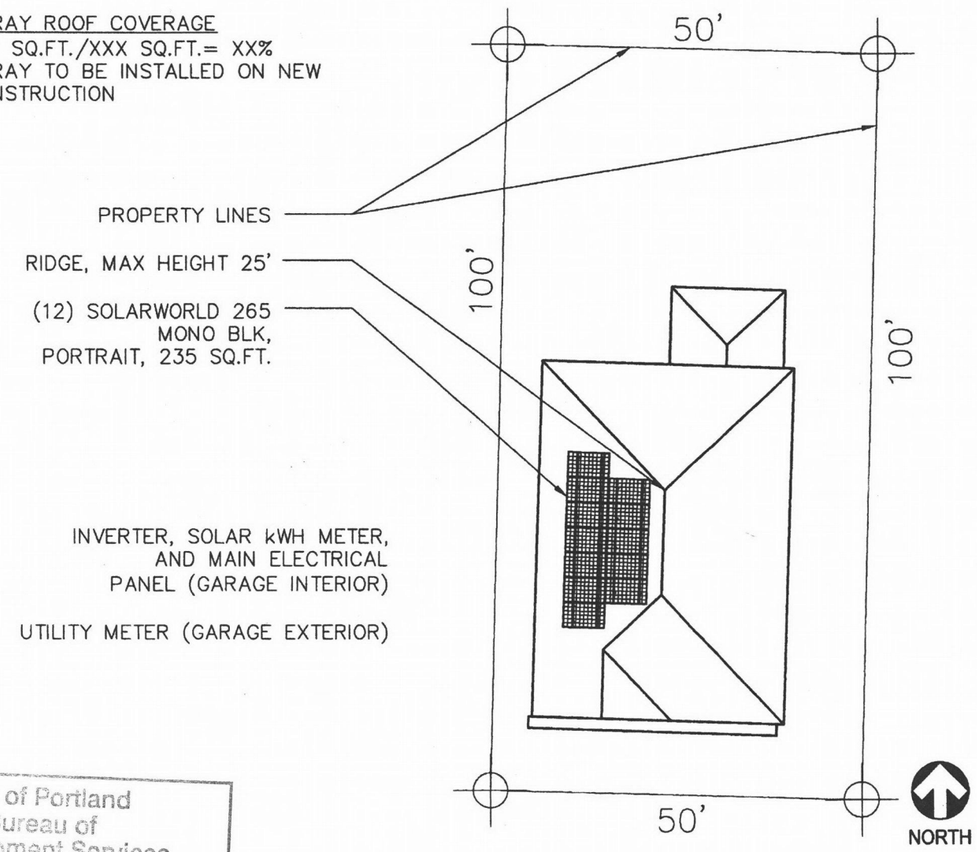
VIEW: SITE PLAN	PANEL ORIENTATION: 270°	ROOF PITCH: 22°	UTILITY CO./ INCENTIVE: PPL-SR

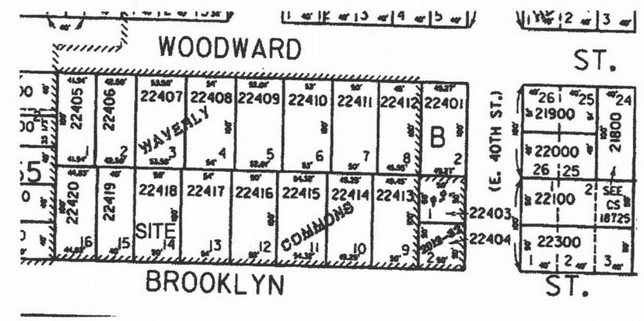
ROOF SPECIFICATIONS:
22° PITCH
COMPOSITION

SYSTEM SPECS:
3.18 kW SYSTEM
(1) POWER ONE PVI 3.0 OUTD-S-US (240V)
(12) SOLARWORLD 265 MONO BLK

ARRAY ROOF COVERAGE
217 SQ.FT./XXX SQ.FT.= XX%
ARRAY TO BE INSTALLED ON NEW CONSTRUCTION



2 SITE PLAN
SCALE 1" = 16'



1 VICINITY MAP
SCALE = 1/128" = 1'-0"

ARRAY SPECIFICATIONS:
ARRAY TILT = 22°
ARRAY ORIENTATION = 270°

AVERAGE SOLAR RESOURCE:
PSF = 96%
TOF = 86%
TSRF = 82%

Customer Name (printed): .
Customer Signature/Date: .

