MONTGOMERY COUNTY HISTORIC PRESERVATION COMMISSION
STAFF REPORT

Address:	115 Elm Ave., Takoma Park	**Meeting Date:**	2/7/18
Resource:	Non-Contributing Resource **Takoma Park Historic District**	**Report Date:**	1/31/18
Applicant:	Gerard Lavery	**Public Notice:**	1/24/18
Review:	HAWP	**Tax Credit:**	n/a
Case Number:	31/06-18H	**Staff:**	Dan Bruechert
Proposal:	Solar Installation		

RECOMMENDATION

Staff recommends that the Historic Preservation Commission **approve** the HAWP application.

PROPERTY DESCRIPTION

SIGNIFICANCE: Non-Contributing Resource to the Takoma Park Historic District
STYLE: Cape Cod
DATE: c.1920-30s

The subject house is a brick one-and-a-half story, side gable, Cape Cod house, with a large front porch with a front gable portico.

To the rear of the house is a brick, non-historic accessory structure with a front gable roof and three pairs of French Doors.

PROPOSAL

The applicant is proposing to install 45 (forty-five) flush mounted solar panels on the roof of the contemporary accessory structure.

APPLICABLE GUIDELINES

When reviewing alterations and additions for new construction to Non-Contributing Resources within the Takoma Park Historic District, decisions are guided by the Takoma Park Historic District Design Guidelines (Design Guidelines) and Montgomery County Code Chapter 24A (Chapter 24A).

Takoma Park Historic District Design Guidelines

There are two very general, broad planning and design concepts which apply to all categories. These are:

The design review emphasis will be restricted to changes that are at all visible from the public right-of-way, irrespective of landscaping or vegetation (it is expected that the majority of new additions will be reviewed for their impact on the overall district), and,

The importance of assuring that additions and other changes to existing structures act to reinforce and continue existing streetscape, landscape, and building patterns rather than to impair the character of the district.

Most Alterations and additions to Non-Contributing/Out-of-Period Resources should be approved as a matter of course. The only exceptions would be major additions and alterations to the scale and massing of Non-Contributing/Out-of-Period Resources which affect the surrounding streetscape and/or landscape and could impair the character of the historic district as a whole.

Montgomery County Code, Chapter 24A Historic Resources Preservation

(b) The commission shall instruct the director to issue a permit, or issue a permit subject to such conditions as are found to be necessary to insure conformity with the purposes and requirements of this chapter, if it finds that:

(1) The proposal will not substantially alter the exterior features of an historic site or historic resource within an historic district; or

(2) The proposal is compatible in character and nature with the historical, archeological, architectural or cultural features of the historic site or the historic district in which an historic resource is located and would not be detrimental thereto or to the achievement of the purposes of this chapter; or

(3) The proposal would enhance or aid in the protection, preservation and public or private utilization of the historic site or historic resource located within an historic district in a manner compatible with the historical, archeological, architectural or cultural value of the historic site or historic district in which an historic resource is located; or

STAFF DISCUSSION

The applicant is proposing to install 45 (forty-five), roof-mounted, solar panels on the accessory structure to the rear of the lot. The solar panels will be installed flush to the roof surface. Historic preservation best practices call for the placement of solar panels on either accessory structures or free-standing installations over installation on the primary resource.

As this alteration does not change the scale and massing of the non-contributing resource and its setback from the streetscape, the *Design Guidelines* state that the proposed alteration should be approved. Staff supports this proposal.

STAFF RECOMMENDATIONS

Staff recommends that the Commission **approve** the HAWP application;
and with the general condition applicable to all Historic Area Work Permits that **the applicant will present *3 permit sets* of drawings to HPC staff for review and stamping prior to submission for permits (if applicable).** After issuance of the Montgomery County Department of Permitting Services (DPS) permit, the applicant will arrange for a field inspection by calling the DPS Field Services Office at 240-777-6370 prior to commencement of work and not more than two weeks following completion of work.

[redacted]

DPS - #8

HISTORIC PRESERVATION COMMISSION
301/563-3400

APPLICATION FOR HISTORIC AREA WORK PERMIT

Contact Email: jkrupski@tesla.com Contact Person: Jim Krupski
Daytime Phone No.: (202) 809-8349

Tax Account No.: 0107 4084

Name of Property Owner: GERARD LAVERY Daytime Phone No.: (202) 251-6859

Address: 214 TAYLOR ST NW WASHINGTON, D.C. 20011
Street Number City State Zip Code

Contractor: SOLARCITY Phone No.: (888) 765-2489

Contractor Registration No.: 128948 (MHIC)

Agent for Owner: Jim Krupski Daytime Phone No.: (202) 809-8349

LOCATION OF BUILDING/PREMISE

House Number: 115 Street: Elm Ave.

Town/City: Takoma Park Nearest Cross Street: Allegheny Ave.

Lot: 25 Block: 16 Subdivision: 0025

Liber: 50685 Folio: 00025 Parcel: 0000

PART ONE: TYPE OF PERMIT ACTION AND USE

1A. CHECK ALL APPLICABLE:

☐ Construct ☐ Extend ☐ Alter/Renovate

☐ Move ☑ Install ☐ Wreck/Raze

☐ Revision ☐ Repair ☐ Revocable.

