HISTORIC AND DESIGN REVIEW COMMISSION
September 16, 2020

HDRC CASE NO:	**2020-386**
ADDRESS:	618 MUNCEY
LEGAL DESCRIPTION:	NCB 1302 BLK 3 LOT 9
ZONING:	R-5, H
CITY COUNCIL DIST.:	2
DISTRICT:	Dignowity Hill Historic District
APPLICANT:	Michael Pensabene/Freedom Solar Power
OWNER:	Ling Han/HAN LING
TYPE OF WORK:	Solar panel installation
APPLICATION RECEIVED:	August 18, 2020
60-DAY REVIEW:	Not applicable due to City Council Emergency Orders
CASE MANAGER:	Huy Pham

REQUEST:

The applicant is requesting a Certificate of Appropriateness for approval to install 11 roof-mounted solar-collector panels including wall mounted meter-related equipment.

APPLICABLE CITATIONS:
3. Guidelines for Additions
6. Designing for Energy Efficiency
C. SOLAR COLLECTORS
i. *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.
ii. *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.
iii. *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.

Solar Checklist for Historic Properties
- Location: Panels should be located on the side or rear roof lines of a primary structure; on any roof line of an accessory structure; or on a ground-mounted array in the rear yard; or a combination. If panels are required to be located on the front roof line of a primary structure for solar efficiency, the panels should maintain at least 18" distance from the roof eaves and be grouped in a rectangular or square configuration that responds to the existing roof forms
- Pitch: Panels should be mounted flush with the roof pitch. If located on a flat roof with a parapet, panels should have the minimal pitch required for solar efficiency.
- Mounting: Panel mounting equipment features low-profile hardware that closely matches the color of the existing roofing material. Panels are not mounted in a manner that adversely affects or damages existing historic roofing materials.
- Color: Panels and hardware should closely match the existing roof color where possible.

FINDINGS:
a. The primary structure at 618 Muncey was constructed circa 1910 in the Folk Victorian style, first appears on the 1912 Sanborn map, and contributes to the Dignowity Hill Historic District. The one-story single-family structure features a modified L-plan with a front face gable flanked by a covered inset porch, wood lap siding, and a standing seam metal roof.
b. SOLAR PANELS – The applicant has proposed to install 11 roof mounted solar collector panels: 8 on the front slopes and 3 on the rear interior slope.
c. LOCATION – The applicant has proposed to install panels on both front and rear roof slopes. Per the Guidelines for Additions 6.C.i., applicants should 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. Per the Solar Checklist for Historic Properties: Location, if panels are required to be located on the front roof line of a primary structure for solar efficiency, the panels should maintain at least 18" distance from the roof eaves and be grouped in a rectangular or square configuration that responds to the existing roof forms. Staff finds the proposed configuration appropriate

d. PITCH – Per the Solar Checklist for Historic Properties: Pitch, panels should be mounted flush with the roof pitch. The applicant has not proposed to use a different pitch and the panels should be flush mounted to the existing roof pitch.
e. MOUNTING – Per the Solar Checklist for Historic Properties: Mounting, panel mounting equipment features low-profile hardware that closely matches the color of the existing roofing material and panels are not mounted in a manner that adversely affects or damages existing historic roofing materials. The applicant has proposed to use “InvisiMount” equipment that flush mounts the panels in a minimal visible manner.
f. COLOR - Per the Solar Checklist for Historic Properties: Color, panels and hardware should closely match the existing roof color where possible. The applicant has proposed to use “InvisiMount” equipment that flush mounts the panels in a minimal visible manner.

RECOMMENDATION:
Staff recommends approval based on finding b through f with the stipulation that if panels are required to be located on the front roof line of a primary structure for solar efficiency, the panels should maintain at least 18" distance from the roof eaves and be grouped in a rectangular or square configuration that responds to the existing roof forms

618 Muncey

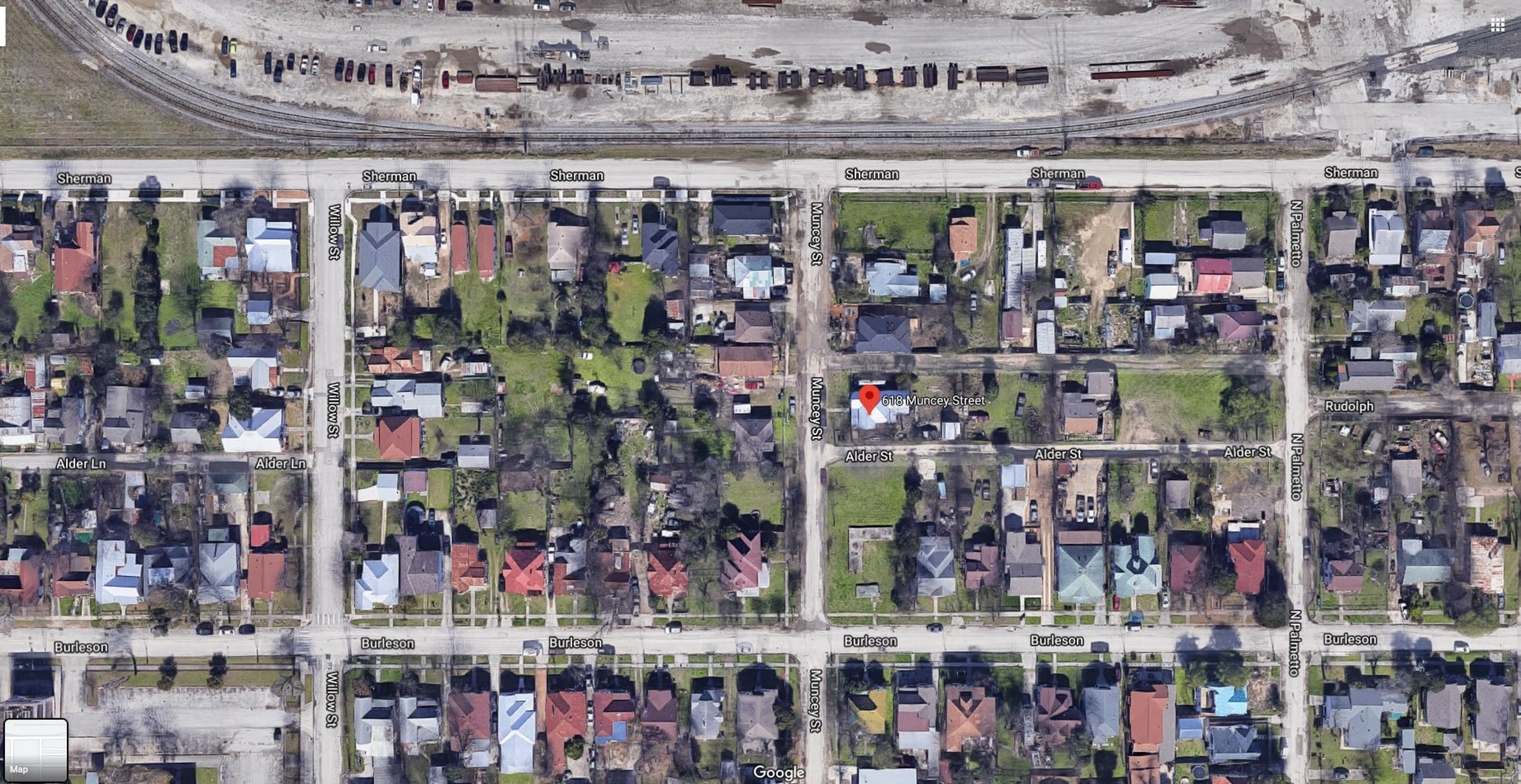
September 8, 2020

1:1,000

0 0.0075 0.015 0.03 mi

0 0.0125 0.025 0.05 km

City of San Antonio GIS
Copyright 9-8-2020


Sherman
Sherman
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Sherman
Sherman
Willow St
Willow St
Willow St
Muncey St
Muncey St
Muncey St
N Palmetto
N Palmetto
N Palmetto
618 Muncey Street
Rudolph
Alder Ln
Alder Ln
Alder St
Alder St
Alder St
Burleson
Burleson
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Burleson
Burleson
Map
Google

