

StruDer Consulting, Inc.
3404 Winmoor Drive, Ijamsville, MD 21754
240-457-3775, ryadava@gmail.com

November 24, 2020

To: Solar Energy World
5681 Main Street
Elkridge, MD 21075

Subject: Structural Certification for Solar Panels Installation on Roof of
Susan Beckman Residence, 1551 33rd Street NW, Washington DC 20007

To whom it may concern,

A design check of the existing roof support framing system at the subject residence was performed for installation of solar panels.

Field measurements / inspection of the roof support framing system, by the client's auditors, are as follows:

The roof structure consists of rubberized membrane on 1x6 planks, supported on timber joists and beams.

The roof section "S1" east side has a maximum projected horizontal span of 10'-0" supported on load bearing walls, and a roof slope of 5°. The maximum unsupported projected horizontal span of the roof beams in this area is approximately 9.2 ft. The roof beams are timber 2"x6" spaced at 18" - 24" OC.

The roof section "S1" west side has a maximum projected horizontal span of 13'-0" supported on load bearing walls, and a roof slope of 5°. The maximum unsupported projected horizontal span of the roof beams in this area is approximately 12.2 ft. The roof beams are timber 2"x8" spaced at 18" - 24" OC.

The roof section "S1" roof joists span approximately 1.5 ft. – 2.0 ft. The roof joists are timber 2"x6" spaced at 24" OC.

The above existing roof support framing system is judged to be adequate subject to all code specified design loads and additional loading imposed by the installation of the solar panels. No reinforcement required.

All applicable loads required by the current codes and design criteria listed below have been applied and The above existing roof support framing system is judged to be adequate subject to all code specified design loads and additional loading imposed by the installation of the solar panels. No reinforcement is required.

All applicable loads required by the current codes and design criteria listed below have been applied and analyzed by the solar racking supplier. Furthermore, the installation crews have been thoroughly trained to install the solar panels system following all the design and installation recommendations specified by SnapNrack for the solar mount rails. Finally, I accept the certifications provided by the solar panel manufacturer for the ability of the panels to withstand design wind and snow loads. The footings shall

Susan Beckman Residence, 1551 33rd Street NW, Washington DC 20007

be spaced at maximum 4'-0" O.C. The 5/16" diameter stainless steel lag bolts shall have minimum 2.5" embedment into the roof joists.

Design Criteria:

- Applicable Design Codes = 2015 IRC / IRC, ASCE 7-10, and NDS-2015
- Roof Dead Load (East Side) = 8.1 psf
- Roof Dead Load (West Side) = 8.3 psf
- Ultimate Design Wind Speed = 115 mph, Exposure B
- Flat Roof Design Snow Load = Maximum of (25 psf + Snow Drift) and 30 psf = 30 psf
- Design sloped roof Snow Load = 30.1 psf


If any condition is found to be different from what is shown on the drawings or there appears to be any damage to the structure, please halt the solar panel installation and notify our office.

Should you have any question or concerns regarding this project, please feel free to contact me.

Sincerely,

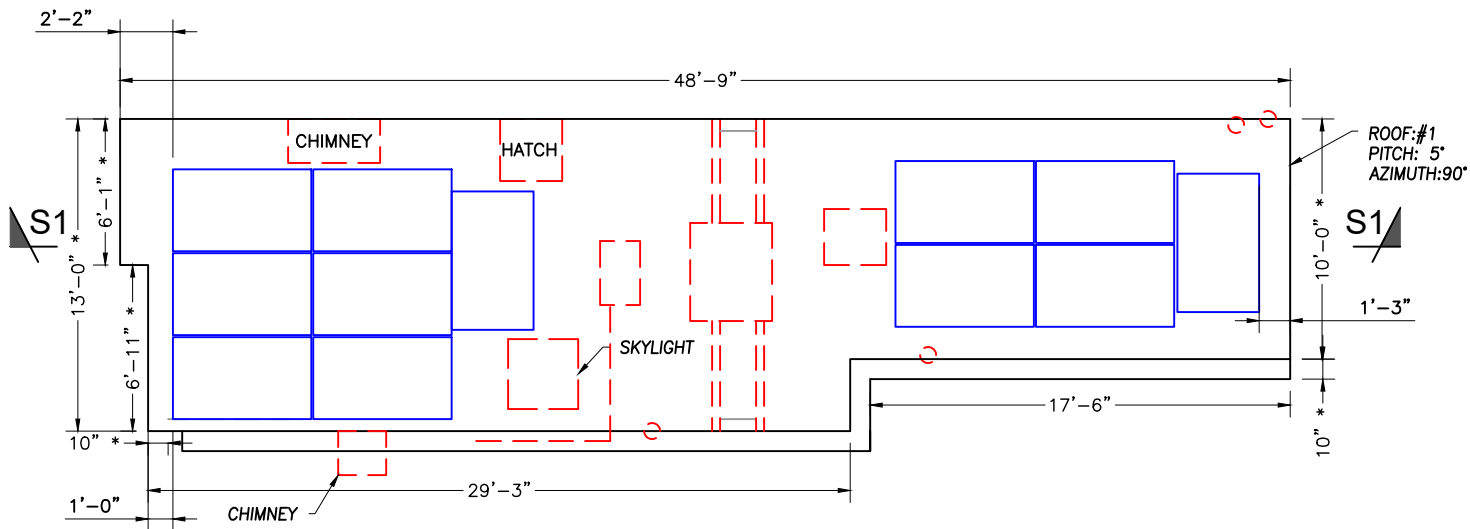
Rabi Shankar Singh Yadava, PhD, PE

Structural Engineer
StruDes Consulting, Inc.

