HISTORIC AND DESIGN REVIEW COMMISSION

July 18, 2018

HDRC CASE NO:	**2018-344**
ADDRESS:	2007 W WOODLAWN
LEGAL DESCRIPTION:	NCB 1963 BLK 1 LOT W 6 FT OF 1 & E 47 FT OF 2
ZONING:	R-6 H
CITY COUNCIL DIST.:	7
DISTRICT:	Monticello Park Historic District
APPLICANT:	Advanced Solar & Electric, LLC
OWNER:	Leonard & Maria Molina
TYPE OF WORK:	Installation of solar panels
APPLICATION RECEIVED:	June 28, 2018
60-DAY REVIEW:	

REQUEST:

The applicant is requesting a Certificate of Appropriateness for approval to install a roof-mounted solar array on the primary structure located at 2007 W Woodlawn. Eighteen (18) panels will be installed on the south (front) facing side gable and four (4) panels will be installed on a rear gable.

APPLICABLE CITATIONS:

Historic Design Guidelines, Chapter 3,Guidelines for Additions
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.

FINDINGS:

a. The primary structure located at 2007 W Woodlawn Ave is a 1-story single family structure constructed in approximately 1940 in the Minimal Traditional style. The home features a cross gable configuration, an asymmetrical front porch with simple columns, and one over one windows, some featuring six over six wood screens. The structure is contributing to the Monticello Park Historic District.
b. LOCATION – The applicant is requesting approval to install 18 solar panels on the south, front facing side of the side gable roof and 4 solar panels on a north, rear facing gable. The 18 panels on the front roof pitch will be visible from the public right-of-way due to their placement. The 4 panels at the rear of the structure will not be visible from the public right-of-way. According to the Historic Design Guidelines for Additions 6.C.i, solar collectors should be located on a side or rear roof pitch to the maximum extent possible. Staff finds that the 4 panels located towards the rear are appropriate. Staff does not find the 18 panels on the front façade consistent with the Guidelines due to their high visibility from the public right-of-way.
c. PITCH – The panels will be installed flush with the roof pitch. Staff finds the pitch consistent with the Guidelines.

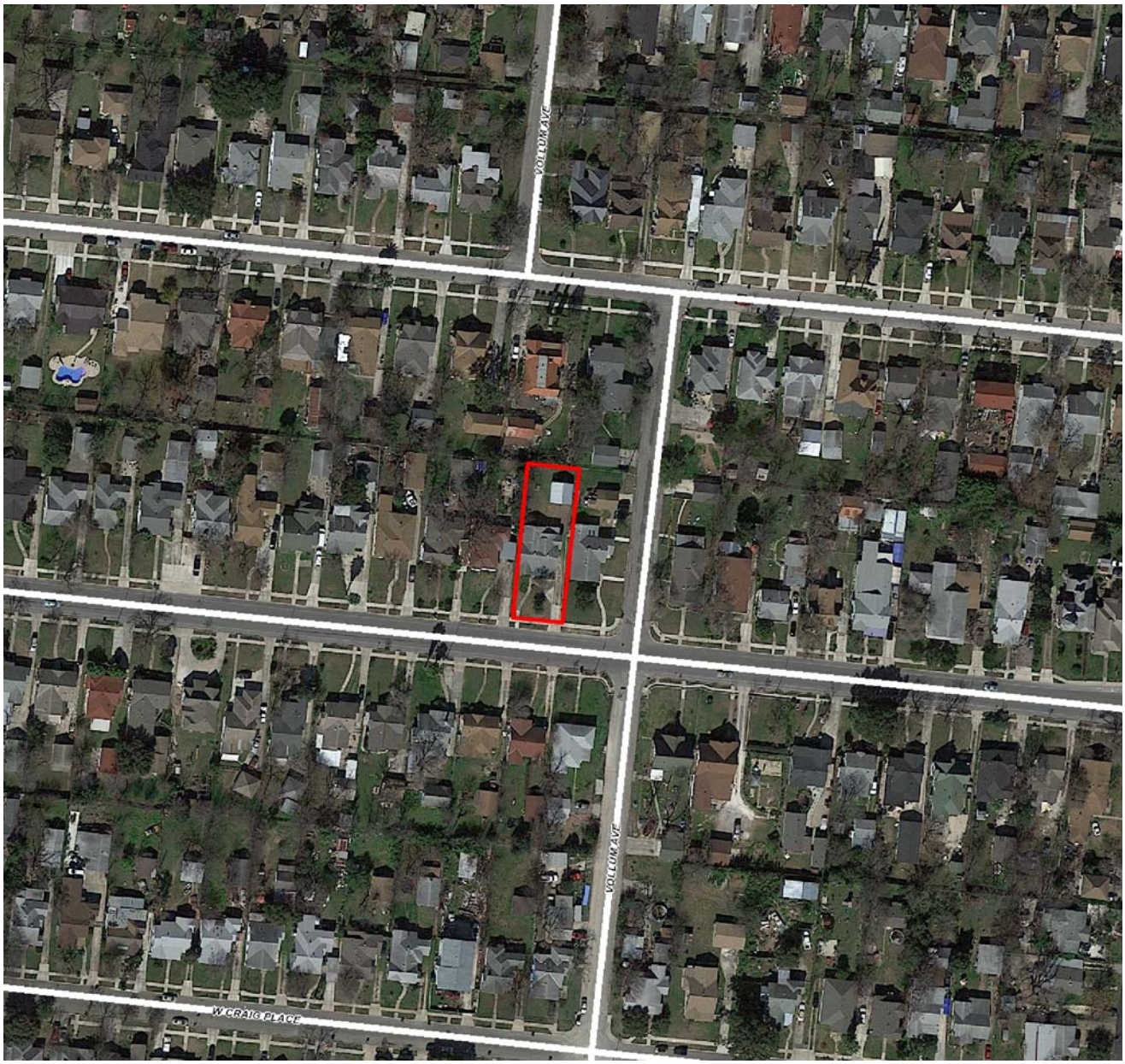
RECOMMENDATION:

Staff does not recommend approval based on finding b. Staff recommends that the applicant relocates the panels on the front façade to the rear of the structure, to the rear accessory structure, or to a ground-mount system to significantly minimize the impact from the public right-of-way. The applicant is required to submit updated drawings reflecting these

changes to staff for review and approval prior to receiving a Certificate of Appropriateness.

CASE MANAGER:

Stephanie Phillips



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Flex Viewer

Powered by ArcGIS Server

Printed:Jul 11, 2018


2007


2007

Advanced Solar and Electric L.L.C.

105 W. Loop 539, Cibolo, Texas 78108 (210) 556-1399 www.advancedsolar.com sales@advancedsolar.com

TECL# 27328

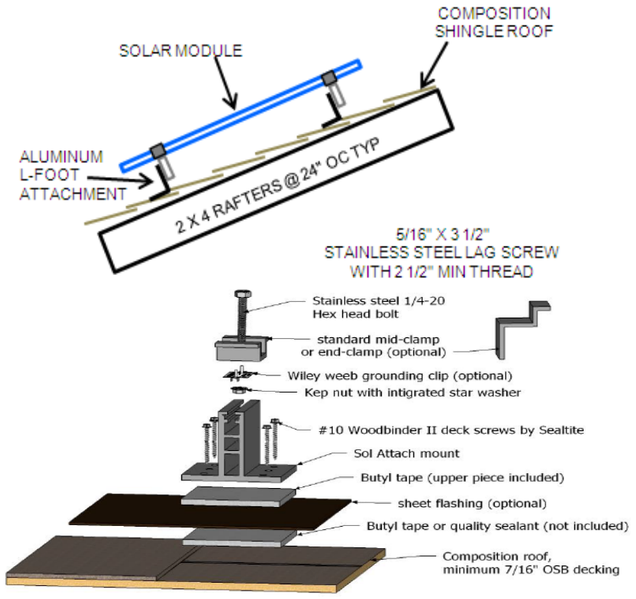
Site Survey Worksheet

CUSTOMER:	Leonard & Maria Molina	DATE:	May 12, 2018
JOB SITE:	2007 W Woodlawn Ave.	w Phone:	210 737-1846
CITY / ST / ZIP	San Antonio 78201 TX	c Phone:	
EMAIL	molina.leonard7@gmail.com	1 or 2 Story:	One Story
Proposed System	7.125 (D/C KW capacity)	AHJ:	COSA (City of San Antonio)
Panel Configuration	QTY 25	285	Hanwha (72c) HANWHA SF260-36-P285
Inverter Configuration	QTY 1	Solar Edge	SE6000H-US
Inverter Configuration	QTY	Solar Edge	
Roof Type	Composite Shingle	Drawn By: Rick	Rep: Brian Odle
Monitoring Included:	NO		

