GUIDELINES FOR PERMITTING A RESIDENTIAL PHOTOVOLTAIC (PV) SYSTEM

The Guidelines include:

- Structural Evaluation
- Plans and Specifications
- Fees
- Documentation
- Inserts
  - Structural Evaluation Worksheet
  - Building Permit Worksheet
  - Electrical Permit Application
- Exhibits
  - A – Site Plan
  - B – Standard Electrical Diagram
  - C – Notes for Electrical Diagram
- PV Bulletin

This guideline is to assist applicants in the permit process for photovoltaic (PV) systems. To determine a property's flood zone designation, complete the form http://records.co.hawaii.hi.us/Weblink8/Browse.aspx?dbid=1&startid=58075 and email the completed form to dpweng@hawaiicounty.gov To obtain an unofficial estimate of the property's flood zone designation, click on the Flood Hazard Assessment Tool at http://gis.hawaiinfip.org/fhat/

Department of Public Works, Building Division

7:45 AM to 4:30 weekdays. Closed First Friday, weekends, and holidays.

http://www.hawaiicounty.gov/public-works-building

Email: cohbuild@hawaiicounty.gov

EAST HAWAI'I: Aupuni Center, 101 Pauahi Street, Suite 7, Hilo, HI 96720

PHONE NUMBER: (808) 961-8331: FAX NUMBER: (808) 961-8410

WEST HAWAI'I: 74-5044 Ane Keohokalole Highway, Bldg E, 1st Floor, Kailua-Kona, HI 96740

PHONE NUMBER: (808) 323-4720 FAX NUMBER: (808) 327-3509

Revised 10.10.12

GUIDELINES FOR PERMITTING A RESIDENTIAL PHOTOVOLTAIC (PV) SYSTEM

STRUCTURAL EVALUATION

The structural evaluation worksheet is to be completed by the applicant and attached to the drawings.

Steps 1 and 2 of the evaluation worksheet is inserted with this booklet.

PLANS AND SPECIFICATIONS

A) Building
   1) A location site plan showing the location of major structures on the property 1" = 20' or larger is preferred.
   2) A roof plan (scale 1"=8') with PV arrays on dwellings with a 3' clear space along the roof ridge.
      a) Show array supports, framing members.
      b) Provide information on roof mounting structure(s) construction.
      c) Detail the module attachment method. *Fasteners must not occur in roof framing beyond the exterior wall line without engineered calculations*

B) Electrical (See Exhibits A-C).
   1) Location plan showing structures and their vicinity 1" = 20' or larger is preferred.
   2) Provide information on roof mounting systems.
   3) A standard electrical diagram showing PV array configuration, wiring system, over current protection, inverter, disconnects, required markings or labels and AC connection to the building.
   4) Provide specification sheets, and installation manuals for all manufactured components including, but not limited to PV modules, inverters, combiner box, and mounting system. These will be returned after the review.
   5) The electrical diagram (E1.1) maybe used to accurately represent the PV system.

FEES

Calculate the fees for all the work to be performed on the electrical permit application and building permit worksheet. On the building permit worksheet, complete the "Estimated Valuation for all work to be performed."

Hawai'i County Code, Chapter 9, Electricity Permit
Division 2. Fees and Charges

Section 9-40. Fee schedule.

(q) Generators, Capacitors, Reactors, Transformers Fixed, and all other alternate energy power sources.
For the purpose of this subsection, 1 kw is equivalent to 1 kva.
Not more than 5 kw..... $10
Over 5 kw but not over 15 kw..... $24
Over 15kw..... $40

GUIDELINES FOR PERMITTING A RESIDENTIAL PHOTOVOLTAIC (PV) SYSTEM

Hawai‘i County Code, Chapter 5, Building Permit

Section 5-35. Table 1-A.

TABLE 1-A – BUILDING PERMIT FEES	
Fees shall be as follows:	
$0 to $500	$10.00
$501 to $2,000	$10.00 for the first $500 plus $1.50 for each additional $100 or fraction thereof, to and including $2,000
$2,001 to $25,000	$32.50 for the first $2,000 plus $7.50 for each additional $1,000 or fraction thereof, to and including $25,000.
$25,001 to $50,000	$205.00 for the first $25,000 plus $6.00 for each additional $1,000 or fraction thereof, to and including $50,000.
$50,001 and up	$355.00 for the first $50,000 plus $3.00 for each additional $1,000 or fraction thereof.