DocuSigned by:

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Professional Certification: I hereby certify that these plans were prepared or approved by me, and i am duly licensed professional engineer under the laws of the District of Columbia. License no. 907100. Expiration date: August 31, 2020. Renewal is not allowed due to emergency declaration. The license is valid. Stamped and signed for structures only.

IQ7
CHEMCURB



SOLAR PANEL LAYOUT
Scale: 1/8" = 1'-0"

NOTES:

1. THE SYSTEM SHALL INCLUDE [12] LONGi Green Energy Technology Co Ltd LR4-60HPB-350M.
2. CHEMBURB SOLARMOUNT RAIL WILL BE INSTALLED IN ACCORDANCE WITH CHEMCURB INSTALLATION MANUAL
3. DIMENSIONS MARKED (*) ARE ALONG ROOF SLOPE.
4. REFER TO STRUCTURAL DRAWING FOR SECTIONS MARKED AND ADDITIONAL NOTES.



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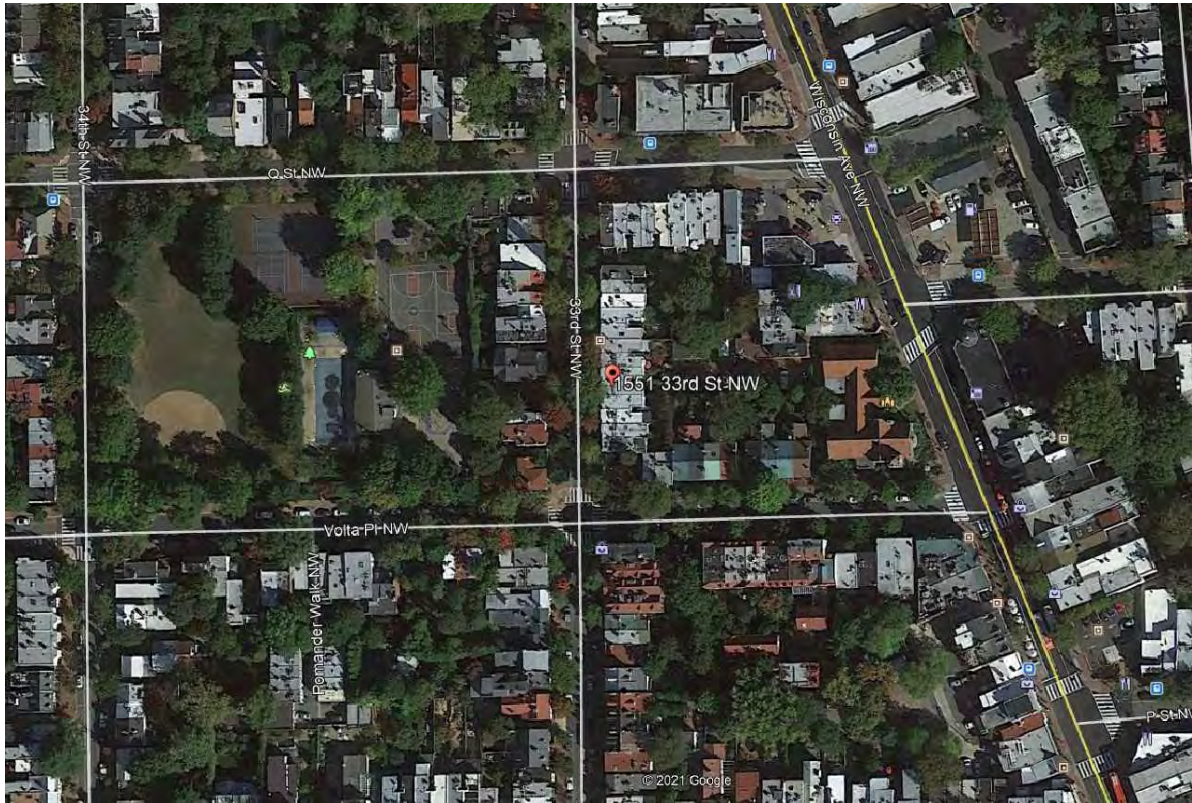
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Plotted: Joshua Nuckols on 11/20/2020 12:08 PM

Project Name and Address

Susan Beckman
1551 33rd St NW
Washington DC, 20007
4.2 kW
DC8484

Drawn by DR	A001
Date 13-NOV-2020	
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PROPOSED PV ARRAY LOCATION



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Plotter: Danielle Rohrman on 5/19/2021 4:35 PM

Project Name and Address

Susan Beckman
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Washington DC, 20007
4.2 kW
DC8484

