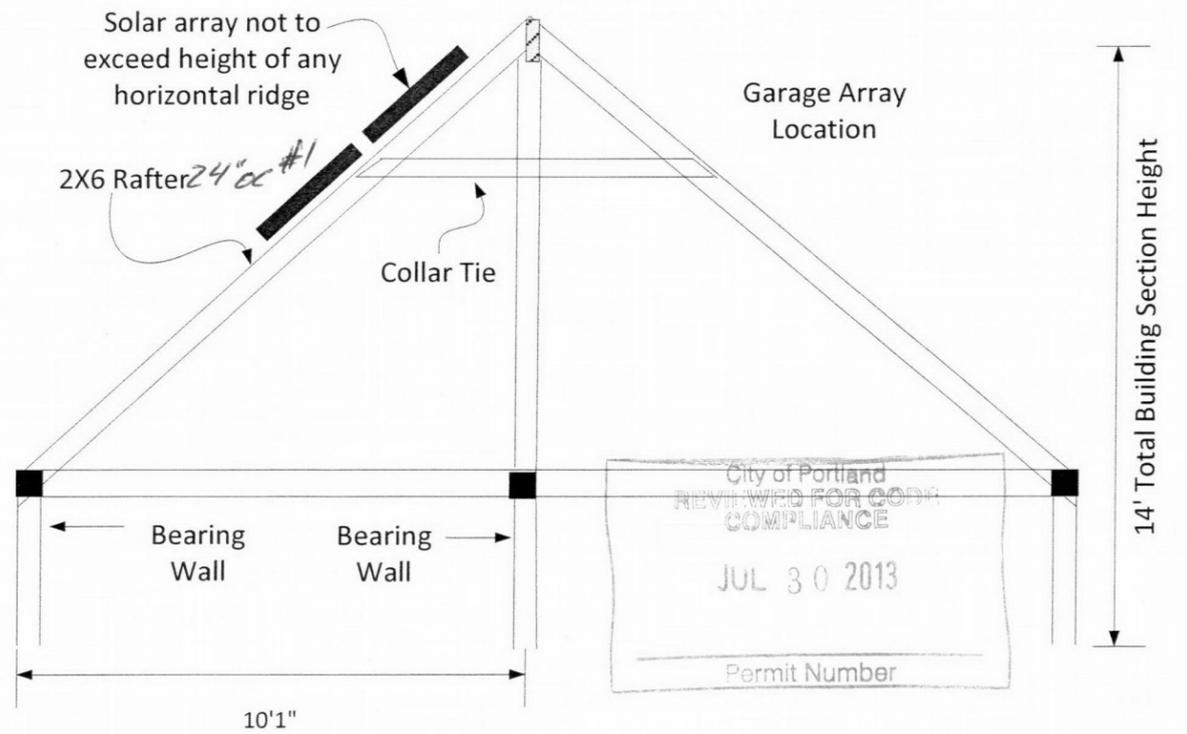
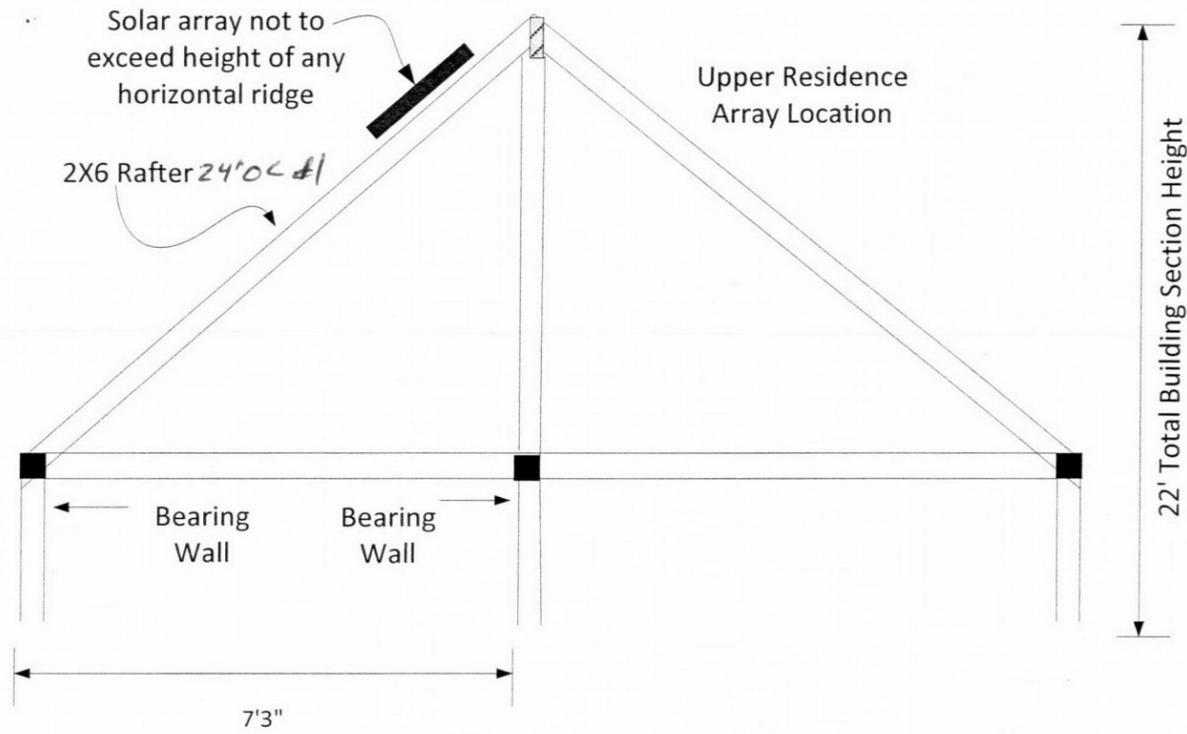
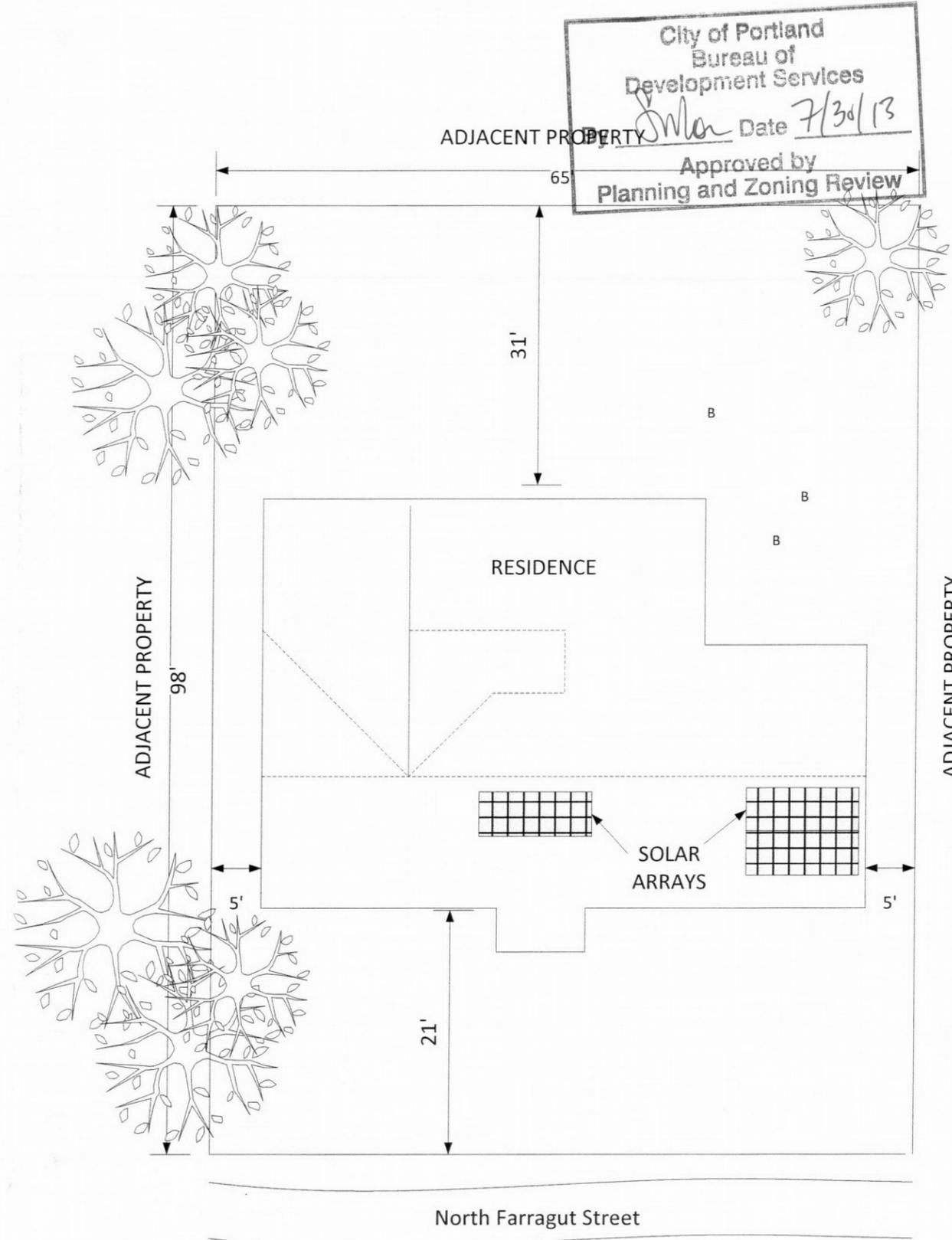