If a value is not provided the determination shall be made by the Building Official.[1]

DOCUMENTATION

A) Include two sets of drawings of site plans stamped by an electrical engineer in accordance with HRS section 444[2], and product submittals as required.
B) Complete the building permit worksheet, and electrical permit application.
C) Submit a check payable to the County Director of Finance for the required fees.

Hawai‘i County Code, Chapter 9, Electricity, Section 9-33. Plans and specifications requirements; deviations.

“(b) All photovoltaic systems for residential and non-residential installations shall require a building permit. Electrical design drawings and specifications shall bear the approval of an electrical engineer registered in the State of Hawai‘i.
(c) No person shall materially deviate from any reviewed plan or specifications or fail, neglect or refuse to comply herewith, unless permission to do so has first been obtained from the electrical engineer on record. Revised drawings and or a letter approving such deviations shall be submitted to the authority having jurisdiction for review.”

[1] Hawai‘i County Code, Chapter 5, Sec 5-31

[2] Under the Hawai‘i Revised Statutes section 444 permits are issued to Hawai‘i State licensed building, electrical, or photovoltaic contractors.

GUIDELINES FOR PERMITTING A RESIDENTIAL PHOTOVOLTAIC (PV) SYSTEM

SPAN TABLES[3]:

A framing plan is required only if the combined weight of the PV array exceed 5 pounds per square foot (PSF or lbs/ ft^2) or, the existing rafters are over-spanned. The following may help determine if the rafters are over-spanned.

Use this table for rafter spans that have conventional lightweight dead loads. If there is a roof system that doesn't fall within these tables consider obtaining the advice of a State of Hawaii registered professional Architect or Structural Engineer.

10 PSF Dead Load Roof live load= 20 psf, ceiling not attached to rafters, L/Δ= 180							
Rafter Size			2 x 4	2 x 6	2 x 8	2 x 10	2 x 12
Spacing (inches)	Species	Grade	The measurements below are in feet-inches (e.g. 9-10=9 feet, 10 inches)				
16	Douglas Fir-larch	#2 or better	9-10	14-4	18-2	22-3	25-9
24	Douglas Fir-larch	#2 or better	8-0	11-9	14-10	18-2	21-0

Use this table for rafter spans with a ceiling attached, and conventional light dead loads

10 PSF Dead Load Roof live load= 20 psf, ceiling not attached to rafters, L/Δ= 240							
Rafter Size			2 x 4	2 x 6	2 x 8	2 x 10	2 x 12
Spacing (inches)	Species	Grade	The measurements below are in feet-inches (e.g. 9-10=9 feet, 10 inches)				
16	Douglas Fir-larch	#2 or better	8-11	14-1	18-2	22-3	25-9
24	Douglas Fir-larch	#2 or better	7-10	11-9	14-10	18-2	21-0

If the roof system has:

a. Over-spanned rafters or trusses,
b. The array is over 5 lbs/ft^2 on any roof construction, or
c. The attachments with a dead load exceeds 45 lbs per attachment;