All Arrays		Array #1	Array #2	Array #3	Array #4
Tilt:		15.0	5.0		
Azimuth:		185	275		
QTY	25	21	4		
KW d/c	7.13	5.99	1.14		
(CPSE only) KW a/c	6.34				
NREL Default kwH	10331	8678	1653		
NREL Actual kWh:	10360	8798	1562		
% Default	100.28%	101.38%	94.48%		

Henry Wood
NABCEP Certification #PV-101913-003022

PV SITE LAYOUT 1



MOUNTING METHOD 2

CONSTRUCTION NOTES:

1. ALL EQUIPMENT TO BE LISTED OR LABLED FOR ITS APPLIATION.
2. INSTALLATION TO BE COMPLIANT WITH THE NEC.
3. MODULE GROUNDNG METHOD SHALL BE LAY-IN GROUND LUGS, GROUNDING-RATED END AND MID CLAMPS, AND/OR DYNOBONDS
4. ALL CONDUCTORS ARE COPPER, UNLESS OTHERWISE SPECIIFIED.
5. 3.0 PSF MAX DEAD LOAD CONTRIBUTED FROM SOLAR ARRAY

LEGEND

1	#8 BARE COPPER GROUND
2	4-#10 USE-2 MC4-W/CONNECTORS TO MODULES, #8 GRND, IN 3/4" EMT
3	1-#8 THWN-2, 2-#8THWN-2 #8 GRND, IN 0.75" EMT
4	1-#8 THWN-2, 2-#8THWN-2, IN 0.75" EMT

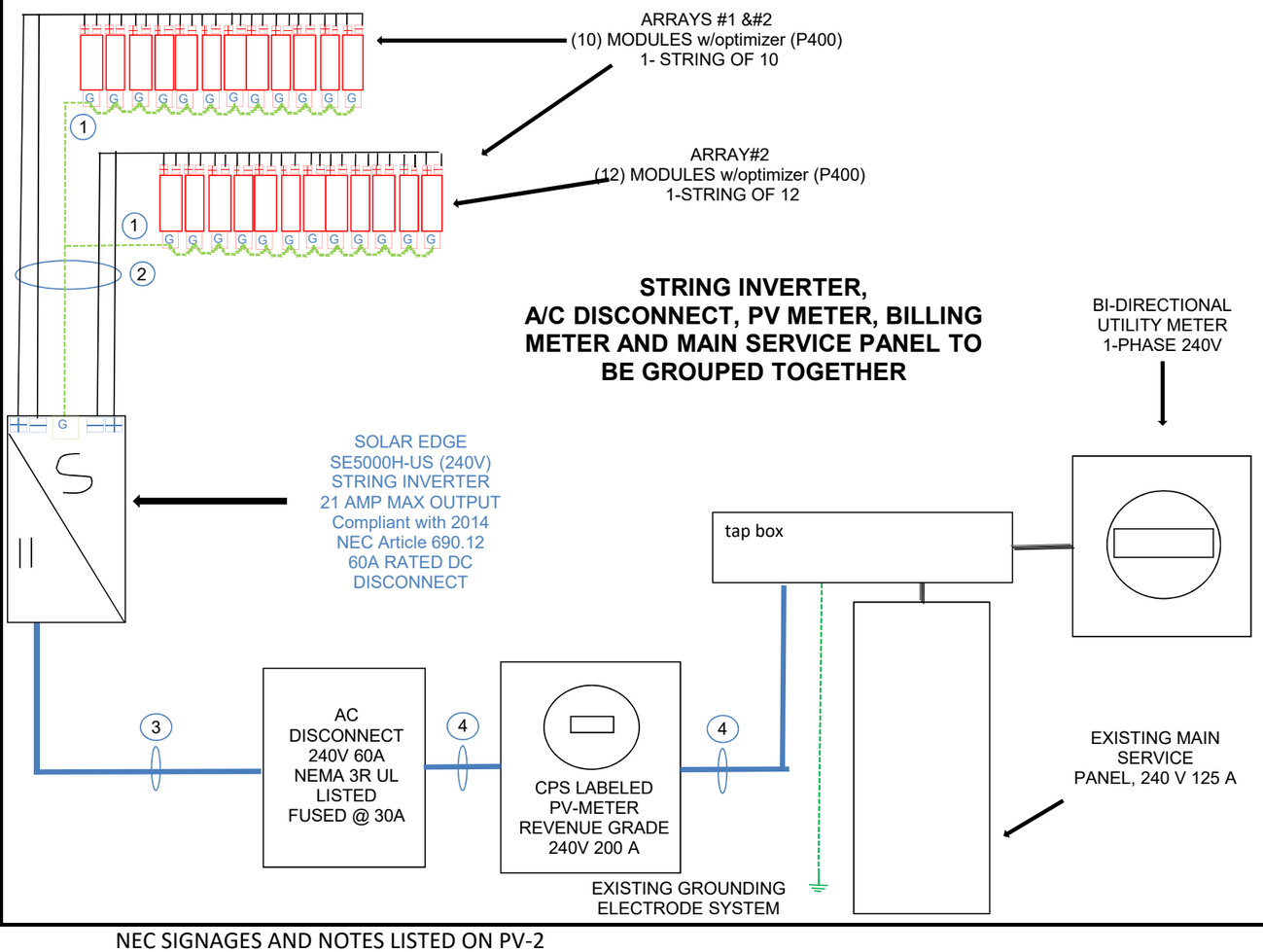
DESIGN & DRAFTING BY:
Advanced Solar and Electric llc
Master Electrician:
James D. Flores, Sr
Master Elect. #96107

Henry Wood
NABCEP Certification #PV-101913-003022

3 WIRING DIAGRAM

Residential SOLAR ARRAY 6.27 KW D/C

Qty 22 Hanwha (72c) HANWHA SF260-36-P285 Modules



NEC SIGNAGES AND NOTES LISTED ON PV-2

Leonard & Maria Molina
2007 W Woodlawn Ave.
San Antonio TX 78201
Residential Application
TECL #27328

SHEET TITLE: PHOTOVOLTAIC INSTALLATION

PAGE NUMBER: PV-1

DESCRIPTION	DATE	REV
ORIGINAL	5/12/2018	A

Residential SOLAR ARRAY 6.27 KW D/C

Qty 22 Hanwha (72c) HANWHA SF260-36-P2 Modules

DESIGN & DRAFTING BY:
Advanced Solar and Electric llc
Master Electrician:
James D. Flores, Sr
(210) 556-1399, don@advancedsolar.com

DESCRIPTION	DATE	REV
ORIGINAL	5/12/2018	A
REVISED		B
REVISED		C
Mstr Elect#	96107	

1
PV SITE LAYOUT

NOTES:
1– ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR COMPLYING WITH THE NEC AND OTHER APPLICABLE CODES ON ALL LABELING THAT IS REQUIRED FOR OTHER COMPONENTS OF THE PV SYSTEM INSTALLATION.
2– LABELING SHALL MEET THE FOLLOWING REQUIREMENTS:
A) REFLECTIVE, WEATHER RESISTANT AND SUFFICIENT DURABILITY TO WITHSTAND THE ENVIROMENT INVOLVED.
B) RED BACKGROUND WITH WHITE LETTERING.
C) MINIMUM 3/8" TALL CHARACTERS (SIZE MAY BE REDUCED ONLY WHEN NECESSARY TO FIT ON EQUIPMENT)
D) ADHESIVE FOR ALL LABELING SHALL BE WEATHER RESISTANT AND OF SUFFICIENT DURABILITY TO WITH STAND THE ENVIROMENT INVOLVED.
3– PERMANENT PLACARDS DENOTING LOCATIONS SHALL BE PLACED AT BOTH THE PV METER AND REVENUE METER WHERE A VARIANCE HAS BEEN APPROVED FOR THE METERS TO BE PLACED REMOTE.
4– LABELING WARNING THAT THERE ARE DUAL SOURCES SUPPLYING SHALL ALSO BE PLACED ON THE JUNCTION BOX USED ON LINE-SIDE INTERCONNETIONS.

