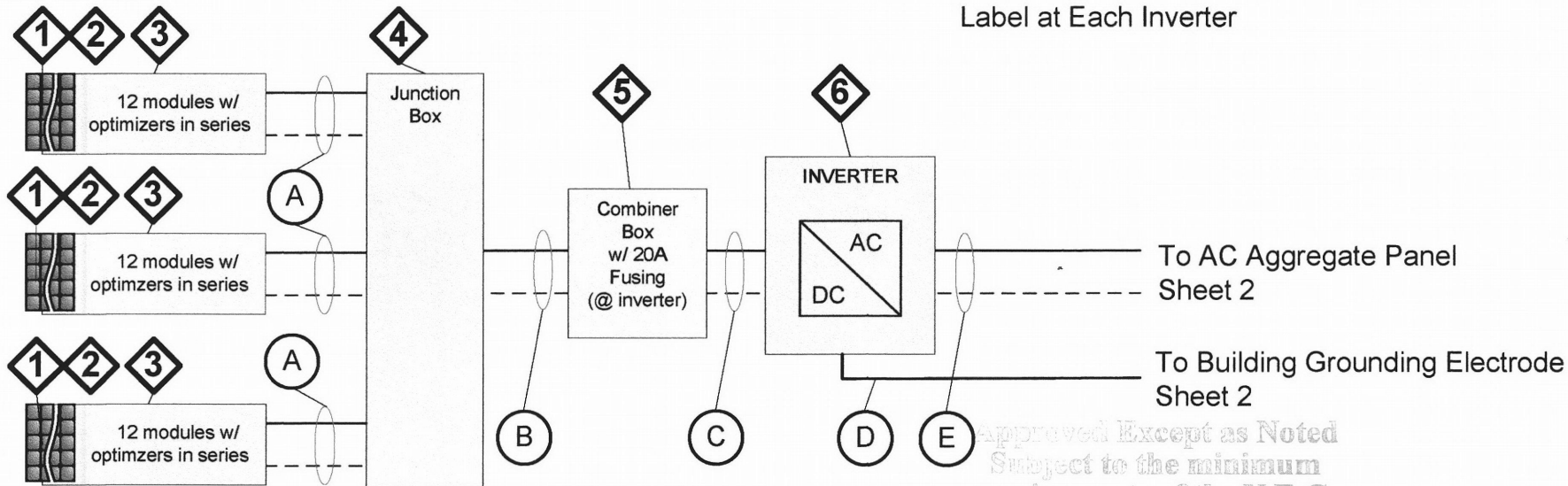


System Information			
PV Module Ratings		Inverter Ratings	
Module Make	SolarWorld	Inverter Make	SolarEdge
Module Model	SW 345XL Mono	Inverter Model	SE11400A-US
Max Power	= 345 W	Max. Output Power	= 12000 W
Open Circuit Voltage	= 47.8 V	Max. DC Voltage	= 500 V
Max Power Point Voltage	= 38.2 V	Normal AC Voltage	= 240 V
Short Circuit Current	= 9.75 A	Max. AC Current	= 47.5 A
Max Power Point Current	= 9.10 A	CEC Inverter Efficiency	= 97.5%

Labels	
Photovoltaic DC Disconnect	
Rated MPP Current	= 34.5 A
Rated MPP Voltage	= 350 V
Max. System Voltage	= 500 V
Max. System Current	= 45.0 A
Photovoltaic AC Disconnect	
AC Output Current	= 47.5 A
Nominal AC Voltage	= 240 V

ENERGY Solutions

P.O. Box 887
Beavercreek, Oregon 97004
Phone: 503-680-3718



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EQUIPMENT SCHEDULE			
REF	DESCRIPTION	PN	NOTES
1	SOLAR PV MODULE	SW 345XL MONO	SOLARWORLD SUNMODULE XL 345W MONO
2	PV MODULE OPTIMIZER	P400	SOLAREGE 400W PV MODULE OPTIMIZER
3	ARRAY MOUNTING HARDWARE	TBD	GROUND MOUNT RACKING SYSTEM
4	JUNCTION BOX	TBD	FOR TRANSITION FROM PV WIRE TO CONDUCTORS IN CONDUIT
5	COMBINER BOX	TBD	DUAL FUSE, 3-CIRCUIT FUSED COMBINER BOX, 20A FUSING
6	AC/DC INVERTER	SE11400A-US	SOLAREGE 11.4KW INVERTER W/ DC DISCONNECT

CONDUIT & CONDUCTOR SCHEDULE					
REF	DESCRIP. / CONDUCTOR TYPE	CONDUCTOR GAUGE	NUMBER OF CONDUCTORS	CONDUIT TYPE	CONDUIT SIZE
A	PV-WIRE & BARE GROUND	#12 / #6	2 / 1	IN FREE AIR	
B	THWN	#8 / #10	6 / 1	EMT	1-1/4"
C	THWN-2	#6 / #10	2 / 1	EMT	3/4"
D	BARE GROUND	#6	1	IN FREE AIR	
E	THWN-2	#6 / #8	3 / 1	EMT	1"

- Notes:
- There are 4 copies of this sub-system
 - Equipment, conductors and conduit as listed or equivalent.
 - Expected nominal string voltage: 350Vdc.

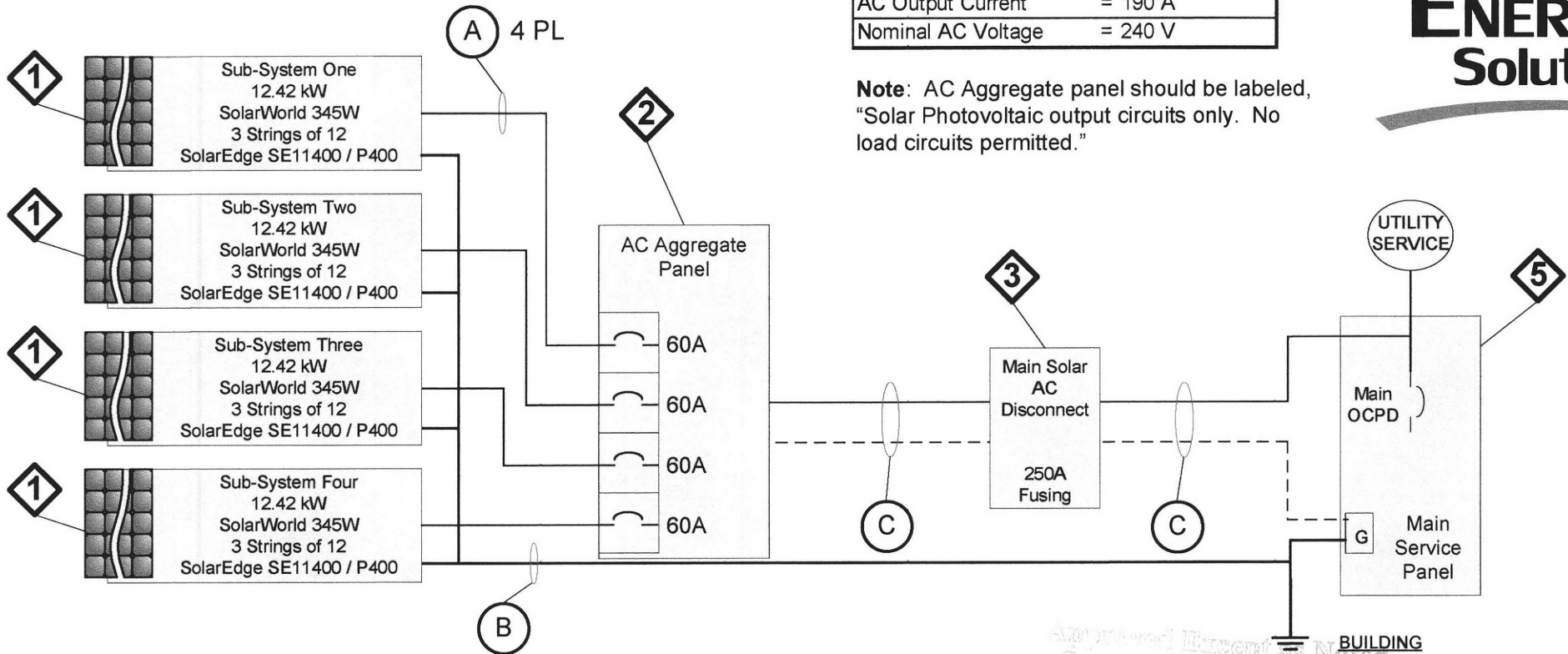
ONE-LINE STANDARD ELECTRICAL DIAGRAM
PROJECT REF: West Hayden Island Moorage
SITE ADDRESS: 2630 North Hayden Island Dr, Portland, OR 97217
SUB-SYSTEM SIZE: 12.42 kW
3 Strings of 12 Modules / Optimizers (Solarworld 345W / SolarEdge P400)
Sheet 1 of 4
Date: May 17, 2017

NOT TO SCALE

M. 106877 ET

Label	
Main Solar AC Disconnect	
AC Output Current	= 190 A
Nominal AC Voltage	= 240 V

Note: AC Aggregate panel should be labeled, "Solar Photovoltaic output circuits only. No load circuits permitted."



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 of the City of Portland

- Notes:
- Equipment, conductors and conduit as listed or equivalent.