CHECK ALL APPLICABLE:

☐ A/C ☐ Slab ☐ Room Addition ☐ Porch ☐ Deck ☐ Shed

☑ Solar ☐ Fireplace ☐ Woodburning Stove ☐ Single Family

☐ Fence/Wall (complete Section 4) ☐ Other:

1B. Construction cost estimate: $ 17,010.00

1C. If this is a revision of a previously approved active permit, see Permit # (n/a)

PART TWO: COMPLETE FOR NEW CONSTRUCTION AND EXTEND/ADDITIONS

2A. Type of sewage disposal: 01 ☐ WSSC 02 ☐ Septic 03 ☐ Other:

2B. Type of water supply: 01 ☐ WSSC 02 ☐ Well 03 ☐ Other:

PART THREE: COMPLETE ONLY FOR FENCE/RETAINING WALL

3A. Height _____ feet _____ inches

3B. Indicate whether the fence or retaining wall is to be constructed on one of the following locations:

☐ On party line/property line ☐ Entirely on land of owner ☐ On public right of way/easement

I hereby certify that I have the authority to make the foregoing application, that the application is correct, and that the construction will comply with plans approved by all agencies listed and I hereby acknowledge and accept this to be a condition for the issuance of this permit.

James Krupski
Signature of owner or authorized agent

17 January 2018
Date

Approved: _____ *For Chairperson, Historic Preservation Commission*

Disapproved: _____ Signature: _____ Date: _____

Application/Permit No.: _____ Date Filed: _____ Date Issued: _____

Edit 6/21/99

SEE REVERSE SIDE FOR INSTRUCTIONS

25323

THE FOLLOWING ITEMS MUST BE COMPLETED AND THE REQUIRED DOCUMENTS MUST ACCOMPANY THIS APPLICATION.

1. **WRITTEN DESCRIPTION OF PROJECT**

   a. Description of existing structure(s) and environmental setting, including their historical features and significance:

   12, 343 square foot residential property roofed with composite shingle single family dwelling with detached garage/living space

   b. General description of project and its effect on the historic resource(s), the environmental setting, and, where applicable, the historic district:

   Installation of 45 solar panels mounted flush to roof of detached garage; 60 ft. trench from garage to main home
   Note: no panels will be installed on the house itself, only on the detached garage.

2. **SITE PLAN**

   Site and environmental setting, drawn to scale. You may use your plat. Your site plan must include:

   a. the scale, north arrow, and date;

   b. dimensions of all existing and proposed structures; and

   c. site features such as walkways, driveways, fences, ponds, streams, trash dumpsters, mechanical equipment, and landscaping.

3. **PLANS AND ELEVATIONS**

   You must submit 2 copies of plans and elevations in a format no larger than 11" x 17". Plans on 8 1/2" x 11" paper are preferred.

   a. ***Schematic construction plans***, with marked dimensions, indicating location, size and general type of walls, window and door openings, and other fixed features of both the existing resource(s) and the proposed work.

   b. Elevations (facades), with marked dimensions, clearly indicating proposed work in relation to existing construction and, when appropriate, context. All materials and fixtures proposed for the exterior must be noted on the elevations drawings. An existing and a proposed elevation drawing of each facade affected by the proposed work is required.

4. **MATERIALS SPECIFICATIONS**

   General description of materials and manufactured items proposed for incorporation in the work of the project. This information may be included on your design drawings.

5. **PHOTOGRAPHS**

   a. Clearly labeled photographic prints of each facade of existing resource, including details of the affected portions. All labels should be placed on the front of photographs.

   b. Clearly label photographic prints of the resource as viewed from the public right-of-way and of the adjoining properties. All labels should be placed on the front of photographs.

6. **TREE SURVEY**

   If you are proposing construction adjacent to or within the dripline of any tree 6" or larger in diameter (at approximately 4 feet above the ground), you must file an accurate tree survey identifying the size, location, and species of each tree of at least that dimension.

7. **ADDRESSES OF ADJACENT AND CONFRONTING PROPERTY OWNERS**

   For **ALL** projects, provide an accurate list of adjacent and confronting property owners (not tenants), including names, addresses, and zip codes. This list should include the owners of all lots or parcels which adjoin the parcel in question, as well as the owner(s) of lot(s) or parcel(s) which lie directly across the street/highway from the parcel in question.

PLEASE PRINT (IN BLUE OR BLACK INK) OR TYPE THIS INFORMATION ON THE FOLLOWING PAGE.
PLEASE STAY WITHIN THE GUIDES OF THE TEMPLATE, AS THIS WILL BE PHOTOCOPIED DIRECTLY ONTO MAILING LABELS.