SIGNAGES PER NEC 690.17 & 705.10-705.12:

CUSTOMER SERVICE PANEL: (2014 NEC ARTICLE 705.10)

WARNING: THIS PREMISE IS SUPPLIED BY MORE THAN ONE SOURCE OF ELECTRIC POWER
(UTILITY, PV, XXX)

PV METER SOCKET:

PV METER

WARNING: ELECTRIC SHOCK HAZARD
TERMINALS ON BOTH THE LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSISTION

PV AC DISCONNECT: (2014 NEC ARTICLES: 690.54)

PV SYSTEM AC DISCONNECT
RATED AC OUTPUT CURRENT: XXX AMPS
NOMINAL OPERATING AC VOLTAGE: XXX VOLTS

PV AC DISCONNECT: (2014 NEC ARTICLES: 690.17, 690.53)

PV SYSTEM DC DISCONNECT
RATED MAX. POWER-POINT CURRENT: XXX ADC
RATED MAX. POWER-POINT VOLTAGE: XXX VDC
MAXIMUM SYSTEM VOLTAGE: XXX VDC
SHORT –CURCUIT CURRENT: XXX ADC

WARNING: ELECTRIC SHOCK HAZARD
TERMINALS ON BOTH THE LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSISTION

PV CONDUIT:

PHOTOVOLTAIC
POWERSOURCE

PV AGGREGATION PANEL:

DO NOT REMOVE, ADD OR RELOCATE ANY CIRCUITS FROM THIS PANEL

TRANSFORMERLESS OR NON-ISOLATED INVERTERS ONLY:

WARNING
ELECTRIC SHOCK HAZZARD
THE DC CONDUCTORS OF THIS PHOTOVOLTAIC SYSTEM ARE UNGROUNDED AND MAY BE ENERGIZED.

INVERTER OUTPUT CONNECTION: (2014 NEC ARTICLE 705.12 D-2 B)

WARNING: INVERTER OUTPUT CONNECTION DO NOT RELOCATE THIS OVERCURRENT DEVICE

UTILITY REVENUE METER SOCKET:

REVENUE METER

Leonard & Maria Molina
2007 W Woodlawn Ave.
San Antonio TX 78201
Residential Application
TECL #27328

SHEET TITLE: PHOTOVOLTAIC INSTALLATION

PAGE NUMBER: PV-2

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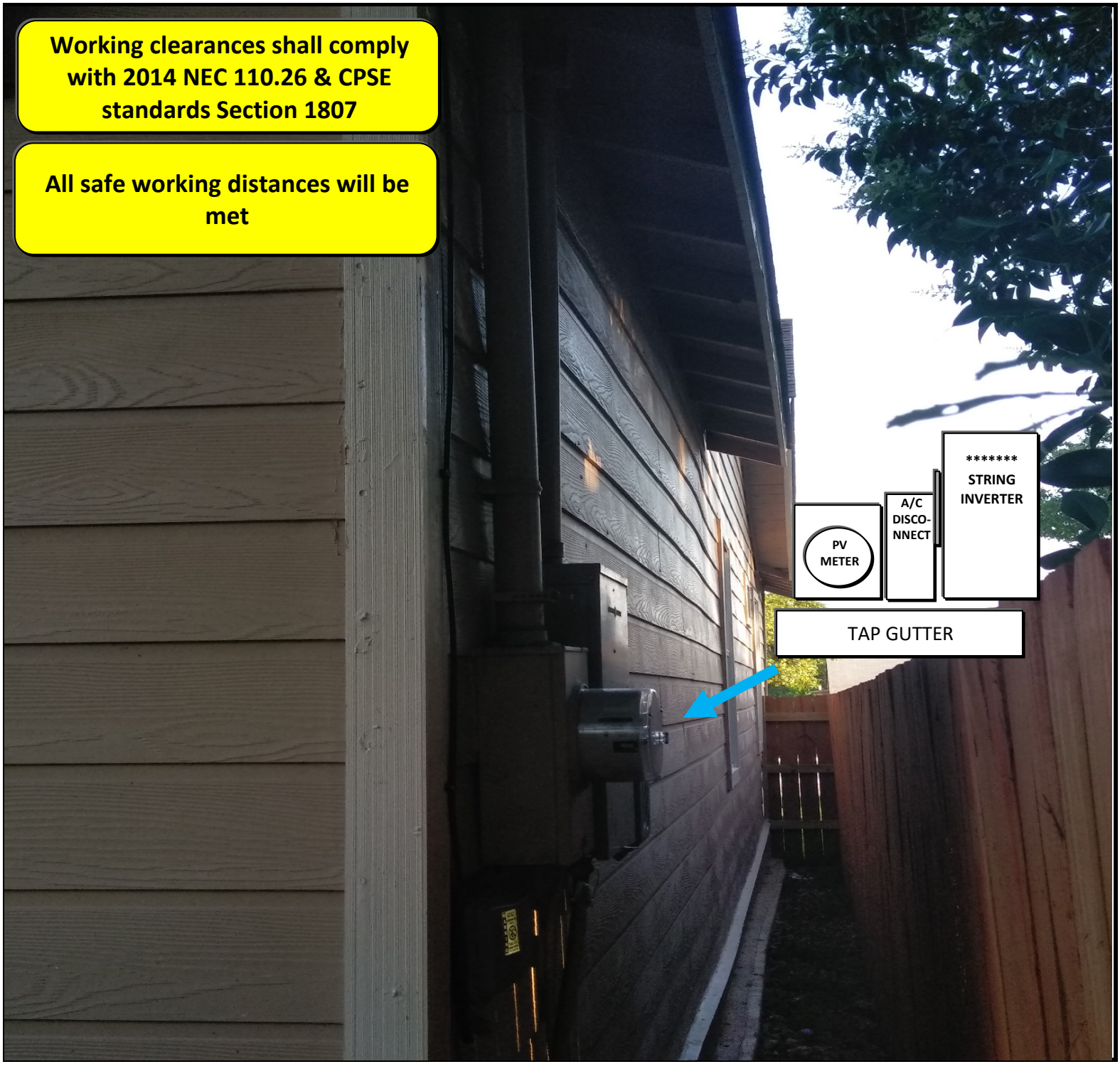
Site Survey Worksheet

CUSTOMER:	**Leonard & Maria Molina**	**DATE:**	**May 12, 2018**
JOB SITE:	**2007 W Woodlawn Ave.**	**PHONE #1:**	**210 737-1846**
CITY / ST / ZIP	**San Antonio TX**	**PHONE #2:**	**0 0**
EMAIL	**molina.leonard7@gmail.com**	**TYPE:**	**Residential**



SF260 | Poly x-tra UL

Hanwha Solar

Five Key Features

1. Guaranteed quality: 5 year product warranty, 25 year performance warranty *
2. Predictable output: Positive power sorting of 0 to + 5 W
3. Innovative solutions: Anti-reflecting coating for high sunlight absorption
4. Robust design: Module certified to withstand high snow loads, up to 5400 Pa (113 psf) **
5. Highly Bankable: Proven field performance with strong company financials

* Please refer to Hanwha SolarOne Co., Ltd. Product Warranty for details.
** Please refer to Hanwha SolarOne Co., Ltd. module Installation Guide.

Quality and Environmental Certificates

- ISO 9001 quality standards and ISO 14001 environmental standards
- OHSAS 18001 occupational health and safety standards
- IEC 61215 and IEC 61730 Class A certifications
- Conformity to CE

About Hanwha SolarOne Co., Ltd.

Hanwha SolarOne Co., Ltd. is a vertically integrated manufacturer of photovoltaic modules designed to meet the needs of the global energy consumer.

- High reliability, guaranteed quality, and excellent cost-efficiency due to vertically integrated production and control of the supply chain;
- Optimization of product performance and manufacturing processes through a strong commitment to research and development;
- Global presence throughout Europe, North America, and Asia, offering regional technical and sales support.

SF260 | Poly x-tra UL

Electrical Characteristics

Electrical Characteristics at Standard Test Conditions (STC)

Power Class	270 W	275 W	280 W	285 W	290 W	295 W
Maximum Power (P_{max})	270 W	275 W	280 W	285 W	290 W	295 W
Open Circuit Voltage (V_{oc})	44.0 V	44.1 V	44.3 V	44.5 V	44.7 V	44.9 V
Short Circuit Current (I_{sc})	8.20 A	8.35 A	8.40 A	8.45 A	8.50 A	8.55 A
Voltage at Maximum Power (V_{mpp})	36.0 V	36.1 V	36.1 V	36.2 V	36.3 V	36.4 V
Current at Maximum Power (I_{mpp})	7.50 A	7.62 A	7.76 A	7.87 A	7.99 A	8.11 A
Module Efficiency	13.7 %	14.0 %	14.3 %	14.5 %	14.7 %	15.0 %
Cell Efficiency	15.8 %	16.0 %	16.2 %	16.5 %	16.8 %	17.1 %

P_{max}, V_{oc}, I_{sc}, V_{mpp}, and I_{mpp} tested at STC defined as irradiance of 1000 W/m² at AM 1.5 solar spectrum and temperature 25 ± 2 °C.
Electrical Characteristics: Measurement tolerance of ± 3 %.