618 Muncey Street
Muncey St
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Alder St
Alder St
Alder St
Map
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618 Muncey St
San Antonio, Texas
Google
Street View
Alder
Muncey
618 Mur
Buford
Gibson
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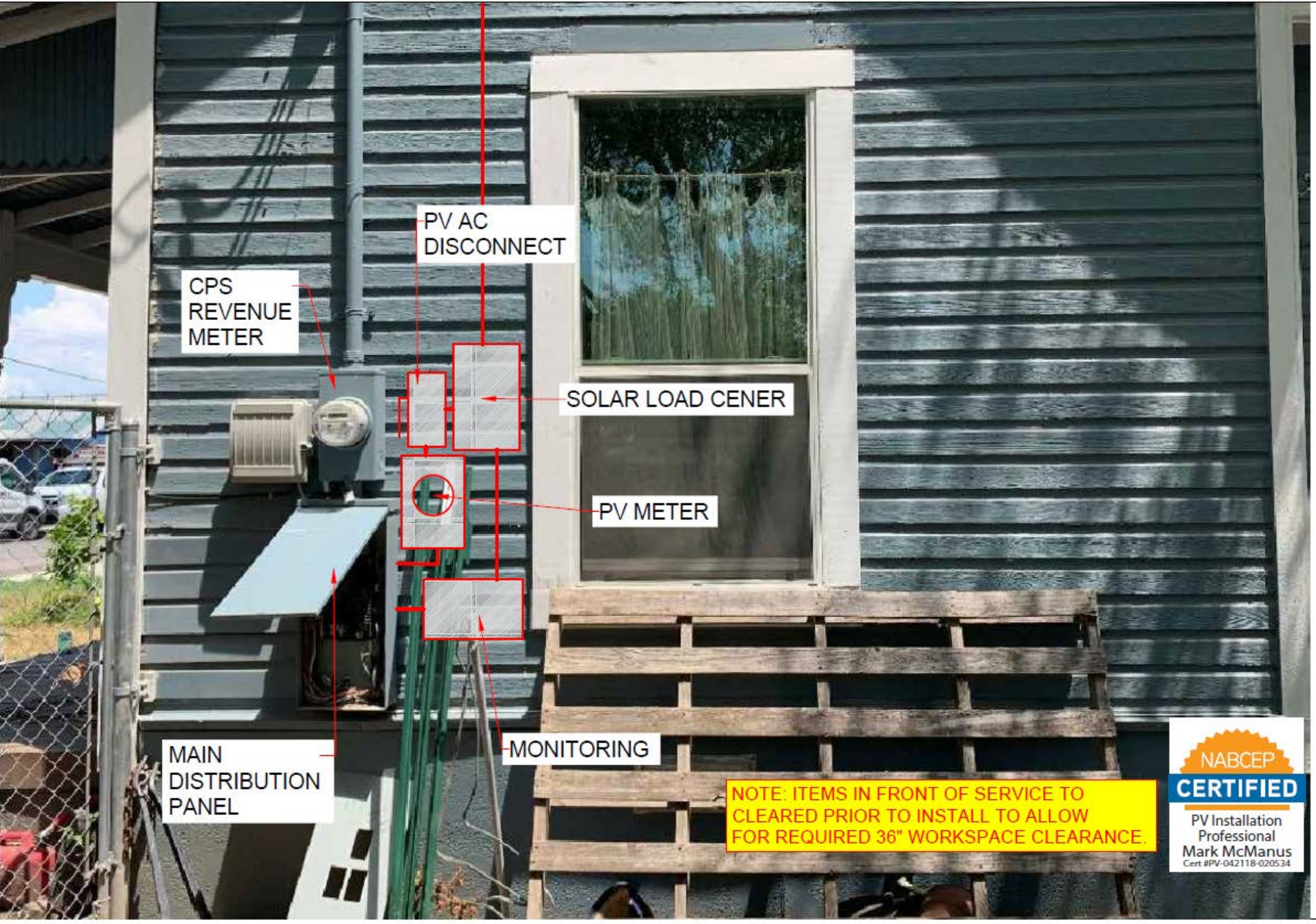
PV AC
DISCONNECT
CPS
REVENUE
METER
SOLAR LOAD CENER
PV METER
MAIN
DISTRIBUTION
PANEL
MONITORING
NOTE: ITEMS IN FRONT OF SERVICE TO
CLEARED PRIOR TO INSTALL TO ALLOW
FOR REQUIRED 36" WORKSPACE CLEARANCE.
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CERTIFIED
PV Installation
Professional
Mark McManus
Cert #PV-042118-020534

LEAD ID: 30023

CONSTRUCTION SUMMARY

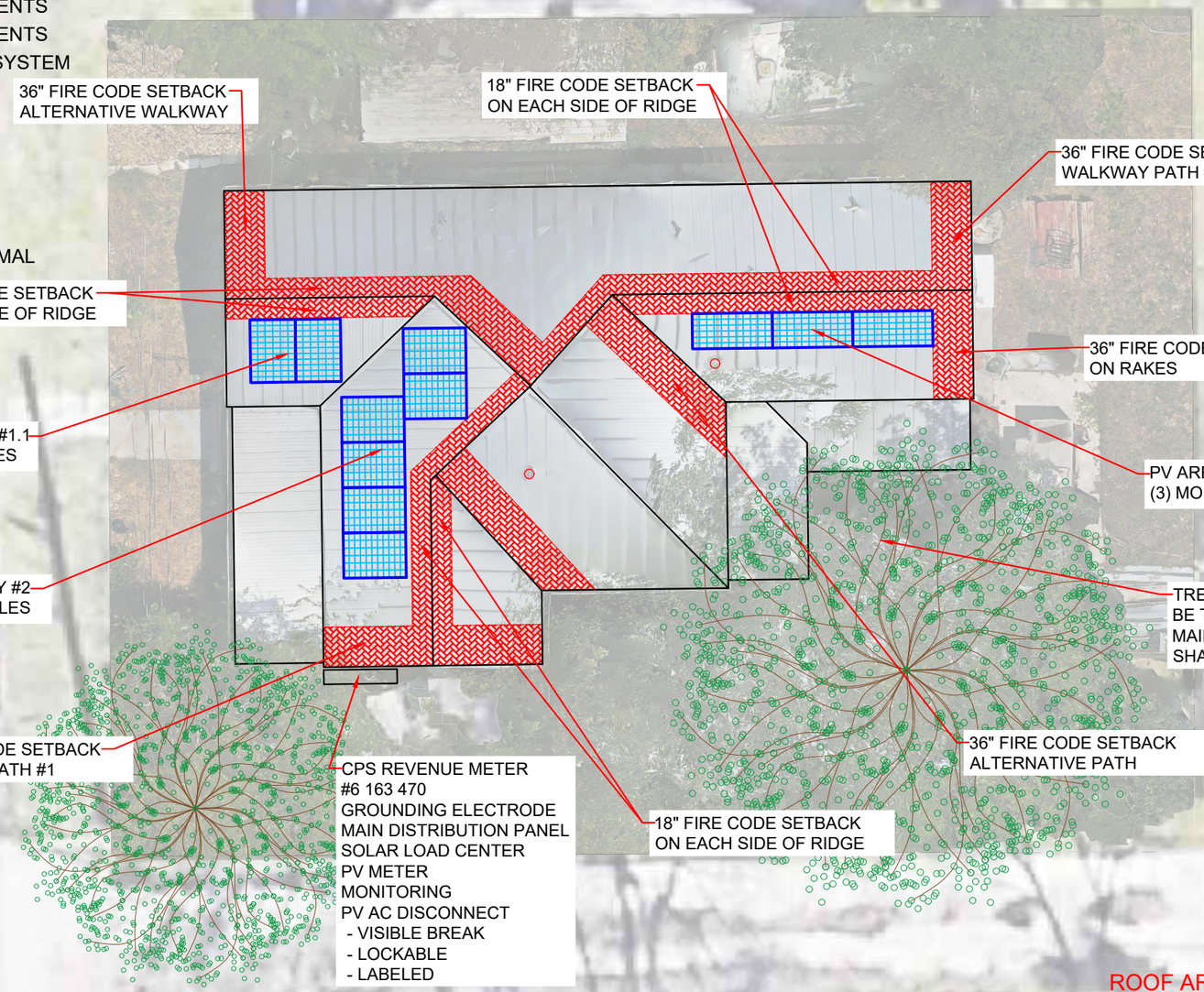
(11)	(SUNPOWER SPR-A415-G-AC) SOLAR MODULES, 4.57 kW DC STC
	MODULE DIMENSIONS = 40.0" X 72.2" X 1.57"
(11)	SUNPOWER SPR-A415-G-AC [240V] PV INVERTERS
	COMBINED INVERTER OUTPUT = 3.84 kW AC.
(108)	(10 X 10.75') LINEAR FEET SUNPOWER INVISIMOUNT
(48)	S5! U-MINI ROOF ATTACHMENTS
(48)	S5! N-MINI ROOF ATTACHMENTS
(1)	SUNPOWER MONITORING SYSTEM

SITE DETAILS

ROOF TYPE: STANDING SEAM METAL
ARRAY #1 - TILT = 38°, AZIMUTH = 179°
ARRAY #2 - TILT = 37°, AZIMUTH = 269°

INSTALLATION DIFFICULTY = 5 => NORMAL

NOTE: HOME IS REPORTLY IN AN HISTORIC DISTRICT.
-TREES SHOULD BE TRIMMED AND MAINTAINED TO REDUCE SHADING OF SOLAR ARRAYS
-REARRANGE BREAKERS TO ALLOW FOR 40A GTB AT OPPOSITE END OF BUS FROM MAIN BREAKER.



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Mark McManus
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ROOF AREA = 1704 SQFT
ARRAY AREA = 224 SQFT
AREA COVERED BY ARRAY = 13.1%

CONSTRUCTION NOTES

1.) ALL EQUIPMENT SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S INSTALLATION INSTRUCTIONS.
2.) ALL OUTDOOR EQUIPMENT SHALL BE RAINTIGHT WITH MINIMUM NEMA 3R RATING.
3.) ALL LOCATIONS ARE APPROXIMATE AND REQUIRE FIELD VERIFICATION.
4.) TYP. ROOF ATTACHMENT SPACING SHALL BE 6'-0" MAX FOR LAG BOLT TYPE ROOF ATTACHMENTS ANCHORED TO RAFTERS
5.) TYP. ROOF ATTACHMENT SPACING SHALL BE 4'-6" MAX FOR S-5! CLAMPS ANCHORED TO STANDING SEAM ROOF PANELS