HAWP APPLICATION: MAILING ADDRESSES FOR NOTIFING
[Owner, Owner's Agent, Adjacent and Confronting Property Owners]

Owner's mailing address	**Owner's Agent's** mailing address
214 TAYLOR ST. NW WASHINGTON, DC 20011	9000 VIRGINIA MANOR RD STE 250 BELTSVILLE, MD 20705
Adjacent and confronting Property Owners mailing addresses	
J.N.A. SCHOOL 117 ELM AVE. TAKOMA PARK, MD 20912-0000	CATHERINE & BRIAN ROWLAND 113 ELM AVE. TAKOMA PARK, MD 20912-0000
CHRISTOPHER HARTLEY 114 ELM AVE. TAKOMA PARK, MD 20912-0000	CHARLES LEE 116 ELM AVE. TAKOMA PARK, MD 20912-0000

Existing Property Condition Photographs:

Detail: Front of house, Google street view, 115 Elm Ave., Takoma Park

Detail: Front of house, Google street view, 115 Elm Ave., Takoma Park

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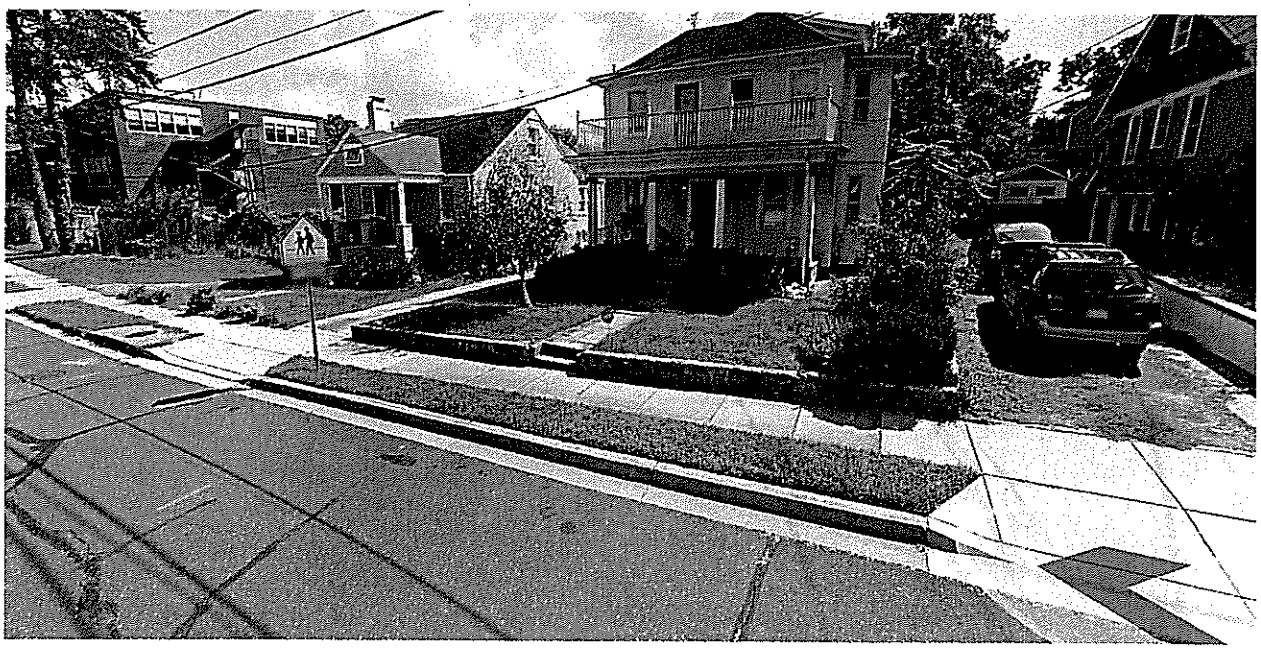
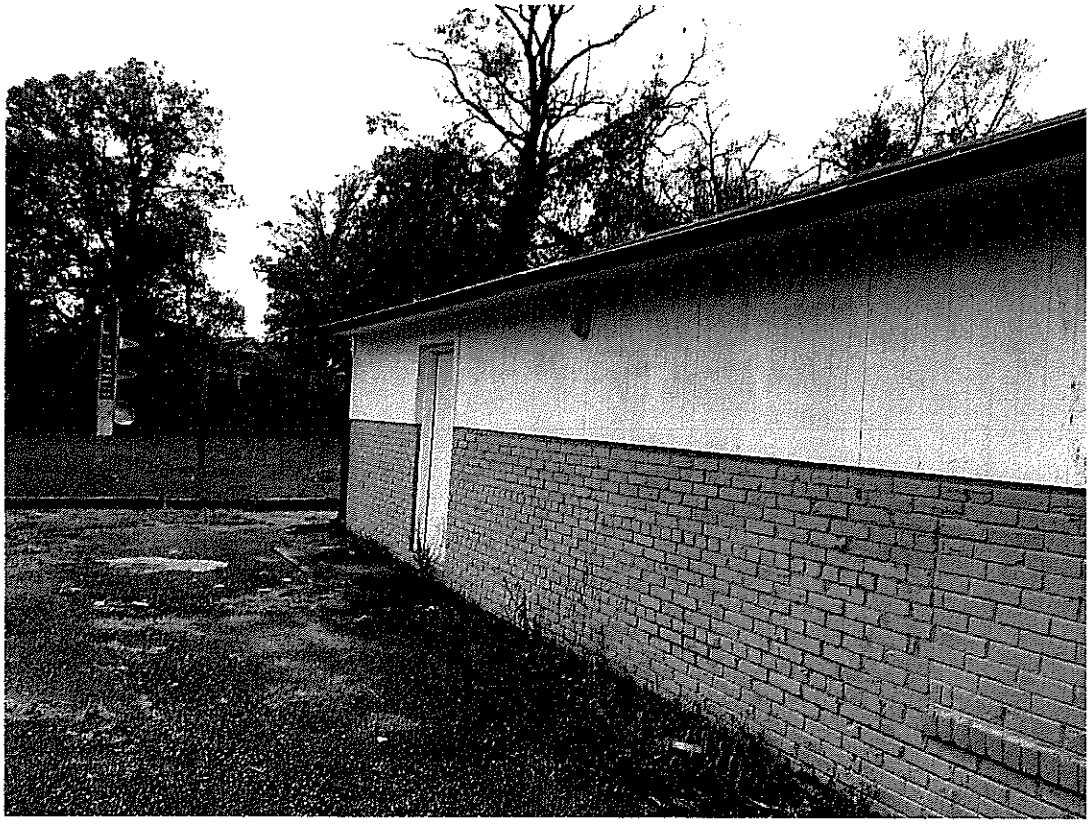
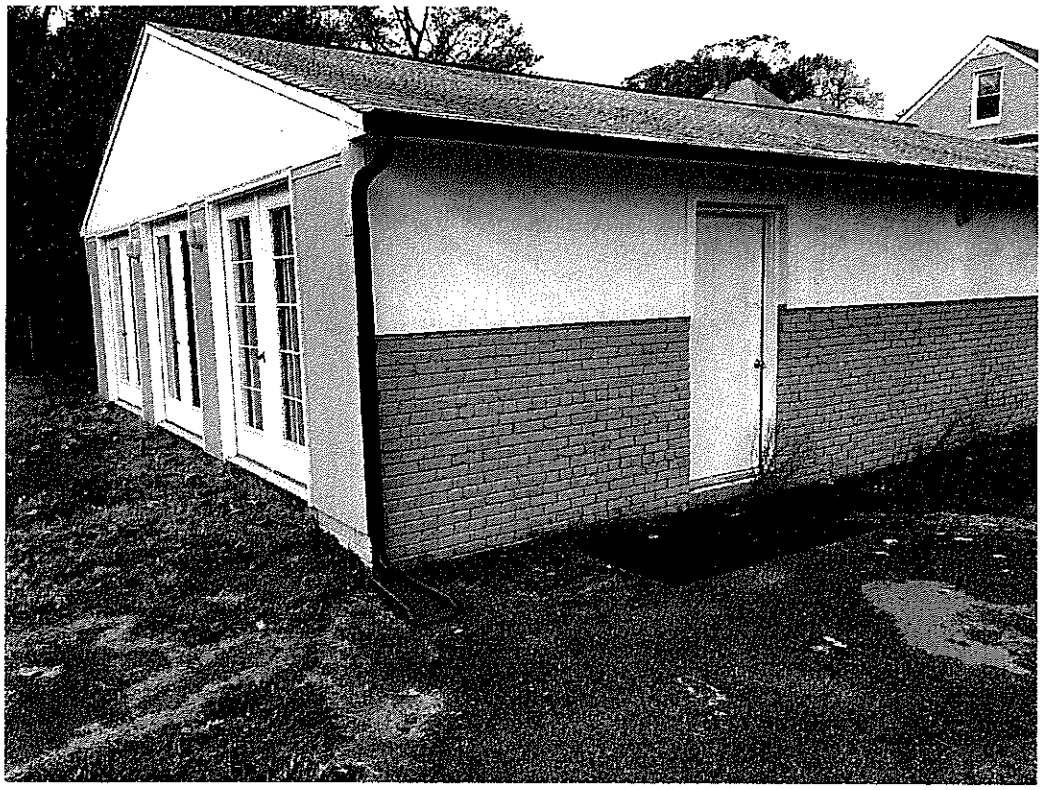