Electrical Characteristics at Normal Operating Cell Temperature (NOCT)

Power Class	270 W	275 W	280 W	285 W	290 W	295 W
Maximum Power (P_{max})	197 W	200 W	204 W	208 W	211 W	215 W
Open Circuit Voltage (V_{oc})	40.5 V	40.6 V	40.8 V	40.9 V	41.1 V	41.3 V
Short Circuit Current (I_{sc})	6.63 A	6.76 A	6.80 A	6.84 A	6.88 A	6.92 A
Voltage at Maximum Power (V_{mpp})	32.7 V	32.8 V	32.9 V	33.0 V	33.1 V	33.2 V
Current at Maximum Power (I_{mpp})	6.00 A	6.10 A	6.21 A	6.30 A	6.39 A	6.49 A
Module Efficiency	12.5 %	12.7 %	13.0 %	13.2 %	13.4 %	13.7 %
Cell Efficiency	15.8 %	16.0 %	16.2 %	16.5 %	16.8 %	17.1 %

P_{max}, V_{oc}, I_{sc}, V_{mpp}, and I_{mpp} tested at NOCT defined as irradiance of 800 W/m²; wind speed 1 m/s.
Electrical Characteristics: Measurement tolerance of ± 3 %.

Temperature Characteristics

Normal Operating Cell Temperature (NOCT)	45 °C ± 3 °C
Temperature Coefficients of P	− 0.45 % / °C
Temperature Coefficients of V	− 0.32 % / °C
Temperature Coefficients of I	+ 0.04 % / °C

Maximum Ratings

Maximum System Voltage	600 V (UL)
Series Fuse Rating	15 A
Maximum Reverse Current	Series fuse rating multiplied by 1.35

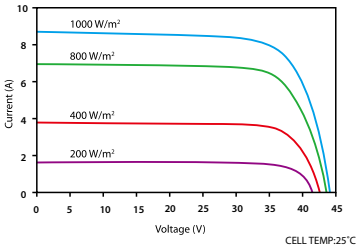
Nomenclature

Full product name:
SF260-36-P*xxx*L
xxx represents the power class

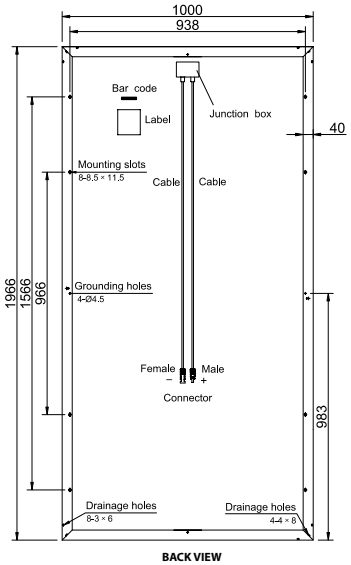
Performance at Low Irradiance:

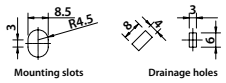
The typical relative change in module efficiency at an irradiance of 200 W/m² in relation to 1000 W/m² (both at 25 °C and AM 1.5 spectrum) is less than 5 %.

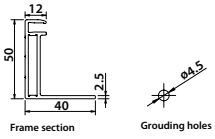
Various Irradiance Levels



Basic Design







Mechanical Characteristics

Dimensions	1966 mm × 1000 mm × 50 mm (77.4 in × 39.37 in × 1.97 in)
Weight	26 kg (57.2 lbs)
Frame	Aluminum alloy
Front	Tempered glass
Encapsulant	EVA
Back Cover	Composite sheet
Cell Technology	Polycrystalline
Cell Size	156 mm × 156 mm (6 in × 6 in)
Number of Cells (Pieces)	72 (6 × 12)
Junction Box	Protection class IP67 with bypass-diode
Output Cables	Solar cable: 4 mm²; length 1200 mm (47.2 in)

System Design

Operating Temperature	− 40 °F to 185 °F
Hail Safety Impact Velocity	25 mm at 23 m/s
Fire Safety Classification (IEC 61730)	Class C
Static Load Wind / Snow	2400 Pa / 5400 Pa

Packaging and Storage

Storage Temperature	− 40 °F to 185 °F
Packaging Configuration	20 pieces per pallet
Loading Capacity (40 ft. HQ Container)	440 pieces

Hanwha Solar

INVERTERS

SolarEdge Single Phase Inverters

for North America

SE3000H-US / SE3800H-US / SE5000H-US / SE6000H-US / SE7600H-US

Optimized installation with HD-Wave technology

- Specifically designed to work with power optimizers
- Record-breaking efficiency
- Fixed voltage inverter for longer strings
- Integrated Arc Fault protection and Rapid Shutdown for NEC 2014 and 2017, per article 690.11 and 690.12
- UL1741 SA certified, for CPUC Rule 21 grid compliance
- Extremely small and easy to install outdoors or indoors
- High reliability without any electrolytic capacitors
- Built-in module-level monitoring
- Optional: Revenue grade data, ANSI C12.20 Class 0.5 (0.5% accuracy)

Single Phase Inverters for North America

SE3000H-US / SE3800H-US / SE5000H-US / SE6000H-US/ SE7600H-US

	SE3000H-US	SE3800H-US	SE5000H-US	SE6000H-US	SE7600H-US	
OUTPUT						
Rated AC Power Output	3000	3800	5000	6000	7600	VA
Max. AC Power Output	3000	3800	5000	6000	7600	VA
AC Output Voltage Min.-Nom.-Max. (183 - 208 - 229)	-	-	✓	-	-	Vac
AC Output Voltage Min.-Nom.-Max. (211 - 240 - 264)	✓	✓	✓	✓	✓	Vac
AC Frequency (Nominal)	59.3 - 60 - 60.5[1]					Hz
Maximum Continuous Output Current 208V	-	-	24	-	-	A
Maximum Continuous Output Current 240V	12.5	16	21	25	32	A
GFDI Threshold	1					A
Utility Monitoring, Islanding Protection, Country Configurable Thresholds	Yes					
INPUT						
Maximum DC Power	4650	5900	7750	9300	11800	W
Transformer-less, Ungrounded	Yes					
Maximum Input Voltage	480					Vdc
Nominal DC Input Voltage	380				400	Vdc
Maximum Input Current 208V [2]	-	-	13.5	-	-	Adc
Maximum Input Current 240V [2]	8.5	10.5	13.5	16.5	20	Adc
Max. Input Short Circuit Current	45					Adc
Reverse-Polarity Protection	Yes					
Ground-Fault Isolation Detection	600kΩ Sensitivity					
Maximum Inverter Efficiency	99	99.2				%
CEC Weighted Efficiency	99					%
Nighttime Power Consumption	< 2.5					W
ADDITIONAL FEATURES						
Supported Communication Interfaces	RS485, Ethernet, ZigBee (optional), Cellular (optional)					
Revenue Grade Data, ANSI C12.20	Optional[3]					
Rapid Shutdown - NEC 2014 and 2017 690.12	Automatic Rapid Shutdown upon AC Grid Disconnect					
STANDARD COMPLIANCE						
Safety	UL1741, UL1741 SA, UL1699B, CSA C22.2, Canadian AFCI according to T.I.L. M-07					
Grid Connection Standards	IEEE1547, Rule 21, Rule 14 (HI)					
Emissions	FCC Part 15 Class B					
INSTALLATION SPECIFICATIONS						
AC Output Conduit Size / AWG Range	0.75-1" Conduit / 14-6 AWG					
DC Input Conduit Size / # of Strings / AWG Range	0.75-1" Conduit /1-2 strings / 14-6 AWG					
Dimensions with Safety Switch (HxWxD)	17.7 x 14.6 x 6.8 / 450 x 370 x 174					in / mm
Weight with Safety Switch	22 / 10		25.1 / 11.4	26.2 / 11.9		lb / kg
Noise	< 25				< 50	dBA
Cooling	Natural Convection				Natural convection and internal fan (user replaceable)	
Operating Temperature Range	-13 to +140 / -25 to +60[4] (-40˚F / -40˚C option)[5]					˚F / ˚C
Protection Rating	NEMA 3R (Inverter with Safety Switch)					

[1] For other regional settings please contact SolarEdge support
[2] A higher current source may be used; the inverter will limit its input current to the values stated
[3] Revenue grade inverter P/N: SExxxxH-US000NNC2
[4] Power de-rating from 50˚C
[5] -40 version P/N: SExxxxH-US000NNU4