DESIGN & DRAFTING BY:
MARK MCMANUS, NABCEP

REVISIONS

DESCRIPTION	DATE	REV
DESIGN PACKET	08/04/2020	A

CONTRACTOR

FREEDOM SOLAR POWER
FREEDOM SOLAR LLC
4801 FREIDRICH LN, STE 100
AUSTIN, TX 78744
TECL # 28621
TBPE FIRM # F-17690

PROJECT NAME

HAN, LING
618 MUNCEY ST
SAN ANTONIO, TX, 78202
(210) 848-3787

SHEET NAME

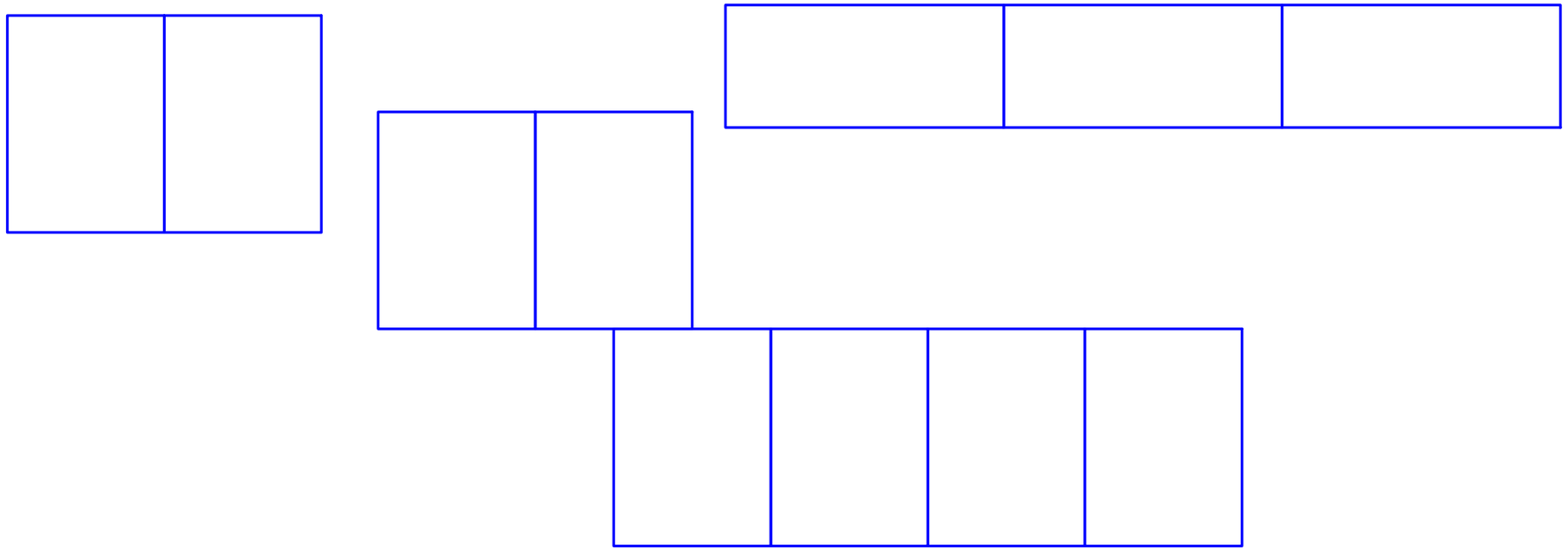
SITE MAP & PV LAYOUT

SHEET SIZE

ANSI B
11" x 17"

SHEET NUMBER

PV-1



SUNPOWER SUPERVISOR S/N_____

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TBPE FIRM # F-17690

PROJECT NAME

HAN, LING
618 MUNCEY ST
SAN ANTONIO, TX, 78202
(210) 848-3787

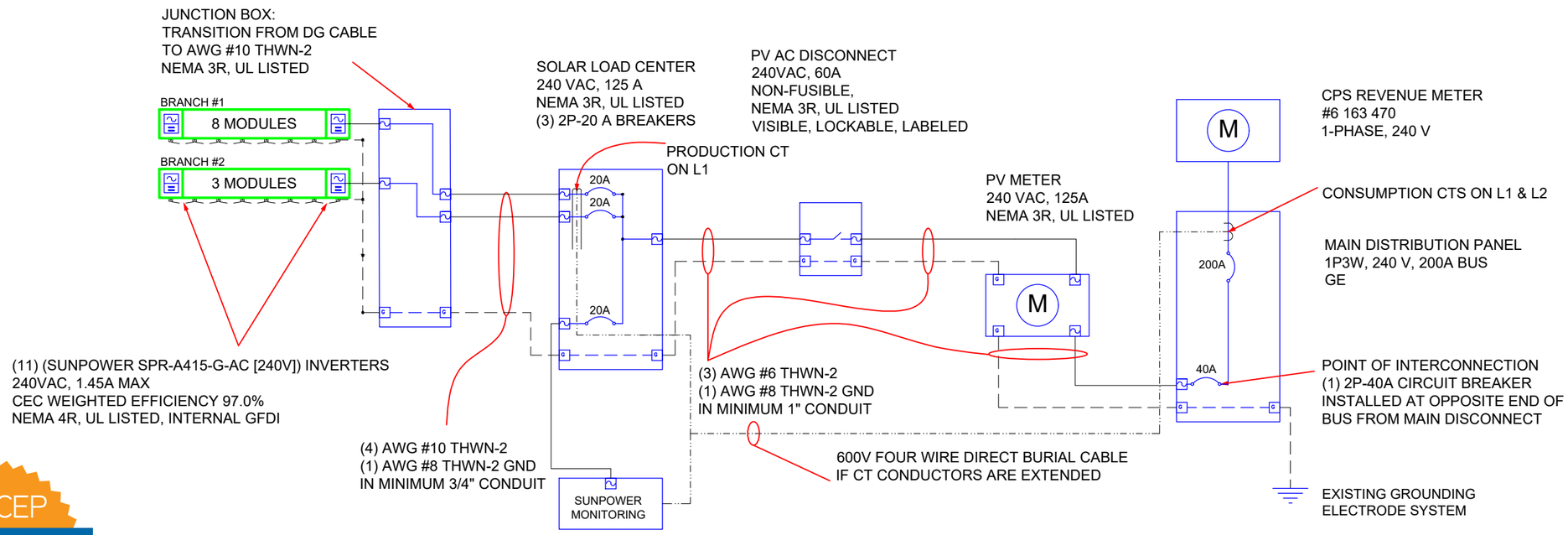
SHEET NAME
STRING MAP & MONITORING LAYOUT

SHEET SIZE
ANSI B
11" x 17"

SHEET NUMBER
PV-2

SOLAR ARRAY - 4.57kW DC STC
(11) (SUNPOWER SPR-A415-G-AC) MODULES
(11) (SUNPOWER SPR-A415-G-AC [240]) INVERTERS

NOTE: HOME IS REPORTLY IN AN HISTORIC DISTRICT.
-TREES SHOULD BE TRIMMED AND MAINTAINED TO REDUCE SHADING OF SOLAR ARRAYS
-REARRANGE BREAKERS TO ALLOW FOR 40A GTB AT OPPOSITE END OF BUS FROM MAIN BREAKER.



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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 ACESSORIES 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.) MAXIMUM MOUNTING HEIGHT FROM GRADE TO CENTER OF METER SOCKET SHALL BE 72" FOR RESIDENTIAL SINGLE PHASE METER SOCKETS 0-320 AMPS. MINIMUM MOUNTING HEIGHT IS 30" FROM FOR AUSTIN ENERGY, AND 48" FOR ALL OTHER JURISDICTIONS
9.) MINIMUM HORIZONTAL CLEARANCE FROM GAS REGULATOR TO ANY ELECTRICAL ENCLOSURE IS 36", EXCEPT AUSTIN ENERGY WHICH REQUIRES 48" CLEARANCE FROM GAS TO METER SOCKET
10.) PV DISCONNECT SHALL BE VISIBLE, LOCKABLE AND LABELED AND THE DOOR CANNOT BE OPENED WHEN HANDLE IS IN ON POSITION

CALCULATIONS FOR CURRENT CARRYING CONDUCTORS	CALCULATIONS FOR OVERCURRENT DEVICES
INVERTER OUTPUT WIRE AMPACITY CALCULATION [NEC 690.8(A)(3)]: 1.45A PER INVERTER (SUNPOWER SPR-A415-G-AC [240V]) MAXIMUM INVERTER BRANCH CURRENT = (11)(1.45A) = 16.0A CONTINUOUS USE: #10 WIRE 75°C DERATED AMPACITY = (0.80)(35.0A) = 28.0A 28.0A > 16.0A CONDITIONS OF USE: #10 WIRE 90°C DERATED AMPACITY = (0.91)(0.80)(40.0A) = 29.1A 29.1A > 16.0A AGGREGATE INVERTER OUTPUT WIRE AMPACITY CALCULATION [NEC 690.8(A)(3)]: COMBINED CURRENT = (11)(1.45A) = 16.0A CONTINUOUS USE: #6 WIRE 75°C DERATED AMPACITY = (0.80)(65A) = 52.0A 52.0A > 16.0A CONDITIONS OF USE: #6 WIRE 90°C DERATED AMPACITY = (0.91)(75A) = 68.3A 68.3A > 16.0A	INVERTER BRANCH AC CURRENT CALCULATION [NEC 690.8(A)(3)]: MAXIMUM BRANCH INVERTER CURRENT = (11)(1.45A) = 16.0A MINIMUM OCPD = (16.0A)(1.25) = 20.0A USE 2P-20A BREAKERS IN SOLAR LOAD CENTER FOR INVERTER BRANCH OCPD SYSTEM AC CURRENT CALCULATION [NEC 690.8(A)(3)]: COMBINED CURRENT = (11)(1.45A) = 16.0A MINIMUM OCPD = (16.0A)(1.25) = 20.0A USE 2P-40A BREAKER IN MDP FOR SYSTEM OCPD NOTE: AWG #6 CONDUCTORS ARE ADEQUATELY PROTECTED BY 40A OCPD