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DR

Date

13-NOV-2020

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A002

Front of Home



Back of Home



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Drawn by

DR

Date

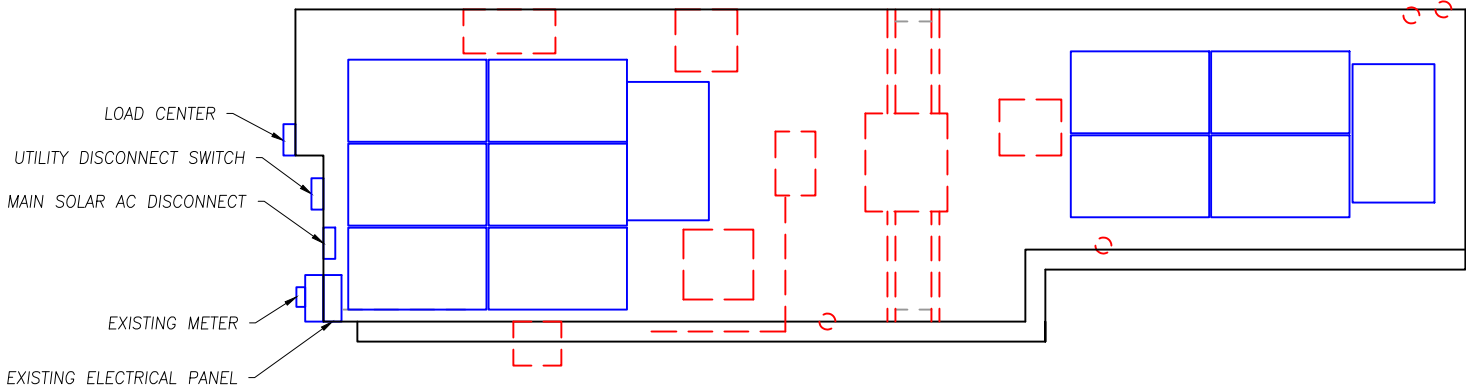
13-NOV-2020

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A003



EQUIPMENT LOCATION PLAN
Scale: NTS

NOTE:
EQUIPMENT LOCATION PLAN IS APPROXIMATE, EXACT LOCATION TO BE VERIFIED WITH INSTALLATION CREW AND HOME OWNER AT THE TIME OF INSTALLATION.

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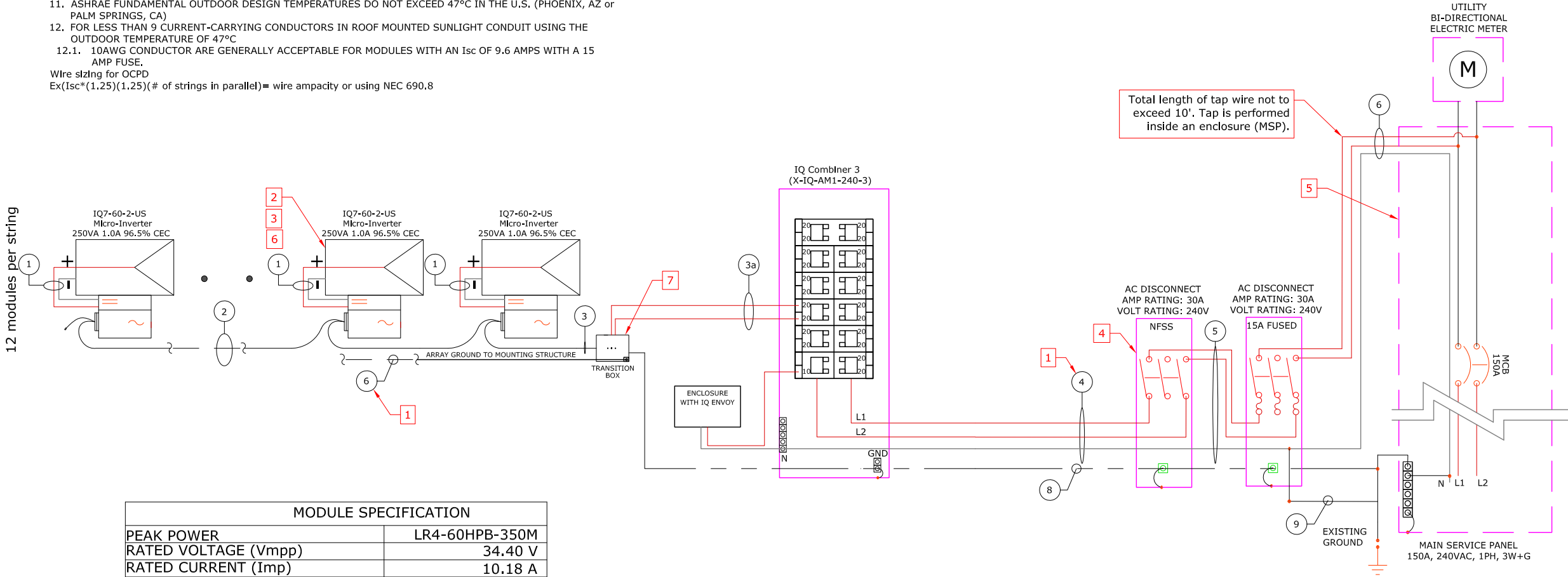
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Date	13-NOV-2020	
Scale	AS NOTED	