RoHS

SolarEdge Power Optimizer

Module Add-On For North America

P300 / P320 / P400 / P405

POWER OPTIMIZER

PV power optimization at the module-level

- Up to 25% more energy
- Superior efficiency (99.5%)
- Mitigates all types of module mismatch losses, from manufacturing tolerance to partial shading
- Flexible system design for maximum space utilization
- Fast installation with a single bolt
- Next generation maintenance with module-level monitoring
- Module-level voltage shutdown for installer and firefighter safety

SolarEdge Power Optimizer

Module Add-On for North America

P300 / P320 / P400 / P405

	P300 (for 60-cell modules)	P320 (for high-power 60-cell modules)	P400 (for 72 & 96-cell modules)	P405 (for thin film modules)	
INPUT					
Rated Input DC Power[1]	300	320	400	405	W
Absolute Maximum Input Voltage (Voc at lowest temperature)	48		80	125	Vdc
MPPT Operating Range	8 - 48		8 - 80	12.5 - 105	Vdc
Maximum Short Circuit Current (Isc)	10	11	10.1		Adc
Maximum DC Input Current	12.5	13.75	12.63		Adc
Maximum Efficiency	99.5				%
Weighted Efficiency	98.8				%
Overvoltage Category	II				
OUTPUT DURING OPERATION (POWER OPTIMIZER CONNECTED TO OPERATING SOLAREDGE INVERTER)					
Maximum Output Current	15				Adc
Maximum Output Voltage	60			85	Vdc
OUTPUT DURING STANDBY (POWER OPTIMIZER DISCONNECTED FROM SOLAREDGE INVERTER OR SOLAREDGE INVERTER OFF)					
Safety Output Voltage per Power Optimizer	1				Vdc
STANDARD COMPLIANCE					
EMC	FCC Part15 Class B, IEC61000-6-2, IEC61000-6-3				
Safety	IEC62109-1 (class II safety), UL1741				
RoHS	Yes				
INSTALLATION SPECIFICATIONS					
Maximum Allowed System Voltage	1000				Vdc
Compatible inverters	All SolarEdge Single Phase and Three Phase inverters				
Dimensions (W x L x H)	128 x 152 x 27.5 / 5 x 5.97 x 1.08		128 x 152 x 35 / 5 x 5.97 x 1.37	128 x 152 x 50 / 5 x 5.97 x 1.96	mm / in
Weight (including cables)	760 / 1.7		830 / 1.8	1064 / 2.3	gr / lb
Input Connector	MC4 Compatible				
Output Wire Type / Connector	Double Insulated; MC4 Compatible				
Output Wire Length	0.95 / 3.0		1.2 / 3.9		m / ft
Operating Temperature Range	-40 - +85 / -40 - +185				˚C / ˚F
Protection Rating	IP68 / NEMA6P				
Relative Humidity	0 - 100				%

[1] Rated STC power of the module. Module of up to +5% power tolerance allowed.

PV SYSTEM DESIGN USING A SOLAREDGE INVERTER[2]	SINGLE PHASE	THREE PHASE 208V	THREE PHASE 480V	
Minimum String Length (Power Optimizers)	8	10	18	
Maximum String Length (Power Optimizers)	25	25	50	
Maximum Power per String	5250	6000	12750	W
Parallel Strings of Different Lengths or Orientations	Yes			

[2] It is not allowed to mix P405 with P300/P400/P600/P700 in one string.

Technical White Paper

SolarEdge Single Phase Inverter System Design and the National Electrical Code

June 2015

Revision 1.5

John Berdner

General Manager for North America

SolarEdge Technologies, Inc.

Safety Features

Ground Fault Protection The SolarEdge system includes ground fault detection as referenced by Article 690.5 and required by 690.35 (C). Because the array circuit conductors are ungrounded, only the requirements of Article 690.35 (C) (1), (2) and (3) apply. Each power optimizer monitors its connected modules and communicates any detected fault to the inverter. The inverter monitors the conductors between the power optimizers and the inverter. In response to a ground fault the inverter will cease to export power, shut down the power optimizers to isolate the faulted circuit, and indicate the ground fault on the inverter's display. The location of the ground fault is also flagged in the web-based monitoring software and, optionally, an email notification of the fault can be generated.

Safety Voltage The SolarEdge system includes a special safety voltage mode that greatly reduces electrocution hazards for installers and emergency response personnel. During installation and commissioning of the system the output voltage of each power optimizer is automatically limited to approximately 1 Vdc. Since the maximum number of power optimizers is limited to 25 or less the maximum safety voltage of the system is limited to approximately 25 Vdc, which is below the UL wet location shock hazard limit of 30 Vdc.

The inverter input circuit voltage (equal to the sum of all power optimizer ouput voltages) only increases to the normal operating voltage when connected to a properly operating inverter. The system automatically reverts to safety voltage mode, i.e. 1 Vdc per power optimizer, should the inverter experience any fault condition, be disconnected from the grid, or if the power optimizers are disconnected from the inverter.

Conductor Routing Single conductor cables in exposed outdoor locations within the PV array are permitted by NEC Article 690.31 (B). Article 690 Section IV, requires all DC conductors to be contained in a metallic raceway once they penetrate a building. In addition, beginning with the 2011 code, these raceways must be run along structural members, must be labeled with "Photovoltaic Power Source" every 10 feet, and on every section that is separated by enclosures, walls, partitions, ceilings or floors. The DC raceway must be at least 10 inches below the roof sheathing where it is not immediately below the PV array. Note that a type MC metal clad cable also meets the raceway requirement.

Grounding

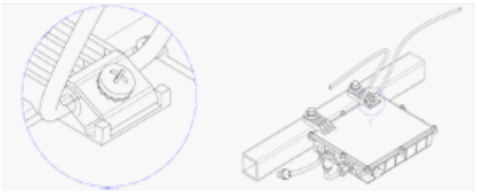
The SolarEdge system utilizes ungrounded PV arrays as allowed under NEC Article 690.35. Because the array is ungrounded, the requirements of 690.42 and 690.47 are not applicable and no main system bonding conductors or DC grounding electrode conductors are required. The inverter and power optimizers must each be supplied only with an equipment ground as required by Article 690.43. The equipment grounding conductors should be sized and installed in accordance with the requirements of Articles 690.45(A), 690.46 and 250.122.

Power Optimizers Where the output of the power optimizers is protected by an over current device, the array equipment grounding conductors should be sized based on the size of the overcurrent device. Since no over current protective devices are required in a typical SolarEdge system, the equipment grounding conductors should be sized based on the maximum power optimizer output current of 15 Amps. NEC 690.45(A) would yield a minimum equipment grounding conductor size of 14 AWG copper, but 120(C) may require a larger size.

Equipment grounding of power optimizers can be accomplished using one of two methods as outlined in the SolarEdge installation manual.

1) Power optimizers are typically bolted directly to a metallic support structure and can be grounded through that support structure using stainless steel star washers between the power optimizer and the support structure. The star washers supplied with the power optimizers have been evaluated and listed as a grounding means in accordance with the requirements of NEC Article 690.43(C).

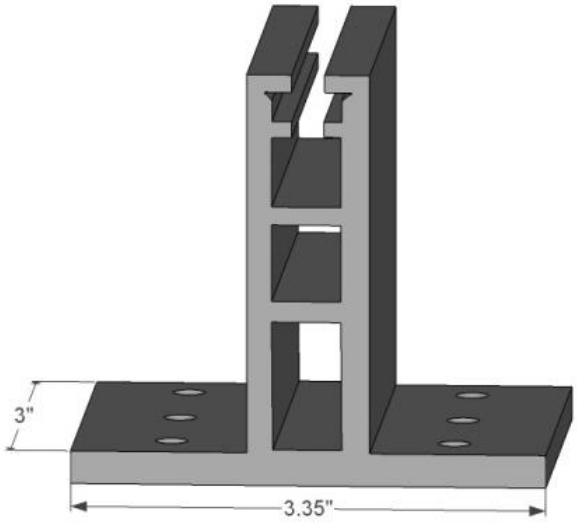
2) When mounted to metallic structures using sliding nuts, or to non-metallic structures, a separate equipment grounding conductor is required. The power optimizers include separate supplementary grounding hardware for this purpose.