Loven Residence

Roof Structure and Site Plan



City of Portland
 REVIEWED FOR CODE
 COMPLIANCE
 JUL 30 2013
 Permit Number



City of Portland
 Bureau of
 Development Services
 Approved by [Signature] Date 7/30/13
 Planning and Zoning Review



Contractor:
 Premier Energy dba Solar Universe
 556 Sommerset Road
 Woodland, WA 98674
 (503) 410-6884
 Contact: Dan Tracy

Customer:
 Roger Loven
 2837 N Farragut Street
 Portland, OR 97217
 503-283-0643



Plot Map July 25, 2013

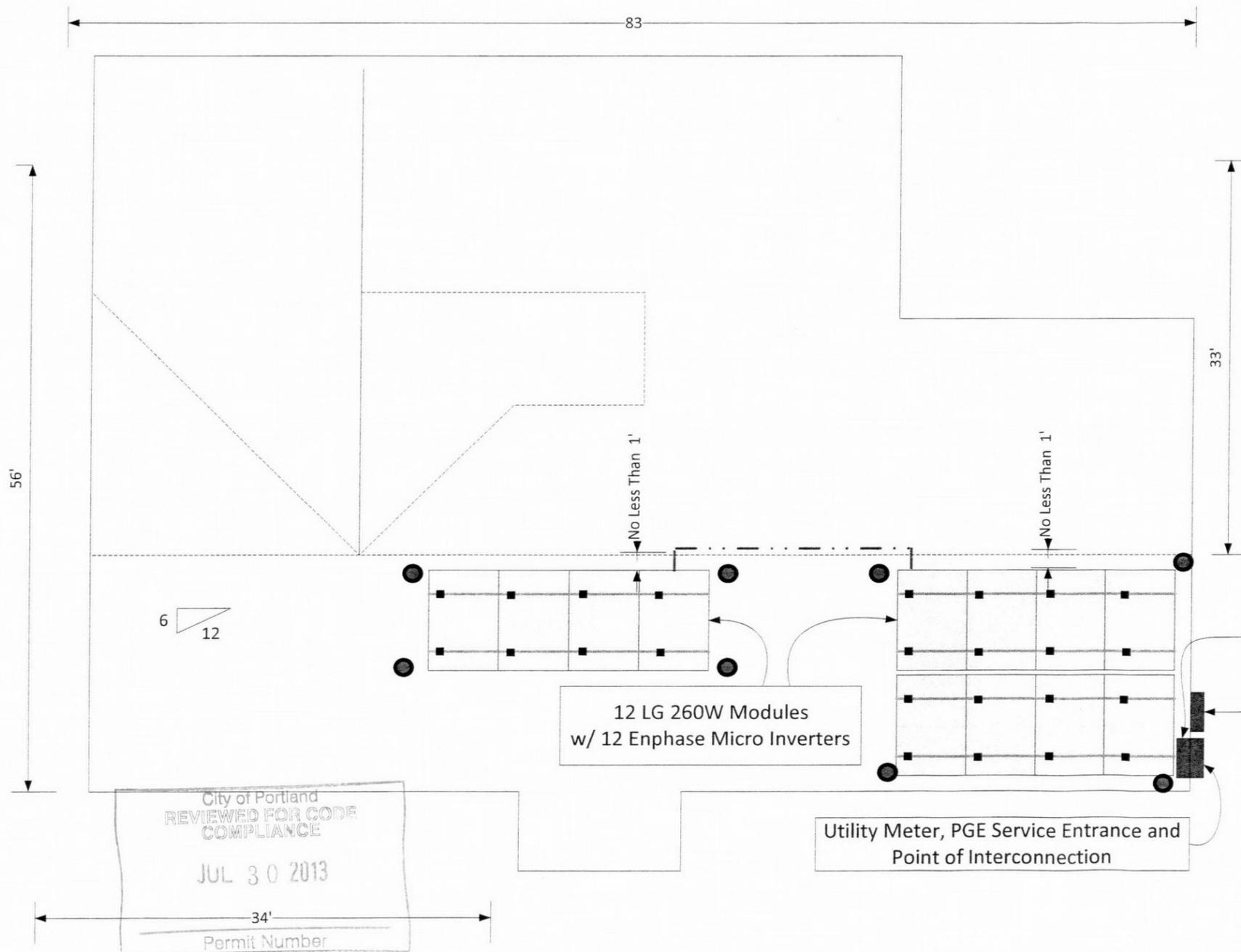
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Loven Residence