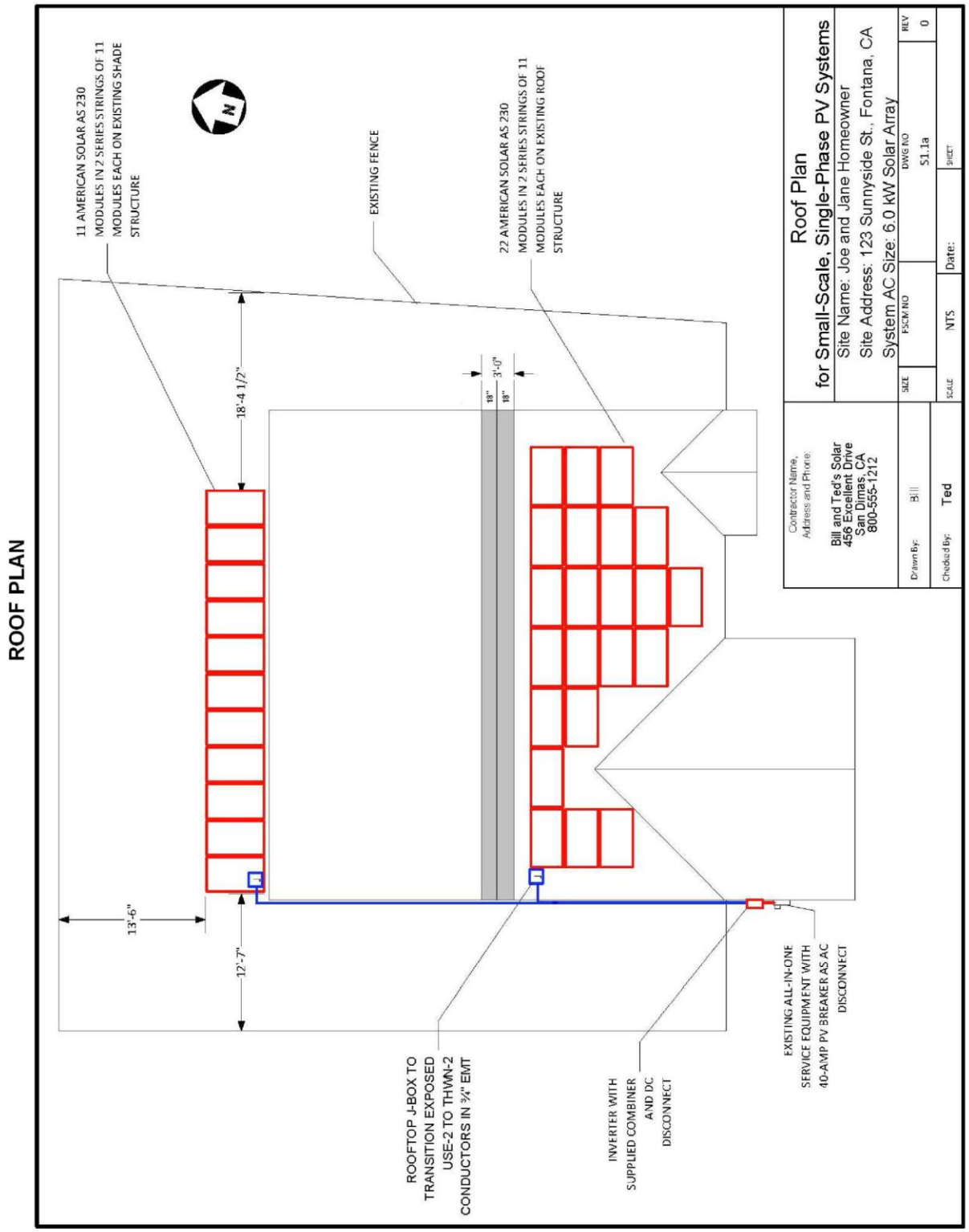
It is required that you provide one of the following:

I. A framing plan showing details how you will strengthen the rafters using the supplied span tables.

[3] The Span Tables and Exhibits A-C were printed with permission from the Solar America Board of Codes & Standards.