DESIGN & DRAFTING BY:
MARK MCMANUS, NABCEP

REVISIONS

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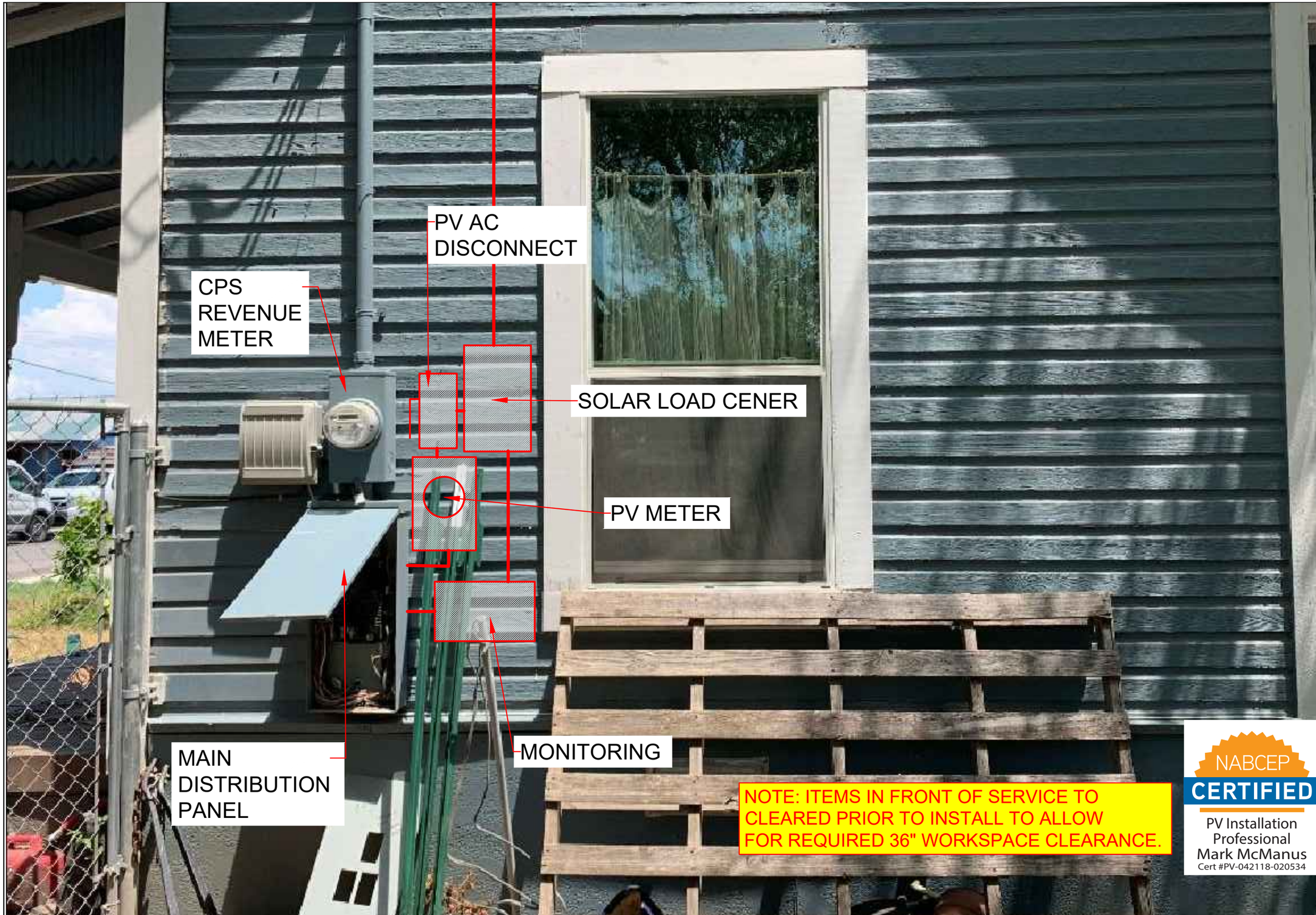
CONTRACTOR
FREEDOM™ SOLAR POWER
FREEDOM SOLAR LLC
4801 FREIDRICH LN, STE 100
AUSTIN, TX 78744
TECL # 28621
TBPE FIRM # F-17690

PROJECT NAME
HAN, LING
618 MUNCEY ST
SAN ANTONIO, TX, 78202
(210) 848-3787

SHEET NAME
ELECTRICAL DIAGRAM

SHEET SIZE
ANSI B
11" x 17"

SHEET NUMBER
PV-3



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Professional
Mark McManus
Cert #PV-042118-020534

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REVISIONS

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CONTRACTOR

FREEDOM™
SOLAR POWER

FREEDOM SOLAR LLC
4801 FREIDRICH LN, STE 100
AUSTIN, TX 78744
TECL # 28621
TBPE FIRM # F-17690

PROJECT NAME

HAN, LING
618 MUNCEY ST
SAN ANTONIO, TX, 78202
(210) 848-3787

SHEET NAME

EQUIPMENT
WALL

SHEET SIZE

ANSI B
11" x 17"

SHEET NUMBER

PV-4

NOTE: NOT ALL LABELS MAY BE APPLICABLE

PV SYSTEM DISCONNECT

REQ'D BY: NEC 690.13(B) — A

APPLY TO:
PV DISCONNECT

WARNING
ELECTRIC SHOCK HAZARD.
DO NOT TOUCH TERMINALS.
TERMINALS ON THE LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION.

REQ'D BY: NEC 690.13(B) — B

APPLY TO:
PV DISCONNECT

WARNING: PHOTOVOLTAIC POWER SOURCE

REQ'D BY: NEC 690.31(G)(3) — C

APPLY TO:
RACEWAYS, CABLE TRAYS,
OTHER WIRING METHODS, AND
ENCLOSURES THAN CONTAIN
PV SYSTEM DC CONDUCTORS

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

REQ'D BY: NEC 705.12(B)(2)(3)(b) — D

APPLY TO:
DISTRIBUTION EQUIPMENT
ADJACENT TO BACK-FED BREAKER

2" ADDRESS NUMBERS

REQ' BY: AHJ — E

APPLY TO:
REVENUE METER SOCKET
(IF APPLICABLE)

PV METER

REQ'D BY: AHJ — F

APPLY TO:
PV METER SOCKET
(IF APPLICABLE)

REVENUE METER

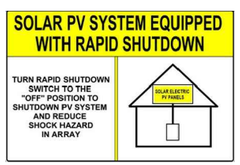
REQ'D BY: AHJ — G

APPLY TO:
REVENUE METER SOCKET
(IF APPLICABLE)

MONITORING

REQ'D BY: FREEDOM SOLAR — H

APPLY TO:
MONITORING DEVICE ENCLOSURE



REQ'D BY: 690.56(1)(a) — I

APPLY TO:
PV DISCONNECT

SIGNAGE REQUIREMENTS

> RED BACKGROUND
> WHITE LETTERING
> MIN. 3/8" LETTER HEIGHT
> ALL CAPITAL LETTERS
> ARIAL OR SIMILAR FONT
> REFLECTIVE, WEATHER RESISTANT MATERIAL, UL 969

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PV Installation Professional
Mark McManus
Cert #PV-042118-020534

DESIGN & DRAFTING BY:
MARK MCMANUS, NABCEP

REVISIONS

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CONTRACTOR

FREEDOM SOLAR POWER
FREEDOM SOLAR LLC
4801 FREIDRICH LN, STE 100
AUSTIN, TX 78744
TECL # 28621
TBPE FIRM # F-17690

PROJECT NAME

HAN, LING
618 MUNCEY ST
SAN ANTONIO, TX, 78202
(210) 848-3787

SHEET NAME
SYSTEM LABELING DETAIL

SHEET SIZE
ANSI B
11" x 17"

SHEET NUMBER
PV-5

DRAW IN CONTROLLED ACCESS ZONE (CAZ) BOUNDARY AND LADDER PLACEMENT ON SITE PLAN BELOW.

HARD HAT IS REQUIRED AT ALL TIMES IN CAZ

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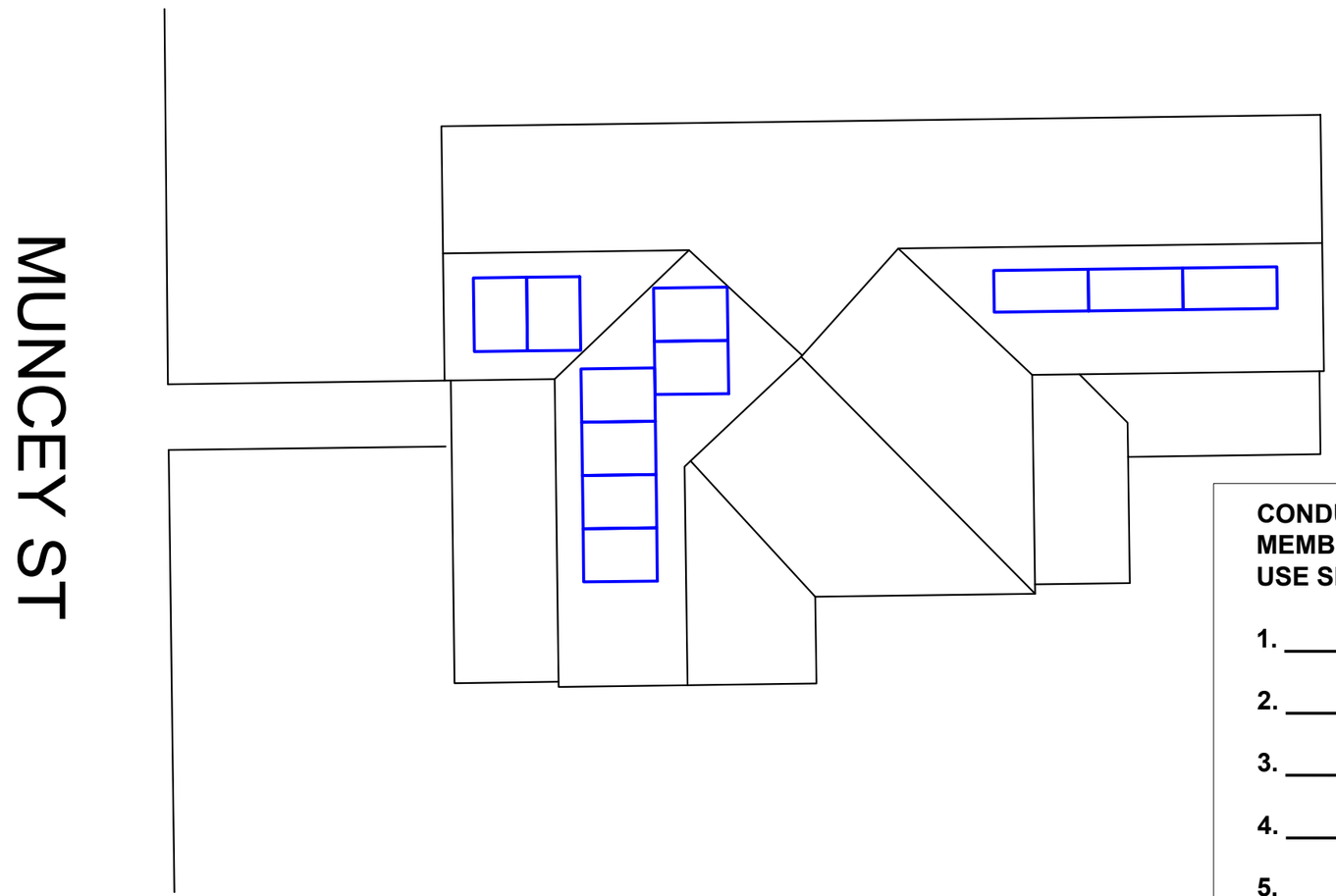

CONDUCT SAFETY MEETING WITH ALL CREW MEMBERS ON SITE AT THE BEGINNING OF EACH JOB. USE SIGN IN SHEET BELOW.