Detail: Front of house, Google street view, 115 Elm Ave., Takoma Park

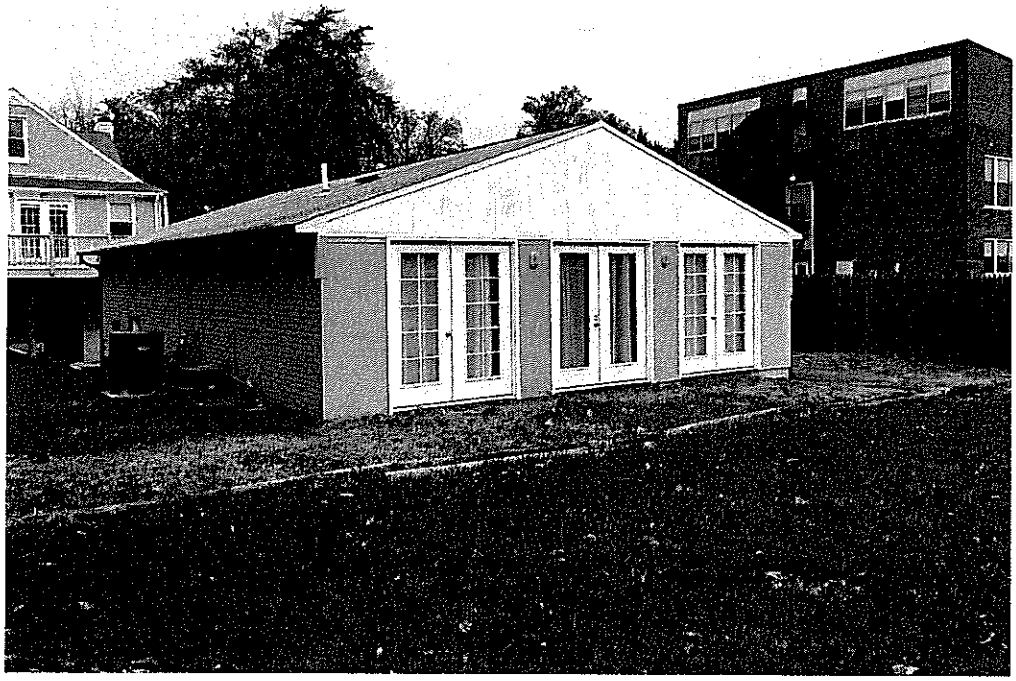
Detail: front of house and detached garage from street