GUIDELINES FOR PERMITTING A RESIDENTIAL PHOTOVOLTAIC (PV) SYSTEM

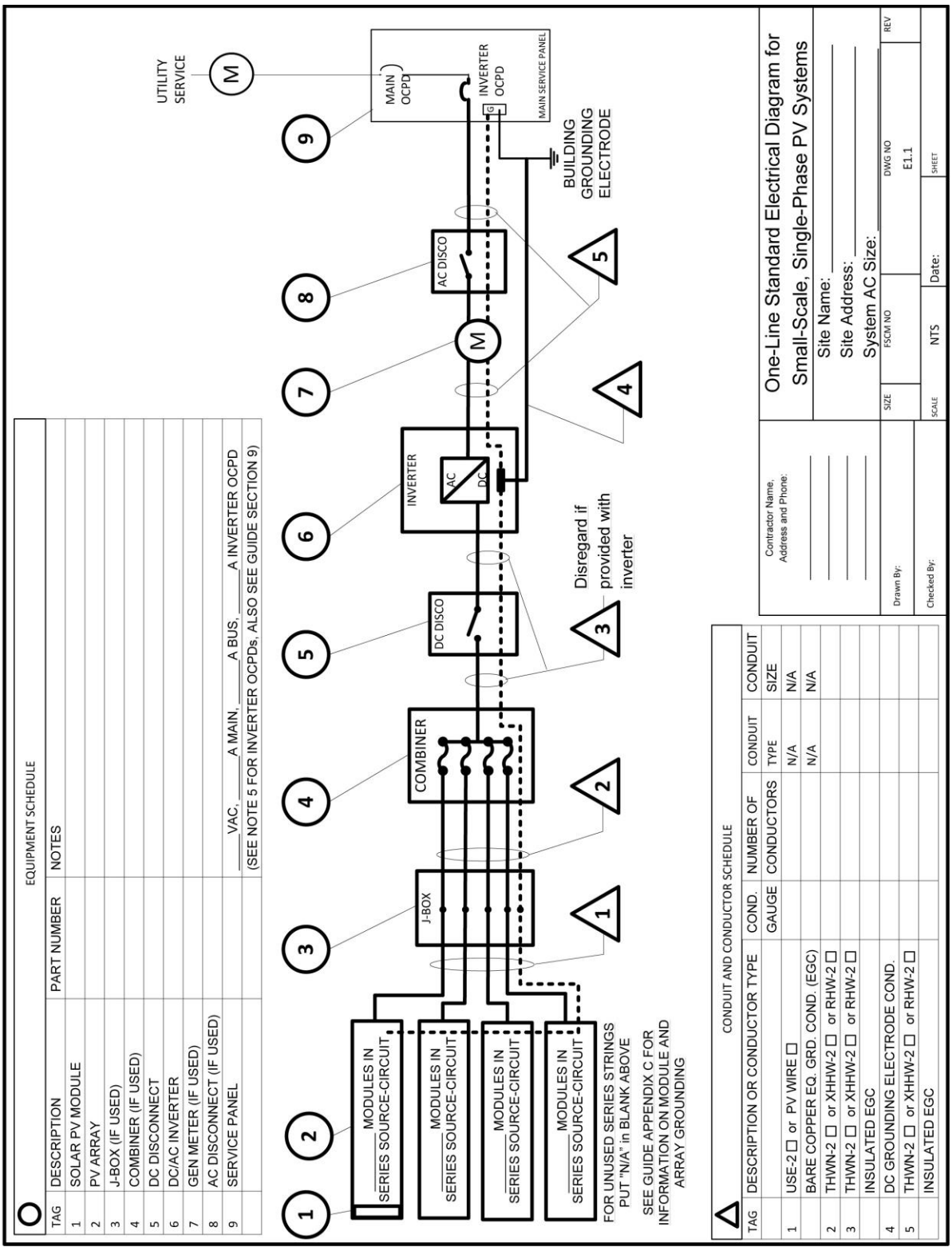
SAMPLE ONLY
DO NOT SUBMIT WITH PLANS



GUIDELINES FOR PERMITTING A RESIDENTIAL PHOTOVOLTAIC (PV) SYSTEM

SAMPLE ONLY
DO NOT SUBMIT WITH PLANS

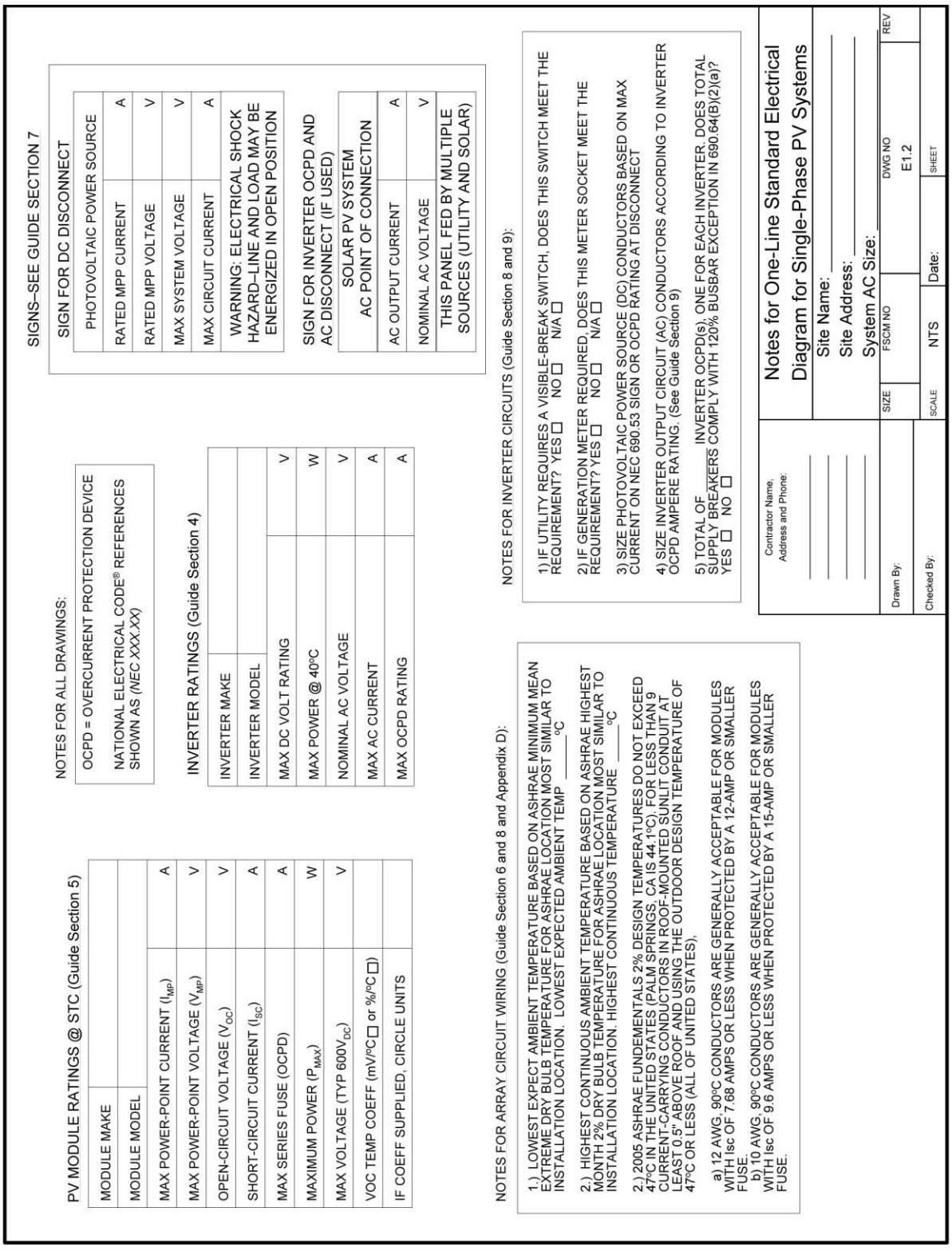
STANDARD ELECTRICAL DIAGRAM



GUIDELINES FOR PERMITTING A RESIDENTIAL PHOTOVOLTAIC (PV) SYSTEM

SAMPLE ONLY
DO NOT SUBMIT WITH PLANS

NOTES FOR ELECTRICAL DIAGRAM



PV MODULE RATINGS @ STC (Guide Section 5)

MODULE MAKE	
MODULE MODEL	
MAX POWER-POINT CURRENT (I_{MP})	A
MAX POWER-POINT VOLTAGE (V_{MP})	V
OPEN-CIRCUIT VOLTAGE (V_{OC})	V
SHORT-CIRCUIT CURRENT (I_{SC})	A
MAX SERIES FUSE (OCPD)	A
MAXIMUM POWER (P_{MAX})	W
MAX VOLTAGE (TYP 600V_{DC})	V
VOC TEMP COEFF (mV/°C☐ or %/°C☐)	
IF COEFF SUPPLIED, CIRCLE UNITS	

NOTES FOR ALL DRAWINGS:

OCPD = OVERCURRENT PROTECTION DEVICE

NATIONAL ELECTRICAL CODE® REFERENCES SHOWN AS *(NEC XXX.XX)*

INVERTER RATINGS (Guide Section 4)

INVERTER MAKE	
INVERTER MODEL	
MAX DC VOLT RATING	V
MAX POWER @ 40°C	W
NOMINAL AC VOLTAGE	V
