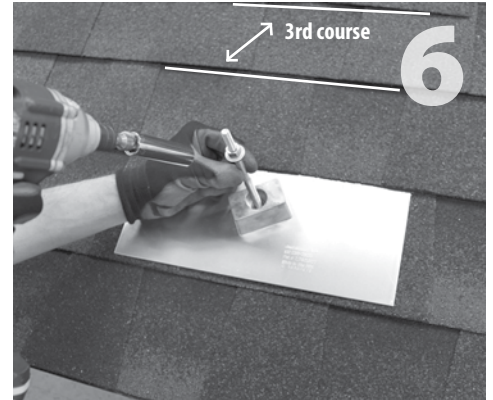
3 Insert flashing between 1st and 2nd course. Slide up so top edge of flashing is at least 3/4" higher than the drip edge of the 3rd course and lower flashing edge is above the drip edge of 1st course. Mark center for drilling.



4 Using drill with 7/32" bit, drill pilot hole into roof and rafter, taking care to drill square to the roof. Do not use mount as a drill guide. Drill should be 'long style bit' aka 'aircraft extension bit' to drill a 3" deep hole into rafter.



5 Clean off any sawdust, and fill hole with sealant compatible with roofing materials.



6 Slide flashing into position. Prepare hanger bolt with hex nut and sealing washer. Insert into hole and drive hanger bolt until QBlock stops rotating easily. **Do NOT over torque.**