City of Portland
Bureau of
Development Services
By R Whiteside Date 8/2/13
Approved by
Planning and Zoning Review

City of Portland
REVIEWED FOR CODE COMPLIANCE
AUG 07 2013
Permit Number

SUNLIGHT SOLAR Energy
www.sunlightsolar.com
541-322-1910
SUNLIGHT SOLAR ENERGY, INC.
4 NW FRANKLIN AVE., BEND, OR 97701
CCB#: 158922 LRT#: 012

Brian & Nikki Rudiger
3535 SE Brooklyn St.
Portland, OR. 97202

REVISIONS

DATE DRAWN: 7/30/13
D.B./C.B.: TCH
APPROVED BY:
LICENSE #:
DATE SIGNED:
SHEET TITLE: SITE PLAN
SHEET : PV1.0

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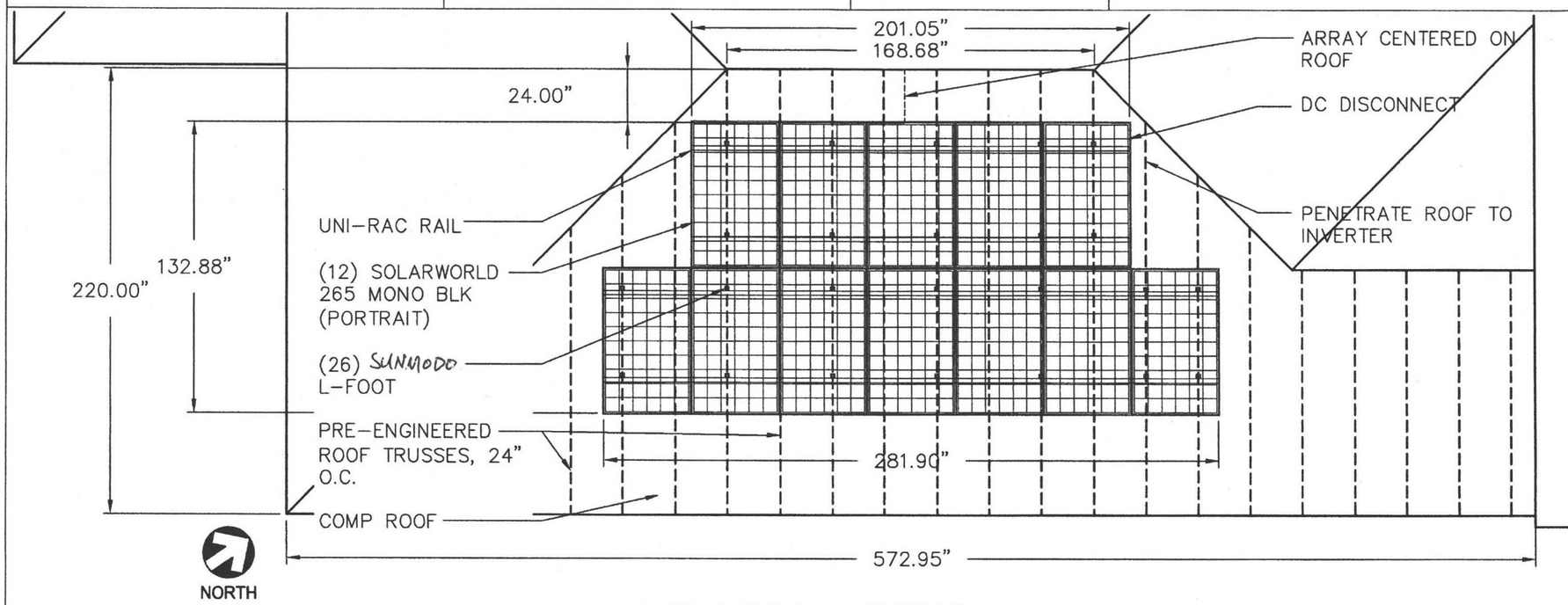
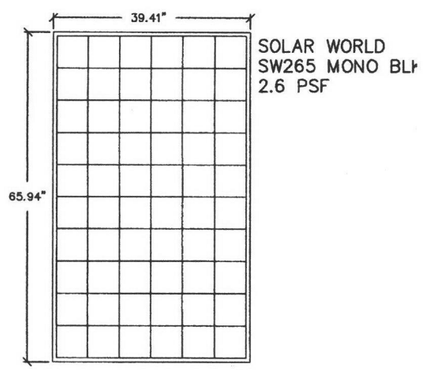
2