MAX AC CURRENT	A
MAX OCPD RATING	A

NOTES FOR ARRAY CIRCUIT WIRING (Guide Section 6 and 8 and Appendix D):

1.) LOWEST EXPECT AMBIENT TEMPERATURE BASED ON ASHRAE MINIMUM MEAN EXTREME DRY BULB TEMPERATURE FOR ASHRAE LOCATION MOST SIMILAR TO INSTALLATION LOCATION. LOWEST EXPECTED AMBIENT TEMP _____ °C

2.) HIGHEST CONTINUOUS AMBIENT TEMPERATURE BASED ON ASHRAE HIGHEST MONTH 2% DRY BULB TEMPERATURE FOR ASHRAE LOCATION MOST SIMILAR TO INSTALLATION LOCATION. HIGHEST CONTINUOUS TEMPERATURE _____ °C

2.) 2005 ASHRAE FUNDEMENTALS 2% DESIGN TEMPERATURES DO NOT EXCEED 47°C IN THE UNITED STATES (PALM SPRINGS, CA IS 44.1°C). FOR LESS THAN 9 CURRENT-CARRYING CONDUCTORS IN ROOF-MOUNTED SUNLIT CONDUIT AT LEAST 0.5" ABOVE ROOF AND USING THE OUTDOOR DESIGN TEMPERATURE OF 47°C OR LESS (ALL OF UNITED STATES),

a) 12 AWG, 90°C CONDUCTORS ARE GENERALLY ACCEPTABLE FOR MODULES WITH Isc OF 7.68 AMPS OR LESS WHEN PROTECTED BY A 12-AMP OR SMALLER FUSE.

b) 10 AWG, 90°C CONDUCTORS ARE GENERALLY ACCEPTABLE FOR MODULES WITH Isc OF 9.6 AMPS OR LESS WHEN PROTECTED BY A 15-AMP OR SMALLER FUSE.