EQUIPMENT SCHEDULE			
REF	DESCRIPTION	PN	NOTES
1	SOLAR PV SUB-SYSTEM	N/A	12.42 KW SUB-SYSTEM, SEE SHEET 1
2	AC AGGREGATE PANEL	TBD	240VAC, 250A MAIN-BUS ONLY LOAD CENTER, WITH (4) 60A, 240V, 2-POLE CIRCUIT BREAKERS (BACK-FED)
3	MAIN SOLAR AC DISCONNECT	D225NRB	SQUARE D, SAFETY SWITCH, 240V, 400A, 2-POLE, 250A FUSING
4	SERVICE PANEL	N/A	240V - 320 AMPS

CONDUIT & CONDUCTOR SCHEDULE					
REF	DESCRIP. / CONDUCTOR TYPE	CONDUCTOR GAUGE	NUMBER OF CONDUCTORS	CONDUIT TYPE	CONDUIT SIZE
A	THWN-2	#6 / #8	3 / 1	EMT	1"
B	BARE GROUND	#6	1	IN FREE AIR	
C	THWN-2	250kcmil / #4	3 / 1	EMT	2-1/2"

BLC
6/30/17

ONE-LINE STANDARD ELECTRICAL DIAGRAM	
PROJECT REF: West Hayden Island Mborage	
SITE ADDRESS: 2630 North Hayden Island Dr, Portland, OR 97217	
SYSTEM SIZE: 49.68 kW	
12 Strings of 12 Modules / Optimizers (Canadian Solar 345W / SolarEdge P400)	
Sheet 2 of 4 Date: May 17, 2017	

NOT TO SCALE

PEARSON FLD

Elev.	High Temp		Distance above roof			Extreme
	0.4%	2% Avg.	0.5"	3.5"	12"	Min
8 m	37 °C	32 °C	54 °C	49 °C	46 °C	-7 °C

Correction Temperatures

$\Delta T_{cold} = -7^{\circ}C - 25^{\circ}C = -32^{\circ}C$ $\Delta T_{hot} = (37^{\circ}C + 35^{\circ}C) - 25^{\circ}C = 47^{\circ}C$
 Flush Roof Mount

Module Voltage Calculations

SolarWorld 345 XL Mono
 $V_{oc} = 47.8V$ $V_{mp} = 38.2V$ $V_{oc} \text{ Temp Coefficient} = -0.304\%/^{\circ}C$
 $I_{sc} = 9.75A$ $I_{mp} = 9.10A$ $P_{max} \text{ Temp Coefficient} = -0.43\%/^{\circ}C$

Cold $V_{oc} = 47.8V + (47.8V \times -0.304\%/^{\circ}C \times -32^{\circ}C) = 47.8V + 4.65V = \mathbf{52.4V}$
 Hot $V_{mp} = 38.2V + (38.2V \times -0.43\%/^{\circ}C \times 47^{\circ}C) = 38.2V - 7.72V = \mathbf{30.5V}$

SolarEdge P400 Optimizer Maximum Power per String: 5250W
 Max Input DC Power: 400W Max Input DC Voltage: 80V
 MPPT Operating Range: 8-80V Max Input Isc Current: 10A
 Maximum DC Output: 15A Min/Max Input String Length: 8/25

SolarEdge SE11400A-US Inverter
 Max DC Input (V): 500V Max DC Input (A): 34.5A
 Nominal DC Input: 350V
 Output voltage: 240Vac Max Output current: 47.5A

String Sizing

12 x 345W = 4140W

Label Calculations

MPPT DC Current:
 $345W \times 36 \div 350V = 35.5A \leftarrow$ Limited to 34.5A by the inverter

Conductor Ampacity, OCPD & Disconnects

Optimizer Output Circuit:
 $15A \times 125\% = 18.8A$ (continuous duty)
 $18.8A \div 1.00 = 18.8A$ (PV Wire in free air)
 #12 AWG (rated for 35A into 75°C terminals in free air)
 $18.8A + 0.76 + 0.8 = 30.9A$ (conditions of use – conduit fill and temp)
 #10 AWG (rated for 35A into 75°C terminals)
 #8 AWG may be required on long PV String conductor runs to minimize voltage drop – confirm lengths and voltage drop on-site.
 20A Fusing on both PV+ and PV- conductors in a combiner box located adjacent to the inverter.

DC Disconnect function integral to inverter. Provides disconnecting means for servicing fuses in the combiner box located adjacent to the inverter.

DC Combiner Box Output Circuit:
 $3 \times 15A \times 125\% = 56.3A$
 #6 AWG (rated for 65A into 75°C terminals)

Conductor Ampacity, OCPD & Disconnects (continued)

Inverter Output Circuit:
 $47.5A \times 125\% = 59.4A$
 #6 AWG (rated for 65A into 75°C terminals and required OCPD)
 60A, 240V, 2-Pole Back-Fed Circuit Breaker in the AC Aggregate Panel.

Circuit Breakers serve as disconnecting means for the adjacent inverters.

AC Aggregate Panel Output Circuit:
 $47.5A \times 4 \times 125\% = 238A$
 250kcmil (rated for 255A into 75°C terminals and required OCPD)
 400A, 240V, 2-Pole, Fused AC Disconnect, with 250A fusing

Voltage Drop calculations:

PV Nominal String Voltage: 350Vdc
 PV MPPT String Current: $345W \times 12 \div 350V = 11.8A$
 DC conductor run is 240 ft (estimated worst case – NOT CONFIRMED)
 DC Voltage Drop
 $(2 \times 240ft \times 11.8A \times 0.778\Omega/kft \times 100) / (1000ft/kft \times 350V) = 1.26\%$

DC Combiner Output:
 PV MPPT Current: 34.5A max inverter limit
 DC conductor run is 5 ft (estimated)
 DC Voltage Drop
 $(2 \times 5ft \times 34.5A \times 0.491\Omega/kft \times 100) / (1000ft/kft \times 350V) = 0.05\%$

Inverter Output is 240Vac, 47.5A
 AC conductor run is 15 ft (estimated worst case)
 AC Voltage Drop
 $(2 \times 15ft \times 47.5A \times 0.491\Omega/kft \times 100) / (1000ft/kft \times 240V) = 0.29\%$

AC Aggregate Panel Output is 240Vac, 190A
 AC conductor run is 85 ft (estimated)
 AC Voltage Drop
 $(2 \times 85ft \times 190A \times 0.0515\Omega/kft \times 100) / (1000ft/kft \times 240V) = 0.69\%$

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ENERGY Solutions

P.O. Box 887
 Beavercreek, Oregon 97004
 Phone: 503-680-3718

ELECTRICAL CALCULATIONS

PROJECT REF: West Hayden Island Morage

SITE ADDRESS: 2630 North Hayden Island Dr,
 Portland, OR 97217

SYSTEM SIZE: 49.68 kW

12 Strings of 12 Modules / Optimizers (Canadian
 Solar 345W / SolarEdge P400)

Sheet 3 of 4
 Date: May 17, 2017

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Beavercreek, Oregon 97004
Phone: 503-680-3718

Notes:

- Existing electrical service feed to be upgraded from 15kVA to 50kVA single-phase transformer.
- Ampacity calculations from array to dc combiner box based on 6 current-carrying conductors per conduit.
- Each PV String lands on a set of fuses in a DC Combiner Box located adjacent to the service. DC Disconnect on the inverter serves as disconnecting means for those fuses.
- Circuit Breakers in AC Aggregate Panel serve as disconnecting means for the adjacent inverters.
- Distances for voltage drop calculations are estimates based on measurements taken from satellite imagery. Voltage drop calculations should be verified on-site using actual conductor run lengths.
- PV strings with shorter conductor runs may be downsized to a #10 AWG conductor.
- If parallel conductors are preferred for the AC Aggregate Panel Output Circuit, parallel #1/0 AWG CU conductors in a single 2-1/2" EMT should be used.
- Interconnection to the main service via a line-side tap in the main service panel to the supply conductors. Complies with 705.12.
- Conductor sizing listed is minimum required based on NEC ampacity calculations for CU conductors, unless otherwise noted.
- PV System to be installed and labeled per National Electric Code.
Specifically:
 - 690.4(D) - 690.31(B)
 - 690.5(C) - 690.35(C) and (F)
 - 690.13(B) - 690.5(C)
 - 690.17(E) - 705.12(D)
- Inverter listed to UL-1741 for grid-interactive use and GFDI protection.
- All equipment used UL listed.
- All equipment, conductors and conduit as listed or equivalent.

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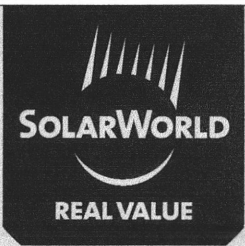
DESIGN / BUILD NOTES

PROJECT REF: West Hayden Island Moorage
SITE ADDRESS: 2630 North Hayden Island Dr,
Portland, OR 97217
SYSTEM SIZE: 49.68 kW
12 Strings of 12 Modules / Optimizers (Canadian
Solar 345W / SolarEdge P400)

Sheet 4 of 4
Date: May 17, 2017

Sunmodule®

SW 340-350 XL MONO



TUV Power controlled:
Lowest measuring tolerance in industry



Every component is tested to meet
3 times IEC requirements



Designed to withstand heavy
accumulations of snow and ice



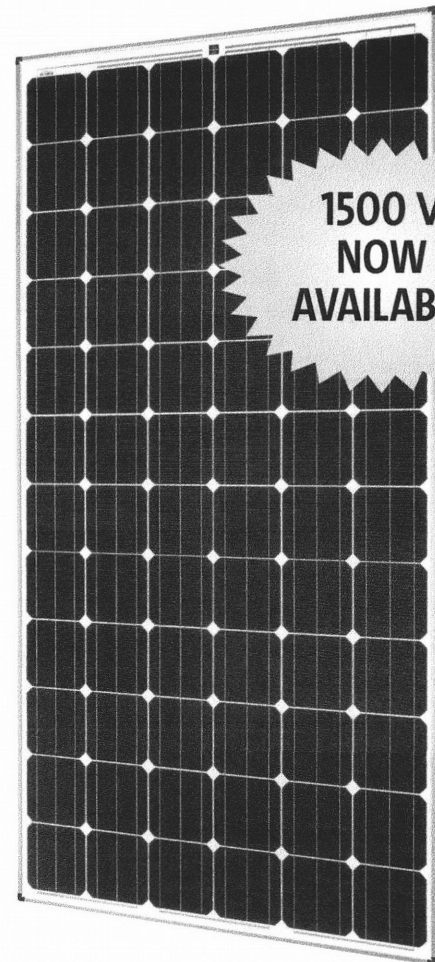
Available with either 1000 V or 1500 V
maximum voltage rating



25-year linear performance warranty
and 10-year product warranty



Glass with anti-reflective coating



World-class quality

Fully-automated production lines and seamless monitoring of the process and material ensure the quality that the company sets as its benchmark for its sites worldwide.

SolarWorld Plus-Sorting

Plus-Sorting guarantees highest system efficiency. SolarWorld only delivers modules that have greater than or equal to the nameplate rated power.