E001

GENERAL ELECTRICAL NOTES: NEC2014

- EQUIPMENT USED SHALL BE NEW, UNLESS OTHERWISE NOTED.
- EQUIPMENT USED SHALL BE UL LISTED, UNLESS OTHERWISE NOTED.
- EQUIPMENT SHALL BE INSTALLED PROVIDING ADEQUATE PHYSICAL WORKING SPACE AROUND THE EQUIPMENT AND SHALL COMPLY WITH NEC.
- COPPER CONDUCTORS SHALL BE USED AND SHALL HAVE INSULATION RATING 600V, 90°C, UNLESS OTHERWISE NOTED.
- CONDUCTORS SHALL BE SIZED IN ACCORDANCE TO NEC. CONDUCTORS AMPACITY SHALL BE DE-RATED FOR TEMPERATURE INCREASE, CONDUIT FILL AND VOLTAGE DROP.
- ALL CONDUCTORS, EXCEPT PV WIRE, SHALL BE INSTALLED IN APPROVED CONDUITS OR RACEWAY. CONDUITS SHALL BE ADEQUATELY SUPPORTED AS PER NEC.
- AC DISCONNECT SHOWN IS REQUIRED IF THE UTILITY REQUIRES VISIBLE-BLADE SWITCH.
- EXPOSED NON-CURRENT CARRYING METAL PARTS SHALL BE GROUNDED AS PER NEC.
- LINE SIDE INTER-CONNECTION SHALL COMPLY WITH NEC
- SMS MONITORING SYSTEM AND IT'S CONNECTION SHOWN IS OPTIONAL. IF USED, REFER TO SMS INSTALLATION MANUAL FOR WIRING METHODS AND OPERATION PROCEDURE.
- ASHRAE FUNDAMENTAL OUTDOOR DESIGN TEMPERATURES DO NOT EXCEED 47°C IN THE U.S. (PHOENIX, AZ or PALM SPRINGS, CA)
- FOR LESS THAN 9 CURRENT-CARRYING CONDUCTORS IN ROOF MOUNTED SUNLIGHT CONDUIT USING THE OUTDOOR TEMPERATURE OF 47°C
1. 10AWG CONDUCTOR ARE GENERALLY ACCEPTABLE FOR MODULES WITH AN I_{sc} OF 9.6 AMPS WITH A 15 AMP FUSE.

Wire sizing for OCPD
Ex($I_{sc} \times (1.25)(1.25)(\# \text{ of strings in parallel})$)= wire ampacity or using NEC 690.8



MODULE SPECIFICATION	
PEAK POWER	LR4-60HPB-350M
RATED VOLTAGE (V _{mpp})	34.40 V
RATED CURRENT (I _{mp})	10.18 A
OPEN CIRCUIT VOLTAGE (V _{oc})	40.40 V
SHORT CIRCUIT CURRENT (I _{sc})	11.16 A
MAXIMUM SYSTEM VOLTAGE	1000VDC
Inverter Specifications	
INVERTER MODEL	IQ7-60-2-US
MAXIMUM DC VOLTAGE	48 V
MAXIMUM POWER OUTPUT	250 VA
NOMINAL AC VOLTAGE	240 VAC
MAXIMUM AC CURRENT	1.00 A
ARRAY DETAILS	
NO. OF MODULE PER STRING	12
NO. OF STRINGS	1
ARRAY WATTS AT STC	4200
MAX. VOLTAGE	240

WIRE/CONDUIT SCHEDULE ARRAY			
TAG	DESCRIPTION	WIRE SIZE/TYPE	NOTES
1	Panel to Micro invter	USE-2 (Factory Made)	Integrated
2	Micro Inverter to Micro Inverter	Pre-Manufactured Cable	
3	Micro Inverter to Transition Box	Pre-Manufactured Cable	
4	Transition Box to Load Center	#10 Cu THHN/THWN-2	Integrated
5	Load Center to AC disconnect	#10 Cu THHN/THWN-2	
6	AC disconnect to AC disconnect	#10 Cu THHN/THWN-2	
7	AC disconnect to Interconnection Point	#6 Cu THHN/THWN-2	
8	Equipment Grounding Conductor	#8 Cu Bare Copper Wire	
9	Equipment Grounding Conductor	#8 Cu THHN/THWN-2	
9	Grounding Electrode Conductor	#8 Cu	

General Notes

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Project Name and Address

Susan Beckman
1551 33rd St. NW
Washington, DC 20007
4.2 kW
DC8345

Drawn by

JN

Date

11/13/2020

Scale

AS NOTED

Sheet

E1

ELECTRICAL CALCULATION

1. Conductor sizing per art 690.8 (B) (1)

a. Conductor must have 30 deg. C. ampacity = 125 percent continuous current per art 215.2(A)(1)

b. conductor must have (after correction for conditions of use continuous current per table 310.16

c. Evaluate conductor temperature of terminations per NEC110.14 (C). Ampacity of wire derated for condition of termination must be continuous current*1.25. All string terminations are rated at 90 deg. C.