7 Insert EPDM rubber washer over hanger bolt into block.

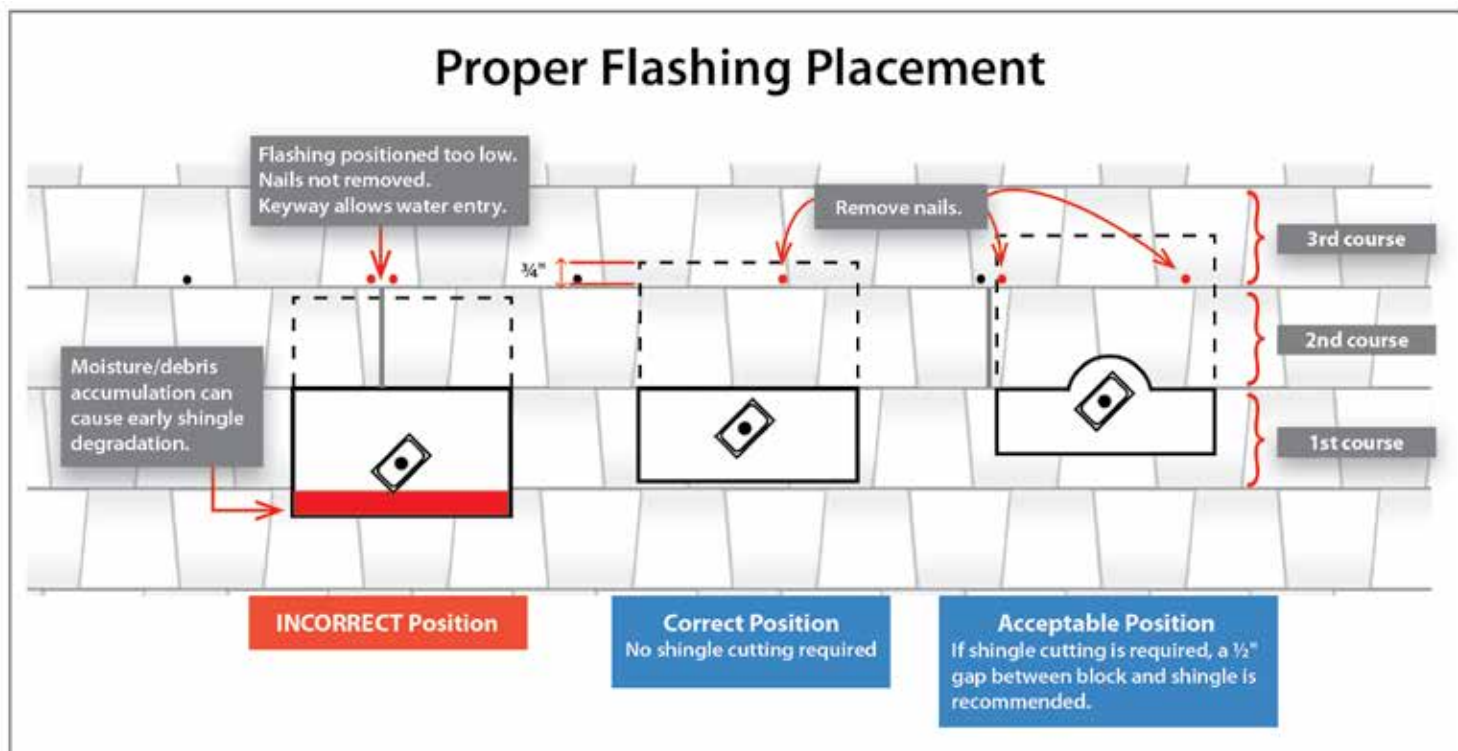


8 Using the rack kit hardware, secure the racking (L-foot) to the mount using torque specs from racking manufacturer. If racking manufacturer does not specify torque setting, tighten to 13 ft.-lbs.

You are now ready for the rack of your choice. Follow all the directions of the rack manufacturer as well as the module manufacturer.

All roofing manufacturers' written instructions must also be followed by anyone modifying a roof system. Please consult the roof manufacturer's specs and instructions prior to touching the roof.

Reference and Tips



Additional tips and information for installing mounts:

- See Classic Composition Mount install and Quick Tips videos on nail removal, bolt prep, and more at: www.quickmountpv.com/support/videos.html
- It is not necessary or advisable to use nails or other fasteners to secure the perimeter of the flashing.
- The Classic Composition Mount is made to work with standard and high-definition composition/asphalt and wood shingle roofs with 5" to 5-5/8" courses. If the exposed surface of the course exceeds this measurement you may need to use our Classic Shake Mount instead.
- Depending on the season and climate, size and location of seal tabs, and quality of the shingles, the seal tabs that adhere the shingle courses together may not effectively seal the shingles to the flashings. If this is the case, simply add several quarter-sized dabs of manufacturer accepted sealant or asphalt roofing cement, meeting ASTM D 4586 Type II, between the flashing and the shingle above.
- Mounts should not be installed in areas of the roof susceptible to ice damming. Water ponding under the shingles can reach the bolt penetration.
- Take care not to damage the roofing material while working on the roof. Removing stone granules and deforming the shingles in any way can shorten the lifespan of the roofing. The value of the solar array is directly affected by the condition of the roof it is attached to.

SUNNY TRIPOWER 12000TL-US / 15000TL-US / 20000TL-US / 24000TL-US / 30000TL-US



STP 12000TL-US-10 / STP 15000TL-US-10 / STP 20000TL-US-10 / STP 24000TL-US-10 / STP 30000TL-US-10



RATED FOR
1000 V DC & 600 V DC
SYSTEMS



Design flexibility

- 1000 V DC or 600 V DC
- Two independent DC inputs
- 15° to 90° mounting angle range
- Detachable DC Connection Unit

System efficiency

- 98.0% CEC, 98.6% Peak
- 1000 V DC increases system efficiency
- OptiTrac Global Peak MPPT

Enhanced safety

- Integrated DC AFCI
- Floating system with all-pole sensitive ground fault protection
- Reverse polarity indicator in combination with Connection Unit

Future-proof

- Complete grid management feature set
- Integrated Speedwire, WebConnect, ModBus interface
- Bi-directional Ethernet communications
- Utility-interactive controls for active and reactive power

SUNNY TRIPOWER 12000TL-US / 15000TL-US / 20000TL-US / 24000TL-US / 30000TL-US

The ultimate solution for decentralized PV plants, now up to 30 kilowatts

The world's best-selling three-phase PV inverter, the SMA Sunny Tripower TL-US, is raising the bar for decentralized commercial PV systems. This three-phase, transformerless inverter is UL listed for up to 1000 V DC maximum system voltage and has a peak efficiency above 98 percent, while OptiTrac Global Peak minimizes the effects of shade for maximum energy production. The Sunny Tripower delivers a future-proof solution with full grid management functionality, cutting edge communications and advanced monitoring. The Sunny Tripower is also equipped with all-pole ground fault protection and integrated AFCI for a safe, reliable solution. It offers unmatched flexibility with a wide input voltage range and two independent MPP trackers. Suitable for both 600 V DC and 1,000 V DC applications, the Sunny Tripower allows for flexible design and a lower levelized cost of energy.