13-190024 RS

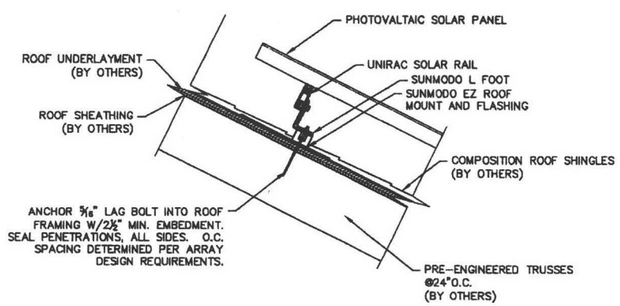
VIEW: ARCH PLAN - ARRAY DESIGN	PANEL ORIENTATION: 270°	ROOF PITCH: 22°	UTILITY CO./ INCENTIVE: PPL-SR



1 PARTIAL ROOF PLAN - ARRAY DESIGN
SCALE 1/4" = 1'-0"



3 TYPICAL MODULE
SCALE 1/2" = 1'-0"



2 ROOF MOUNT PROFILE DETAIL
SCALE 1" = 1'-0"

Customer Name (printed): _____

Customer Signature/Date: _____

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Brian & Nikki Rudiger
3535 SE Brooklyn St.
Portland, OR. 97202

REVISIONS

DATE DRAWN: 7/30/13

D.B./C.B.: TCH

APPROVED BY:

LICENSE #:

DATE SIGNED:

SHEET TITLE: ARRAY DESIGN

SHEET : PV2.0

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AUG 07 2013
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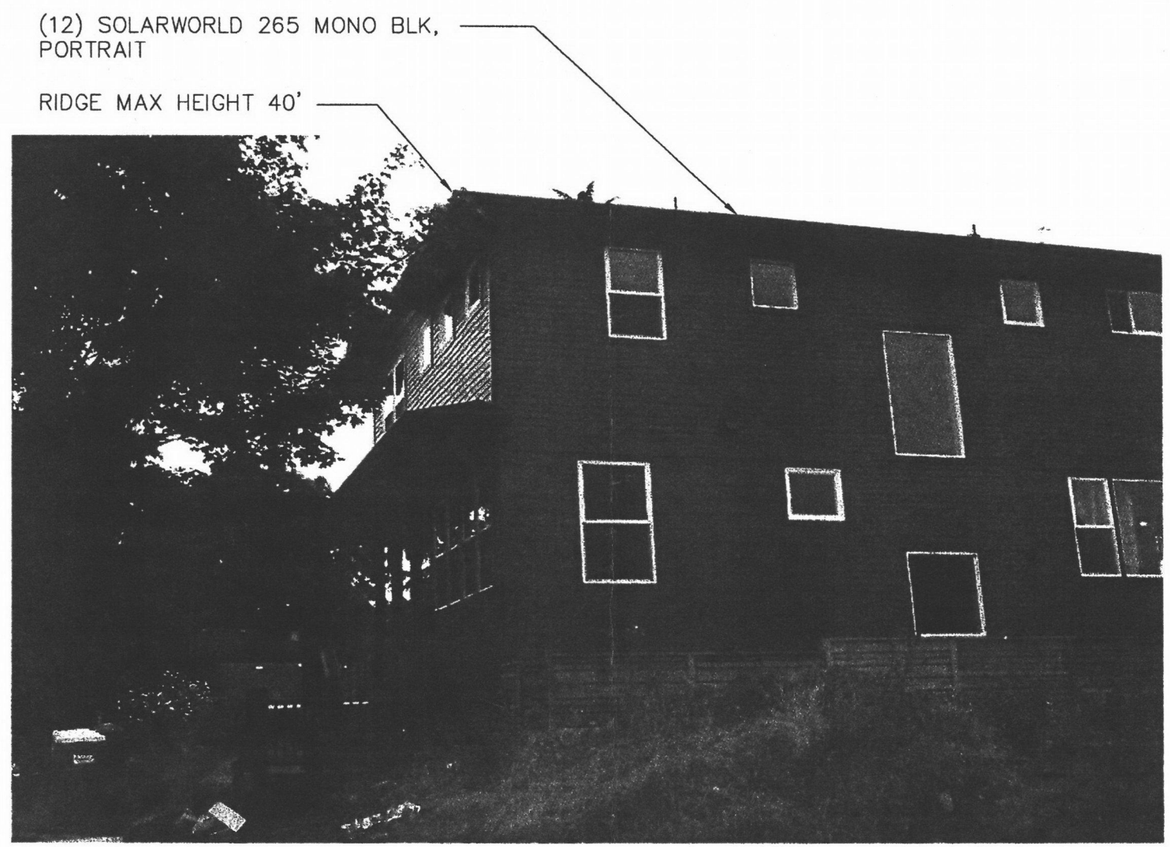
VIEW: ARCH PLAN - ROOF PHOTO	PANEL ORIENTATION: 270°	ROOF PITCH: 22°	UTILITY CO./ INCENTIVE: PPL-SR



1 ARRAY - LOOKING WEST FROM GROUND
NTS

Customer Name (printed): _____

Customer Signature/Date: _____

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Portland, OR. 97202

REVISIONS

DATE DRAWN: 7/30/13

D.B./C.B.: TCH

APPROVED BY:

LICENSE #:

DATE SIGNED:

SHEET TITLE: ROOF PHOTO

SHEET : PV3.0

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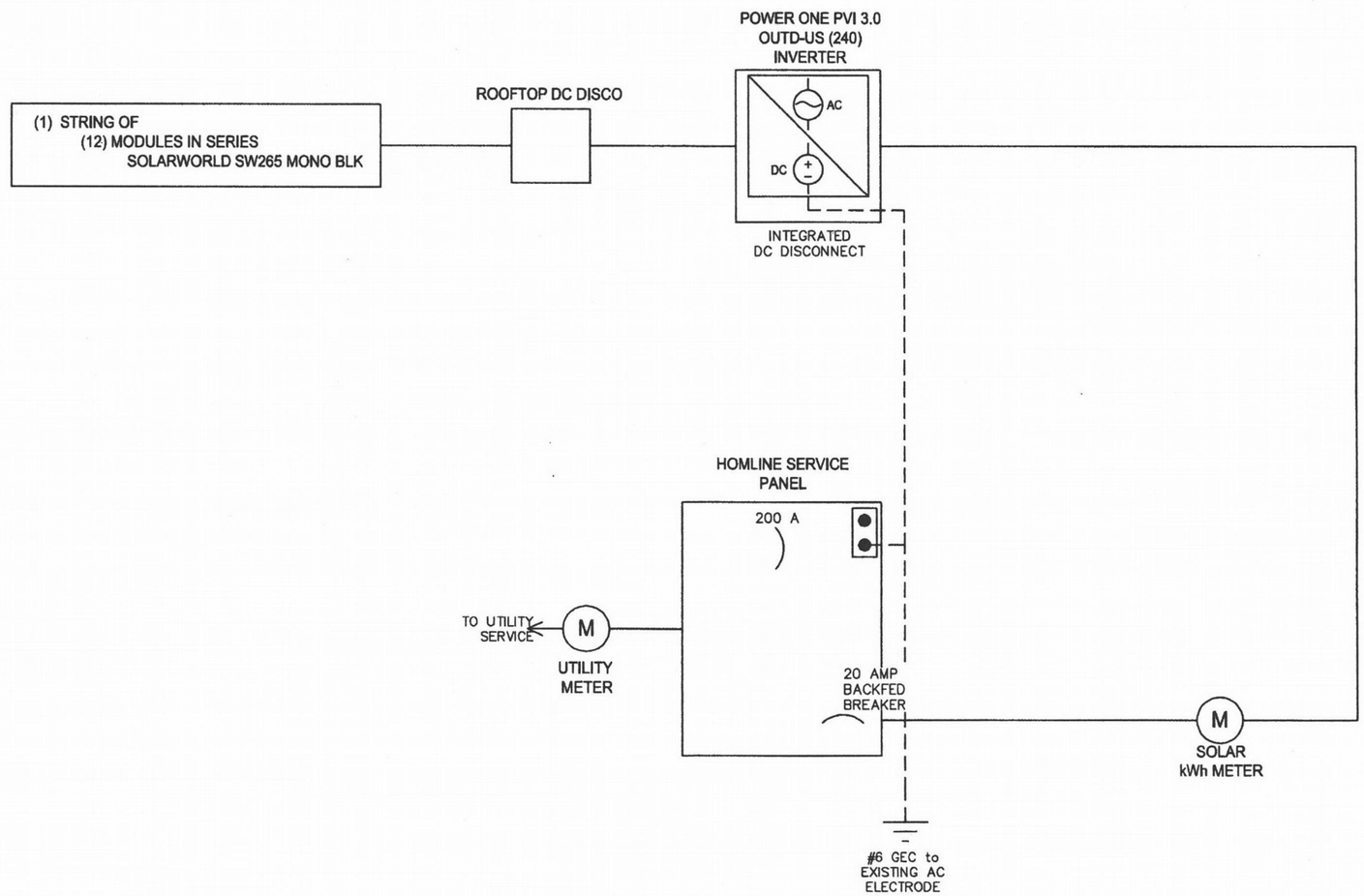
VIEW: ELECTRICAL ONE-LINE	PANEL ORIENTATION: 270°	ROOF PITCH: 22°	UTILITY CO./ INCENTIVE: PPL-SR



Customer Name (printed): _____

Customer Signature/Date: _____

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3535 SE Brooklyn St.
Portland, OR. 97202

REVISIONS

DATE DRAWN: 7/30/13

D.B./C.B.: TCH

DC APPROVED BY: Robert Blue

LICENSE #: 24256-J

DATE SIGNED: 8/6/13

SHEET TITLE: ELECTRICAL ONE-LINE

SHEET : PV5.0

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AUG 07 2013
Permit Number

VIEW: ELECTRICAL CALCULATIONS	PANEL ORIENTATION: 270°	ROOF PITCH: 22°	UTILITY CO./ INCENTIVE: PPL-SR

SITE TEMPRATURE INFORMATION
City, ST Portland, OR (ASHRAE)
RECORD HIGH °C: 36 °C
RECORD LOW °C: -6 °C
AVERAGE HIGH TEMP °C: 27 °C

SERVICE PANEL RATINGS
BUS AMP RATING (A): 200 A
SERVICE VOLTAGE (V): 240 V
MAIN AMP RATING (A): 200 A
PV OCPD AMP RATING (A): 20 A

DC AMPACITY & WIRE SIZING
NEC table 310.15 (B)(16)
DC AMPACITY
(module Isc)x(1.56)
8.82 x 1.56= 13.76 A
WIRE SELECTION
SIZE AND TYPE: #12 THHN
RATED AMPACITY: 25 A
ADJUSTED WIRE AMPACITY
(rated ampacity for selected wire) 25