1. _____
2. _____
3. _____
4. _____
5. _____

GUEST SIGN IN

1. _____
2. _____
3. _____

COMPETENT PERSON: _____ **JOB START DATE:** _____

DESIGN & DRAFTING BY:
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REVISIONS

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FREEDOM SOLAR LLC
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AUSTIN, TX 78744
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TBPE FIRM # F-17690

PROJECT NAME

HAN, LING
618 MUNCEY ST
SAN ANTONIO, TX, 78202
(210) 848-3787

SHEET NAME

SAFETY PLAN

SHEET SIZE

ANSI B
11" x 17"

SHEET NUMBER

PV-6

A SERIES

SUNPOWER®

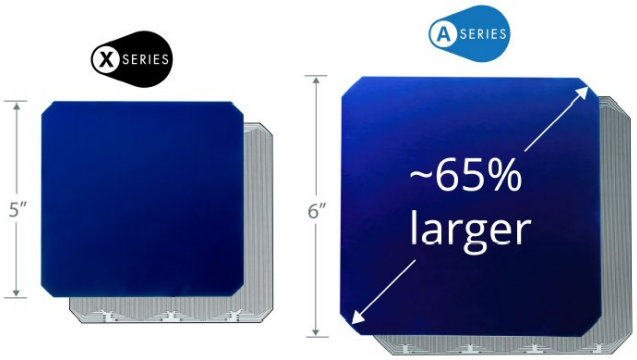
400–425 W Residential AC Module

SunPower® Maxeon® Technology

Built specifically for use with the SunPower Equinox™ system, the only fully integrated solution designed, engineered and warranted by one manufacturer.

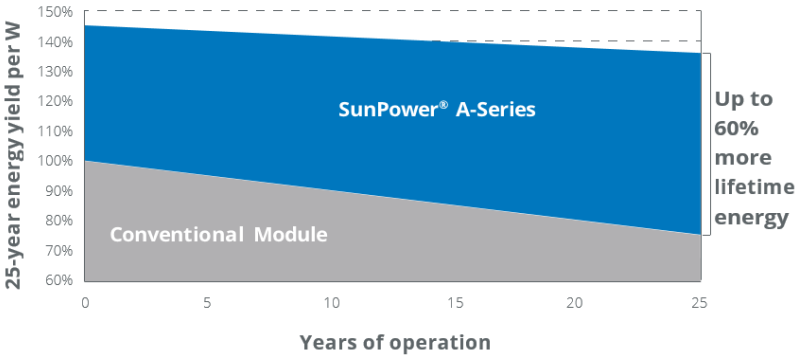
Highest Power Density Available.

SunPower's new Maxeon® Gen 5 cell is 65% larger than prior generations, delivering the most powerful cell and highest-efficiency panel in residential solar. The result is more power per square meter than any commercially available solar.



Highest Lifetime Energy and Savings.

Designed to deliver 60% more energy over 25 years in real-world conditions like partial shade and high temperatures.[1]



Best Reliability. Best Warranty.

With more than 25 million modules deployed around the world, SunPower technology is proven to last. That's why we stand behind our module and microinverter with the industry's best 25-year Combined Power and Product Warranty, including the highest Power Warranty in solar.

BETTER PRODUCT · BETTER WARRANTY
25-yr SunPower Complete Confidence

Fundamentally Different. And Better.

SunPower® Maxeon® Technology

- Most powerful cell in home solar [2]
- Delivers unmatched reliability [3]
- Patented solid metal foundation prevents breakage and corrosion

Factory-integrated Microinverter (MI)

- Highest-power integrated MI in solar
- 60% lighter than prior SunPower MIs
- Engineered and calibrated by SunPower for SunPower AC modules

A-Series: A425 | A415 | A400 SunPower® Residential AC Module

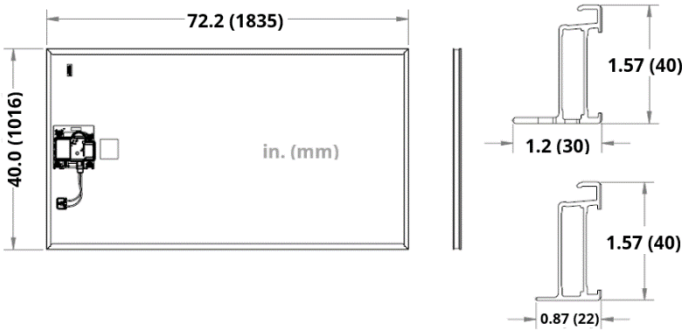
AC Electrical Data	
Inverter Model: SPWR-A4	@240 VAC
Peak Output Power	366 VA
Max. Continuous Output Power	349 VA
Nom. (L–L) Voltage/Range[2] (V)	240 / 211–264
Max. Continuous Output Current (A)	1.45
Max. Units per 20 A (L–L) Branch Circuit[3]	11
CEC Weighted Efficiency	97.0%
Nom. Frequency	60 Hz
Extended Frequency Range	47–68 Hz
AC Short Circuit Fault Current Over 3 Cycles	5.8 A rms
Overvoltage Class AC Port	III
AC Port Backfeed Current	18 mA
Power Factor Setting	1.0
Power Factor (adjustable)	0.7 lead. / 0.7 lag.

DC Power Data			
	SPR-A425-G-AC	SPR-A415-G-AC	SPR-A400-G-AC
Nom. Power [5] (Pnom)	425 W	415 W	400 W
Power Tol.	+5/−0%	+5/−0%	+5/−0%
Module Efficiency	22.8	22.3	21.5
Temp. Coef. (Power)	−0.29%/°C		
Shade Tol.	Integrated module-level max. power point tracking		

Tested Operating Conditions	
Operating Temp.	−40°F to +140°F (−40°C to +60°C)
Max. Ambient Temp.	122°F (50°C)
Max. Load	Wind: 62 psf, 3000 Pa, 305 kg/m² front & back Snow: 125 psf, 6000 Pa, 611 kg/m² front
Impact Resistance	1 inch (25 mm) diameter hail at 52 mph (23 m/s)

Mechanical Data	
Solar Cells	66 Monocrystalline Maxeon Gen 5
Front Glass	High-transmission tempered glass with anti-reflective coating
Environmental Rating	Outdoor rated
Frame	Class 1 black anodized (highest AAMA rating)
Weight	46.5 lbs (21.1 kg)
Recommended Max. Module Spacing	1.3 in. (33 mm)

Warranties, Certifications, and Compliance	
Warranties	• 25-year limited power warranty • 25-year limited product warranty
Certifications and Compliance	• UL 1703 • UL 1741 / IEEE-1547 • UL 1741 AC Module (Type 2 fire rated) • UL 62109-1 / IEC 62109-2 • FCC Part 15 Class B • ICES-0003 Class B • CAN/CSA-C22.2 NO. 107.1-01 • CA Rule 21 (UL 1741 SA)[4] (includes Volt/Var and Reactive Power Priority) • UL Listed PV Rapid Shutdown Equipment[6] Enables installation in accordance with: • NEC 690.6 (AC module) • NEC 690.12 Rapid Shutdown (inside and outside the array) • NEC 690.15 AC Connectors, 690.33(A)–(E)(1) When used with InvisiMount racking and InvisiMount accessories (UL 2703): • Module grounding and bonding through InvisiMount • Class A fire rated When used with AC module Q Cables and accessories (UL 6703 and UL 2238)[6]: • Rated for load break disconnect
PID Test	Potential-induced degradation free



1 SunPower 415 W, 22.2% efficient, compared to a Conventional Panel on same-sized arrays (260 W, 16% efficient, approx. 1.6 m²), 7.9% more energy per watt (based on PVSyst pan files for avg. US climate), 0.5%/yr slower degradation rate (Jordan, et. al. "Robust PV Degradation Methodology and Application." PVSC 2018).
2 Based on search of datasheet values from websites of top 10 manufacturers per IHS, as of January 2019.
3 #1 rank in "Fraunhofer PV Durability Initiative for Solar Modules: Part 3." PVTech Power Magazine, 2015. Campeau, Z. et al. "SunPower Module Degradation Rate," SunPower white paper, 2013.
4 Factory set to 1547a-2014 default settings. CA Rule 21 default settings profile set during commissioning. See the Equinox Installation Guide #518101 for more information.
5 Standard Test Conditions (1000 W/m² irradiance, AM 1.5, 25°C). NREL calibration standard: SOMS current, LACCS FF and voltage. All DC voltage is fully contained within the module.
6 This product is UL Listed as PVRSE and conforms with NEC 2014 and NEC 2017 690.12; and C22.1-2015 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors; when installed according to manufacturer's instructions.

See www.sunpower.com/facts for more reference information.

For more details, see extended datasheet www.sunpower.com/datasheets Specifications included in this datasheet are subject to change without notice.

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UL LISTED AC MODULE GRID SUPPORT UTILITY INTERACTIVE PV RAPID SHUTDOWN EQUIPMENT E478330
Module Fire Performance: Type 2

SUNPOWER®

Please read the Safety and Installation Instructions 532628 for additional details.