25-year linear performance guarantee and extension of product warranty to 10 years

SolarWorld guarantees a maximum performance digression of 0.7% p.a. in the course of 25 years, a significant added value compared to the two-phase warranties common in the industry, along with our industry-first 10-year product warranty.*

*in accordance with the applicable SolarWorld Limited Warranty at purchase.
www.solarworld.com/warranty



- Qualified, IEC 61215
- Safety tested, IEC 61730
- Blowing sand resistance, IEC 60068-2-68
- Ammonia resistance, IEC 62716
- Salt mist corrosion, IEC 61701
- Periodic inspection

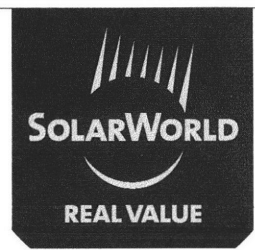


- Periodic inspection
- Power controlled



Sunmodule®

SW 340-350 XL MONO



PERFORMANCE UNDER STANDARD TEST CONDITIONS (STC)*

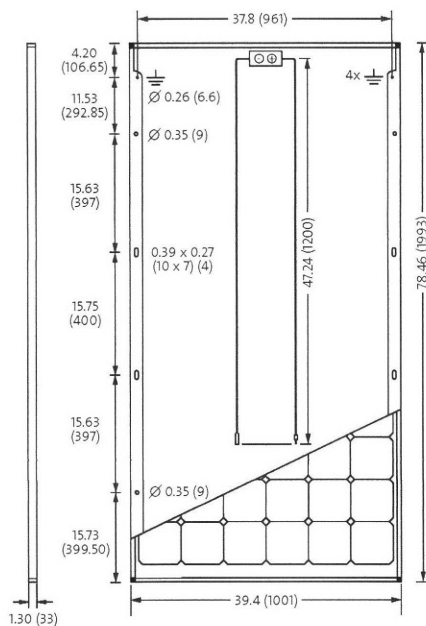
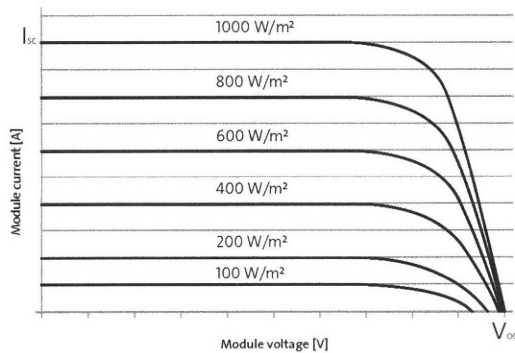
		SW 340	SW 345	SW 350
Maximum power	P_{max}	340 Wp	345 Wp	350 Wp
Open circuit voltage	V_{oc}	47.6 V	47.8 V	48.0 V
Maximum power point voltage	V_{mpp}	38.0 V	38.2 V	38.4 V
Short circuit current	I_{sc}	9.69 A	9.75 A	9.82 A
Maximum power point current	I_{mpp}	9.01 A	9.10 A	9.17 A
Module efficiency	η_m	17.04 %	17.29 %	17.54 %

*STC: 1000W/m², 25°C, AM 1.5

PERFORMANCE AT 800 W/M², NOCT, AM 1.5

		SW 340	SW 345	SW 350
Maximum power	P_{max}	259.3 Wp	263.8 Wp	267.2 Wp
Open circuit voltage	V_{oc}	41.5 V	41.8 V	42.0 V
Maximum power point voltage	V_{mpp}	34.9 V	35.2 V	35.4 V
Short circuit current	I_{sc}	8.05 A	8.10 A	8.16 A
Maximum power point current	I_{mpp}	7.42 A	7.50 A	7.56 A

Minor reduction in efficiency under partial load conditions at 25° C: at 200 W/m², 100% of the STC efficiency (1000 W/m²) is achieved.



All units provided are imperial. SI units provided in parentheses.
SolarWorld AG reserves the right to make specification changes without notice.

COMPONENT MATERIALS

Cells per module	72	Front	Low-iron tempered glass with ARC (EN 12150)
Cell type	Monocrystalline	Frame	Clear anodized aluminum
Cell dimensions	6.17 in x 6.17 in (156.75 x 156.75 mm)	Weight	47.6 lbs (21.6 kg)

THERMAL CHARACTERISTICS

NOCT	46 °C
TCI_{sc}	0.042 % / °C
TCV_{oc}	-0.304 % / °C
TCP_{mpp}	-0.43 % / °C
Operating temp	-40 to +85 °C

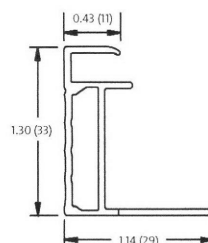
ADDITIONAL DATA

Power sorting	-0 Wp/+5 Wp
J-Box	IP65
Connector	PV wire per UL4703 with H4/UTX connectors
Module fire performance	(UL 1703) Type 1

PARAMETERS FOR OPTIMAL SYSTEM INTEGRATION

Maximum system voltage NEC	1000 V or 1500 V - Specify when ordering
Maximum system voltage SC II	1000 V
Maximum reverse current	25 A
Number of bypass diodes	3
Design loads*	Two rail system 113 psf downward, 64 psf upward
Design loads*	Edge mounting 178 psf downward, 23 psf upward

* Please refer to the Sunmodule installation instructions for the details associated with these load cases.



- Compatible with both "Top-Down" and "Bottom" mounting methods
- Grounding Locations:
 - 4 locations along the length of the module in the extended flange.

SW-01-7540US-I 1500V 160419



SolarEdge Single Phase Inverters

For North America

SE3000A-US / SE3800A-US / SE5000A-US / SE6000A-US /
SE7600A-US / SE10000A-US / SE11400A-US

INVERTERS



The best choice for SolarEdge enabled systems

- Integrated arc fault protection (Type 1) for NEC 2011 690.11 compliance
- Superior efficiency (98%)
- Small, lightweight and easy to install on provided bracket
- Built-in module-level monitoring
- Internet connection through Ethernet or Wireless
- Outdoor and indoor installation
- Fixed voltage inverter, DC/AC conversion only
- Pre-assembled Safety Switch for faster installation
- Optional – revenue grade data, ANSI C12.1



Single Phase Inverters for North America

SE3000A-US / SE3800A-US / SE5000A-US / SE6000A-US /
SE7600A-US / SE10000A-US / SE11400A-US

	SE3000A-US	SE3800A-US	SE5000A-US	SE6000A-US	SE7600A-US	SE10000A-US	SE11400A-US	
OUTPUT								
Nominal AC Power Output	3000	3800	5000	6000	7600	9980 @ 208V 10000 @ 240V	11400	VA
Max. AC Power Output	3300	4150	5400 @ 208V 5450 @ 240V	6000	8350	10800 @ 208V 10950 @ 240V	12000	VA
AC Output Voltage Min.-Nom.-Max. ⁽¹⁾ 183 - 208 - 229 Vac	-	-	✓	-	-	✓	-	
AC Output Voltage Min.-Nom.-Max. ⁽¹⁾ 211 - 240 - 264 Vac	✓	✓	✓	✓	✓	✓	✓	
AC Frequency Min.-Nom.-Max. ⁽¹⁾	59.3 - 60 - 60.5 (with HI country setting 57 - 60 - 60.5)							Hz
Max. Continuous Output Current	12.5	16	24 @ 208V 21 @ 240V	25	32	48 @ 208V 42 @ 240V	47.5	A
GFDI Threshold	1							A
Utility Monitoring, Islanding Protection, Country Configurable Thresholds	Yes							Yes
INPUT								
Maximum DC Power (STC)	4050	5100	6750	8100	10250	13500	15350	W
Transformer-less, Ungrounded	Yes							
Max. Input Voltage	500							Vdc
Nom. DC Input Voltage	325 @ 208V / 350 @ 240V							Vdc
Max. Input Current ⁽²⁾	9.5	13	16.5 @ 208V 15.5 @ 240V	18	23	33 @ 208V 30.5 @ 240V	34.5	Adc
Max. Input Short Circuit Current	45							Adc
Reverse-Polarity Protection	Yes							
Ground-Fault Isolation Detection	600ka Sensitivity							
Maximum Inverter Efficiency	97.7	98.2	98.3	98.3	98	98	98	%
CEC Weighted Efficiency	97.5	98	97.5 @ 208V 98 @ 240V	97.5	97.5	97 @ 208V 97.5 @ 240V	97.5	%
Nighttime Power Consumption	< 2.5					< 4		W
ADDITIONAL FEATURES								
Supported Communication Interfaces	RS485, RS232, Ethernet, ZigBee (optional)							
Revenue Grade Data, ANSI C12.1	Optional ⁽³⁾							
Rapid Shutdown – NEC 2014 690.12	Functionality enabled when SolarEdge rapid shutdown kit is installed ⁽⁴⁾							
STANDARD COMPLIANCE								
Safety	UL1741, UL1699B, UL1998, CSA 22.2							
Grid Connection Standards	IEEE1547							
Emissions	FCC part15 class B							
INSTALLATION SPECIFICATIONS								
AC output conduit size / AWG range	3/4" minimum / 16-6 AWG					3/4" minimum / 8-3 AWG		
DC input conduit size / # of strings / AWG range	3/4" minimum / 1-2 strings / 16-6 AWG					3/4" minimum / 1-2 strings / 14-6 AWG		
Dimensions with Safety Switch (HxWxD)	30.5 x 12.5 x 7.2 / 775 x 315 x 184					30.5 x 12.5 x 10.5 / 775 x 315 x 260		
Weight with Safety Switch	51.2 / 23.2		54.7 / 24.7			88.4 / 40.1		in / mm lb / kg
Cooling	Natural Convection				Natural convection and internal fan (user replaceable)	Fans (user replaceable)		
Noise	< 25					< 50		
Min.-Max. Operating Temperature Range	-13 to +140 / -25 to +60 (-40 to +60 version available ⁽⁵⁾)							"F / °C
Protection Rating	NEMA 3R							

⁽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: SExxxxA-US000NRR2 (for 7600W inverter:SE7600A-US002NRR2).

⁽⁴⁾ Rapid shutdown kit P/N: SE1000-RSD-S1.

⁽⁵⁾ -40 version P/N: SExxxxA-US000NNU4 (for 7600W inverter:SE7600A-US002NNU4).