Detail: East side of detached garage

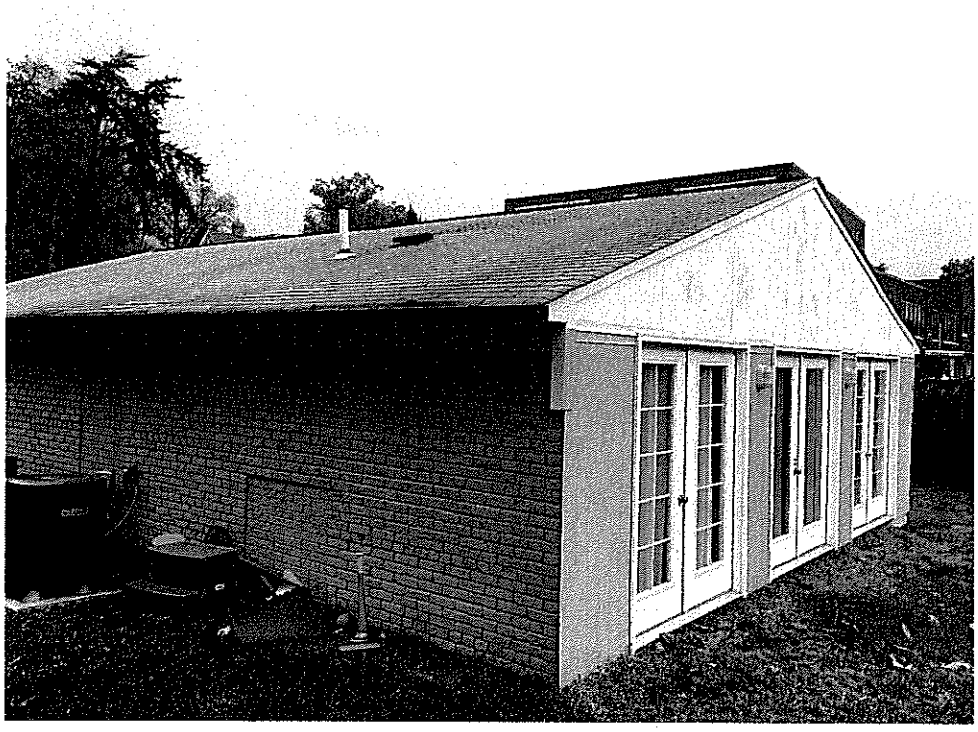




Detail: Southeast corner of detached garage

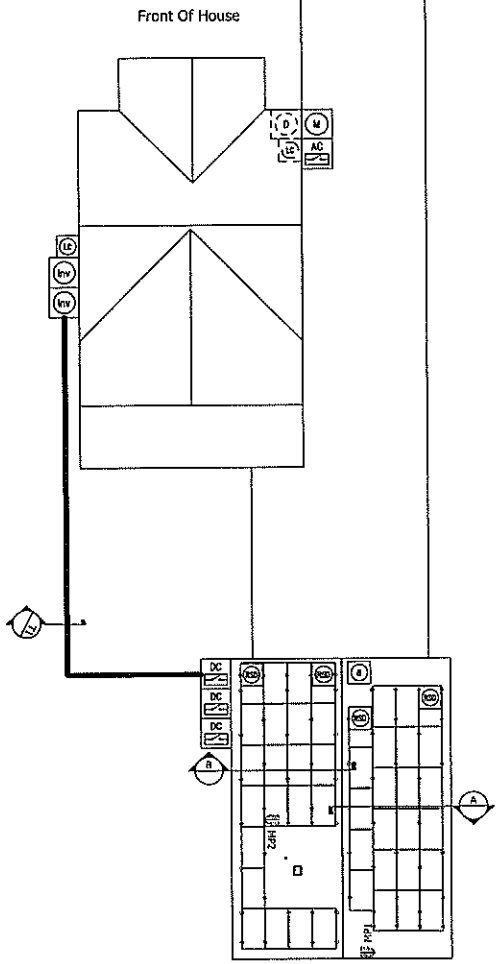


Detail: Southwest corner of detached garage



Detail: path of trench

Detail: Google satellite view of 115 Elm Avenue; the detached garage is circled.