PHOTOVOLTAIC OUTPUT CIRCUIT (DC)
CONDUIT SIZING (NEC table 5 ch. 9)
NUMBER OF (#12 THHN) IN CONDUIT 2
WIRE AREA
(2)#12 THHN + (1)#12 EGC
2 x 0.0133 + 0.0133= 0.040 sq.in.
CONDUIT SELECTION
SIZE AND TYPE: 1/2" EMT
PERMITTED AREA FOR OVER 2 WIRES: 0.122 sq.in.
AREA COMPARISON
WIRE AREA vs. PERMITTED AREA FOR OVER 2 WIRES: 0.040 < 0.122

AC AMPACITY & WIRE SIZING
NEC table 310.15 (B)(16)
AC AMPACITY
(inverter max AC current) x (1.25)
14.5 x 1.25= 18.13 A
WIRE SELECTION
SIZE AND TYPE: #12 THHN
RATED AMPACITY: 25 A
AMPACITY COMPARISON
AC AMPACITY vs. RATED WIRE AMPACITY: 18.13 < 25

INVERTER OUTPUT CIRCUIT (AC)
CONDUIT SIZING (NEC table5 ch. 9)
NUMBER OF (#12 THHN) IN CONDUIT: 3
WIRE AREA
(3)#12 THHN + (1)#12 EGC
3 x 0.0133 + 0.0133= 0.053 sq.in.
CONDUIT SELECTION
SIZE AND TYPE: 1/2" EMT
PERMITTED AREA FOR OVER 2 WIRES: 0.122 sq.in.
AREA COMPARISON
WIRE AREA vs. PERMITTED AREA FOR OVER 2 WIRES: 0.053 < 0.122

RATED VOLTAGE AT AVERAGE HIGH TEMPRATURE
VOLTAGE ADJUSTMENT
AVERAGE HIGH TEMP. IN (Portland, OR (ASHRAE)): 27 °C
ΔT
(Avg. High Temp. - (25°C (STC))
27 - 25 = 2 °C
MOUNT HEIGHT ADJUSTER
ROOF MOUNT: 35 °C
ADJUSTED ΔT
(T) + (mount height adjuster)
2+35 = 37 °C
Vmp @ AVERAGE HIGH TEMPRATURE
[1-(adjusted T x Vmp temp coeff)] x (Vmp x # of panels per string)
[1-(37 x 0.0045)] x (31.9 x12) = 319.06 V

VOLTAGE DROP - ARRAY TO INVERTER
WIRE INFORMATION
WIRE LENGTH: 50 ft
WIRE TYPE: #12 THHN
RATED WIRE RESISTANCE (NEC table 8 ch. 9)= 1.98 Ω/kft
ADJUSTED VOLTAGE DROP
(.2) x (wire length) x (module Imp) x (rated wire resistance)/(Vmp @ avg. high temp)
0.2 x 50 x 8.33 x 1.98/319.06= 0.52% Vdrop

VOLTAGE DROP - INVERTER TO HOUSE PANEL
WIRE INFORMATION
WIRE LENGTH: 10 ft
WIRE TYPE: #12 THHN
RATED WIRE RESISTANCE (NEC table 8 ch. 9)= 1.98 Ω/kft
ADJUSTED VOLTAGE DROP
(.2) x (wire length) x (inverter max AC current) x (rated wire resistance)/(AC voltage)
0.2 x 10 x 14.5 x 1.98/240= 0.24% Vdrop

ARRAY DESIGN
OF ARRAYS: 1
OF STRINGS: 1
OF PANELS PER STRING: 12

INVERTER RATINGS
INVERTER MANUFACTURER:POWER ONE
INVERTER MODEL:PVI-3.0-OUTD-US
MAX DC VOLT RATING (V): 600 V
MAX POWER @ 40°C (W): 3300 W
NOMINAL AC VOLTAGE (V): 240 V
MAX AC CURRENT (A): 14.5 A