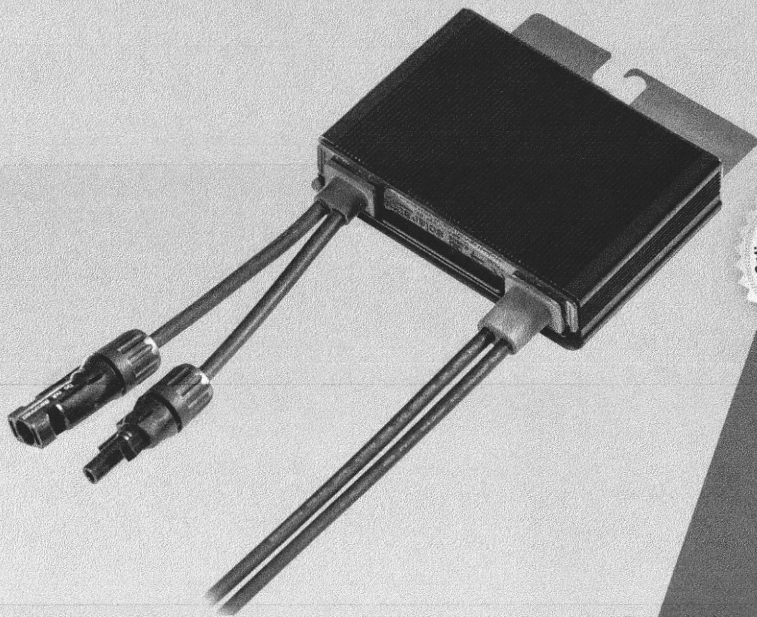
RoHS

solaredge

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		Adc
Maximum DC Input Current	12.5	13.75	12.5		Adc
Maximum Efficiency	99.5				%
Weighted Efficiency	98.8				%
Overvoltage Category	II				
OUTPUT DURING OPERATION (POWER OPTIMIZER CONNECTED TO OPERATING SOLAREEDGE INVERTER)					
Maximum Output Current	15				Adc
Maximum Output Voltage	60		85		Vdc
OUTPUT DURING STANDBY (POWER OPTIMIZER DISCONNECTED FROM SOLAREEDGE INVERTER OR SOLAREEDGE 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 48 / 5 x 5.97 x 1.89	mm / in
Weight (including cables)	770 / 1.7		930 / 2.05	930 / 2.05	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 SOLAREEDGE 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.



SUNMOD 

Ez Mount L Foot

for Shingle Roofs



***The Next Generation
in Flashed Mounts for Shingle Roofs!***

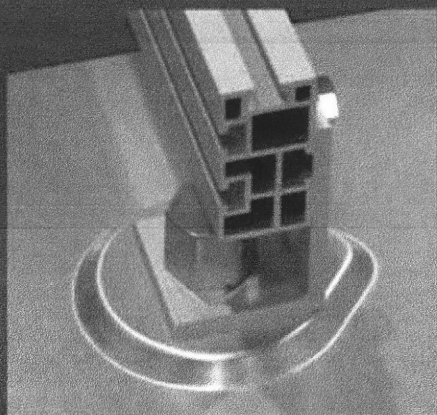
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Phone: 360-844-0048 www.sunmodo.com

Ez Roof Mount . . . Engineered and Designed for easy installation.

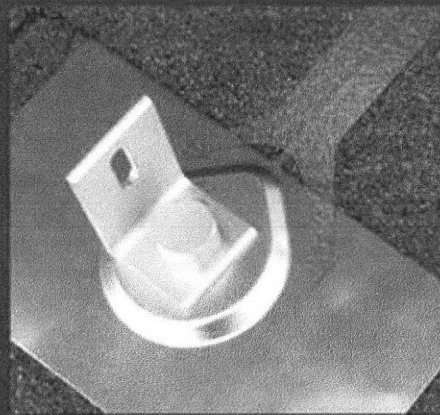
Our roof mounting system is water tight and durable for any composite/shake roof!



Serrated L Foot allows for rail mounting on either side.



Versatile aluminum base for multiple configurations.

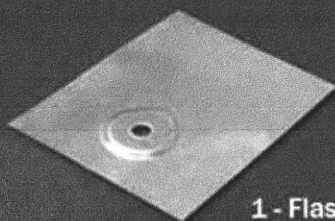


Flashing designed to redirect water flow.

Ez Mount L-Foot Kit for Shingle Roofs

Kit# K10068-001

All kits come complete with the following parts:



1 - Flashing
Part# A20052-001



1 - Al Shoe
Part# A20065-001



1 - Hex Cap
Part# A20066-001



1 - Ez L Foot
Part# A20064-001

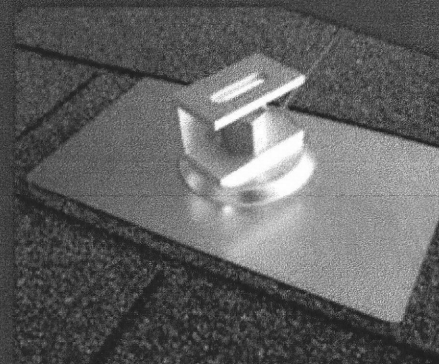


1 - Lag Bolt SS 5/16 x 4
Part# B15015-002



1 - Bolt 3/8 - 16 x 3/4"
1 - Flange Nut 3/8"

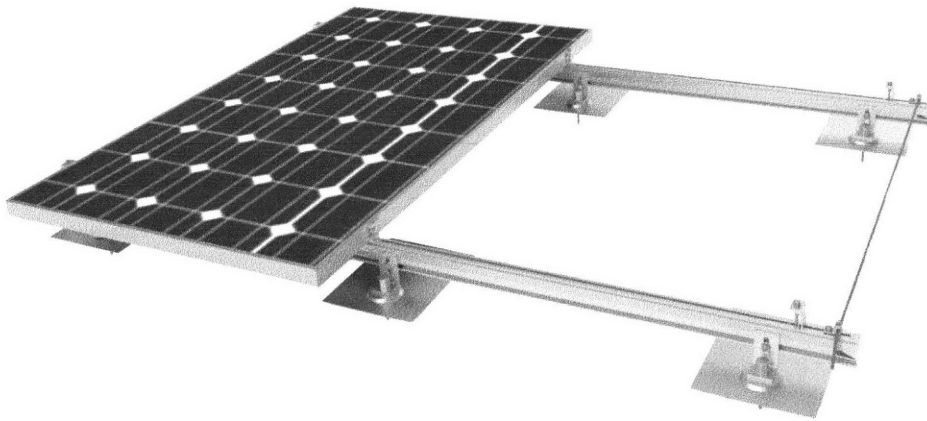
Also available:



1905 E 5th St., Ste. A
Vancouver, WA 98661

Phone: 360-844-0048 www.sunmodo.com

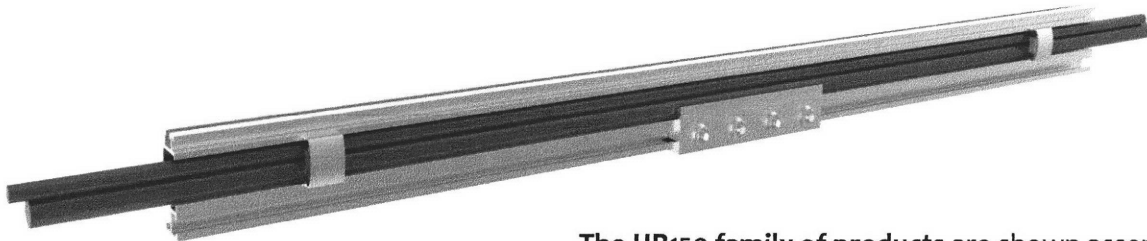
HR150 RAIL PRODUCT INTRODUCTION



Conceal unsightly wires with the proper cable management solutions from SunModo.

The Helio Rail Family has a new member, SunModo is happy to introduce the HR150 open profile rail system. Using this open profile rail system you find the right solution to manage your PV cables. The HR150 PV cable management system maintains NEC compliance and eliminates the risk of using wire ties.

Cabling in PV installations is often organized using simple cable ties. These ties are highly susceptible to corrossions caused by weather conditions over time and require frequent maintenance and replacement. This is not the case with cable management options offered by the HR150.

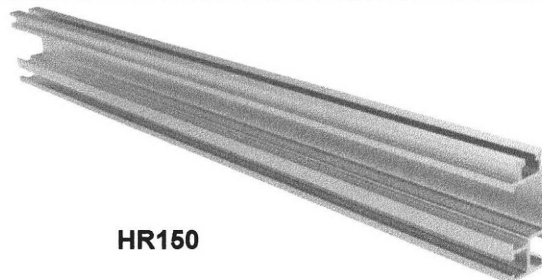
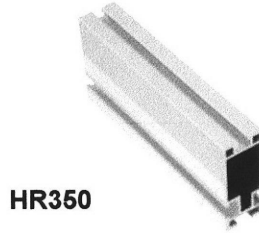
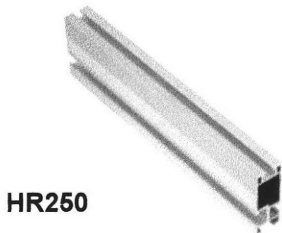


The HR150 family of products are shown assembled above. Two HR150 Rails are spliced together with an HR150 Rail Splice. PV electrical wires are shown routed in the channels of the HR150 Rails, retained with two Wire Covers snapped into place.

Quick and straightforward mounting without the need for tools reduces costs when it comes to the installation of cable ducts.