Roof Top Photovoltaic System Layout

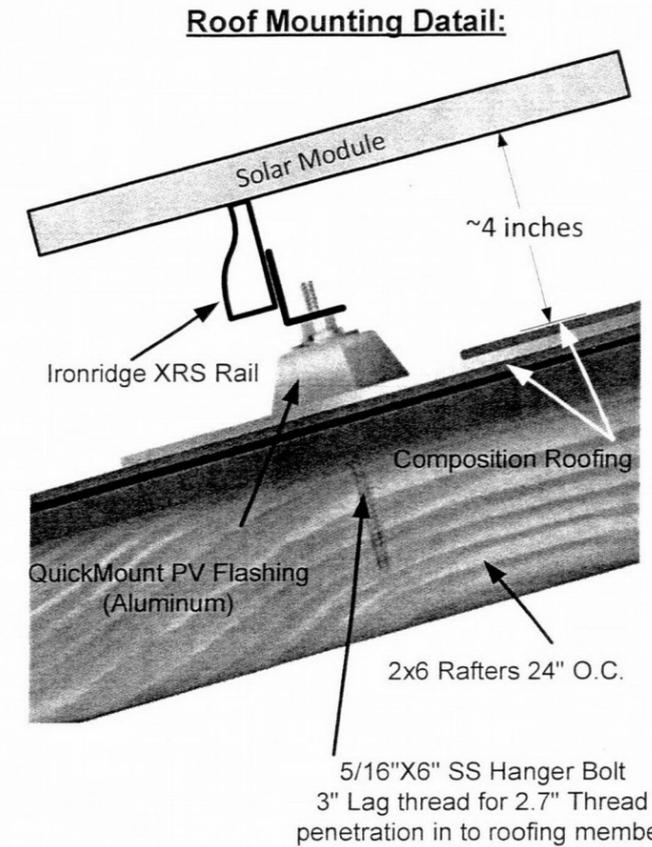
Legend:

- = Sun Eye Reading Location
- = Flashed Roof Standoff
- = Racking
- | = Conduit



Mounting Notes

1. 2x6 Rafters @ 24" O.C. #17
2. Roof penetrations: 48" O.C.
3. Composition Roofing
4. Panel height off roof < 18 inches
5. Weight of PV modules and assembly less than 4.5 lbs per sq. ft.
6. Azimuth: 180°
7. Module Tilt: 26° & 23°
8. WEEB Grounding Hardware
9. All installations comply with manufacturer's installation instructions
10. All horizontal ridges kept clear of PV components at least 1 ft. either side
11. PV array to cover less than 25% of total roof area
12. Solar Code 305.4 #3.2: Attachments shall be spaced no greater than 24" O.C. in any direction when located within 36" of a roof edge, hip, eave, or ridge.



2087

211 sq. ft. = Total array area

10.2% = Area of Total Roof that the array covers



ELECTRICAL CONTRACTOR:
Eagle Electric
4134 N Vancouver Avenue
Portland OR 97217
OR CCB# 192277
Danny Pharr: (503) 287-3294

EQUIPMENT
(12) LG 260W Modules
(12) Enphase M215 Micro Inverters
Iron Ridge Mounting System
Aluminum PV Roof Flashings

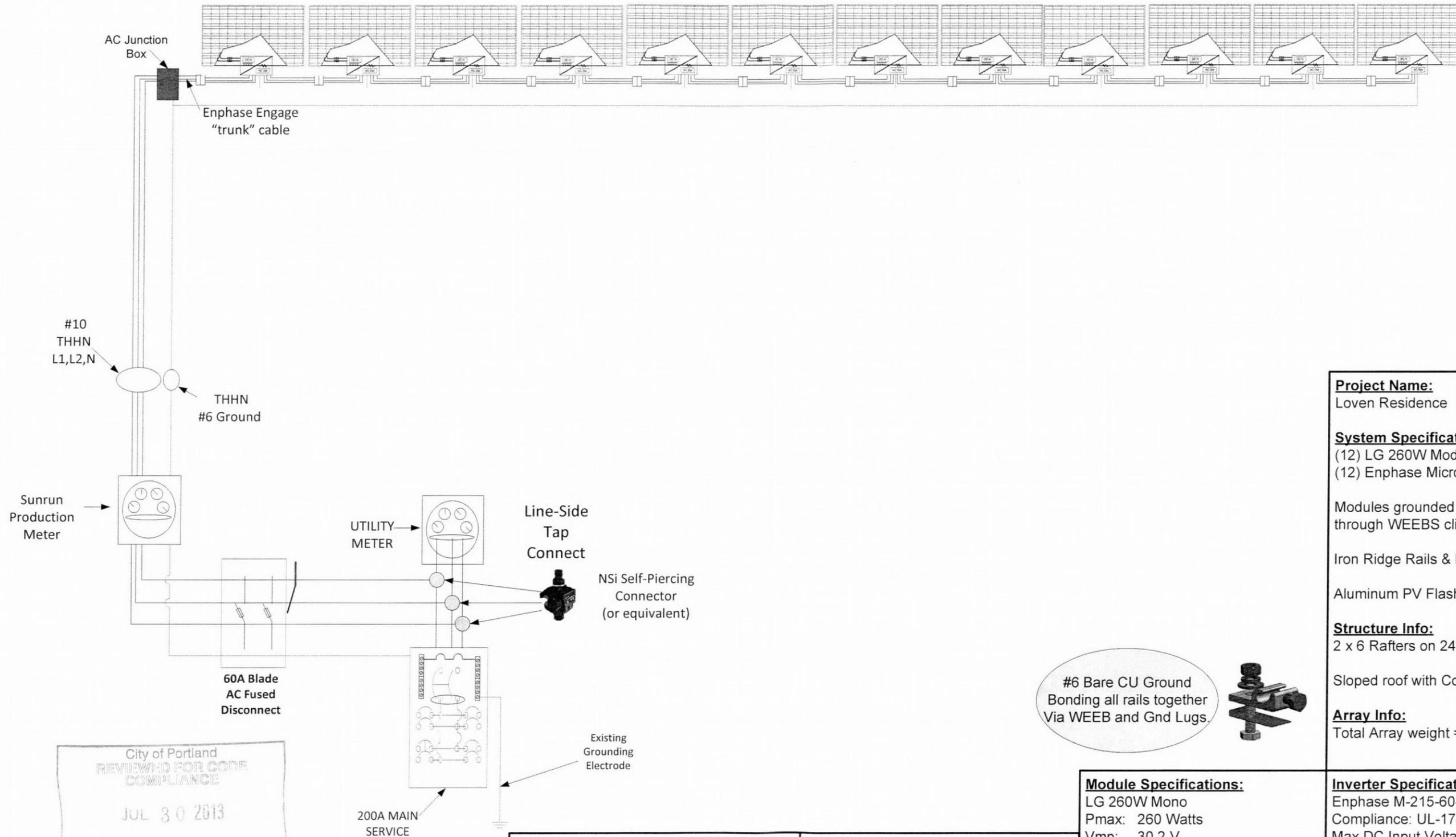
July 25, 2013
Roger Loven 2837 N Farragut Street Portland OR 97217 503-283-0643

GENERAL CONTRACTOR: Premier Energy dba. Solar Universe 556 Sommerset Road Woodland, WA 98674 OR CCB# 195595 Dan Tracy: (503) 410-6884
--



Loven Residence

Photovoltaic Installation Electrical Diagram
 Rated 3.12 kW under standard test conditions



City of Portland
 REVIEWED FOR CODE
 COMPLIANCE
 JUL 30 2013
 Permit Number



Three Line Drawing
 July 21, 2013

Contractor:
 Premier Energy dba Solar Universe
 556 Sommerset Road
 Woodland, WA 98674
 (503) 410-6884
 Contact: Dan Tracy

Customer:
 Roger Loven
 2837 N Farragut Street
 Portland OR 97217
 (503) 283-0643

Module Specifications:
 LG 260W Mono
 Pmax: 260 Watts
 Vmp: 30.2 V
 Imp: 8.61 A
 Voc: 37.9 V
 Isc: 9.2 A
 Max Series Fuse: 15A
 Max System Voltage: 600V
 Dimensions: 64.5"x39.37"x1.37"
 Weight: 37 lbs.