Hussein kazan

I hereby certify that these documents were Prepared or approved by me, and I am da duly licensed professional engineer under the laws Of the State of Maryland, License No. 33446. Expiration Date 08-16-2018

STATE OF MARYLAND · HUSSEIN A. KAZAN · No. 33446 · PROFESSIONAL ENGINEER

Digitally signed by Hussein kazan
Date: 2017.11.28 12:29:50 -05'00'

MP1	PITCH: 18 AZIMUTH: 80 MATERIAL: Comp Shingle	ARRAY PITCH: 18 ARRAY AZIMUTH: 80 STORY: 1 Story
MP2	PITCH: 18 AZIMUTH: 260 MATERIAL: Comp Shingle	ARRAY PITCH: 18 ARRAY AZIMUTH: 260 STORY: 1 Story

LEGEND

- (M) (E) UTILITY METER & WARNING LABEL
- (Inv) INVERTER W/ INTEGRATED DC DISCO & WARNING LABELS
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- (RSD) RAPID SHUTDOWN
- STANDOFF LOCATIONS
- CONDUIT RUN ON EXTERIOR
- CONDUIT RUN ON INTERIOR
- GATE/FENCE
- HEAT PRODUCING VENTS ARE RED
- INTERIOR EQUIPMENT IS DASHED

SITE PLAN

Scale: 1/16" = 1'

01' 16' 32'

N W E S

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JOB NUMBER: JB-2093964 00
MOUNTING SYSTEM: ZS Comp V4 w Flashing-Insert
MODULES: (45) Hanwha Q-Cells # Q.Peak-G4.1/SC300
INVERTER: Multiple Inverters

CUSTOMER:
JERRY LAVERY
115 ELM AVE
TAKOMA PARK, MD 20912

DESCRIPTION: 13.5 KW PV ARRAY

PAGE NAME: SITE PLAN

DESIGN: Kyle Lennon

SHEET: 2 REV: DATE: 11/28/2017

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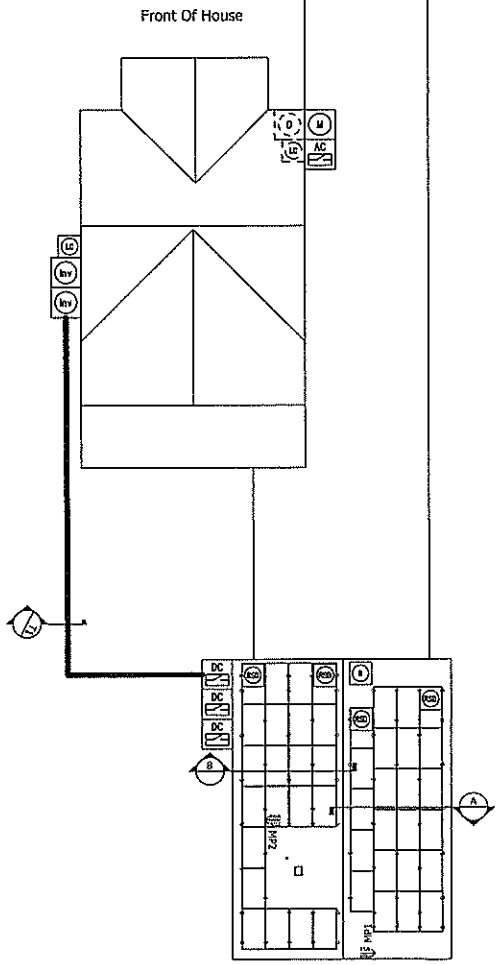

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ABBREVIATIONS

A	AMPERE
AC	ALTERNATING CURRENT
BLDG	BUILDING
CONC	CONCRETE
DC	DIRECT CURRENT
EGC	EQUIPMENT GROUNDING CONDUCTOR
(E)	EXISTING
EMT	ELECTRICAL METALLIC TUBING
FSB	FIRE SET-BACK
GALV	GALVANIZED
GEC	GROUNDING ELECTRODE CONDUCTOR
GND	GROUND
HDG	HOT DIPPED GALVANIZED
I	CURRENT
Imp	CURRENT AT MAX POWER
Isc	SHORT CIRCUIT CURRENT
kVA	KILOVOLT AMPERE
kW	KILOWATT
LBW	LOAD BEARING WALL
MIN	MINIMUM
(N)	NEW
NEUT	NEUTRAL
NTS	NOT TO SCALE
OC	ON CENTER
PL	PROPERTY LINE
POI	POINT OF INTERCONNECTION
PV	PHOTOVOLTAIC
SCH	SCHEDULE
S	STAINLESS STEEL
STC	STANDARD TESTING CONDITIONS
TYP	TYPICAL
UPS	UNINTERRUPTIBLE POWER SUPPLY
V	VOLT
Vmp	VOLTAGE AT MAX POWER
Voc	VOLTAGE AT OPEN CIRCUIT
W	WATT
3R	NEMA 3R, RAINTIGHT