Helio Rails

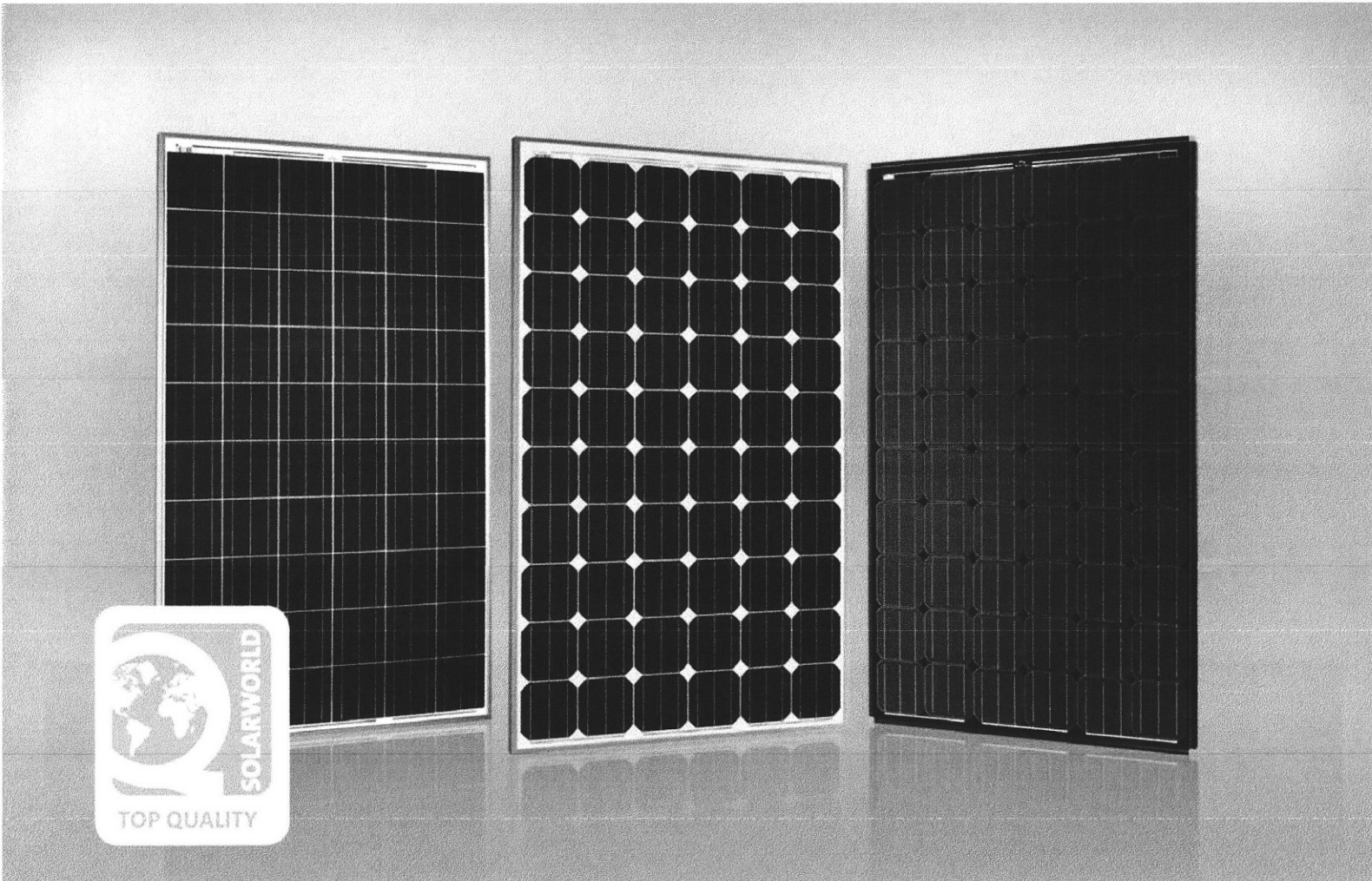
All rails feature both 1/4" and 3/8" side slots, and 1/4" top slot for clamping PV panels and are available in clear and black. Please reference to our catalog for stock lengths.



Rail Selection

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

Load		Rail Span					
SNOW (PSF)	WIND (MPH)	4 ft	5 ft	6 ft	8 ft	10 ft	12 ft
None	100						
	120						
	140						
	150						
	160						
20	175	HR150	HR250		HR350	HR500	
	100						
	120						
	140						
	150						
40	160						
	175						
	100						
	120						
	140						
50-70	150						
	160						
	175						
	100						
	120						
80-90	140						
	150						
	160						
	175						
	100						



07/2012

Sunmodule Plus SW xxx poly
Sunmodule Plus SW xxx mono (black)

DANGER!

⚠ Electric shock

The connection of two or more modules in series results in the accumulation of voltage and imposes danger. Do not insert electrically conductive parts into connectors! Do not attach solar modules and wiring with wet connectors! Make sure to work with dry tools and under dry working conditions!

⚠ Work on live parts

When working on wiring, use and wear protective equipment (insulated tools, insulated gloves, etc.)!

WARNING!

⚠ Arcing

Modules generate direct current (DC) when exposed to light. When breaking a closed circuit, a dangerous arc may be generated. Do not cut any live wires.

⚠ Safe installation

Do not carry out installation work in strong winds. Secure yourself and other persons against falling. Secure work materials against dropping. Ensure a safe working environment so as to prevent accidents.

⚠ Fire protection/explosion protection

Modules must not be installed in the vicinity of highly flammable gases, vapors or dusts (e.g. filling stations, gas tanks, paint spraying equipment). The safety instructions for other system components must also be followed. Make sure to comply with local standards, building regulations and accident prevention regulations during installation. For roof installation, modules must be mounted on a fire-resistant base material.

ATTENTION

Do not use damaged modules. Do not dismantle modules. Do not remove any parts or nameplates fitted by the manufacturer. Do not apply paint or adhesives to the module, nor work on it with sharp objects.

Unpacking and intermediate storage

Do not use the junction box as a handle. Do not place modules roughly on hard floor or on their corners. Do not place modules on top of each other. Do not step or stand on modules. Do not place any objects on modules. Do not work on modules with sharp objects; store modules in a dry place.

Grounding of module and frame

We recommend ensuring the functional grounding of the module metal frame. If an exterior lightning protection system is already provided, the PV system has to be integrated into the protection concept against direct lightning stroke. Local standards shall be observed.

Grounding in the US and Canada

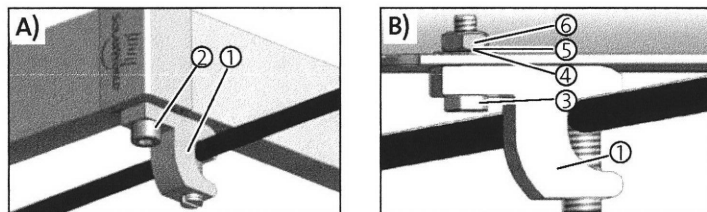
The modules can be connected to the grounding holes using a lay-in lug. The lug can be fixed:

- A) at the module corner by using a socket head cap screw, or
- B) at the hole provided in the flange by using a screw with a serrated washer, a washer and a nut.

Any grounding method and components listed according to NEC requirements are also acceptable in the US and Canada.

Table: Recommended components for grounding in the US and Canada

Item	Manufacturer/Description	Tightening torque
Lay-In lug ①	IlSCO GBL-4DB (E34440)	35 lbf-in, 4-6 AWG str 25 lbf-in, 8 AWG str 20 lbf-in, 10-14 AWG sol/str
Socket head cap screw ②	10-24, 5/8", SS 18-8	62 lbf-in (7.0 Nm)
Bolt ③	#6-32, SS	25 in-lbs (2.9 Nm)
Serrated washer ④	M5, SS	
Washer ⑤	ID 9/64", OD 3/8", SS	
Nut ⑥	#6-32, SS	



Underwriters Laboratories Information (U.S. and Canada)

For the electrical ratings please refer to the datasheet. The fire rating of this module is valid only when mounted in the manner specified in the mechanical mounting instructions. The module is considered to be in compliance with UL 1703 only when the module is mounted in the manner specified by the mounting instructions below. A module with exposed conductive parts is considered to be in compliance with UL 1703 only when it is electrically grounded in accordance with the instructions presented below and the requirements of the National Electrical Code. Where common grounding hardware (nuts, bolts, star washers, split-ring lock washers, flat washers and the like) is used to attach a listed grounding/bonding device, the attachment must be made in conformance with the grounding device manufacturer's instructions. Common hardware items such as nuts, bolts, star washers, lock washers and the like have not been evaluated for electrical conductivity or for use as grounding devices and should be used only for maintaining mechanical connections and holding electrical grounding devices in the proper position for electrical conductivity. Such devices, where supplied with the module and evaluated through the requirements in UL 1703, may be used for ground-

ing connections in accordance with the instructions provided with the module. The electrical characteristics are within ± 10 percent of the indicated values of ISC, VOC, and Pmax under standard test conditions (irradiance of 100 mW/cm², AM 1.5 spectrum, and a cell temperature of 25°C (77°F)). Under normal conditions, a photovoltaic module is likely to experience conditions that produce more current and/or voltage than reported at standard test conditions. The requirements of the National Electrical Code (NEC) in Article 690-8 shall be followed to address these increased outputs. In installations not under the requirements of the NEC, the values of ISC and VOC marked on this module should be multiplied by a factor of 1.25 when determining component voltage ratings, conductor ampacities, overcurrent device ratings, and size of controls connected to the PV output. To reduce the operating temperature the module has to be mounted on any surface with a minimum distance of 4 inches (10 cm).

In Canada the installation shall be in accordance with CSA C22.1, Safety Standard for Electrical Installations, Canadian Electrical Code, Part 1.

Suitable ambient conditions

The module is intended for use in moderate climatic conditions. Artificially concentrated sunlight shall not be directed on the module or panel. The module must neither be immersed in water nor be exposed to continuous wetting (e.g. by fountains). Exposure to salt or sulfur (sulfur sources, volcanoes) implies a risk of corrosion. The module must not be used for maritime (e.g. boats) or automotive (vehicles) purposes. The module must not be exposed to extraordinary chemical loads (e.g. emissions from manufacturing plants). If the modules are installed on stables, a distance of 1 m to ventilation openings shall be ensured; apart from this, the modules shall not be used as a direct roof panel on stables.

Appropriate installation situation

Make sure that the module meets the technical requirements of the overall system. Other system components should not exert any adverse mechanical or electrical influences on the module. Modules may bend under high loads. For this reason, sharp-edged fixing elements or other sharp objects (e.g. cable ties on mounting sections) must not be mounted near the module back side. For modules connected in series, only modules of the same amperage rating may be used together. For modules connected in parallel, modules with the same voltage ranges must be used together. The modules must not be operated at a higher voltage than the permissible system voltage. The inside opening of the frame corner element is intended for water drainage and must not be blocked. For system documentation, please note the serial numbers.

Optimum installation

In order to avoid performance losses, all modules connected in series should be arranged with the same orientation and tilt angle. The modules should be installed in an all-season shadow-free area. Even partial shadowing results in yield losses and is to be avoided. Ventilation of the module back side will prevent heat build-up adversely affecting performance.

Mounting

The modules must be securely fixed at a minimum of 4 locations on the substructure. Fixing is only allowed in designated areas or at the provided mounting holes. These designated areas for fixing are located on the module long sides. They are located between 1/8 of the module length and 1/4 of the module length, measured from the module corner. Fixing the module on its narrow sides is not sufficient. In regards to "Top-Down" mounting methods, the clamping area on the module frame must be at least 130 mm² (0.20 in²) for each fixing point. The required clamping pressure is 100 N/mm² (14,5 lbf/in²). For "Bottom - Up" mounting methods, use a stainless steel serrated lock nut and M8 (5/16") bolt to secure the module to the mounting structure with the provided mounting holes. The bolts must be tightened to 20 Nm (15 ft-lbs). Do not drill any holes into the module. Use corrosion-proof fixing material.