Project Name:
 Loven Residence

System Specifications:
 (12) LG 260W Modules
 (12) Enphase Micro-Inverters

Modules grounded to racking system through WEEBS clips

Iron Ridge Rails & Mounting Hardware

Aluminum PV Flashing with SS Hardware

Structure Info:
 2 x 6 Rafters on 24" Centers

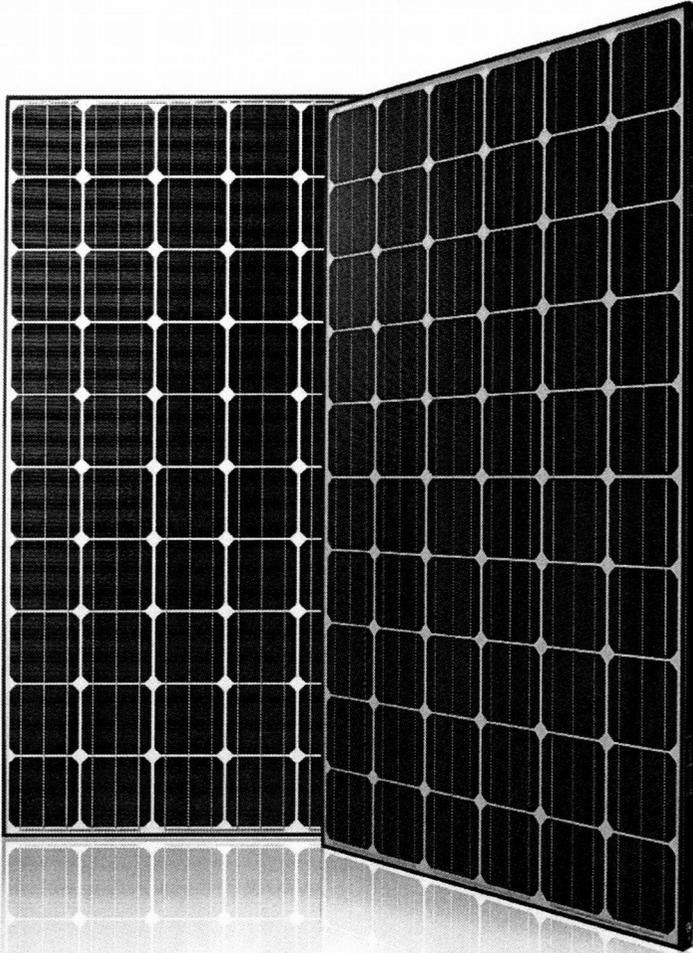
Sloped roof with Composition Roofing

Array Info:
 Total Array weight = 554 lbs.

Inverter Specifications:
 Enphase M-215-60-2LL-S22
 Compliance: UL-1741, IEEE 1547
 Max DC Input Voltage: 45Vdc
 Max DC Input Current: 10.5 Amps
 Max DC Short Current: 15 Amps
 Max AC Output Power: 215 Watts
 Nominal Output Current: 900 MA
 Nominal Voltage Range: 240V/ 211V-264V

MonoX™

LG260S1C-G3 / LG255S1C-G3 / LG250S1C-G3



LG Electronics, Inc. (Korea Exchange: 06657.KS) is one of the globally leading companies and technology innovator for electronics, information and communication products. LG Electronics currently employs more than 91,000 people worldwide in 117 companies. In fiscal year 2011 a turnover of 48,97 billion USD has been achieved.

LG is one of the world's largest manufacturers of mobile phones, flat screen TVs, air conditioners, washing machines and refrigerators. As a future-oriented company, LG relies on the technology of renewable energies and is expanding it. The entire range of high quality solar products are being manufactured in LG's leading production site Korea.



The LG Mark of Excellence

Customers rest assured of cutting-edge technology and reliability when they see the LG logo on every module. The LG logo reflects the high standards that have guided LG for more than 50 years.



100% EL Test Completed

All LG modules are tested at various stages of the production by Electroluminescence inspection. The EL inspection detects cracks unseen by the naked eye.



Light and Robust

With a weight of just 16.8 kg, LG modules are proven to demonstrate outstanding durability against external pressure up to 5400 Pa.



Reliable Warranties

LG stands by its products with the strength of a global corporation and sterling warranty policies. Together with a 10 year product warranty a 25 year linear performance warranty is offered.



Positive Power Tolerance

LG provides rigorous quality testing to solar modules to assure customers of the stated power outputs of all modules, with a positive nominal tolerance starting at 0%.



Convenient Installation

LG modules are carefully designed to help installers benefit from quick and easy installations throughout carrying, grounding, and connecting stages of modules.

Mechanical Properties

Cells	6 x 10
Cell vendor	LG
Cell type	Monocrystalline
Cell dimensions	156 x 156 mm ²
Cell busbars	3
Dimensions (L x W x H)	1640 x 1000 x 35 mm
Static snow load	5400 Pa
Static wind load	2400 Pa
Weight	16.8 ± 0.5 kg
Connector type	MC4, IP 67
Junction box	IP 67 with 3 bypass diodes
Length of cables	2 x 1000 mm
Frame	Anodized aluminum

Certifications and Warranty

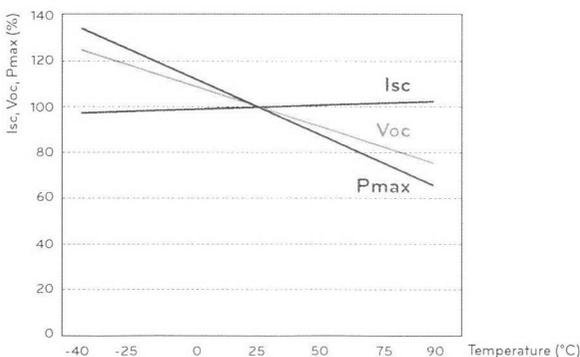
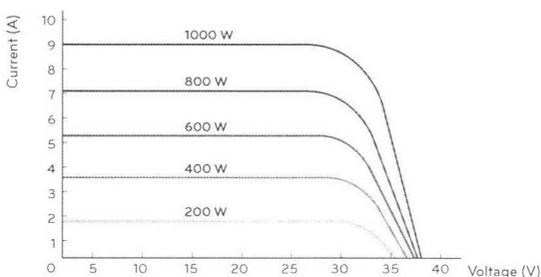
Certifications	IEC 61215, IEC 61730-1/-2, IEC 61701, UL 1703, OHAS 18001, ISO 9001, ISO 14001, DLG-Fokustest Ammonia Resistance
Product warranty	10 years
Output warranty of Pmax (measurement Tolerance ± 3%)	25 years linear warranty*

*1st year: 97%, 2nd - 25th year: -0,7%/a, 25th year: 80,2%

Temperature Coefficients

NOCT	44.9 ± 2 °C
Pmpp	-0.459 %/K
Voc	-0.343 %/K
Isc	0.054 %/K

Characteristic Curves



Electrical Properties (STC*)