www.SMA-America.com



Technical data	Sunny Tripower 12000TL-US	Sunny Tripower 15000TL-US	Sunny Tripower 20000TL-US	Sunny Tripower 24000TL-US	Sunny Tripower 30000TL-US
Input (DC)					
Max. usable DC power (@ cos φ = 1)	12250 W	15300 W	20400 W	24500 W	30800 W
Max. DC voltage	*1000 V	*1000 V	*1000 V	*1000 V	1000 V
Rated MPPT voltage range	300 V...800 V	300 V...800 V	380 V...800 V	450 V...800 V	500 V...800 V
MPPT operating voltage range	150 V...1000 V	150 V...1000 V	150 V...1000 V	150 V...1000 V	150 V...1000 V
Min. DC voltage / start voltage	150 V / 188 V	150 V / 188 V	150 V / 188 V	150 V / 188 V	150 V / 188 V
Number of MPP tracker inputs	2	2	2	2	2
Max. input current / per MPP tracker input	66 A / 33 A	66 A / 33 A	66 A / 33 A	66 A / 33 A	66 A / 33 A
Output (AC)					
AC nominal power	12000 W	15000 W	20000 W	24000 W	30000 W
Max. AC apparent power	12000 VA	15000 VA	20000 VA	24000 VA	30000 VA
Output phases / line connections	3 / 3-N-PE				3 / 3-N-PE, 3-PE
Nominal AC voltage	480 / 277 V WYE				480 / 277 V WYE, 480 V Delta
AC voltage range	244 V...305 V				
Rated AC grid frequency	60 Hz				
AC grid frequency / range	50 Hz, 60 Hz / -6 Hz...+5 Hz				
Max. output current	14.4 A	18 A	24 A	29 A	36.2 A
Power factor at rated power / adjustable displacement	1 / 0.0 leading...0.0 lagging				
Harmonics	< 3%				
Efficiency					
Max. efficiency / CEC efficiency	98.2% / 97.5%	98.2% / 97.5%	98.5% / 97.5%	98.5% / 98.0%	98.6% / 98.0%
Protection devices					
DC reverse polarity protection	●	●	●	●	●
Ground fault monitoring / grid monitoring	●	●	●	●	●
All-pole sensitive residual current monitoring unit	●	●	●	●	●
DC AFCI compliant to UL 1699B	●	●	●	●	●
AC short circuit protection	●	●	●	●	●
Protection class / overvoltage category	I / IV	I / IV	I / IV	I / IV	I / IV
General data					
Dimensions (W / H / D) in mm (in)	665 / 650 / 265 (26.2 / 25.6 / 10.4)				
Packing dimensions (W / H / D) in mm (in)	780 / 790 / 380 (30.7 / 31.1 / 15.0)				
Weight	55 kg (121 lbs)				
Packing weight	61 kg (134.5 lbs)				
Operating temperature range	-25°C...+60°C				
Noise emission (typical) / internal consumption at night	51 dB(A) / 1 W				
Topology	Transformerless				
Cooling concept / electronics protection rating	OptiCool / NEMA 3R				
Features					
Display / LED indicators (Status / Fault / Communication)	— / ●				
Interface: RS485 / Speedwire, WebConnect	○ / ●				
Data interface: SMA Modbus / SunSpec ModBus	● / ●				
Mounting angle range	15°...90°				
Warranty: 10 / 15 / 20 years	● / ○ / ○				
Certifications and approvals	UL 1741, UL 1998, UL 1699B, IEEE 1547, FCC Part 15 (Class A & B), CAN/CSA C22.2 107.1-1				
NOTE: US inverters ship with gray lids. Data at nominal conditions. *Suitable for 600 V DC max. systems					
● Standard features ○ Optional features — Not available					
Type designation	STP 12000TL-US-10	STP 15000TL-US-10	STP 20000TL-US-10	STP 24000TL-US-10	STP 30000TL-US-10