Electrical connection

The modules are provided with factory-assembled cables and connectors. Do not open the junction box in any case. Connectors may only be connected under dry conditions. Make sure to avoid gaps in a plugged connection. Only single-core solar cables with an adequate cross-section (4 mm² minimum) and appropriate connectors may be used for connecting the modules. Cables should be attached to the installation system by means of UV-resistant cable ties. Exposed cables should be protected against sunlight and damage by suitable precautions (e.g. conduits). In order to limit voltages released by indirect lightning shock, the area of all conductor loops must be reduced to a minimum. Check that wiring is correct (polarity!) prior to starting the generator.

Cleaning

In general, the modules do not need any cleaning if the tilt angle is sufficient (> 15°; self-cleaning by rain). In case of heavy soiling, it is recommended to clean the modules with plenty of water (low pressure hose) and without the use of cleaning agents. If necessary, a soft cleaning device (sponge) may be used. Never scrape or rub off dirt as this may result in micro-scratches.

Maintenance

We recommend regular inspections of the system to ensure that:

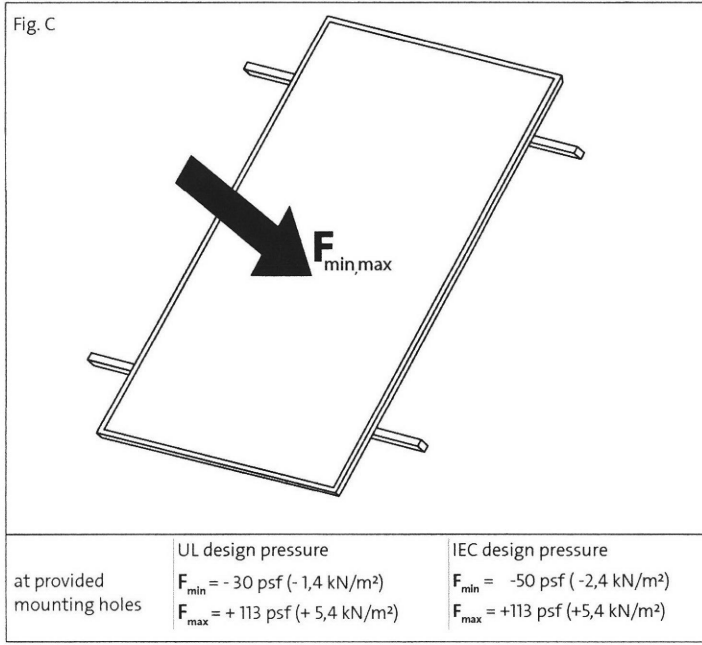
1. All fixtures are securely tightened and corrosion-free;
2. Wiring is securely connected, properly arranged and free of corrosion;
3. Cables are free of damage;

Please also observe applicable standards.

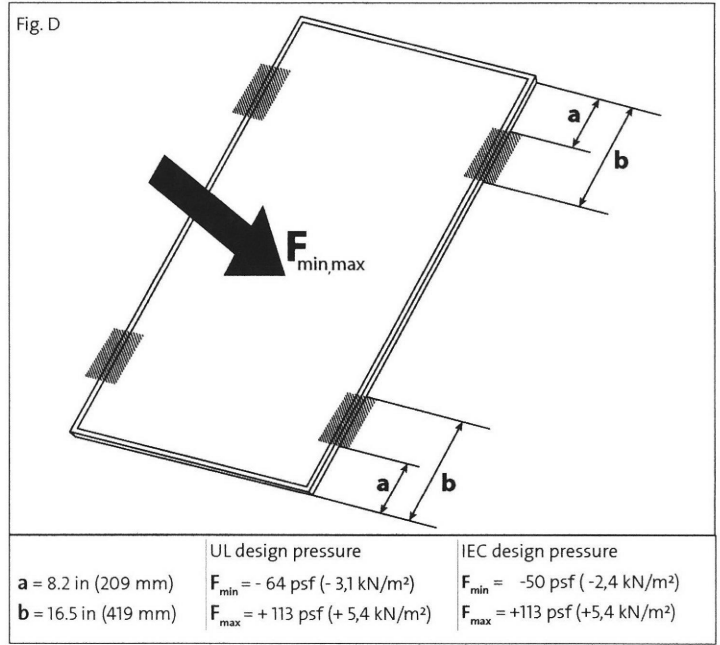
Disclaimer of liability

SolarWorld AG does not guarantee the operational capability and functionality of modules if the instructions contained in the present user information are not complied with. Since compliance with these instructions and the conditions and methods of installation, operation, use and maintenance of the modules are not checked or monitored by SolarWorld AG, SolarWorld AG accepts no liability for damage arising through improper use or incorrect installation, operation, use or maintenance. Furthermore, liability for infringements of patent law or of other third party rights arising from the use of the modules is excluded unless we are automatically liable by law.

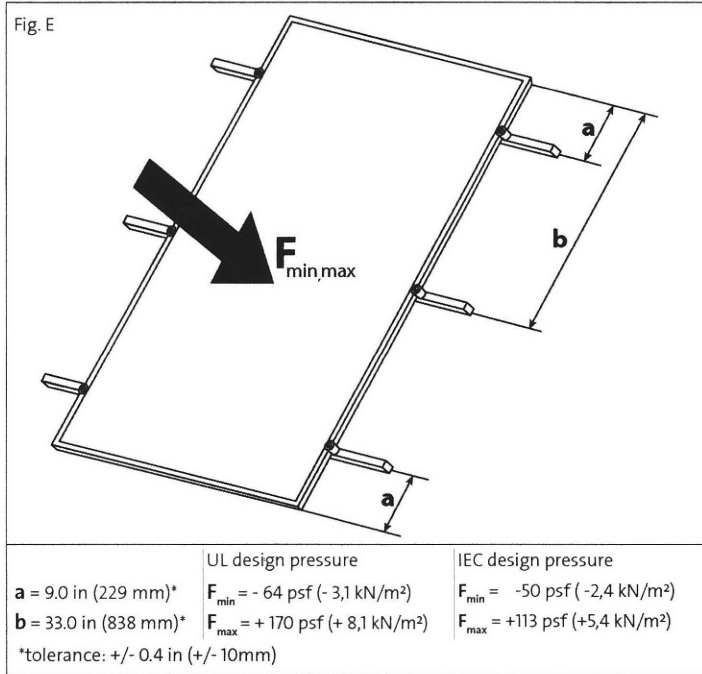
Bottom – Up mounting method



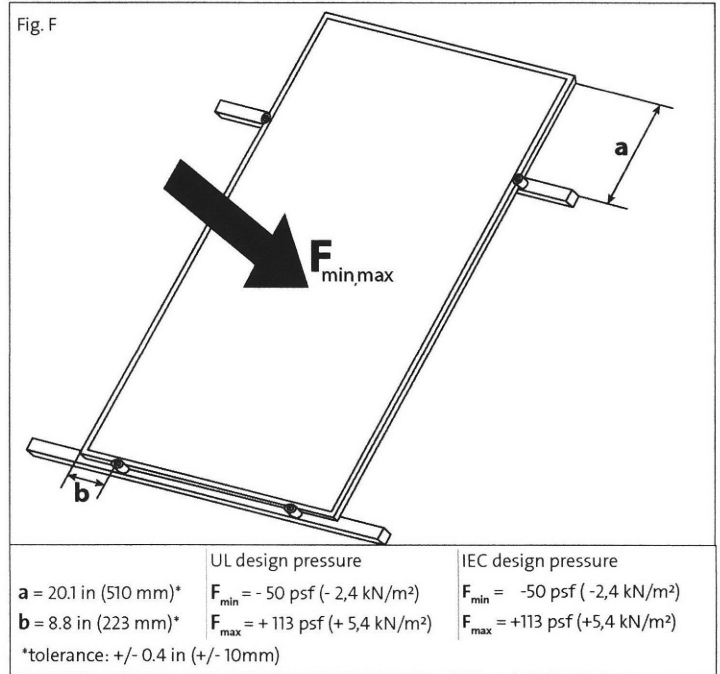
Top-Down mounting method



Top-Down mounting method



Top-Down mounting method



Revisions

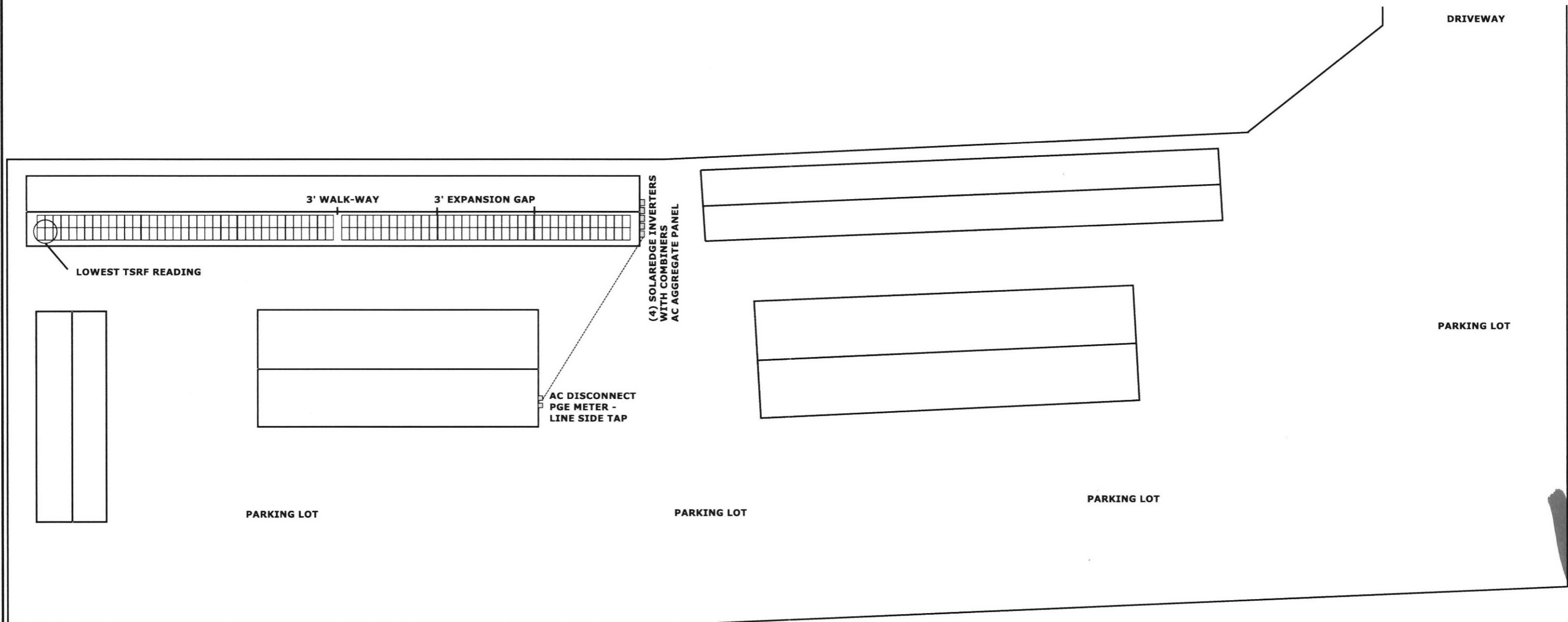
Version	Changes	Date
1.0	New document	2012-07-12