532618 RevA

SunPower® InvisiMount™ | Residential Mounting System

Simple and Fast Installation

- Integrated module-to-rail grounding
- Pre-assembled mid and end clamps
- Levitating mid clamp for easy placement
- Mid clamp width facilitates consistent, even module spacing
- UL 2703 Listed integrated grounding

Flexible Design

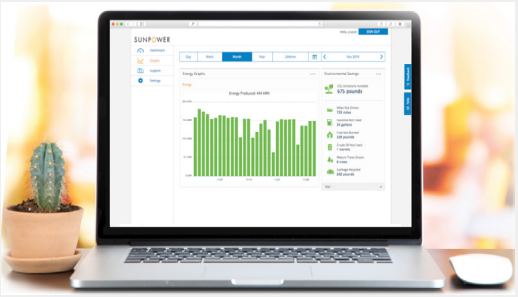
- Addresses nearly all sloped residential roofs
- Design in landscape and portrait with up to 8′ rail span
- Pre-drilled rails and rail splice
- Rails enable easy obstacle management

Customer-Preferred Aesthetics

- #1 module and #1 mounting aesthetics
- Best-in-class system aesthetics
- Premium, low-profile design
- Black anodized components
- Hidden mid clamps and capped, flush end clamps

Part of Superior System

- Built for use with SunPower DC and AC modules
- Best-in-class system reliability and aesthetics
- Optional rooftop transition flashing, rail-mounted J-box, and wire management rail clips
- Combine with SunPower modules and SunPower EnergyLink® monitoring app



Elegant Simplicity

SunPower® InvisiMount™ is a SunPower-designed rail-based mounting system. The InvisiMount system addresses residential sloped roofs and combines faster installation time, design flexibility, and superior aesthetics. The InvisiMount product was specifically envisioned and engineered to pair with SunPower modules. The resulting system-level approach amplifies the aesthetic and installation benefits—for homeowners and for installers.

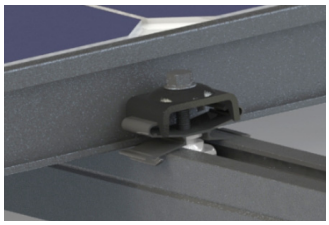
sunpower.com

SunPower® InvisiMount™ | Residential Mounting System

InvisiMount Components

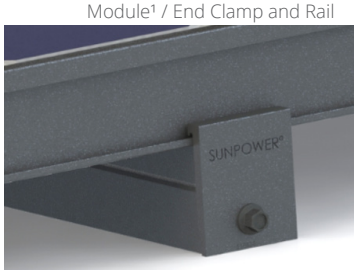
Ground Lug Assembly

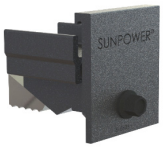
Module[1] / Mid Clamp and Rail



Row-to-Row Spacer

Module[1] / End Clamp and Rail





End Clamp

Mid Clamp

Row-to-Row Grounding Clip

Rail and Rail Splice

InvisiMount Component Details		
Mid clamp	Black oxide stainless steel 300 series	63 g (2.2 oz)
End clamp	Black anodized aluminum 6000 series	110 g (3.88 oz)
Rail	Black anodized aluminum 6000 series	830 g/m (9 oz/ft)
Rail splice	Aluminum alloy 6000 series	830 g/m (9 oz/ft)
Rail bolt	M10-1.5 × 25 mm; custom T-head SS304	18 g (0.63 oz)
Rail nut	M10-1.5; DIN 6923 SS304	nominal
Ground lug assembly	SS304; A2-70 bolt; tin-plated copper lug	106.5 g (3.75 oz)
Row-to-row grounding clip	SS 301 with SS 304 M6 bolts	75 g (2.6 oz)
Row-to-row spacer	Black POM-grade plastic	5 g (0.18 oz)

InvisiMount Operating Conditions	
Temperature	−40° C to 90° C (−40° F to 194° F)
Max. Load (LRFD)	• 3000 Pa uplift • 6000 Pa downforce

Roof Attachment Hardware Supported by Design Tool	
Application	• Composition Shingle Rafter Attachment • Composition Shingle Roof Decking Attachment • Curved and Flat Tile Roof Attachment • Universal interface for other roof attachments

InvisiMount Component LRFD Capacities[2]		
Mid clamp	Uplift	664 lbf
	Shear	540 lbf
End clamp	Uplift	899 lbf
	Shear	220 lbf
Rail	Moment: upward	548 lbf-ft
	Moment: downward	580 lbf-ft
Rail splice	Moment: upward	548 lbf-ft
	Moment: downward	580 lbf-ft
L-foot	Uplift	1000 lbf
	Shear	390 lbf

InvisiMount Warranties And Certifications	
Warranties	• 25-year product warranty • 5-year finish warranty
Certifications	• UL 2703 Listed • Class A Fire Rated

Roof Attachment Hardware Warranties
Refer to roof attachment hardware manufacturer's documentation.

[1] Module frame that is compatible with the InvisiMount system required for hardware interoperability.
[2] SunPower recommends that all Equinox™, InvisiMount™, and AC module systems always be designed using the InvisiMount Span Tables #524734. If a designer decides to instead use the component capacities listed in this document to design a system, note that the capacities shown are Load and Resistance Factor Design (LRFD) design loads, and are NOT to be used for Allowable Stress Design (ASD) calculations; and that a licensed Professional Engineer (PE) must then stamp all calculations. If you have any questions please contact SunPower Technical Support at 1-855-977-7867.

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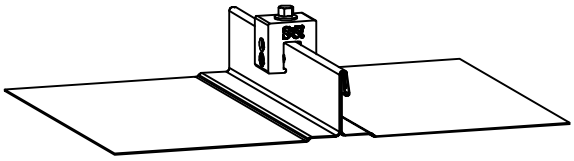
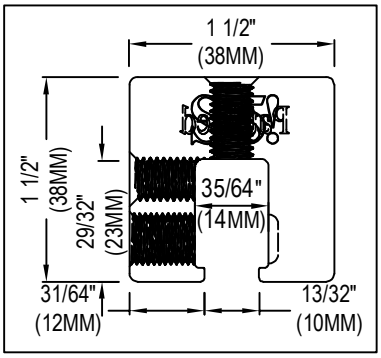
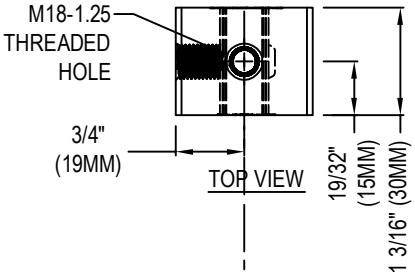
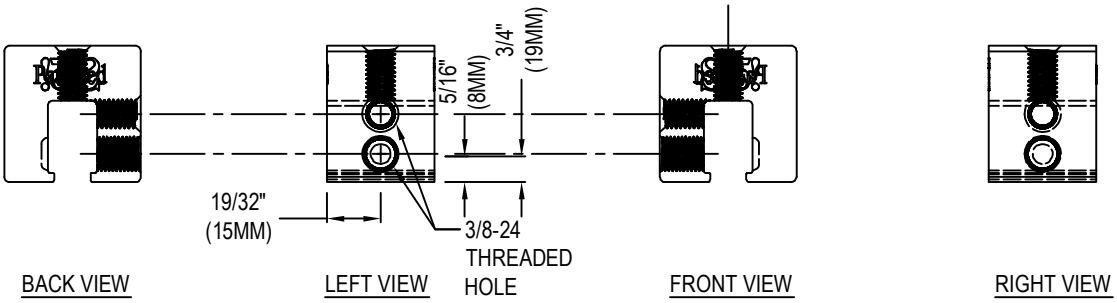
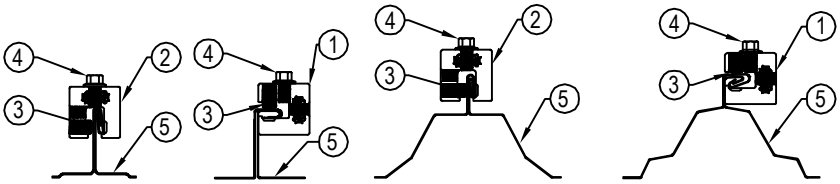








LEGEND:
1. S-5-U MINI (HORIZONTAL)
2. S-5-U MINI (VERTICAL)
3. M8-1.25 X 16MM HEX FLANGE BOLT
4. 3/8-24 X .8" ROUND POINT SETSCREW
5. EXAMPLE PROFILE



FOR STANDING SEAM SPECIFIC MECHANICAL LOAD TEST INFORMATION AND CLAMP INSTALLATION INFORMATION PLEASE VISIT: WWW.S-5.COM

NOTES:
1. INSTALLATION TO BE COMPLETED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.
2. DO NOT SCALE DRAWING.
3. THIS DRAWING IS INTENDED FOR USE BY ARCHITECTS, ENGINEERS, CONTRACTORS, CONSULTANTS AND DESIGN PROFESSIONALS FOR PLANNING PURPOSES ONLY. THIS DRAWING MAY NOT BE USED FOR CONSTRUCTION.
4. ALL INFORMATION CONTAINED HEREIN WAS CURRENT AT THE TIME OF DEVELOPMENT BUT MUST BE REVIEWED AND APPROVED BY THE PRODUCT MANUFACTURER TO BE CONSIDERED ACCURATE.
5. CONTRACTOR'S NOTE: FOR PRODUCT AND COMPANY INFORMATION VISIT www.CADdetails.com/info AND ENTER REFERENCE NUMBER 2500-010.