Accessories



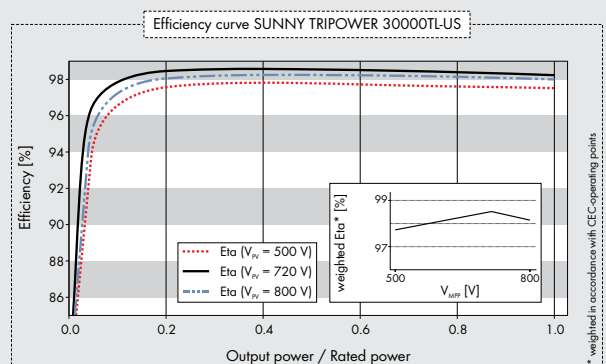
RS485 interface
DM-485CB-US-10



Connection Unit
CU 1000-US-10



SMA Cluster Controller
CLCON-10





- **20.4% efficiency**

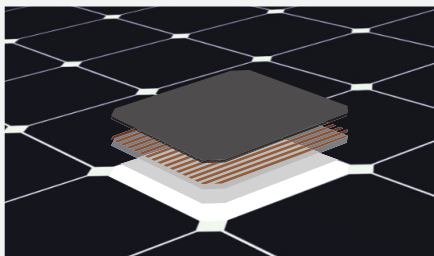
Captures more sunlight and generates more power than conventional panels.

- **High performance**

Delivers excellent performance in real world conditions, such as high temperatures, clouds and low light.^{1, 2, 3}

- **Commercial grade**

Optimized to maximize returns and energy production, the E-Series panel is a bankable solution for commercial solar applications.



Moxeon® Solar Cells: Fundamentally better.

Engineered for performance, designed for reliability.

Engineered for peace of mind

Designed to deliver consistent, trouble-free energy over a very long lifetime.^{4, 5}

Designed for reliability

The SunPower® Moxeon Solar Cell is the only cell built on a solid copper foundation. Virtually impervious to the corrosion and cracking that degrade Conventional Panels.^{4, 5}

#1 Ranked in Fraunhofer durability test.¹⁰

100% power maintained in Atlas 25+ comprehensive PVDI Durability test.¹¹

HIGH PERFORMANCE & EXCELLENT RELIABILITY



E20 - 327 PANELS



HIGH EFFICIENCY⁶

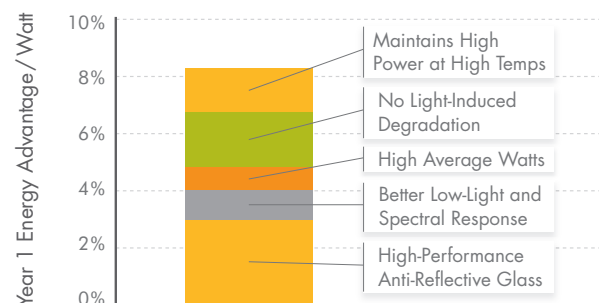
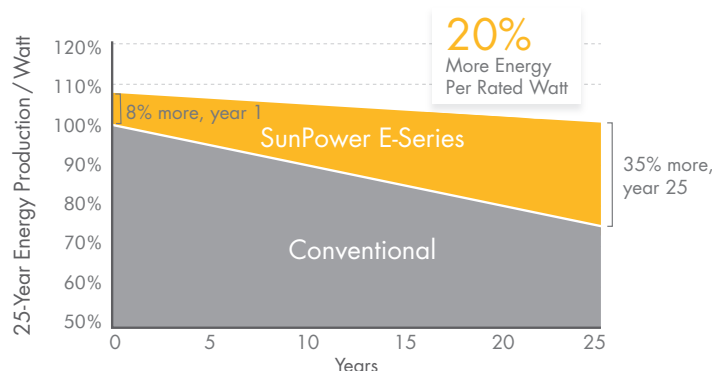
Generate more energy per square foot

E-Series commercial panels convert more sunlight to electricity producing 36% more power per panel,¹ and 60% more energy per square foot over 25 years.^{3, 4}

HIGH ENERGY PRODUCTION⁷

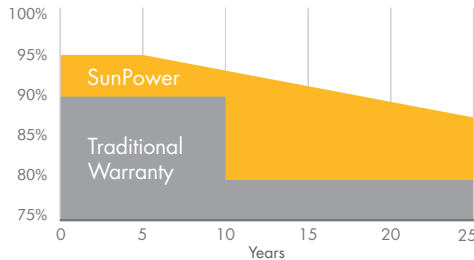
Produce more energy per rated watt

More energy to power your operations. High year one performance delivers 7-9% more energy per rated watt.³ This advantage increases over time, producing 20% more energy over the first 25 years to meet your needs.⁴