NOTES FOR INVERTER CIRCUITS (Guide Section 8 and 9):

1) IF UTILITY REQUIRES A VISIBLE-BREAK SWITCH, DOES THIS SWITCH MEET THE REQUIREMENT? YES ☐ NO ☐ N/A ☐

2) IF GENERATION METER REQUIRED, DOES THIS METER SOCKET MEET THE REQUIREMENT? YES ☐ NO ☐ N/A ☐

3) SIZE PHOTOVOLTAIC POWER SOURCE (DC) CONDUCTORS BASED ON MAX CURRENT ON NEC 690.53 SIGN OR OCPD RATING AT DISCONNECT

4) SIZE INVERTER OUTPUT CIRCUIT (AC) CONDUCTORS ACCORDING TO INVERTER OCPD AMPERE RATING. (See Guide Section 9)

5) TOTAL OF _____ INVERTER OCPD(s), ONE FOR EACH INVERTER, DOES TOTAL SUPPLY BREAKERS COMPLY WITH 120% BUSBAR EXCEPTION IN 690.64(B)(2)(a)? YES ☐ NO ☐

SIGNS--SEE GUIDE SECTION 7

SIGN FOR DC DISCONNECT

PHOTOVOLTAIC POWER SOURCE	
RATED MPP CURRENT	A
RATED MPP VOLTAGE	V
MAX SYSTEM VOLTAGE	V
MAX CIRCUIT CURRENT	A

WARNING: ELECTRICAL SHOCK HAZARD–LINE AND LOAD MAY BE ENERGIZED IN OPEN POSITION

SIGN FOR INVERTER OCPD AND AC DISCONNECT (IF USED)

SOLAR PV SYSTEM AC POINT OF CONNECTION	
AC OUTPUT CURRENT	A
NOMINAL AC VOLTAGE	V

THIS PANEL FED BY MULTIPLE SOURCES (UTILITY AND SOLAR)

Contractor Name, Address and Phone:

Notes for One-Line Standard Electrical Diagram for Single-Phase PV Systems

Site Name: _____

Site Address: _____

System AC Size: _____

Drawn By:	SIZE	FSCM NO	DWG NO	REV
			E1.2	
Checked By:	SCALE	NTS	Date:	SHEET

GUIDELINES FOR PERMITTING A RESIDENTIAL PHOTOVOLTAIC (PV) SYSTEM

BUILDING DIVISION – DPW

COUNTY OF HAWAI'I – 101 Pauahi Street, Suite 7 – Hilo, Hawai'i 96720
Hilo Office (808) 961-8331 • Fax (808) 961-8410 Kona Office (808) 323-4720 • Fax (808) 323-3509

Bulletin No: PV 2012-01

Date: August 24, 2012

Code/ Edition: Hawaii County Code Chapter 9 and the 2008 National Electrical Code (NEC)

Subject: Photovoltaic (PV) energy systems

The following clarifications are the result of discussions at the public PV workshops conducted on August 14 and 15, 2012, by the Department of Public Works:

A. PV - GENERAL

1. Inspection

Building and electrical inspections may be requested in any order following installation of panels on roof.

B. PV - ROOF MOUNTED

1. Inspection

Building Division has decided to provide ladders to inspectors. In the interim, contractors please continue to provide ladders and fall protection at the time of inspection.

2. Plan Review and Approval

Per the manufacturers' literature and ICC Evaluation Reports for **Iron Ridge Mounting Systems and mounting attachments**: **Unirac** and **Solar Mount** systems are approved for use and may be installed to a maximum height of 30' in Wind Zones A, B, or C and Seismic Zones A, B, C, or D and do not require a licensed Hawai`i state architect or structural engineer review and approval (a professional stamp). Such applications within Wind Exposure D (1/4 mile of the ocean) and/or Seismic Zones E or F require a licensed Hawai`i state architect or structural engineer review and approval.

Thank you again for your participation. Please email or call me with questions or comments.

Neil Erickson
Plans Examining Manager
nerickson@co.hawaii.hi.us

Issued by: David Yamamoto, Building Division Chief