S-5!® MINI CLAMPS

S-5-U MINI CLAMP

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A SERIES

SUNPOWER®

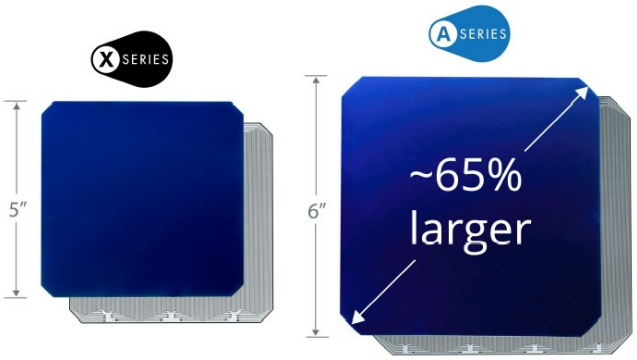
400–425 W Residential AC Module

SunPower® Maxeon® Technology

Built specifically for use with the SunPower Equinox™ system, the only fully integrated solution designed, engineered and warranted by one manufacturer.

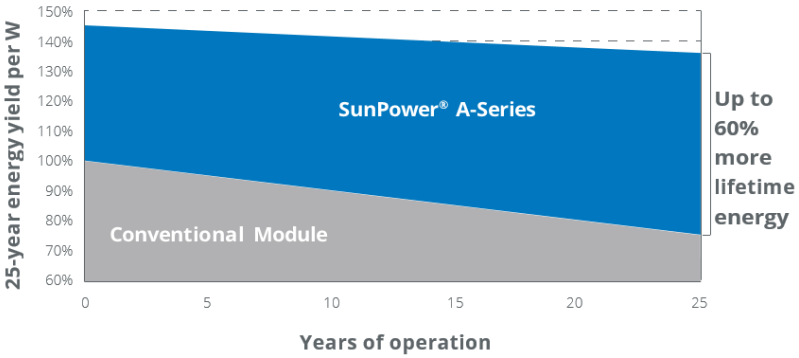
Highest Power Density Available.

SunPower's new Maxeon® Gen 5 cell is 65% larger than prior generations, delivering the most powerful cell and highest-efficiency panel in residential solar. The result is more power per square meter than any commercially available solar.



Highest Lifetime Energy and Savings.

Designed to deliver 60% more energy over 25 years in real-world conditions like partial shade and high temperatures.[1]



Best Reliability. Best Warranty.

With more than 25 million modules deployed around the world, SunPower technology is proven to last. That's why we stand behind our module and microinverter with the industry's best 25-year Combined Power and Product Warranty, including the highest Power Warranty in solar.

BETTER PRODUCT · BETTER WARRANTY
25-yr SunPower Complete Confidence

Fundamentally Different. And Better.

SunPower® Maxeon® Technology

- Most powerful cell in home solar [2]
- Delivers unmatched reliability [3]
- Patented solid metal foundation prevents breakage and corrosion

Factory-integrated Microinverter (MI)

- Highest-power integrated MI in solar
- 60% lighter than prior SunPower MIs
- Engineered and calibrated by SunPower for SunPower AC modules

A-Series: A425 | A415 | A400 SunPower® Residential AC Module

AC Electrical Data	
Inverter Model: SPWR-A4	@240 VAC
Peak Output Power	366 VA
Max. Continuous Output Power	349 VA
Nom. (L–L) Voltage/Range[2] (V)	240 / 211–264
Max. Continuous Output Current (A)	1.45
Max. Units per 20 A (L–L) Branch Circuit[3]	11
CEC Weighted Efficiency	97.0%
Nom. Frequency	60 Hz
Extended Frequency Range	47–68 Hz
AC Short Circuit Fault Current Over 3 Cycles	5.8 A rms
Overvoltage Class AC Port	III
AC Port Backfeed Current	18 mA
Power Factor Setting	1.0
Power Factor (adjustable)	0.7 lead. / 0.7 lag.

DC Power Data			
	SPR-A425-G-AC	SPR-A415-G-AC	SPR-A400-G-AC
Nom. Power [5] (Pnom)	425 W	415 W	400 W
Power Tol.	+5/−0%	+5/−0%	+5/−0%
Module Efficiency	22.8	22.3	21.5
Temp. Coef. (Power)	−0.29%/°C		
Shade Tol.	Integrated module-level max. power point tracking		

Tested Operating Conditions	
Operating Temp.	−40°F to +140°F (−40°C to +60°C)
Max. Ambient Temp.	122°F (50°C)
Max. Load	Wind: 62 psf, 3000 Pa, 305 kg/m² front & back Snow: 125 psf, 6000 Pa, 611 kg/m² front
Impact Resistance	1 inch (25 mm) diameter hail at 52 mph (23 m/s)

Mechanical Data	
Solar Cells	66 Monocrystalline Maxeon Gen 5
Front Glass	High-transmission tempered glass with anti-reflective coating
Environmental Rating	Outdoor rated
Frame	Class 1 black anodized (highest AAMA rating)
Weight	46.5 lbs (21.1 kg)
Recommended Max. Module Spacing	1.3 in. (33 mm)

Warranties, Certifications, and Compliance	
Warranties	• 25-year limited power warranty • 25-year limited product warranty
Certifications and Compliance	• UL 1703 • UL 1741 / IEEE-1547 • UL 1741 AC Module (Type 2 fire rated) • UL 62109-1 / IEC 62109-2 • FCC Part 15 Class B • ICES-0003 Class B • CAN/CSA-C22.2 NO. 107.1-01 • CA Rule 21 (UL 1741 SA)[4] (includes Volt/Var and Reactive Power Priority) • UL Listed PV Rapid Shutdown Equipment[6] Enables installation in accordance with: • NEC 690.6 (AC module) • NEC 690.12 Rapid Shutdown (inside and outside the array) • NEC 690.15 AC Connectors, 690.33(A)–(E)(1) When used with InvisiMount racking and InvisiMount accessories (UL 2703): • Module grounding and bonding through InvisiMount • Class A fire rated When used with AC module Q Cables and accessories (UL 6703 and UL 2238)[6]: • Rated for load break disconnect
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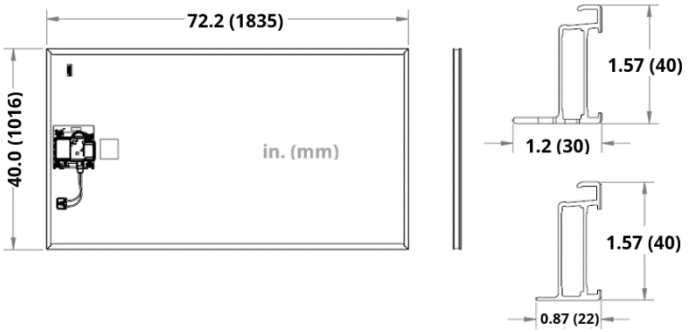

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Module Fire Performance: Type 2

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532618 RevA

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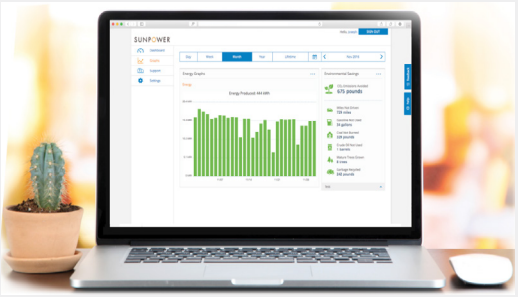

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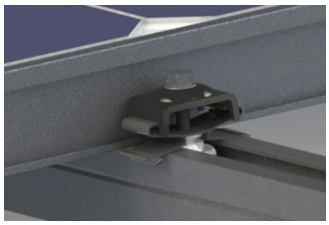
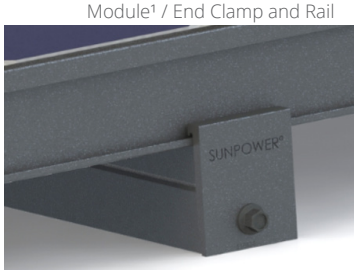
Ground Lug Assembly

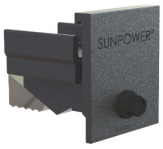
Module[1] / Mid Clamp and Rail



Row-to-Row Spacer

Module[1] / End Clamp and Rail





End Clamp

Mid Clamp

Row-to-Row Grounding Clip

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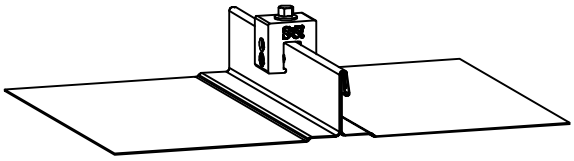
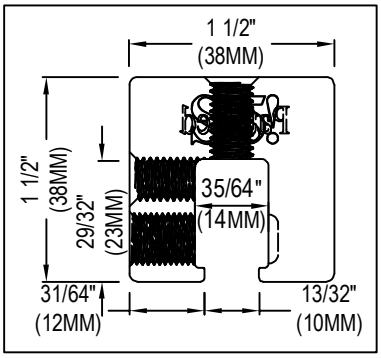
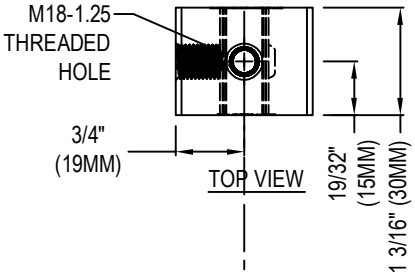
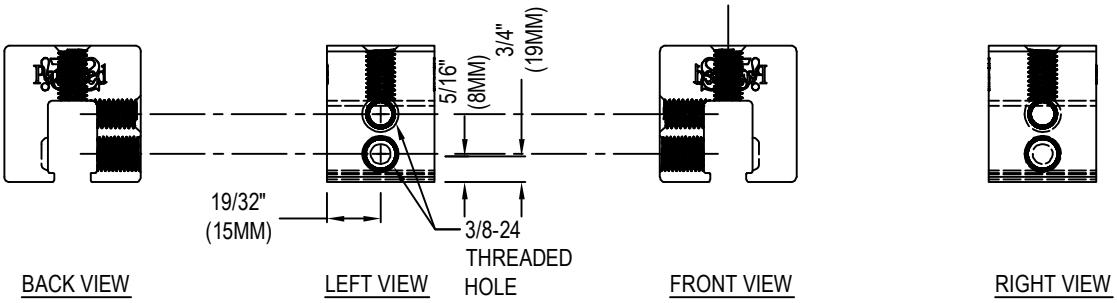
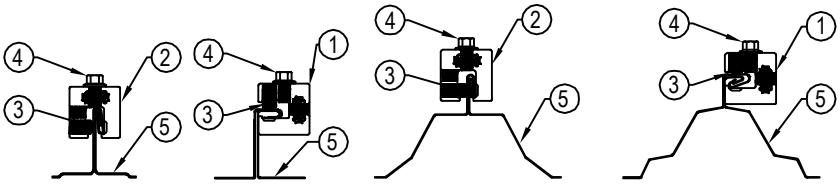