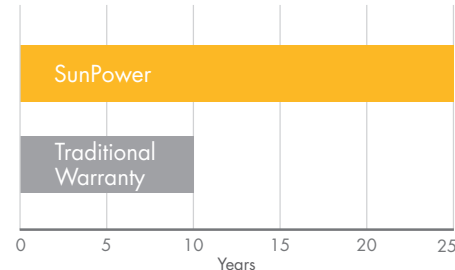
SUNPOWER OFFERS THE BEST COMBINED POWER AND PRODUCT WARRANTY

POWER WARRANTY



More guaranteed power: 95% for first 5 years, -0.4%/yr. to year 25.⁸

PRODUCT WARRANTY



Combined Power and Product Defect 25 year coverage that includes panel replacement costs.⁹

ELECTRICAL DATA

	E20-327-COM	E19-310-COM
Nominal Power ¹² (P _{nom})	327 W	310 W
Power Tolerance	+5/-3%	+5/-3%
Avg. Panel Efficiency ¹³	20.4%	19.3%
Rated Voltage (V _{mpp})	54.7 V	54.7 V
Rated Current (I _{mpp})	5.98 A	5.67 A
Open-Circuit Voltage (V _{oc})	64.9 V	64.4 V
Short-Circuit Current (I _{sc})	6.46 A	6.05 A
Maximum System Voltage	1000 V UL & 1000 V IEC	
Maximum Series Fuse	20 A	
Power Temp Coef. (P _{mpp})	-0.38% / °C	
Voltage Temp Coef. (V _{oc})	-176.6 mV / °C	
Current Temp Coef. (I _{sc})	3.5 mA / °C	

OPERATING CONDITION AND MECHANICAL DATA

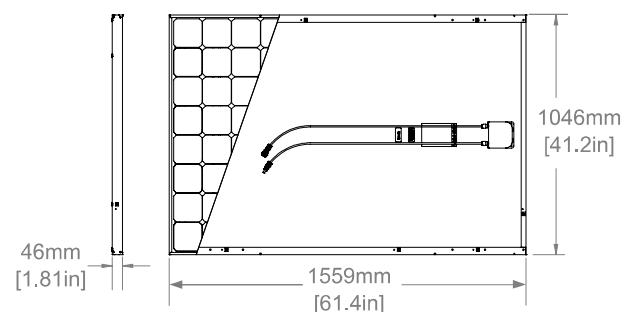
Temperature	-40°F to +185°F (-40°C to +85°C)
Max load	Wind: 50 psf, 2400 Pa, 245 kg/m ² front & back Snow: 112 psf, 5400 Pa, 550kg/m ² front
Impact resistance	1 inch (25 mm) diameter hail at 52 mph (23 m/s)
Appearance	Class B
Solar Cells	96 Monocrystalline Maxeon Gen II Cells
Tempered Glass	High Transmission Tempered Anti-Reflective
Junction Box	IP-65 Rated
Connectors	MC4 Compatible
Frame	Class 2 silver anodized
Weight	41 lbs (18.6 kg)

TESTS AND CERTIFICATIONS

Standard tests	UL 1703, IEC 61215, IEC 61730
Quality tests	ISO 9001:2008, ISO 14001:2004
EHS Compliance	RoHS, OHSAS 18001:2007, lead-free, PV Cycle
Ammonia test	IEC 62716
Salt Spray test	IEC 61701 (passed maximum severity)
PID test	Potential-Induced Degradation free: 1000V ¹⁰
Available listings	CEC, JET, KEMCO, MCS, FSEC, CSA, UL, TUV

REFERENCES:

- All comparisons are SPR-E20-327 vs. a representative conventional panel: 240W, approx. 1.6 m², 15% efficiency.
- PVEvolution Labs "SunPower Shading Study," Feb 2013.
- Typically 7-9% more energy per watt, BEW/DNV Engineering "SunPower Yield Report," Jan 2013.
- SunPower 0.25%/yr degradation vs. 1.0%/yr conv. panel. Campeau, Z. et al. "SunPower Module Degradation Rate," SunPower white paper, Feb 2013; Jordan, Dirk "SunPower Test Report," NREL, Oct 2012.
- "SunPower Module 40-Year Useful Life" SunPower white paper, Feb 2013. Useful life is 99 out of 100 panels operating at more than 70% of rated power.
- Out of all 2600 panels listed in Photon International, Feb 2012.
- 8% more energy than the average of the top 10 panel companies tested in 2012 (151 panels, 102 companies), Photon International, March 2013.
- Compared with the top 15 manufacturers. SunPower Warranty Review, Feb 2013.
- Some exclusions apply. See warranty for details.
- 5 of top 8 panel manufacturers were tested by Fraunhofer ISE, "PV Module Durability Initiative Public Report," Feb 2013.
- Compared with the non-stress-tested control panel. Atlas 25+ Durability test report, Feb 2013.
- Standard Test Conditions (1000 W/m² irradiance, AM 1.5, 25° C).
- Based on average of measured power values during production.



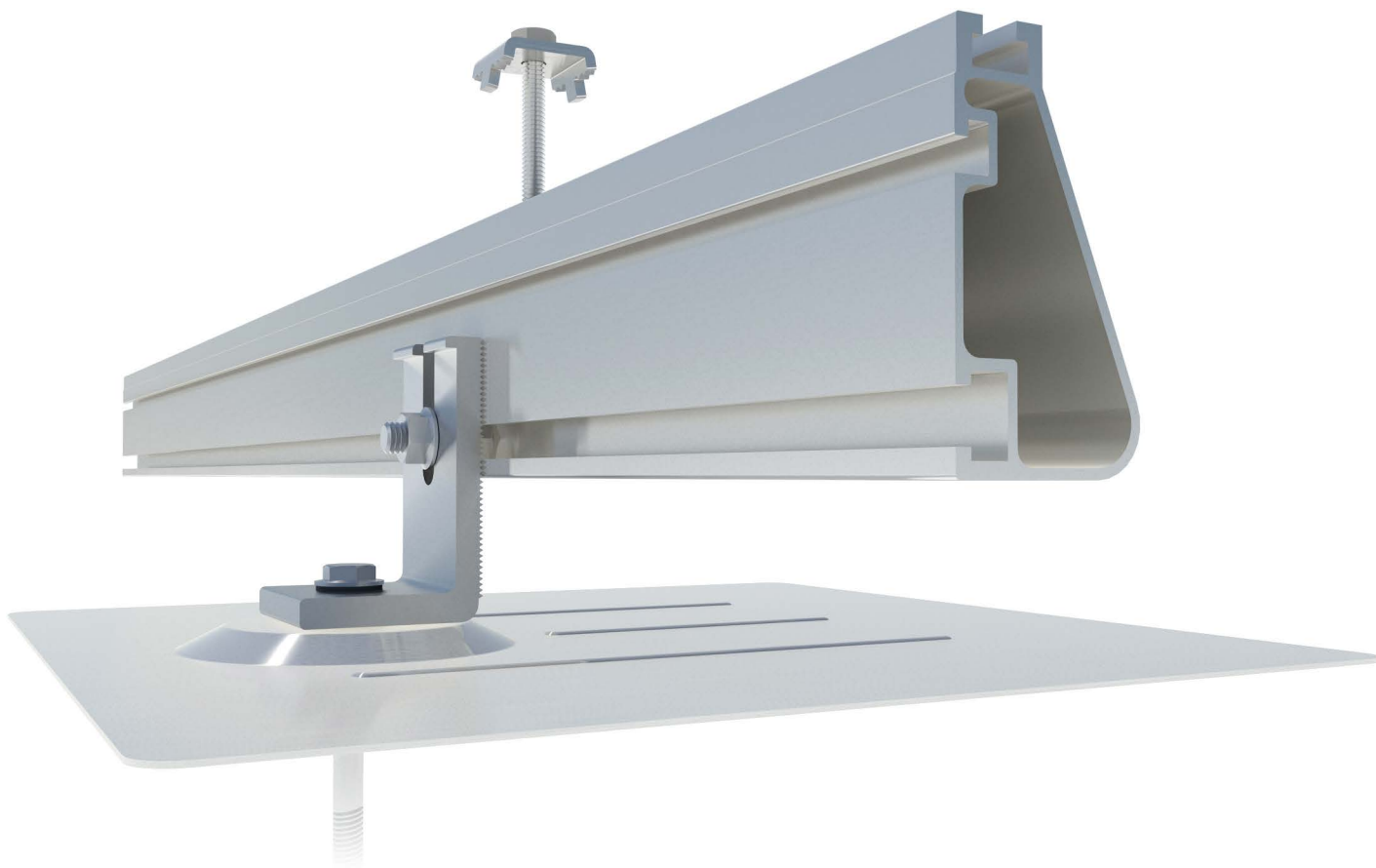
See <http://www.sunpowercorp.com/facts> for more reference information.