ELECTRICAL NOTES

1. THIS SYSTEM IS GRID-INTERTIED VIA A UL-LISTED POWER-CONDITIONING INVERTER.
2. THIS SYSTEM HAS NO BATTERIES, NO UPS.
3. A NATIONALLY-RECOGNIZED TESTING LABORATORY SHALL LIST ALL EQUIPMENT IN COMPLIANCE WITH ART. 110.3.
4. WHERE ALL TERMINALS OF THE DISCONNECTING MEANS MAY BE ENERGIZED IN THE OPEN POSITION, A SIGN WILL BE PROVIDED WARNING OF THE HAZARDS PER ART. 690.17.
5. EACH UNGROUNDED CONDUCTOR OF THE MULTIWIRE BRANCH CIRCUIT WILL BE IDENTIFIED BY PHASE AND SYSTEM PER ART. 210.5.
6. CIRCUITS OVER 250V TO GROUND SHALL COMPLY WITH ART. 250.97, 250.92(B).
7. DC CONDUCTORS EITHER DO NOT ENTER BUILDING OR ARE RUN IN METALLIC RACEWAYS OR ENCLOSURES TO THE FIRST ACCESSIBLE DC DISCONNECTING MEANS PER ART. 690.31(E).
8. ALL WIRES SHALL BE PROVIDED WITH STRAIN RELIEF AT ALL ENTRY INTO BOXES AS REQUIRED BY UL LISTING.
9. MODULE FRAMES SHALL BE GROUNDED AT THE UL-LISTED LOCATION PROVIDED BY THE MANUFACTURER USING UL LISTED GROUNDING HARDWARE.
10. MODULE FRAMES, RAIL, AND POSTS SHALL BE BONDED WITH EQUIPMENT GROUND CONDUCTORS.

JURISDICTION NOTES

STRUCTURAL DESIGN FOR THE SUPPORTING STRUCTURE OF THE HOUSE WAS PERFORMED IN ACCORDANCE WITH IRC/IBC 2015 – STRUCTURAL DESIGN FOR THE RACK SYSTEM AND MOUNTING HARDWARE WAS PERFORMED IN ACCORDANCE WITH IRC/IBC 2015.

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LICENSE

#11805 MASTER ELECTRICIAN
Nicholaus Meyers

MODULE GROUNDING METHOD: ZEP SOLAR

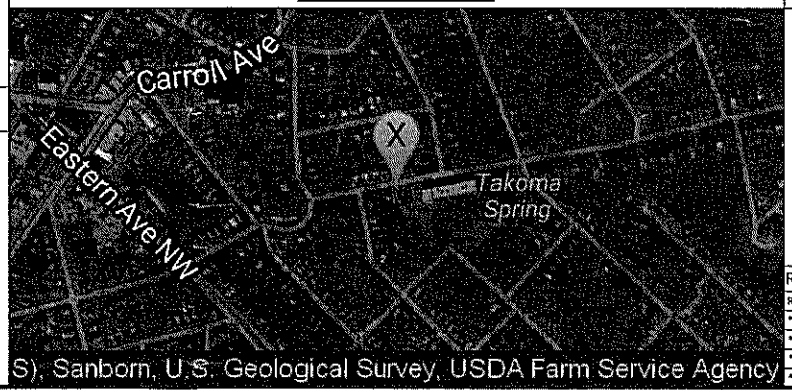
AHJ: Montgomery County

UTILITY: PEPCO (MD)

GENERAL NOTES

1. ALL WORK SHALL COMPLY WITH THE 2015 IBC AND 2015 IRC.
2. ALL ELECTRICAL WORK SHALL COMPLY WITH THE 2014 NATIONAL ELECTRIC CODE.

VICINITY MAP



INDEX

REV	BY	DATE	COMMENTS
REV A	NAME	DATE	COMMENTS
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TAKOMA PARK, MD 20912

DESCRIPTION: 13.5 KW PV ARRAY

PAGE NAME: COVER SHEET

DESIGN: Kyle Lennon

SHEET: 1 REV: DATE: 11/28/2017

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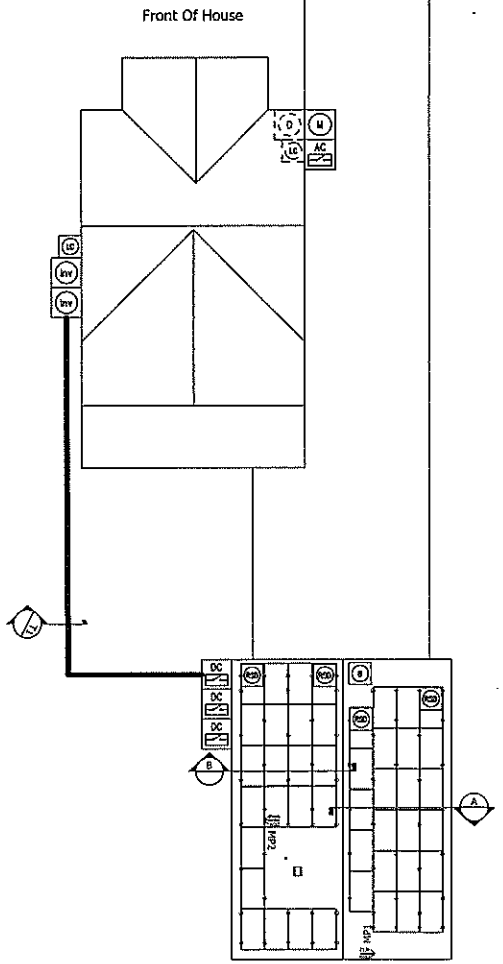