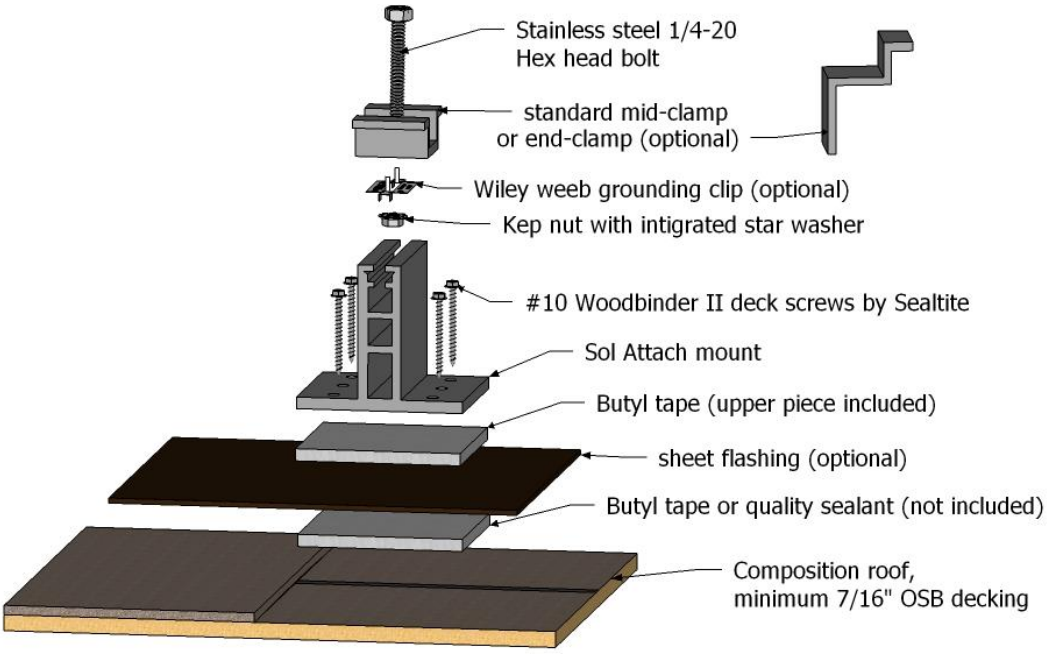


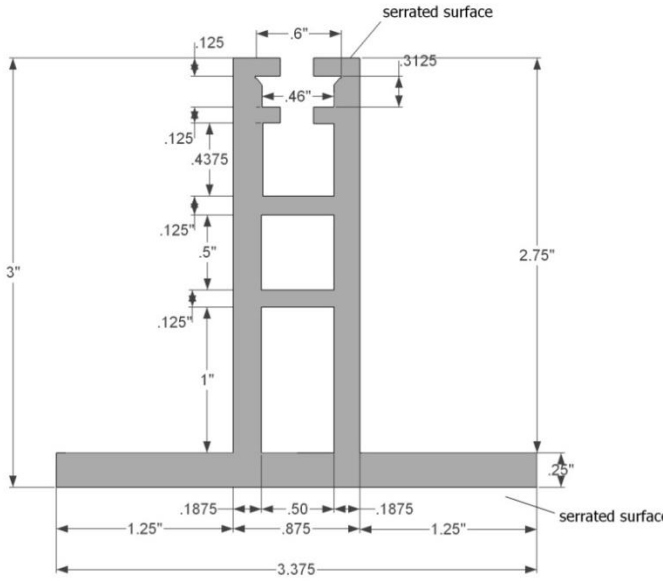
Inverters The AC output equipment grounding conductor for the inverter is required in accordance with Article 690.43(C) and Article 250.122. The size of the equipment grounding conductor is based on the size of the AC overcurrent device protecting the AC output circuit connected to the inverter. The minimum allowable size of the AC overcurrent device should be sized based on the continuous output current of the inverter * 1.25. The maximum size of the AC overcurrent device for each inverter is specified in the inverter documentation.

For additional information concerning the installation of SolarEdge equipment please refer to the installation manuals and white papers supplied with the equipment or on the SolarEdge website www.solaredge.com.

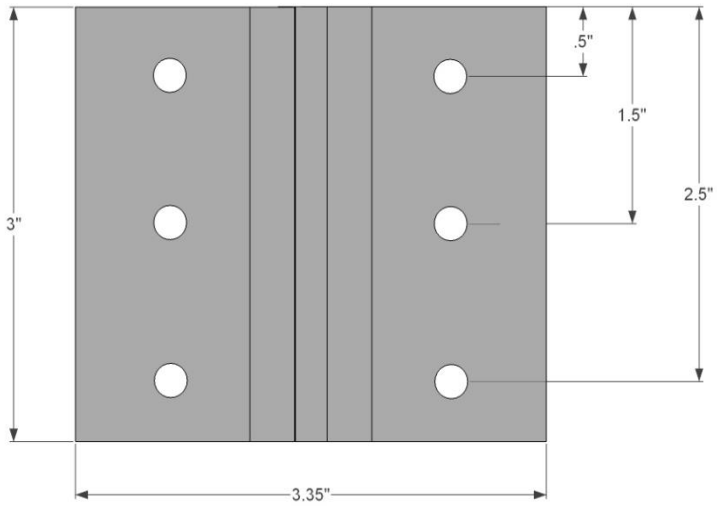
Sol Attach, LLC
Composition roof mounting foot
Extrusions made of 6061-T6 alloy
Patent Pending







Front View

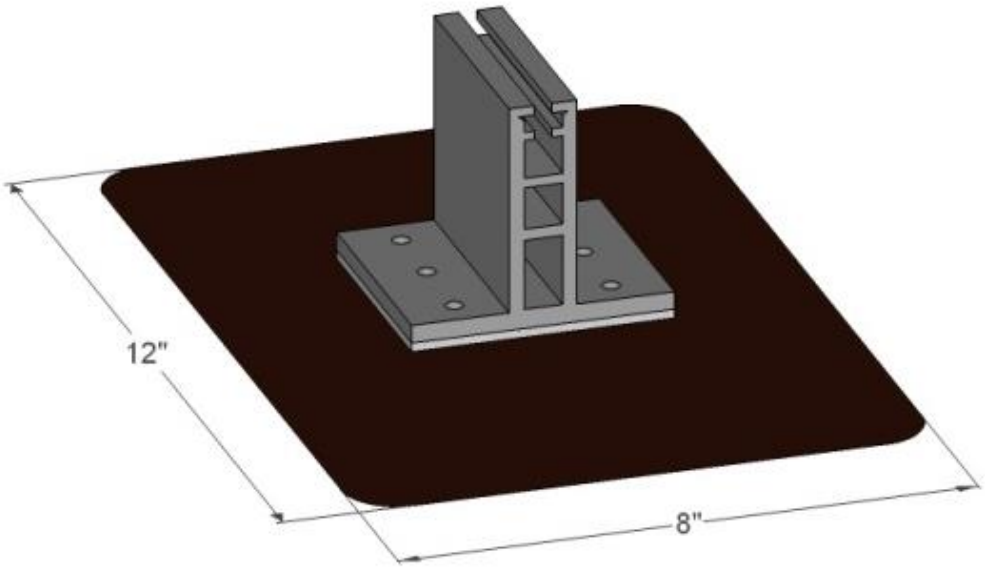


Top View

Weights:

Each single mount	6.6 oz
One mount with 4 deck screws and butyl tape	8.6 oz
One mount with screws, butyl, and mid-clamp	10.1 oz
One mount with screws, butyl, mid-clamp, and flashing	12.6 oz

Flat flashing



May 22, 2014

Sol Attach, LLC
Attn: Kevin Stapleton
16238 Bear Run
San Antonio, TX 78247

ANCHOR ENGINEERING, INC.
www.anchoreng.com
Texas Registered Engineering Firm #1979

Re: Solar Mounting System for Pitched Rooftops with Sol Attach Roof Mounting System in **Texas**

To Whom It May Concern:

Anchor Engineering, Inc. has reviewed the Sol Attach Roof Mounting System for the design assumptions outlined below and we have concluded that the Sol Attach Roof Mounting System is in compliance with the following codes/standards.

1. ASCE 7-05 – Minimum Design Loads for Buildings and Other Structures, by ASCE/SEI, 2005.
2. ASCE 7-10 – Minimum Design Loads for Buildings and Other Structures, by ASCE/SEI, 2010.
3. 2006 IBC/ 2009 IBC/ 2012 IBC, by International Code Council, 2006/2009/2012.
4. 2006 IRC/ 2009 IRC/ 2012 IRC, by International Code Council, 2006/2009/2012.