2. OCP Sizing per art 690.8(B)(1)

a. round up to next size per art 240.4(B)

3. Conductor sizing per art 690.8 (B) (1)

a. Conductor must have 30 deg. C ampacity = 125 percent continuous current per art 215.2(A)(1)

b. conductor must have (after correction for conditions of use) continuous current per table 310.16

c. Evaluate conductor temperature of terminations per 110.14(C). Ampacity of wire derated for condition of termination must be continuous current*1.25. All branch terminations are rated at 75 deg. C min.

4. OCP Sizing per art 690.8(B)(1)

a. round up to next size per art 240.4(B)

5. Conductor sizing per art 690.8 (B) (1)

a. Conductor must have 30 deg. C ampacity = 125 percent continuous current per art 215.2(A)(1)

b. conductor must have (after correction for conditions of use continuous current per table 310.16

c. Evaluate conductor temperature of terminations per 110.14(C). Ampacity of wire derated for condition of termination must be continuous current*1.25. All inverter output terminations are rated at 75 deg. C.

6. OCP Sizing

a. round up to next size per art 240.4(B)

7. Conductor sizing per art 690.8 (B) (1)

a. Conductor must have 30 deg. C ampacity = 125 percent continuous current per art 215.2(A)(1)

b. conductor must have (after correction for conditions of use continuous current per table 310.16

c. Evaluate conductor temperature of terminations per 110.14(C). Ampacity of wire derated for condition of termination must be continuous current*1.25. All inverter output terminations are rated at 75 deg. C min.

PV module and Inverter data shown in table 1:

Table 1

MODULE SPECIFICATION	
PEAK POWER	LR4-60HPB-350M
RATED VOLTAGE (Vmpp)	34.40 V
RATED CURRENT (Imp)	10.18 A
OPEN CIRCUIT VOLTAGE (Voc)	40.40 V
SHORT CIRCUIT CURRENT (Isc)	11.16 A
MAXIMUM SYSTEM VOLTAGE	1000VDC
Inverter Specifications	
INVERTER MODEL	IQ7-60-2-US
MAXIMUM DC VOLTAGE	48 V
MAXIMUM POWER OUTPUT	250 VA
NOMINAL AC VOLTAGE	240 VAC
MAXIMUM AC CURRENT	1.00 A
ARRAY DETAILS	
NO. OF MODULE PER STRING	12
NO. OF STRINGS	1
ARRAY WATTS AT STC	4200
MAX. VOLTAGE	240

Wire size indicate calculation details:

Wire Numbers (1 to 9) are as indicated in electrical drawing E1

Wire Number 1 is inbuilt wire from PV manufacture company #10 PV WIRE 2KV RATED.

Wire Number 2 is #10 Cu PV Wire

wire Number 3 is #10 THHN/THN-2

wire Number 3a is #10 THHN/THN-2

wire Number 4 & 5 is inverter to AC disconnect continuous output current*1.25

No of inverter= 12*1.25=15A which will be #10 Cu THHN/THWN-2 wire size

Wire Number 6 is AC disconnect to interconnection point #6 Cu THHN/THWN-2

Wire Number 7 is Bare Copper Wire #8 Cu

Wire Number 8 is Equipment Ground conductor #8 Cu

Wire Number 9 is Grounding electrode conductor (GEC) #8 Cu

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Project Name and Address

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1551 33rd St. NW
Washington, DC 20007
4.2 kW