	LG260S1C-G3	LG255S1C-G3	LG250S1C-G3
Maximum power at STC (Pmax)	260	255	250
MPP voltage (Vmpp)	30.2	30.0	29.8
MPP current (Impp)	8.61	8.50	8.39
Open circuit voltage (Voc)	37.9	37.7	37.6
Short circuit current (Isc)	9.20	9.10	9.00
Module efficiency (%)	15.9	15.6	15.2
Operating temperature (°C)		-40 ~ +90	
Maximum system voltage (V)		1000	
Maximum series fuse rating (A)		15	
Power tolerance (%)		0 ~ +3	

* STC (Standard Test Condition): Irradiance 1000 W/m², module temperature 25 °C, AM 1.5

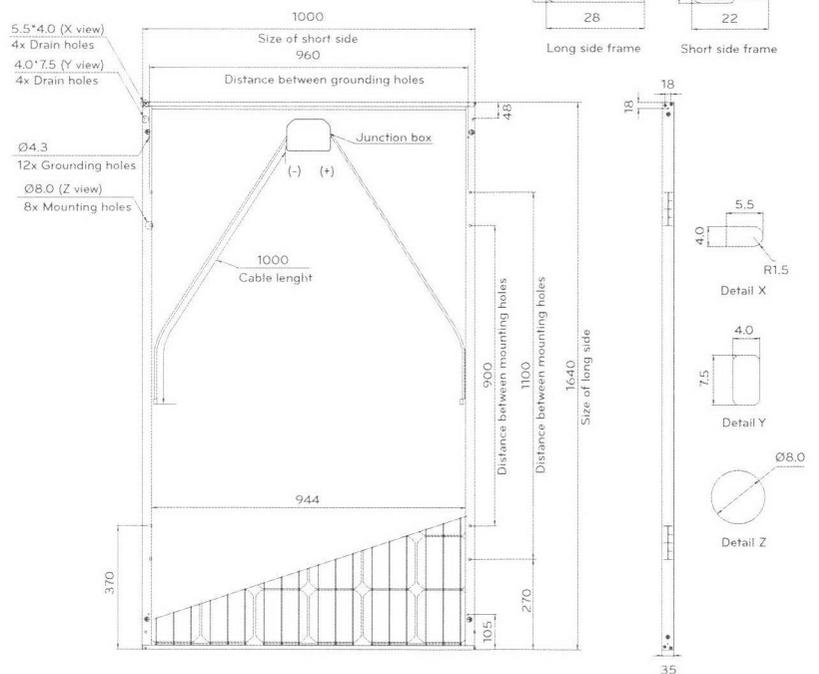
* The nameplate power output is measured and determined by LG Electronics at its sole and absolute discretion.

Electrical Properties (NOCT*)

	LG260S1C-G3	LG255S1C-G3	LG250S1C-G3
Maximum power (W)	190	187	183
Maximum power voltage (V)	27.3	27.1	26.9
Maximum power current (A)	6.97	6.88	6.79
Open circuit voltage (Voc)	35.0	34.8	34.7
Short circuit current (Isc)	7.44	7.36	7.28
Efficiency reduction (from 1000 W/m ² to 200 W/m ²)		< 4.5 %	

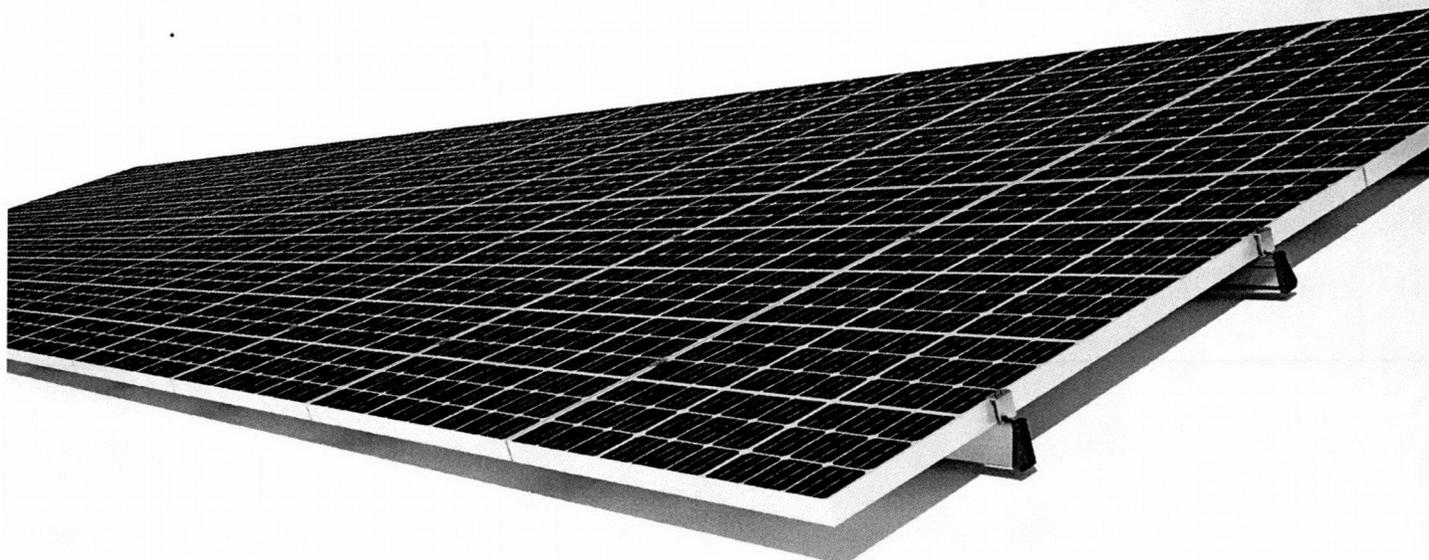
* NOCT (Nominal Operating Cell Temperature): Irradiance 800 W/m², ambient temperature 20 °C, wind speed 1 m/s

Dimensions (mm)



* The distance between the center of the mounting/grounding holes





IronRidge Roof Mounts are the highest quality and fastest system for solar panel installers. Our customers appreciate the professional appearance found exclusively with IronRidge rail profiles.

Key Features

Longest Spans In The Industry Means Fewest Required Attachment Points

Fewest Attachment Points Reduce Total Installed Costs And Liability

Unique Curved Profile Of The Standard Rail Increases Strength And Enhances Aesthetic Design

Backed By Industry Leading Warranty 10 yr. Limited Product, 3 yr. Finish

PE Certified For Most States

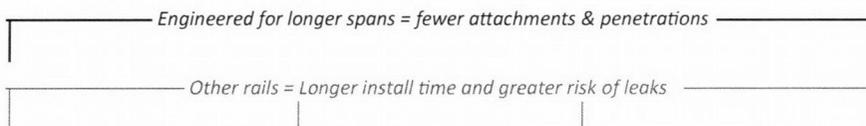
Universal Clamping Components Work With Most Solar Module Brands

Versatile Design Allows For Use In Ground Mount, Roof Mount, or Large Array Applications

Best Customer Service And Support

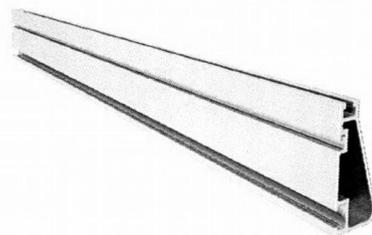
IronRidge Roof Mount System is a reliable, comprehensive, and feature rich photovoltaic mounting solution. Anchored by IronRidge Standard or IronRidge Light rails, our Roof Mount platform includes all of the components necessary for supporting virtually any commercial or residential roof mount installation, regardless of roof type or pitch.