Design Assumptions:

- Maximum mean roof height of no more than 30'-0" as defined by ASCE 7-05/ASCE 7-10.
- Importance Factor of no more than 1.0 as defined by ASCE 7-05/ASCE 7-10.
- Dry service conditions.
- Array may be located within roof zones 1, 2, or 3.
- Analysis of the mount is based upon the maximum effects of either the largest gravity loads or wind uplift loads. The point loads (either positive or negative) can act in either direction depending upon the type of loading (i.e. wind, snow…etc.).
- Fasteners installed per manufacturer specifications.
- When using the Sol Attach, four PV mounts per PV module such that adjacent modules share two PV mounts.
- Use two Sol Attach per side unless noted otherwise (See charts below).
- At end clamp locations the Sol Attach Mount is only activated by one half of the panel.
- Snow load = 5 psf.

Product Specifications:

- Aluminum alloy is 6061-T6.
- Kwikseal II Woodbinder Screws. The screws must penetrate the sheathing fully and have a minimum of three threads exposed.
- (3) screws per Sol Attach Mount at end clamp locations.

Module Specifications:

- Modules may be installed in landscape or portrait orientation.
- Modules may have a maximum short side dimension of 39.1".
- Modules may have a maximum long side dimension of 77.1".
- Modules may be a maximum of 59.5lb.

ANCHOR ENGINEERING, INC.
www.anchoreng.com

Roof Pitch: 7-27°			
Wind Speed, (V_{ult})	Wind Speed, (V_{asd})	Exposure	Fastener Req'd per Sol Attach w/ 7/16" OSB
155 mph ≥ x	120 mph ≥ x	C	(6) Screws
155 mph ≥ x > 148 mph	120 mph ≥ x > 115 mph	B	(6) Screws
148 mph ≥ x	115 mph ≥ x	B	(4) Screws

Roof Pitch: 27-45°			
Wind Speed, (V_{ult})	Wind Speed, (V_{asd})	Exposure	Fastener Req'd per Sol Attach w/ 7/16" OSB
155 mph ≥ x >	120 mph ≥ x	B, C	(4) Screws

Module Specifications:

- Modules may be installed in landscape or portrait orientation.
- Modules may have a maximum short side dimension of 39.1".
- Modules may have a maximum long side dimension of 77.1".
- Modules may be a maximum of 59.5lb.

Please see attached data sheets for the Sol Attach Roof Mounting System specification sheet.

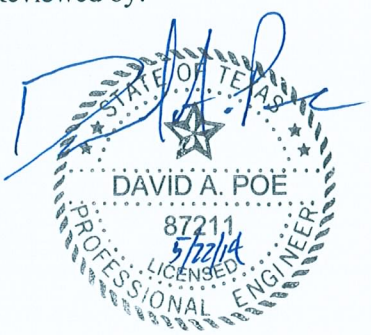
The Sol Attach Roof Mounting System was evaluated for pull-out resistance of the fasteners and punching shear in the OSB. Review of any building structural element is outside the scope of this letter.

Should questions arise, or if further information is required, please contact our office.

Sincerely,
Anchor Engineering, Inc.

Dustin C. Stallings, E.I.
Design Engineer I

Reviewed by:



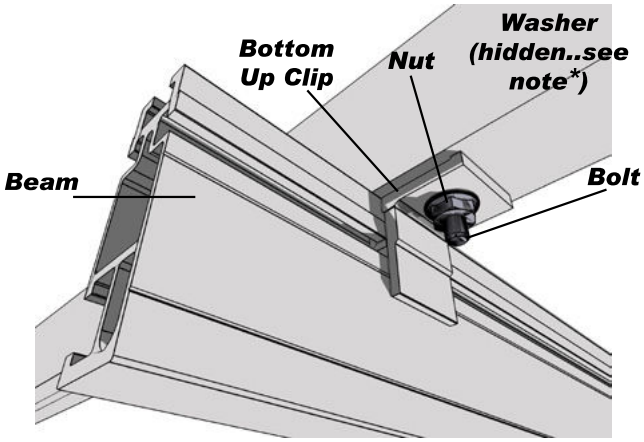
David A. Poe, P.E., S.E.
Principal Engineer

SOLARMOUNT Technical Datasheet

Pub 130817

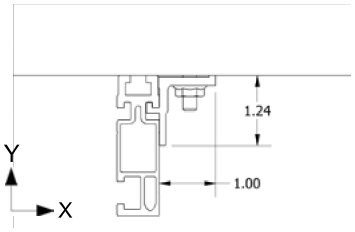
SOLARMOUNT Module Connection Hardware

SOLARMOUNT Bottom Up Module Clip
Part No. 302000C



- **Bottom Up Clip material:** One of the following extruded aluminum alloys: 6005-T5, 6105-T5, 6061-T6
- **Ultimate tensile:** 38ksi, Yield: 35 ksi
- **Finish:** Clear Anodized
- **Bottom Up Clip weight:** ~0.031 lbs (14g)
- Allowable and design loads are valid when components are assembled with SOLARMOUNT series beams according to authorized UNIRAC documents
- Assemble with one ¼"-20 ASTM F593 bolt, one ¼"-20 ASTM F594 serrated flange nut, and one ¼" flat washer
- Use anti-seize and tighten to 10 ft-lbs of torque
- Resistance factors and safety factors are determined according to part 1 section 9 of the 2005 Aluminum Design Manual and third-party test results from an IAS accredited laboratory
- Module edge must be fully supported by the beam

* **NOTE ON WASHER:** Install washer on bolt head side of assembly. **DO NOT** install washer under serrated flange nut

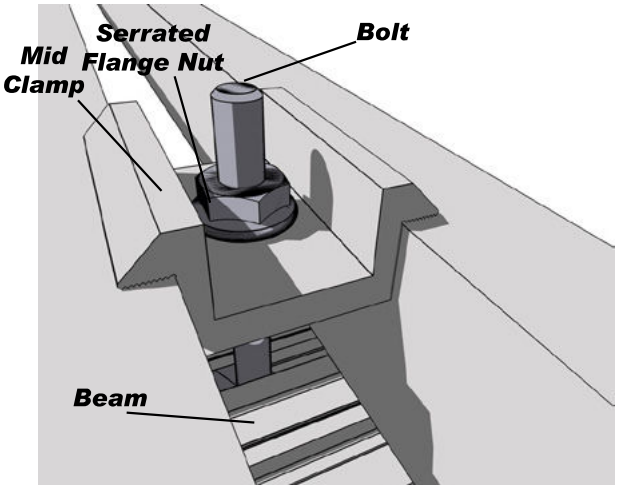


Applied Load Direction	Average Ultimate lbs (N)	Allowable Load lbs (N)	Safety Factor, FS	Design Load lbs (N)	Resistance Factor, Φ
Tension, Y+	1566 (6967)	686 (3052)	2.28	1038 (4615)	0.662
Transverse, X±	1128 (5019)	329 (1463)	3.43	497 (2213)	0.441
Sliding, Z±	66 (292)	27 (119)	2.44	41 (181)	0.619

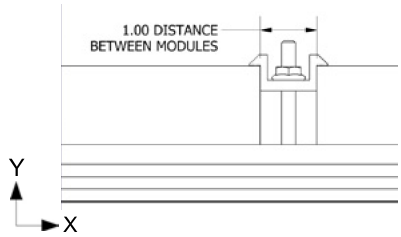
Dimensions specified in inches unless noted

SOLARMOUNT Mid Clamp

Part No. 302101C, 302101D, 302103C, 302104D, 302105D, 302106D



- **Mid clamp material:** One of the following extruded aluminum alloys: 6005-T5, 6105-T5, 6061-T6
- **Ultimate tensile:** 38ksi, Yield: 35 ksi
- **Finish:** Clear or Dark Anodized
- **Mid clamp weight:** 0.050 lbs (23g)
- Allowable and design loads are valid when components are assembled according to authorized UNIRAC documents
- Values represent the allowable and design load capacity of a single mid clamp assembly when used with a SOLARMOUNT series beam to retain a module in the direction indicated
- Assemble mid clamp with one Unirac ¼"-20 T-bolt and one ¼"-20 ASTM F594 serrated flange nut
- Use anti-seize and tighten to 10 ft-lbs of torque
- Resistance factors and safety factors are determined according to part 1 section 9 of the 2005 Aluminum Design Manual and third-party test results from an IAS accredited laboratory