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Date

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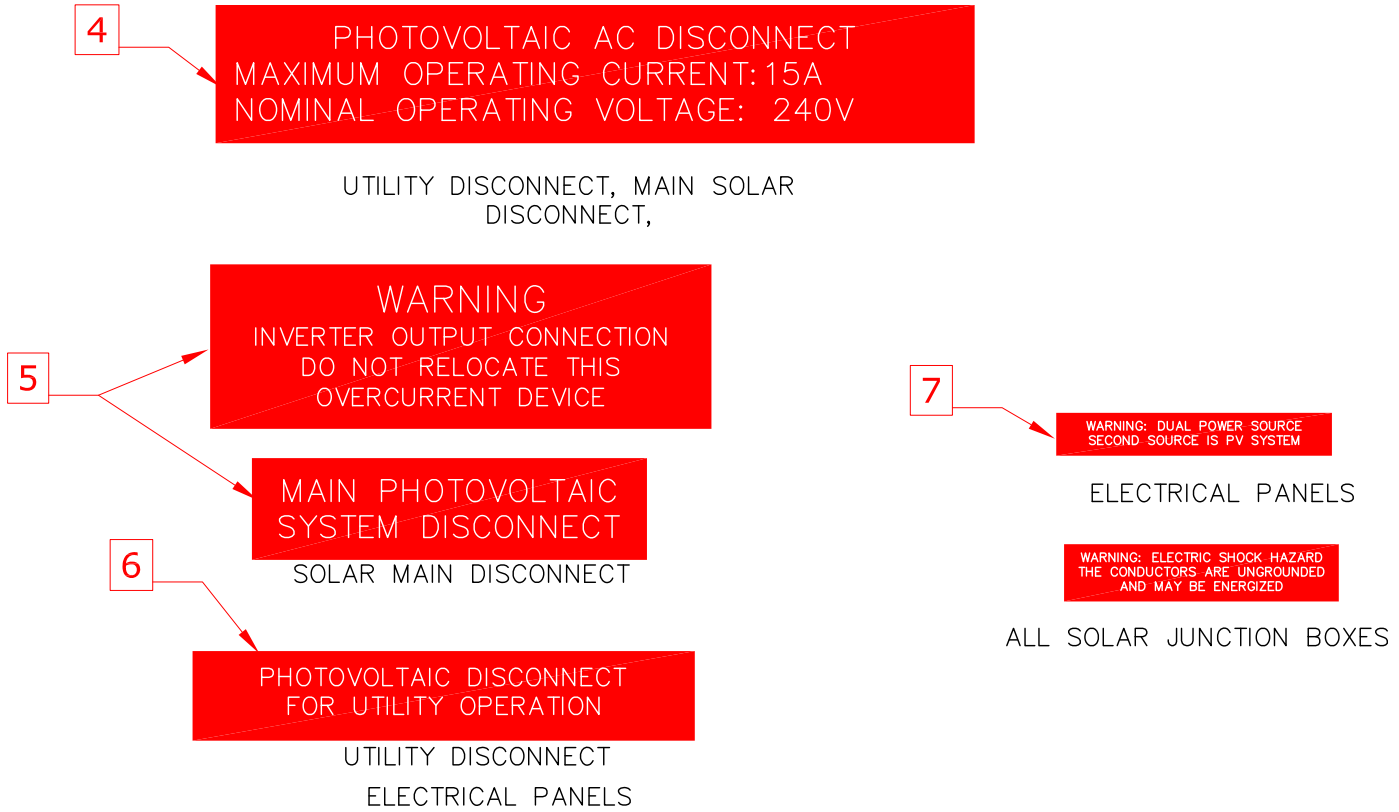
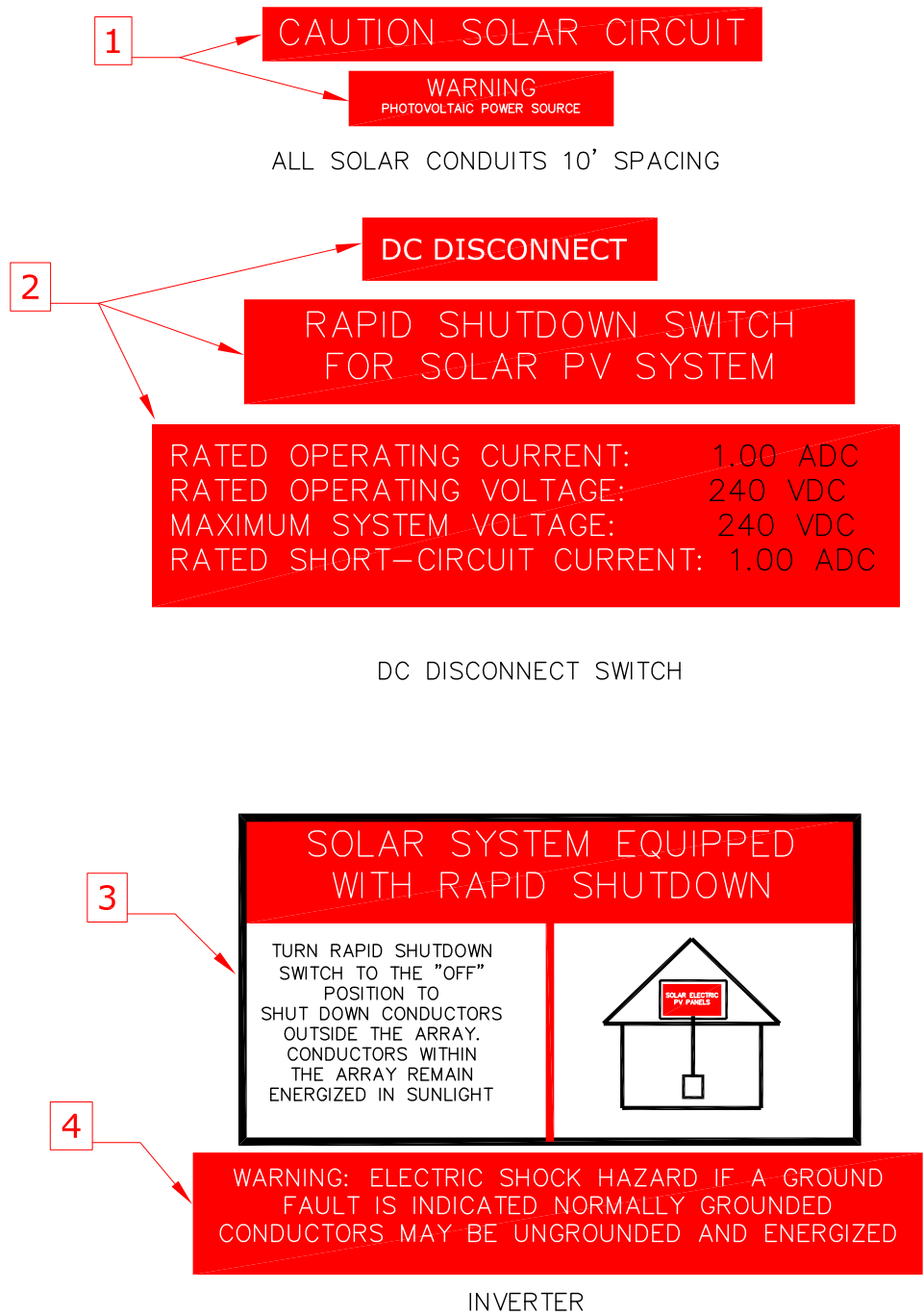
Scale