IronRidge Standard Rails Less Material, Faster Install, Minimized Risk of Leaks



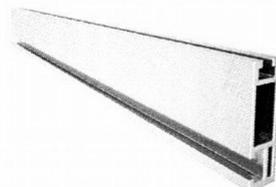
IronRidge Standard Rail

- Engineered profile allows for spans over 13'
- Cantilever can be 40% of span length
- Attractive structural design, ideal for residential and commercial applications



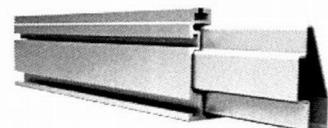
IronRidge Light Rail

- Light, cost effective rail system supports spans up to 8'
- Cantilever can be 40% of span length



Splices (Internal)

- Can be installed at same location as an attachment
- Does not require additional attachments to support the splice



Maximum Span Chart:
IronRidge Standard Rail
IronRidge Light Rail

Wind Speed	Snow Loads											
	0 psf	10 psf	20 psf	30 psf	40 psf	50 psf	60 psf	0 psf	10 psf	20 psf	30 psf	40 psf
90 mph	13.5'	12.5	10.5	10.0	9.0	8.5	7.5	8	7	6	5.5	5
100 mph	13.5	12.5	10.5	10.0	9.0	8.5	7.5	8	7	6	5.5	5
110 mph	13	12.5	10.5	10.0	9.0	8.5	7.5	7.6	7	6	5.5	5
120 mph	12	12	10.5	10.0	9.0	8.5	7.5	7	7	6	5.5	5
130 mph	11	11	10.5	10.0	9.0	8.5	7.5	6.5	6.5	6	5.5	5
140 mph	10	10	10	9.5	9.0	8.5	7.5	6	6	6	5.5	5
150 mph	9.6	9.5	9.5	9.5	8.5	8	7.5	5.5	5.5	5.5	5.5	5

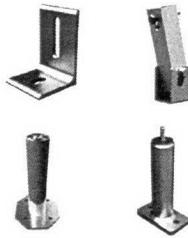
Roof Zone 1, Flush Mount Only
 Slope = 6" / ft.
 Exposure category B
 Module length: 77"

Building mean roof height = 30'
 Clearance between roof and rail: 2"
 End Cant Span: 40% (adj. interior span)
 Middle 1/3 span rail splice not permitted

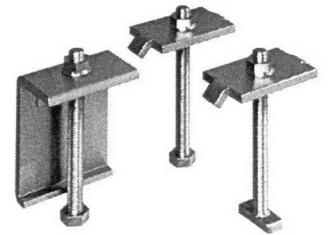
* For more information visit www.ironridge.com to download certification letters, installation guides, and to use our roof mount configuration software.

Attachments

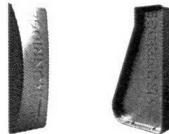
- Adjustable L feet (4 pack kits)
- Adjustable tilt leg kits (5° to 45°)
- Flush mount aluminum standoffs (3", 4", 6", 7")
- Tilt steel standoffs (4", 6")


Clamps

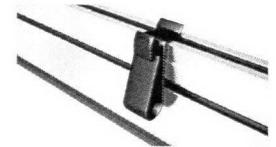
- Panel Sizes 1.22" to 2.30"
- Mid clamps (require only 1/4" between panels)
- Mid clamps available in hex or t-bolt
- All hardware stainless steel


End Caps

Protect against debris while providing a finished look for both standard and light rails


Wire Clips

Accommodate up to eight 6mm panel wires or an Enphase wire harness


Why IronRidge


Experience - Designing/manufacturing solar mounting products since 1996

Single Source - Roof mounts, ballasted mounts, large arrays, and more; *a solution for your specific application*

Customer Satisfaction - Customer service and technical support to help you succeed

On-line Resources Available:

- Video Tutorials
- Product Configurators
- Product Certifications
- Installation Guides
- Data Sheets
- Reseller Locator

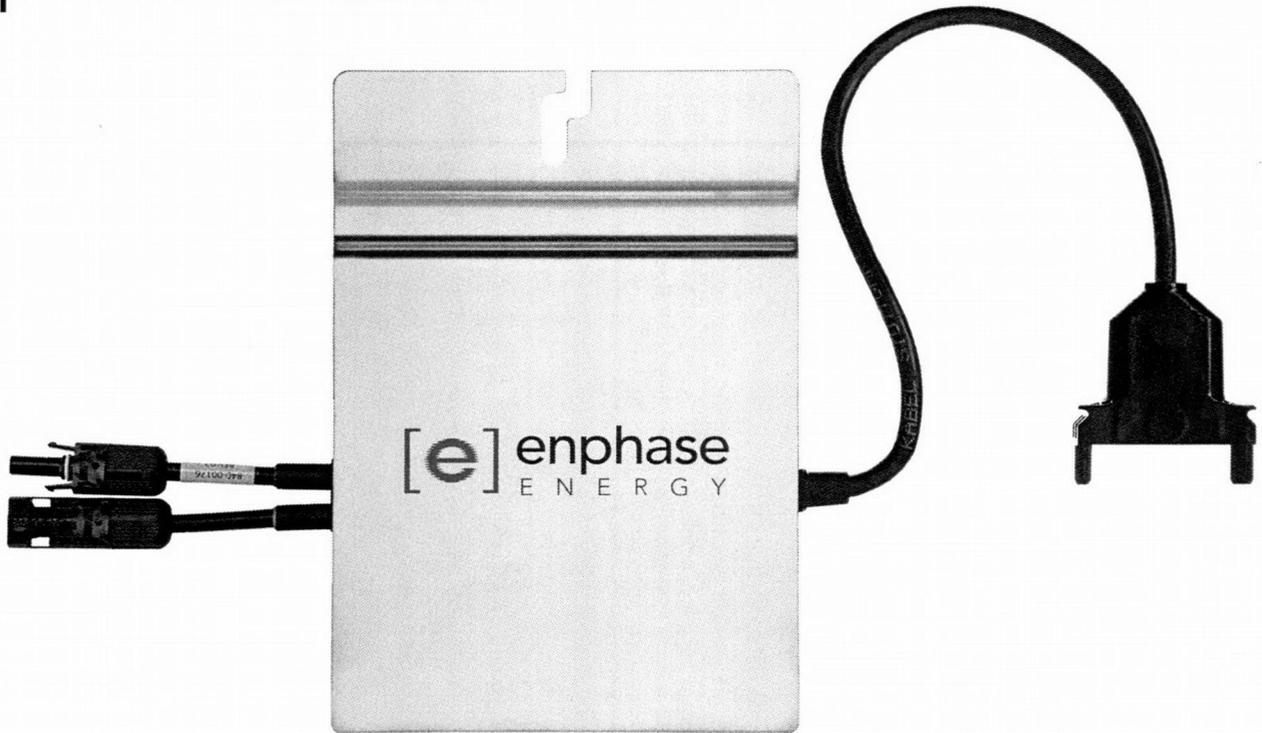


Sales: 800-227-9523
sales@ironridge.com

www.IronRidge.com
 1435 Baechtel Road
 Willits, CA 95490

Enphase® Microinverters

Enphase® M215



The **Enphase® Microinverter System** improves energy harvest, increases reliability, and dramatically simplifies design, installation, and management of solar power systems.