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service@solarworld-usa.com

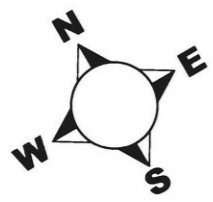
www.solarworld-usa.com



SITE PLAN – N. HAYDEN ISLAND MOORAGE



254



SOLAR CONTRACTOR:

ENERGY SOLUTIONS LLC
 PO BOX 887
 BEAVERCREEK, OR 97004
 503.680.3718
 CCB# 202002

OWNER:

2630 N. HAYDEN ISLAND
 PORTLAND OR 97217
 MOORAGE OWNER ASSOCIATION
 CW TAYLOR
 503.939.8586

BUILDING DATA:

NON-OCCUPIED
 COMMERCIAL

APPLICABLE CODES:

2014 OREGON STRUCTURAL
 INSTALLATION SPECIALTY
 CODE
 2014 NEC CODE

ROOF SPECS:

COMPOSITION ROOF W/ 2X4
 TRUSSES DOUGLAS FIR #2 @
 24" ON
 CENTER
 ROOF AREA = 7,800'SQ
 TILT = 34 DEGREES
 17 - 310 DEGREES

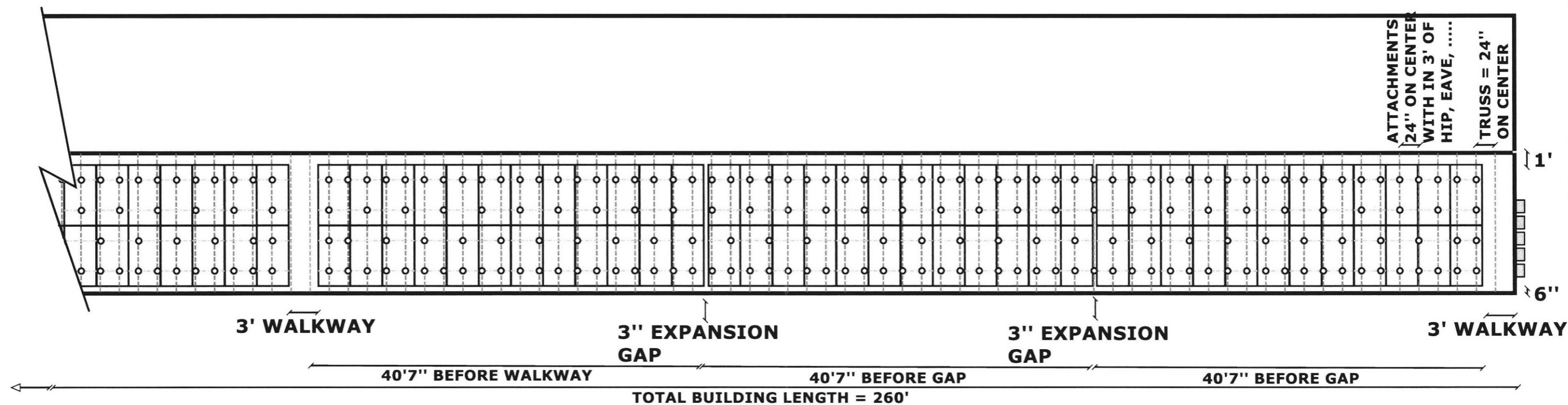
SYSTEM INFO:

(146) SOLARWORLD 340 WATT XL MONO
 MODULES
 (4) SOLAREGE 11400A-US INVERTER W/ (146)
 P300 DC OPTIMIZERS
 (1) ZIGBEE MONITORING UNIT - CELLULAR
 SYSTEM SIZE = 49.64 KW

PROJECT NOTES

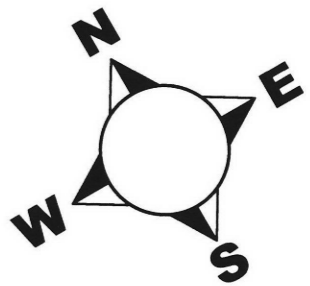
1. 303.2 – PV SYSTEMS AND SUPPORTING STRUCTURE SHALL COMPLY WITH REQUIREMENTS OF OSSC CHAPTER 6 OR THE ORSC AS APPLICABLE
2. 303.3 – ALL PV MODULES TO BE UL 1703 LISTED
3. 303.5 – PV SYSTEM SHALL HAVE A FIRE CLASSIFICATION THAT IS EQUAL TO OR GREATER THAN THE ROOF ASSEMBLY REQUIRED BY OSSC SECTION 1501.1
4. 303.6 – ALL COMPONENTS OF THE PV SYSTEM SHALL BE RATED FOR THEIR USE.
5. 303.4 – 303.8 – PV LAYOUT SHALL NOT RESTRICT EGRESS, LIGHT, VENTILATION, OR ROOF DRAINAGE
6. 304.9.1 GENERAL PATHWAYS REQUIREMENTS EXEMPTION 1: ON STRUCTURE WITH A PV ARRAY AREA OF 1,000 SF OR LESS INSTALLED ON A ROOF WITH A SLOPE THAT EXCEEDS 2:12 AND WITH AN INTERSECTING ADJACENT ROOF WHERE NO
6. ...CONTINUED...SECTION IS LARGER THAN 150 FEET MEASURED IN LENGTH OR WIDTH. EXEMPTION 1A: WHERE PV ARRAY DOES NOT EXCEED 25% AS MEASURED IN PLAN VIEW OF TOTAL ROOF AREA OF THE STRUCTURE, A MINIMUM OF 12" UNOBSTRUCTED PATHWAY SHALL BE MAINTAINED ALONG EACH SIDE OF ANY HORIZONTAL RIDGE.
7. ROOF STRUCTURE IS CONVENTIONAL LIGHT FRAMED WOOD CONSTRUCTION WITH 2X4 TRUSSES AT 24" ON CENTER MAX EXEMPT FROM ALLOWABLE SPAN REQUIREMENTS IN TABLE 305.4.1
8. 304.9.5 – DISCONNECTS, J-BOXES, COMBINER BOXES OR GUTTERS SHALL NOT BE PLACED IN ANY REQUIRED PATHWAYS OR CUTOUTS
9. ROOF MATERIAL IS COMPOSITION ROOF, IF METAL, FOLLOWS PRESCRIPTIVE PATH IN 2010 OREGON SOLAR CODE
10. PER 305.4 ITEM 3 – TOTAL SYSTEM WEIGHT SHOULD NOT EXCEED 4.5 PSF. PV MODULES AND RACKING SHALL BE DIRECTLY ATTACHED TO ROOF FRAMING. ATTACHEMENTS SPACING WILL BE 48" ON CENTER MAX, WHEN ATTACHMENT IS LOCATED WITHIN 3' OF ROOF HIP, EDGE, EAVE, AND RIDGE SHALL BE 24" ON CENTER MAX
11. MAX MODULE HEIGHT WILL NOT EXCEED 12" OFF ROOF SURFACE
12. SECTION 304.7 – MECHANICAL EQUIPMENT CLEARANCES OF 30"

STANDOFFS ARE ATTACHED EVERY 24" IF LOCATED WITHIN 3' OF ANY HIP, EAVE, RIDGE, OR VALLEY PER CODE. IF OVER 3', STANDOFFS ARE ATTACHED EVERY 48" ON CENTER.

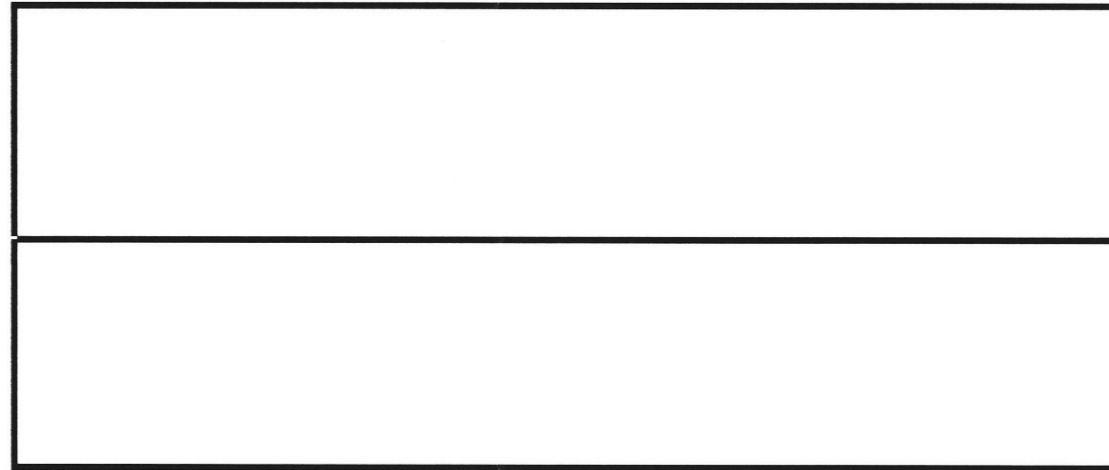
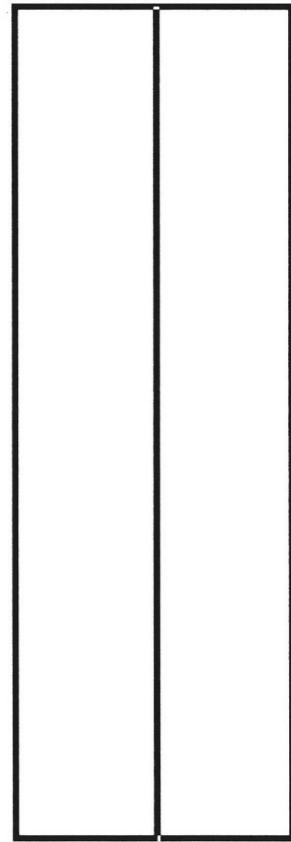
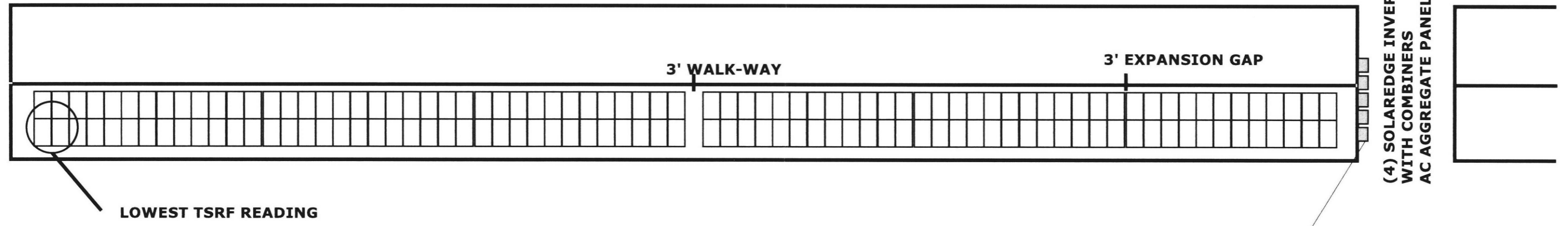