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E2

LABEL INFORMATION



LABEL SCHEDULE			
TAG	DESCRIPTION/LOCATION	CODE REFERENCE	PAGE
1	Conduit	IFC 605.11.1.4	E001
2	DC Disconnect - DC PV Power Source	NEC 690.53	E001
3	Inverter - Shock Hazard	NEC 690.5(C)	E001
4	PV AC Disconnect - System Parameters	NEC 690.54	E001
5	AC Disconnect - Utility Disconnect	NEC 705.12(D), 690.64(B)(7)	E001
6	Electrical Panel - Dual Power Source	NEC 690.54	E001
7	Warning: Electric Shock	NEC 690.35(F)	E001

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Washington, DC 20007
4.2 kW

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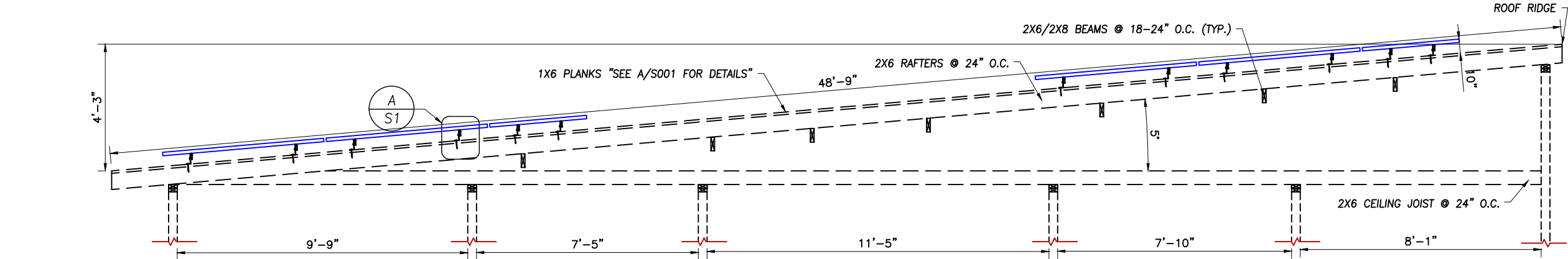
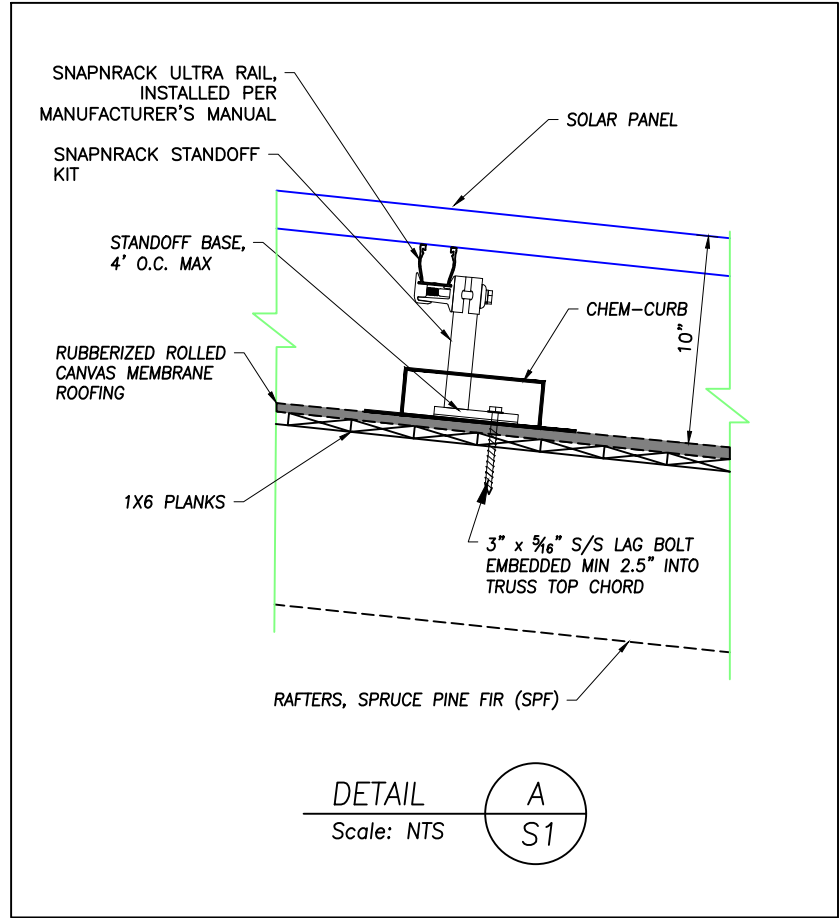
11/13/2020