The Enphase System includes the microinverter, the Envoy® Communications Gateway,™ and Enlighten®, Enphase's monitoring and analysis software.

PRODUCTIVE

- Maximum energy production
- Resilient to dust, debris and shading
- Performance monitoring

RELIABLE

- System availability greater than 99.8%
- No single point of system failure

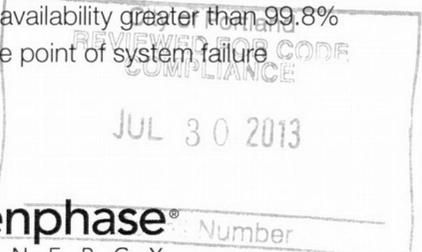
SMART

- Quick and simple design, installation, and management
- 24/7 monitoring and analysis

SAFE

- Low-voltage DC
- Reduced fire risk

[e] enphase® Number
ENERGY



INPUT DATA (DC)	M215-60-2LL-S22/S23 and M215-60-2LL-S22-NA/S23-NA (Ontario)
Recommended input power (STC)	190 - 270 W
Maximum input DC voltage	45 V
Peak power tracking voltage	22 - 36 V
Operating range	16 - 36 V
Min./Max. start voltage	22 V / 45 V
Max. DC short circuit current	15 A
Max. input current	10.5 A

OUTPUT DATA (AC)	@208 VAC	@240 VAC
Rated (continuous) output power	215 W	215 W
Nominal output current	1.0 A (Arms at nominal duration)	0.9 A (Arms at nominal duration)
Nominal voltage/range	208 / 183-229 V	240 / 211-264 V
Extended voltage/range	179-232 V	206-269 V
Nominal frequency/range	60.0 / 59.3-60.5 Hz	60.0 / 59.3-60.5 Hz
Extended frequency range	57-60.5 Hz	57-60.5 Hz
Power factor	>0.95	>0.95
Maximum units per 20 A branch circuit	25 (three phase)	17 (single phase)
Maximum output fault current	1.05 Arms, over 3 cycles; 1.04 Arms over 5 cycles	

EFFICIENCY	
CEC weighted efficiency	96.0%
Peak inverter efficiency	96.3%
Static MPPT efficiency (weighted, reference EN50530)	99.6%
Dynamic MPPT efficiency (fast irradiation changes, reference EN50530)	99.3%
Night time power consumption	46 mW

MECHANICAL DATA	
Ambient temperature range	-40°C to + 65°C
Operating temperature range (internal)	-40°C to + 85°C
Dimensions (WxHxD)	17.3 cm x 16.4 cm x 2.5 cm (6.8" x 6.45" x 1.0") without mounting bracket
Weight	1.6 kg (3.5 lbs)
Cooling	Natural convection - No fans
Enclosure environmental rating	Outdoor - NEMA 6

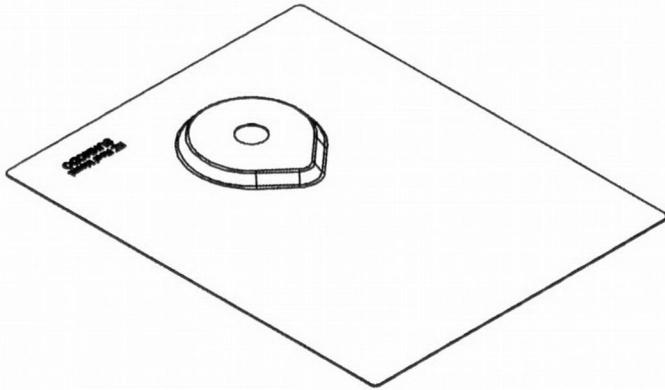
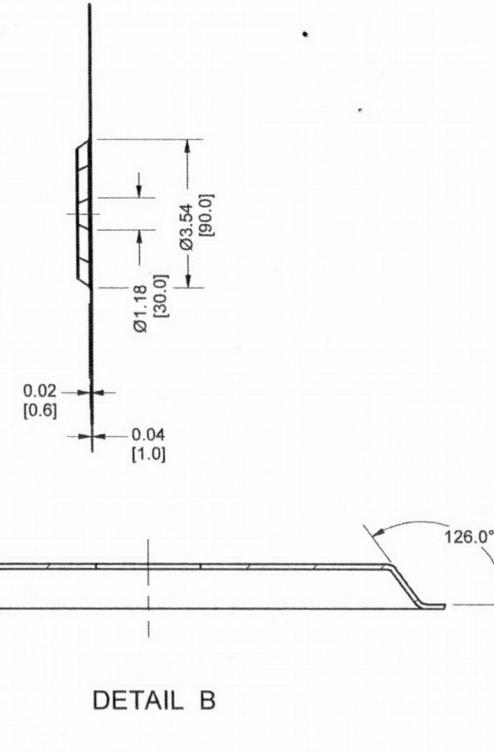
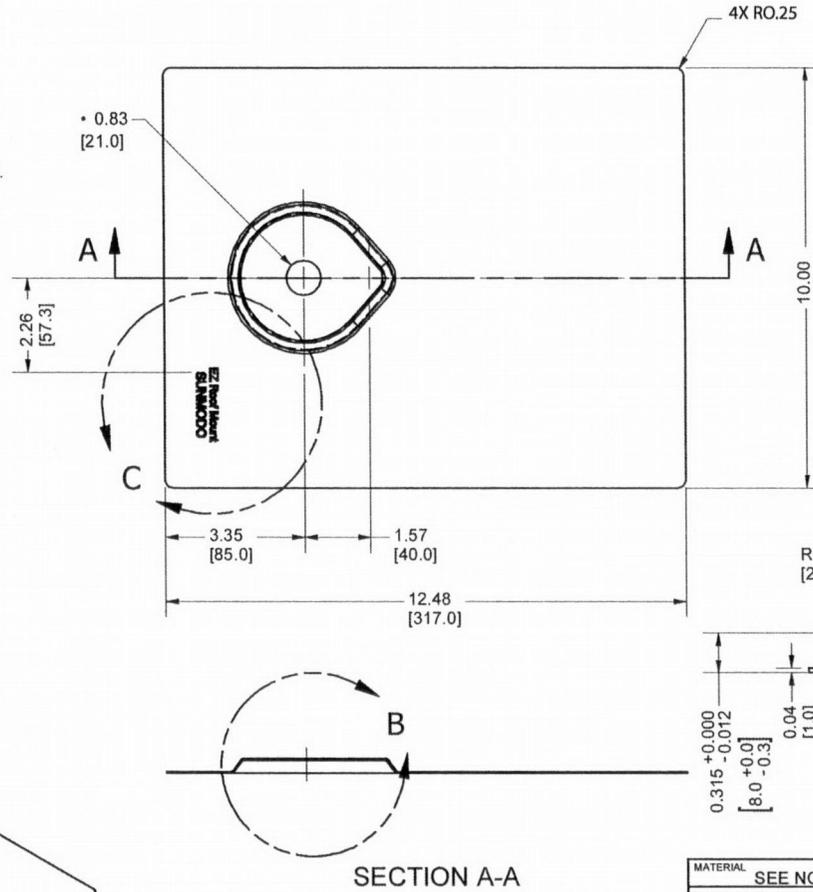
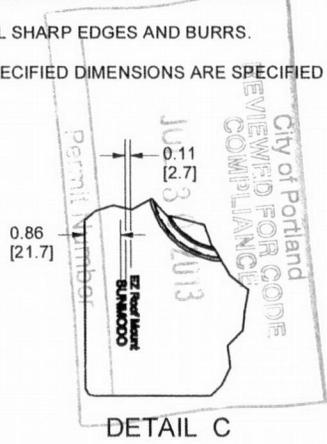
FEATURES	
Compatibility	Pairs with most 60-cell PV modules
Communication	Power line
Monitoring	Free lifetime monitoring via Enlighten software
Compliance	UL1741/IEEE1547, FCC Part 15 Class B CAN/CSA-C22.2 NO. 0-M91, 0.4-04, and 107.1-01