PV MODULE RATINGS @ STC:
MODULE MANUFACTURER:SOLARWORLD
MODULE MODEL #:SW 265 MONO
OPERATING CURRENT (Imp): 8.33 A
SHORT-CIRCUIT CURRENT (Isc): 8.82 A
OPERATING VOLTAGE (Vmp): 31.90 V
OPEN-CIRCUIT VOLTAGE (Voc) 38.10 V
MAXIMUM POWER (W): 265.00 W
Vmp TEMP COEFF.: -0.45% /°C
Voc TEMP COEFF.: -0.30% /°C
MAX FUSE RATING (A): 16 A

690.53 P.V. POWER SOURCE SIGNAGE ON DC DISCONNECT
RATED CURRENT (A)
(Imp)x(# strings)
8.33 x 1= 8.3 A
RATED VOLTAGE (V)
(Vmp)x(# of panels per string)
31.9 x 12= 382.8 V
MAX SYSTEM VOLTAGE (V)
25-(lowest local temp °C) = T
25 - (-6)= 31 °C
[1+(T x temp. coeff)] x (Voc x # of panels in series)
1+(31 x 0.003)] x (38.1 x 12) = 499.72 V
MAX CIRCUIT CURRENT (A)
(Isc)x(# of strings)x(1.25)
8.82 x 1 x 1.25= 11.03 A

Customer Name (printed): _____

Customer Signature/Date: _____

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CCB#: 158822 LRT#: 012

Brian & Nikki Rudiger
3535 SE Brooklyn St.
Portland, OR. 97202

REVISIONS

DATE DRAWN: 7/30/13
D.B./C.B.: TCH
DC APPROVED BY: Robert John
LICENSE #: 24256-J
DATE SIGNED: 8/6/13
SHEET TITLE: ELECTRICAL CALCS
SHEET : PV5.1

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VIEW: STRUCTURAL CALCULATIONS	PANEL ORIENTATION: 270°	ROOF PITCH: 22°	UTILITY CO./ INCENTIVE: PPL-SR

Exposure Category – B
50 lb/ft² wind pressure uplift
(Category B, 20' roof height,
85mph wind speed)

Exposure B: Urban or suburban living areas, wooded areas, or other terrain with numerous closely spaced obstructions having the size of a single-family dwelling or larger.

Exposure C: Open terrain with scattered obstructions having heights generally less than 30 ft. Use category C for all cases where B and C don't apply.

Exposure D: Flat, unobstructed areas and open water surfaces outside hurricane prone regions. This category includes mud flats, salt flats, and unbroken ice.

International Building Code, section 1609.4.2 and 1609.4.3
ASCE Standard 7-95

PANEL HOLD DOWN/DESIGN WIND PRESSURE – SOLARMOUNT

UPLIFT

18.04 ft² per panel * 12 panels = 216.5 ft² Array
50 lb/ft² * 216.5ft² = 10,825lb wind uplift potential

HOLD DOWN

227 lb/in withdraw resistance (5/16") - 4" lag screw
227 lb/in * 2.25" of contact lag = 511 lbs of hold down/lag
1 screw per L-Foot = 511 lbs hold down each
10,825lbs wind uplift / 511 lbs hold down per stand = 22 stands for this racking system
Sunlight Solar will use greater than 22 stands for this racking system.
* Calculations based on manufacturer's recommendations certified by Oregon Building Code and P.E. stamped on 9/1/2006

PANEL DATA

SW265 MONO BLK
65.94" x 39.41"
18.0 ft² per panel
Module Weight = 46.7 lbs.

DISTRIBUTED DEAD LOAD

Module Weight = 2.6 lbs./ft²
Mount System Weight = 0.6 lbs./ft²
Distributed Weight = 3.20 lbs/ft²

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Customer Signature/Date: _____

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REVISIONS

DATE DRAWN: 7/30/13
D.B./C.B.: TCH
APPROVED BY:
LICENSE #:
DATE SIGNED:
SHEET TITLE: STRUCTURAL CALCS
SHEET : PV6.0

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