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E3



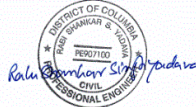
NOTES:

- ALL WORK SHALL COMPLY WITH REQUIREMENTS OF THE 2017 DC CONSTRUCTION CODES, 2015 INTERNATIONAL CODE COUNCIL (ICC) FAMILY MODEL CODES, 2013 ASHRAE 90.1, AS AMENDED BY THE DC MUNICIPAL REGULATIONS (DCMR) TITLE 12, SECTIONS A THROUGH M, LOADING CODE (ASCE 7-10), WOOD DESIGN CODE(NDS 2015) AND LOCAL REQUIREMENTS.
- LOAD CRITERIA PER :
 - EXPOSURE CATEGORY "B"
 - GROUND SNOW LOAD, $P_g = 30$ PSF
 - LATERAL LOAD RISK CATEGORY "II"
 - ULTIMATE DESIGN WIND SPEED = 115 MPH
- SOLAR PANELS AND RACKING SYSTEMS SHALL BE INSTALLED PER MANUFACTURER'S RECOMMENDATION.
- FOLLOW ALL LOCAL AND FEDERAL SAFETY REQUIREMENTS.

STRUCTURAL SECTION S1
Scale: 1/4" =1'-0"


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DocuSigned by:



Ralu Bumbury Smith
PROFESSIONAL ENGINEER

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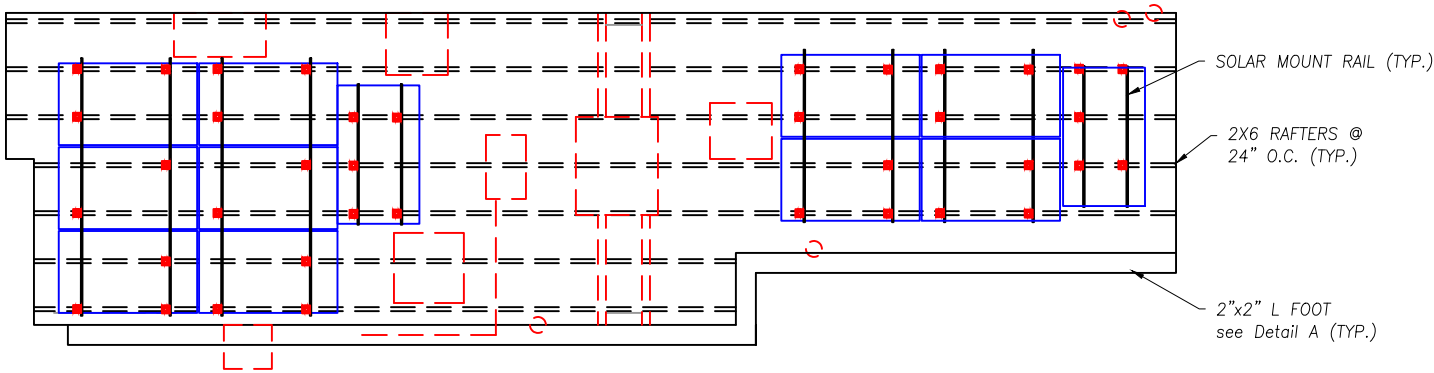
Project Name and Address
Susan Beckman
1551 33rd St NW
Washington DC, 20007
4.2 kW
DC8484

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DR

Date
13-NOV-2020

Scale
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Sheet
S001



SOLAR PANEL FOOTING PLAN


Scale: 1/8" =1'-0"

NOTES:


- 1. CHEMCURB SOLAR MOUNT RAIL SHALL BE INSTALLED IN ACCORDANCE WITH CHEMCURB INSTALLATION MANUAL.
- 2. "L" FEET SHALL BE SPACED AT A MAXIMUM OF 4' O/C.

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Scale
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S002

Old Georgetown Board Application Requests

1. Please add a map or aerial image that shows the property's location in Georgetown, with streets clearly labeled.
2. Please include photographs of the front and rear of the home, as well as any potential vantage points of the proposed rooftop installation from street or alley.
3. The OGB typically recommends approval of solar panels on flat roofs when the views can be minimized, particularly from the front or primary roads. Based on staff's experience with installations on similar homes on this street, the proposed 12" setback from the front building wall may not be enough to remove the installation from view. Do you have the room to push the installation further east or to remove the front row of panels?
4. A section drawing, with dimensions, that shows the height of any existing parapets, roof line, and proposed installation would be helpful in determining visibility, although the board will take into account oblique views.
5. Please include photographs or elevation drawings that show the proposed placement of electrical boxes, junction boxes, conduit, etc. on the exterior building walls. The OGB prefers these be located on rear or side walls as opposed to the front facade.
6. Will any part of the rail or panel installation be mounted to parapets?

Old Georgetown Board Application Request Responses:

1. Refer to A002
2. Refer to A003
3. The DC codes require a 1:1 ratio with the height of the module and the setback from the front and back of the house. The front of the house has a setback of 1'3", while the height of the module and racking is 10" (refer to S001 for the height of the module)
4. Refer to Detail $\frac{A}{S1}$ on drawing S001 for the height of the module including the racking
5. Refer to E001 for location of electrical equipment (rear of house)
6. No