To learn more about Enphase Microinverter technology, visit enphase.com



NOTES: UNLESS OTHERWISE SPECIFIED

1. DIMENSIONS SHOWN ARE INCHES [MILIMETERS].
2. MATERIAL: AL 1060 T=1mm.
FINISH: CLEAR ANODIZED 10 µm THICK.
3. PART SHALL BE FREE OF OIL AND DIRT MARKS.
4. THE UNSPECIFIED INTERNAL RADII ARE .031
5. BREAK ALL SHARP EDGES AND BURRS.
6. THE UNSPECIFIED DIMENSIONS ARE SPECIFIED BY 2D CAD FILE.



SECTION A-A

DETAIL B

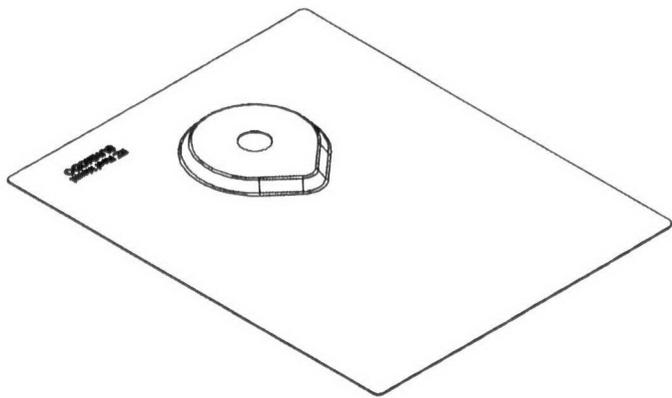
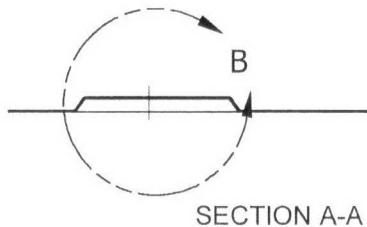
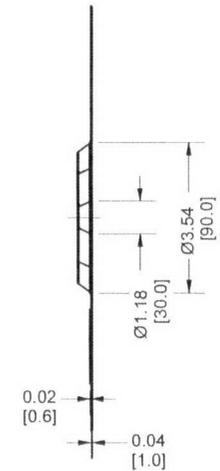
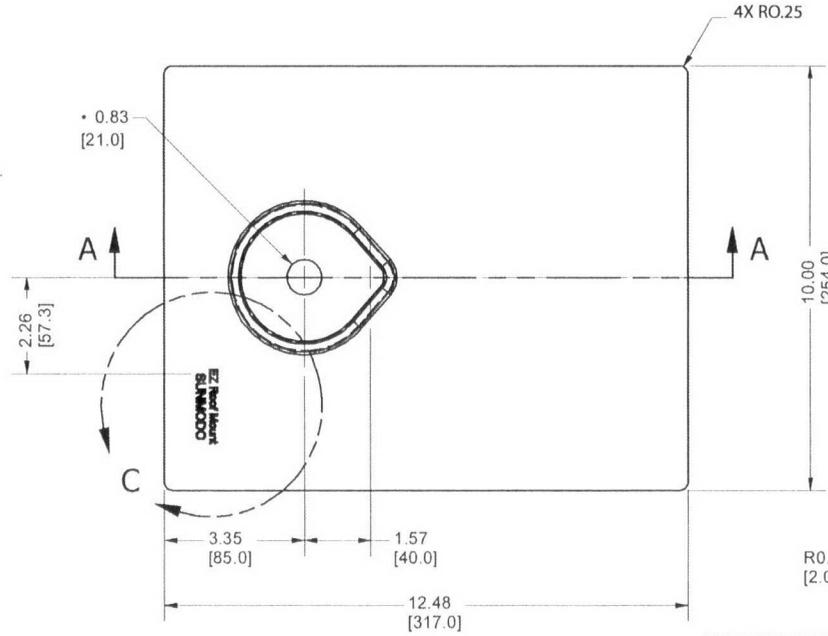
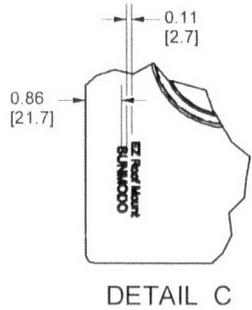
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MATERIAL: SEE NOTES	
Third Angle Projection:	
GENERAL SPECIFICATIONS All Dimensions in inches [millimeters]	
Tolerances	
X.XXX ±0.01 [0.25mm]	Break all sharp edges .010-.020 unless otherwise specified.
X.XX ±0.02 [0.50mm]	
X.X ±0.039 [1.0mm]	
Unless otherwise spec'd	
DRAWN BY: ZCG	DATE: 02/16/2011
CHECKED BY:	
APPROVALS:	

Sunmodo Corp.	
1915 E 5TH STREET, STE C, VANCOUVER, WA 98661	
TITLE ROOF MOUNT FLASHING	
B	DRAWING NUMBER A20052-001
SCALE: NONE	SHEET 1 of 1

NOTES: UNLESS OTHERWISE SPECIFIED

1. DIMENSIONS SHOWN ARE INCHES [MILIMETERS].
2. MATERIAL: AL 1060 T=1mm.
FINISH: CLEAR ANODIZED 10 μm THICK.
3. PART SHALL BE FREE OF OIL AND DIRT MARKS.
4. THE UNSPECIFIED INTERNAL RADII ARE .03".
5. BREAK ALL SHARP EDGES AND BURRS.
6. THE UNSPECIFIED DIMENSIONS ARE SPECIFIED BY 2D CAD FILE.



MATERIAL		SEE NOTES	
Third Angle Projection:			
GENERAL SPECIFICATIONS All Dimensions in inches [millimeters]			
Tolerances			
XXX ±0.01 [0.25mm]		Break at sharp edges	
XX ±0.02 [0.50mm]		0.10-0.20 unless	
X ±0.039 [1.0mm]		otherwise specified	
Unless otherwise specified			
DRAWN BY	DATE		
Zcg	02/16/2011		
CHECKED BY			
APPROVALS			

Sunmodo Corp.	
1915 E 5TH STREET, STE C, VANCOUVER, WA 98661	
TITLE ROOF MOUNT FLASHING	
B	DRAWING NUMBER A20052-001
SCALE:	NONE
SHEET	1 of 1

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4

3

2

1