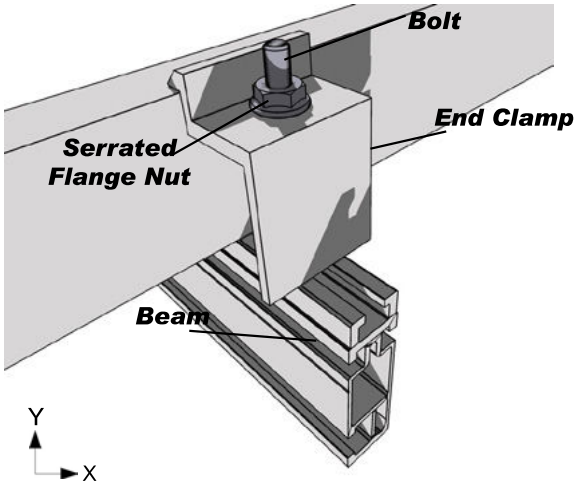


Applied Load Direction	Average Ultimate lbs (N)	Allowable Load lbs (N)	Safety Factor, FS	Design Load lbs (N)	Resistance Factor, Φ
Tension, Y+	2020 (8987)	891 (3963)	2.27	1348 (5994)	0.667
Transverse, Z±	520 (2313)	229 (1017)	2.27	346 (1539)	0.665
Sliding, X±	1194 (5312)	490 (2179)	2.44	741 (3295)	0.620

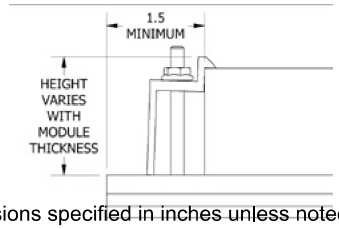
Dimensions specified in inches unless noted

SOLARMOUNT End Clamp

Part No. 302001C, 302002C, 302002D, 302003C, 302003D, 302004C, 302004D, 302005C, 302005D, 302006C, 302006D, 302007D, 302008C, 302008D, 302009C, 302009D, 302010C, 302011C, 302012C



- **End clamp material:** One of the following extruded aluminum alloys: 6005-T5, 6105-T5, 6061-T6
- **Ultimate tensile:** 38ksi, Yield: 35 ksi
- **Finish:** Clear or Dark Anodized
- **End clamp weight:** varies based on height: ~0.058 lbs (26g)
- Allowable and design loads are valid when components are assembled according to authorized UNIRAC documents
- Values represent the allowable and design load capacity of a single end clamp assembly when used with a SOLARMOUNT series beam to retain a module in the direction indicated
- Assemble with one Unirac ¼"-20 T-bolt and one ¼"-20 ASTM F594 serrated flange nut
- Use anti-seize and tighten to 10 ft-lbs of torque
- Resistance factors and safety factors are determined according to part 1 section 9 of the 2005 Aluminum Design Manual and third-party test results from an IAS accredited laboratory
- Modules must be installed at least 1.5 in from either end of a beam

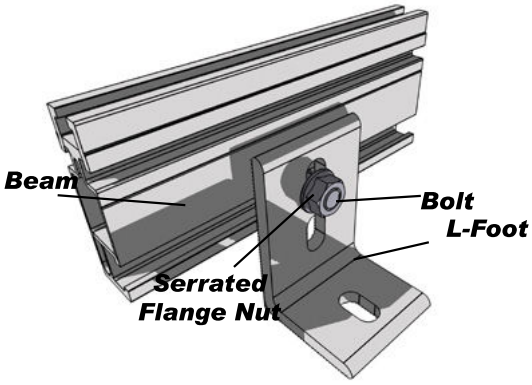


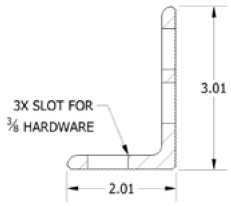
Applied Load Direction	Average Ultimate lbs (N)	Allowable Load lbs (N)	Safety Factor, FS	Design Loads lbs (N)	Resistance Factor, Φ
Tension, Y+	1321 (5876)	529 (2352)	2.50	800 (3557)	0.605
Transverse, Z±	63 (279)	14 (61)	4.58	21 (92)	0.330
Sliding, X±	142 (630)	52 (231)	2.72	79 (349)	0.555

Dimensions specified in inches unless noted

SOLARMOUNT Beam Connection Hardware

SOLARMOUNT L-Foot
Part No. 304000C, 304000D





Dimensions specified in inches unless noted

- **L-Foot material:** One of the following extruded aluminum alloys: 6005-T5, 6105-T5, 6061-T6
- **Ultimate tensile:** 38ksi, Yield: 35 ksi
- **Finish:** Clear or Dark Anodized
- **L-Foot weight:** 0.215 lbs (98g)
- Allowable and design loads are valid when components are assembled with SOLARMOUNT series beams according to authorized UNIRAC documents
- **For the beam to L-Foot connection:**
  - Assemble with one ASTM F593 ⅜"-16 hex head screw and one ASTM F594 ⅜"serrated flange nut
  - Use anti-seize and tighten to 30 ft-lbs of torque
- Resistance factors and safety factors are determined according to part 1 section 9 of the 2005 Aluminum Design Manual and third-party test results from an IAS accredited laboratory

NOTE: Loads are given for the L-Foot to beam connection only; be sure to check load limits for standoff, lag screw, or other attachment method

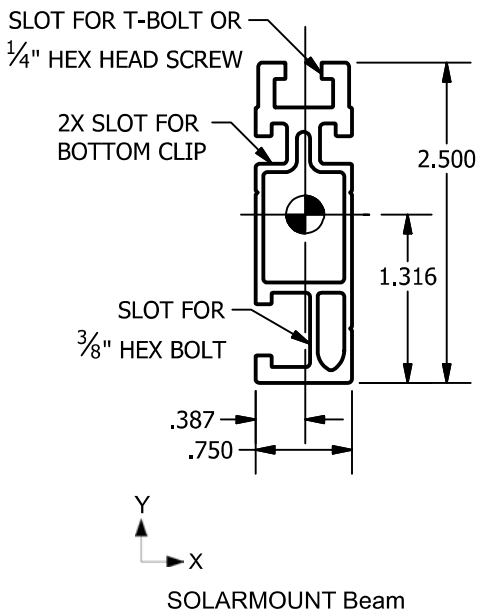
Applied Load Direction	Average Ultimate lbs (N)	Allowable Load lbs (N)	Safety Factor, FS	Design Load lbs (N)	Resistance Factor, Φ
Sliding, Z±	1766 (7856)	755 (3356)	2.34	1141 (5077)	0.646
Tension, Y+	1859 (8269)	707 (3144)	2.63	1069 (4755)	0.575
Compression, Y-	3258 (14492)	1325 (5893)	2.46	2004 (8913)	0.615
Traverse, X±	486 (2162)	213 (949)	2.28	323 (1436)	0.664

SOLARMOUNT Beams

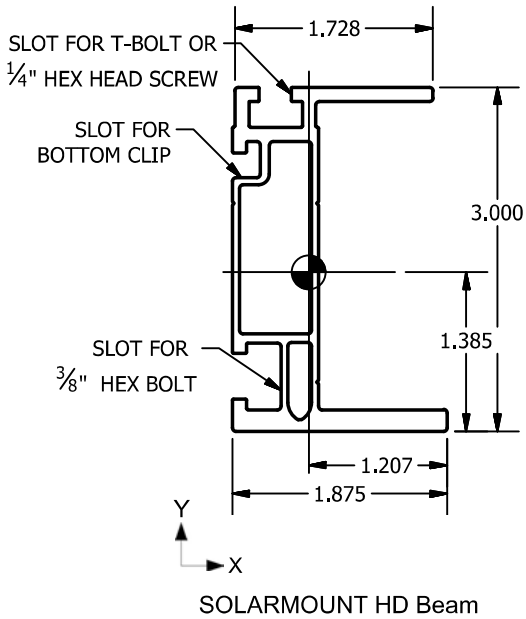
Part No. 310132C, 310132C-B, 310168C, 310168C-B, 310168D 310208C, 310208C-B, 310240C, 310240C-B, 310240D, 410144M, 410168M, 410204M, 410240M

Properties	Units	SOLARMOUNT	SOLARMOUNT HD
Beam Height	in	2.5	3.0
Approximate Weight (per linear ft)	plf	0.811	1.271
Total Cross Sectional Area	in^2	0.676	1.059
Section Modulus (X-Axis)	in^3	0.353	0.898
Section Modulus (Y-Axis)	in^3	0.113	0.221
Moment of Inertia (X-Axis)	in^4	0.464	1.450
Moment of Inertia (Y-Axis)	in^4	0.044	0.267
Radius of Gyration (X-Axis)	in	0.289	1.170
Radius of Gyration (Y-Axis)	in	0.254	0.502

** Rails are extruded using these aluminum alloys: 6005-T5, 6105-T5, 6061-T6*



SOLARMOUNT Beam



SOLARMOUNT HD Beam

Dimensions specified in inches unless noted