For further details, see supplementary specs: www.sunpowercorp.com/datasheets. Read safety and installation instructions before using this product.

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Document # 505701 Rev B /LTR_EN



Built for solar's toughest roofs.

IronRidge builds the strongest roof mounting system in solar. Every component has been tested to the limit and proven in extreme environments.

Our rigorous approach has led to unique structural features, such as curved rails and reinforced flashings, and is also why our products are fully certified, code compliant and backed by a 20-year warranty.



Strength Tested

All components evaluated for superior structural performance.



PE Certified

Pre-stamped engineering letters available in most states.



Class A Fire Rating

Certified to maintain the fire resistance rating of the existing roof.



Design Software

Online tool generates a complete bill of materials in minutes.



Integrated Grounding

UL 2703 system eliminates separate module grounding components.



20 Year Warranty

Twice the protection offered by competitors.

XR Rails

XR10 Rail



A low-profile mounting rail for regions with light snow.

- 6' spanning capability
- Moderate load capability
- Clear anodized finish

XR100 Rail



The ultimate residential solar mounting rail.

- 8' spanning capability
- Heavy load capability
- Clear & black anod. finish

XR1000 Rail



A heavyweight mounting rail for commercial projects.

- 12' spanning capability
- Extreme load capability
- Clear anodized finish

Internal Splices

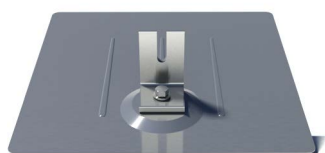


All rails use internal splices for seamless connections.

- Self-tapping screws
- Varying versions for rails
- Grounding Straps offered

Attachments

FlashFoot



Anchor, flash, and mount with all-in-one attachments.

- Ships with all hardware
- IBC & IRC compliant
- Certified with XR Rails

Slotted L-Feet



Drop-in design for rapid rail attachment.

- High-friction serrated face
- Heavy-duty profile shape
- Clear & black anod. finish

Standoffs



Raise flush or tilted systems to various heights.

- Works with vent flashing
- Ships pre-assembled
- Lengths from 3" to 9"

Tilt Legs



Tilt assembly to desired angle, up to 45 degrees.

- Attaches directly to rail
- Ships with all hardware
- Fixed and adjustable

Clamps & Grounding

End Clamps



Slide in clamps and secure modules at ends of rails.

- Mill finish & black anod.
- Sizes from 1.22" to 2.3"
- Optional Under Clamps

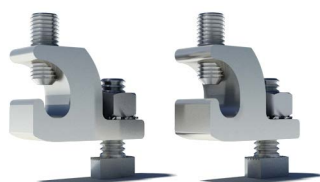
Grounding Mid Clamps



Attach and ground modules in the middle of the rail.

- Parallel bonding T-bolt
- Reusable up to 10 times
- Mill & black stainless

T-Bolt Grounding Lugs



Ground system using the rail's top slot.

- Easy top-slot mounting
- Eliminates pre-drilling
- Swivels in any direction

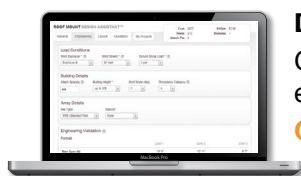
Accessories



Provide a finished and organized look for rails.

- Snap-in Wire Clips
- Perfected End Caps
- UV-protected polymer

Free Resources



Design Assistant

Go from rough layout to fully engineered system. For free.

Go to IronRidge.com/rm



NABCEP Certified Training

Earn free continuing education credits, while learning more about our systems.

Go to IronRidge.com/training



PROPERTY ON S FLORES
EXAMPLE OF SOLAR PANELS

LPA Inc. In San Antonio

Raw Happiness

Alamo Architects

Laborde & Associates PC, CL

E Cevallos

E Cevallos St

Clay

Clay

Clay

Clay

S Flores St

S Flores St

E Cevallos St

Groff Brothers

Nogales