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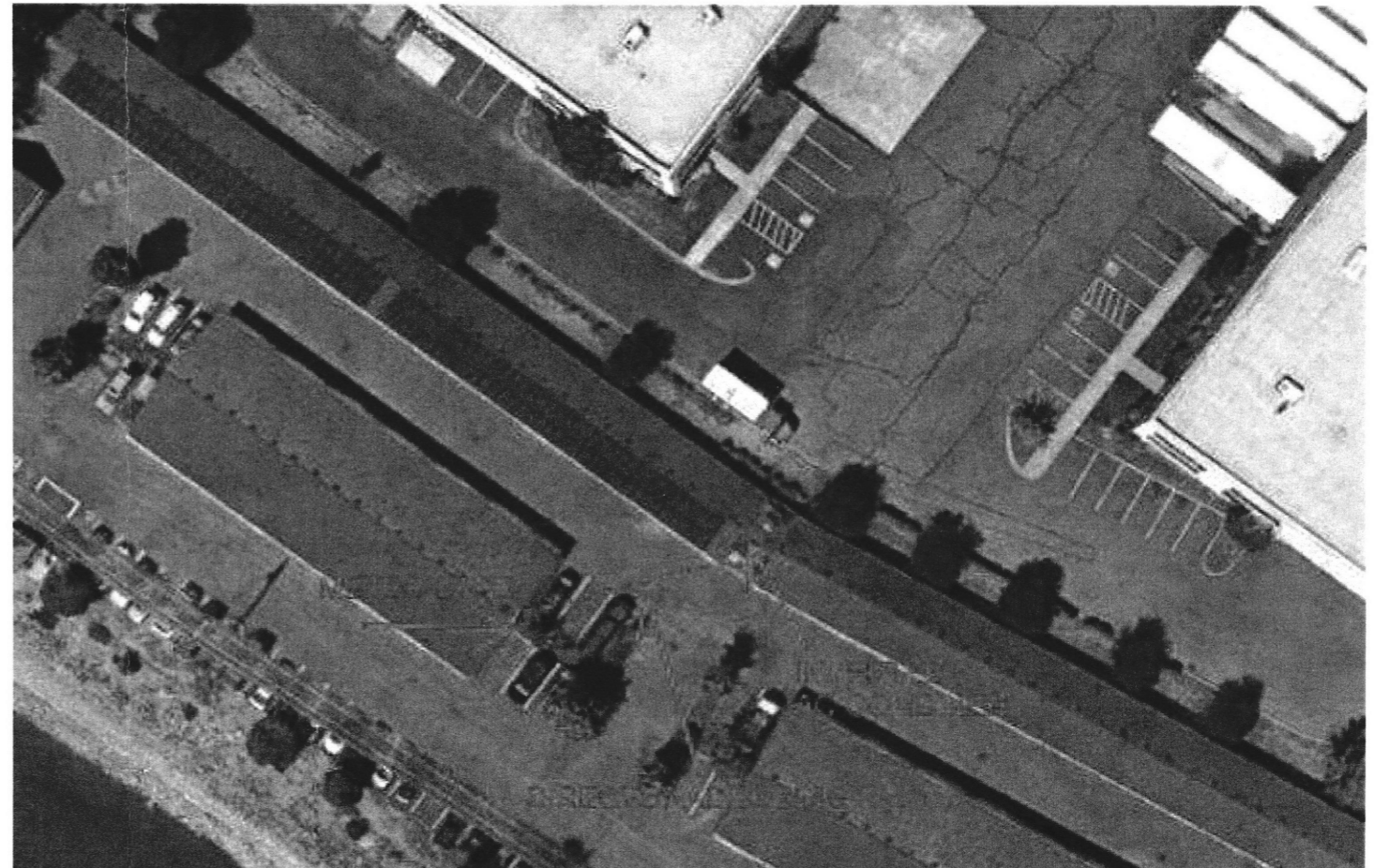
2630 N. HAYDEN ISLAND
 PORTLAND OR 97217
 MOORAGE OWNER ASSOCIATION
 CW TAYLOR
 49.64 KW SOLAR ARRAY – MULTI-RESIDENT

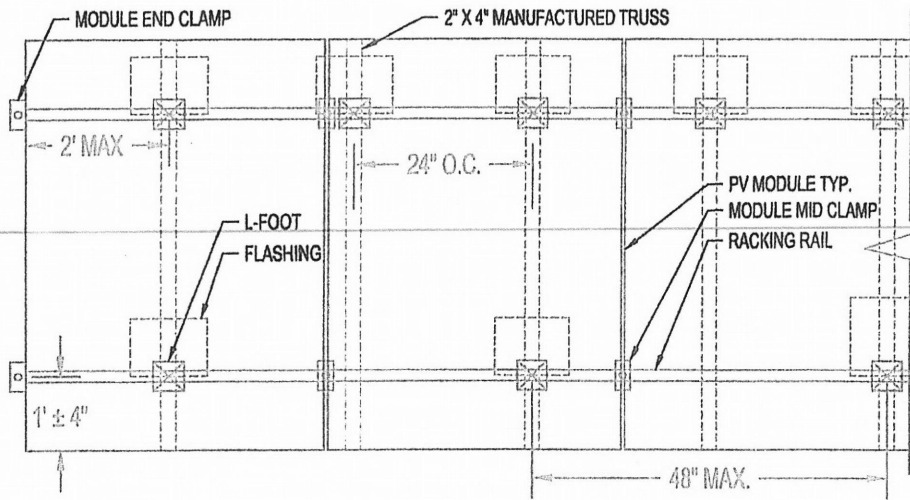


ENLARGED ROOF PLAN

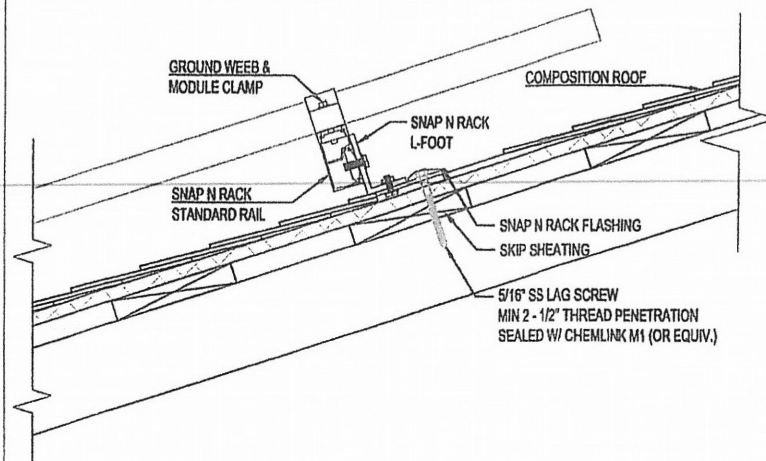


- AC DISCONNECT
- PGE METER - LINE SIDE TAP

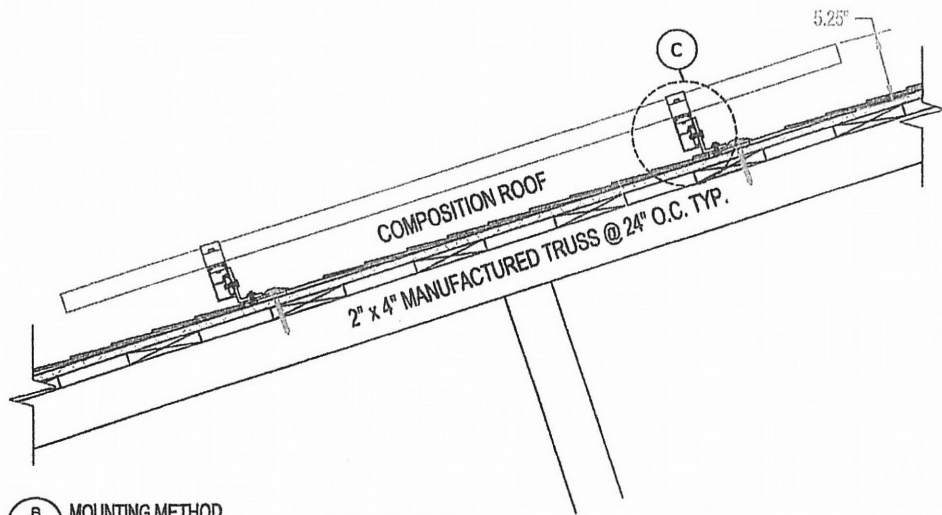




A MOUNTING PLAN VIEW (PORTRAIT)
PV-8 SCALE: 1" = 1'-6"



C MOUNTING DETAIL
PV-8 SCALE: 1" = 2'-0"



B MOUNTING METHOD
PV-8 SCALE: 1" = 2'-0"