LEGEND:
1. S-5-U MINI (HORIZONTAL)
2. S-5-U MINI (VERTICAL)
3. M8-1.25 X 16MM HEX FLANGE BOLT
4. 3/8-24 X .8" ROUND POINT SETSCREW
5. EXAMPLE PROFILE



FOR STANDING SEAM SPECIFIC MECHANICAL LOAD TEST INFORMATION AND CLAMP INSTALLATION INFORMATION PLEASE VISIT: WWW.S-5.COM

NOTES:
1. INSTALLATION TO BE COMPLETED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.
2. DO NOT SCALE DRAWING.
3. THIS DRAWING IS INTENDED FOR USE BY ARCHITECTS, ENGINEERS, CONTRACTORS, CONSULTANTS AND DESIGN PROFESSIONALS FOR PLANNING PURPOSES ONLY. THIS DRAWING MAY NOT BE USED FOR CONSTRUCTION.
4. ALL INFORMATION CONTAINED HEREIN WAS CURRENT AT THE TIME OF DEVELOPMENT BUT MUST BE REVIEWED AND APPROVED BY THE PRODUCT MANUFACTURER TO BE CONSIDERED ACCURATE.
5. CONTRACTOR'S NOTE: FOR PRODUCT AND COMPANY INFORMATION VISIT www.CADdetails.com/info AND ENTER REFERENCE NUMBER 2500-010.

S-5!® MINI CLAMPS

S-5-U MINI CLAMP

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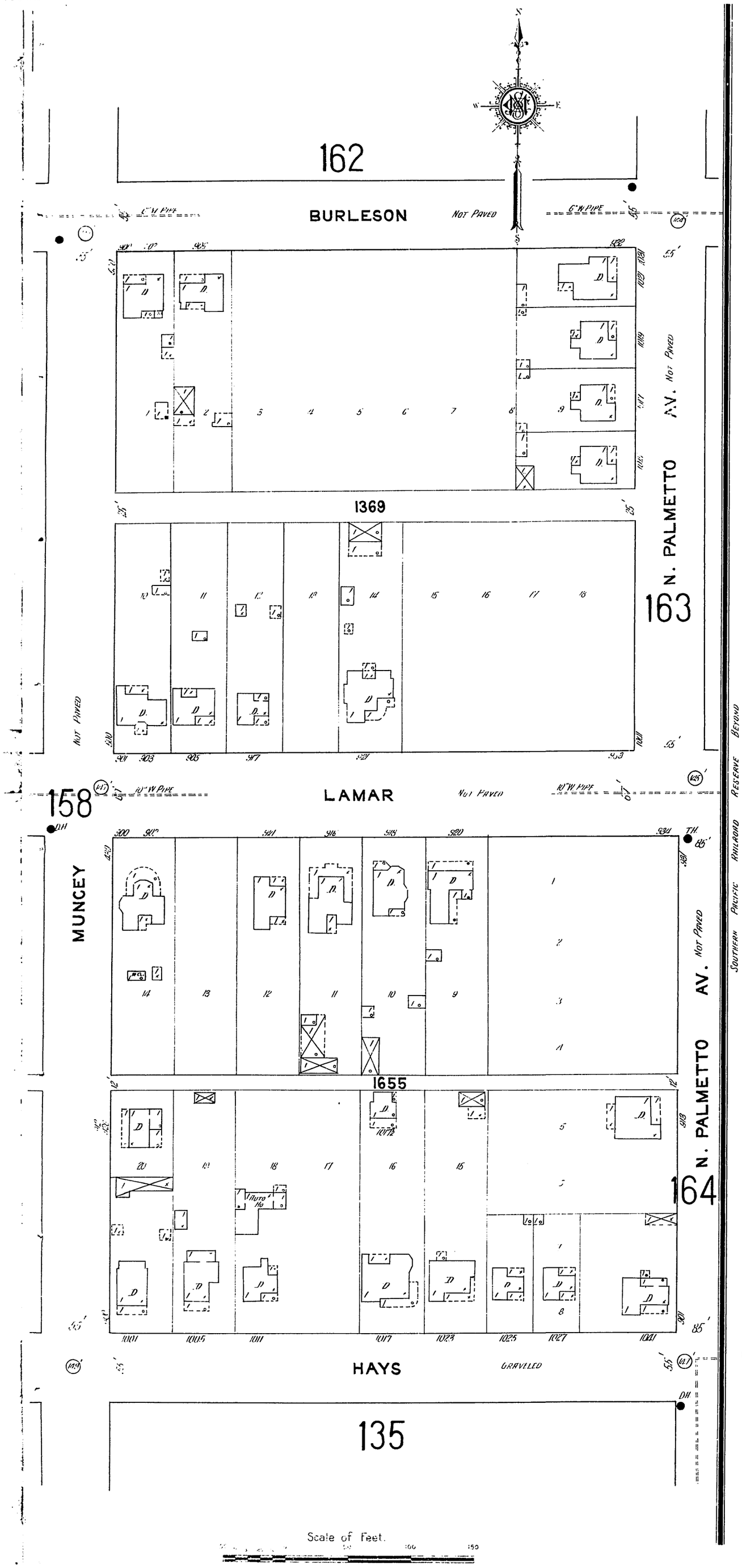
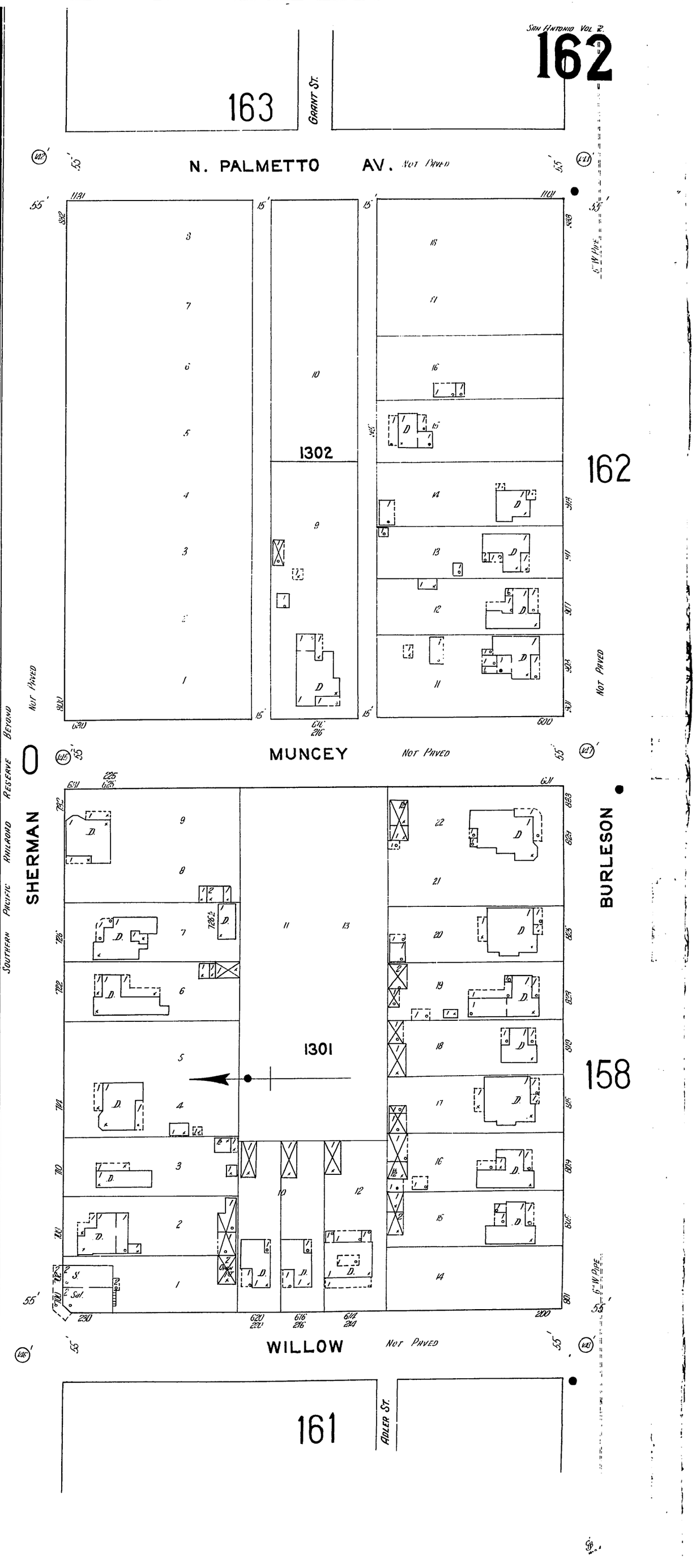

162
BURLESON
NOT PAVED
6" W. PIPE
1369
N. PALMETTO AV.
163
158
LAMAR
10" W. PIPE
MUNCEY
1655
164
HAYS
GRAVELED
135
Scale of Feet.


San Antonio Vol. 2.
162
163
GRANT ST.
N. PALMETTO AV.
NOT PAVED
1302
MUNCEY
SHERMAN
1301
WILLOW
161
ADLER ST.
BURLESON
158
6" W. PIPE