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STATE OF MARYLAND HUSSEIN A. KAZAN No. 33446 PROFESSIONAL ENGINEER

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SITE PLAN

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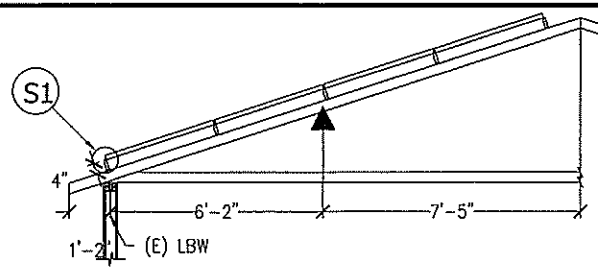

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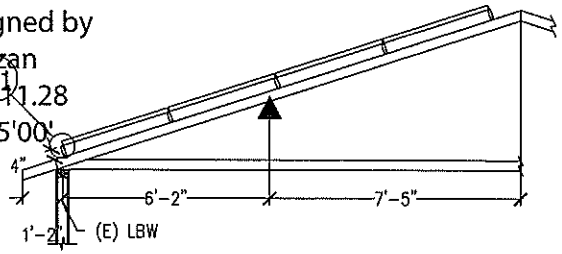


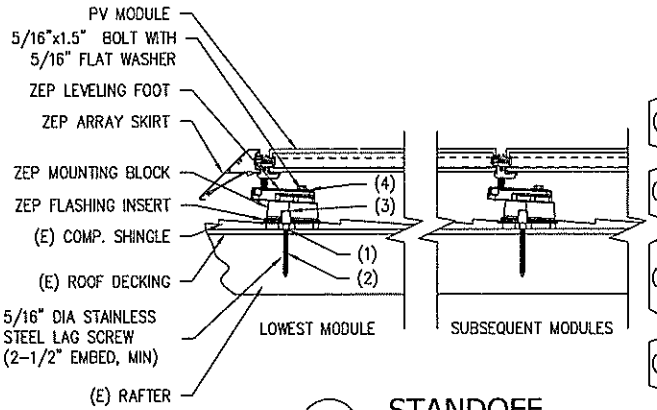
A SIDE VIEW OF MP1 NTS

MP1	X-SPACING	X-CANTILEVER	Y-SPACING	Y-CANTILEVER	NOTES
LANDSCAPE	72"	24"	39"	0"	STAGGERED
PORTRAIT	48"	19"	65"	0"	
TOP CHORD 2x4 @ 24" OC BOT CHORD 2x4 @24" OC			ROOF AZI 80 PITCH 18 ARRAY AZI 80 PITCH 18 Comp Shingle		STORIES: 1
X AND Y ARE ALWAYS RELATIVE TO THE STRUCTURE FRAMING THAT SUPPORTS THE PV. X IS ACROSS RAFTERS AND Y IS ALONG RAFTERS.					

I hereby certify that these documents were Prepared or approved by me, and I am da duly Licensed professional engineer under the laws Of the State of Maryland, License No. 33446, Expiration Date 09-16-2018

B SIDE VIEW OF MP2 NTS

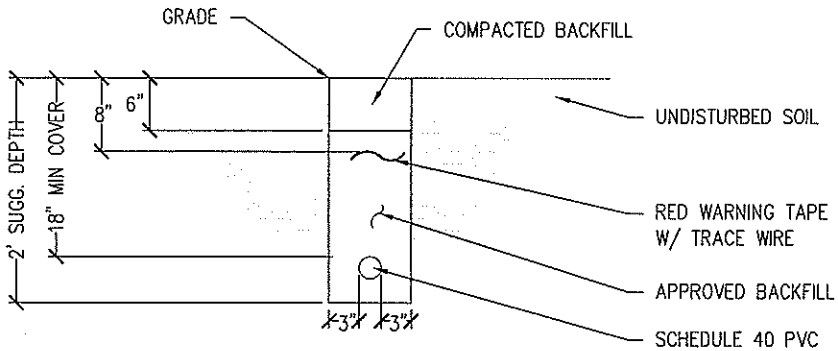
MP2	X-SPACING	X-CANTILEVER	Y-SPACING	Y-CANTILEVER	NOTES
LANDSCAPE	72"	24"	39"	0"	STAGGERED
PORTRAIT	48"	19"	65"	0"	
TOP CHORD 2x4 @ 24" OC BOT CHORD 2x4 @24" OC			ROOF AZI 260 PITCH 18 ARRAY AZI 260 PITCH 18 Comp Shingle		STORIES: 1
X AND Y ARE ALWAYS RELATIVE TO THE STRUCTURE FRAMING THAT SUPPORTS THE PV. X IS ACROSS RAFTERS AND Y IS ALONG RAFTERS.					



INSTALLATION ORDER	
(1)	LOCATE RAFTER, MARK HOLE LOCATION, AND DRILL PILOT HOLE.
(2)	ATTACH FLASHING INSERT TO MOUNTING BLOCK AND ATTACH TO RAFTER USING LAG SCREW.
(3)	INJECT SEALANT INTO FLASHING INSERT PORT, WHICH SPREADS SEALANT EVENLY OVER THE ROOF PENETRATION.
(4)	INSTALL LEVELING FOOT ON TOP OF MOUNTING BLOCK & SECURELY FASTEN WITH BOLT.

S1 STANDOFF

Scale: 1 1/2" = 1'



T1 TRENCH DETAIL

Scale: 3/4"=1'-0"

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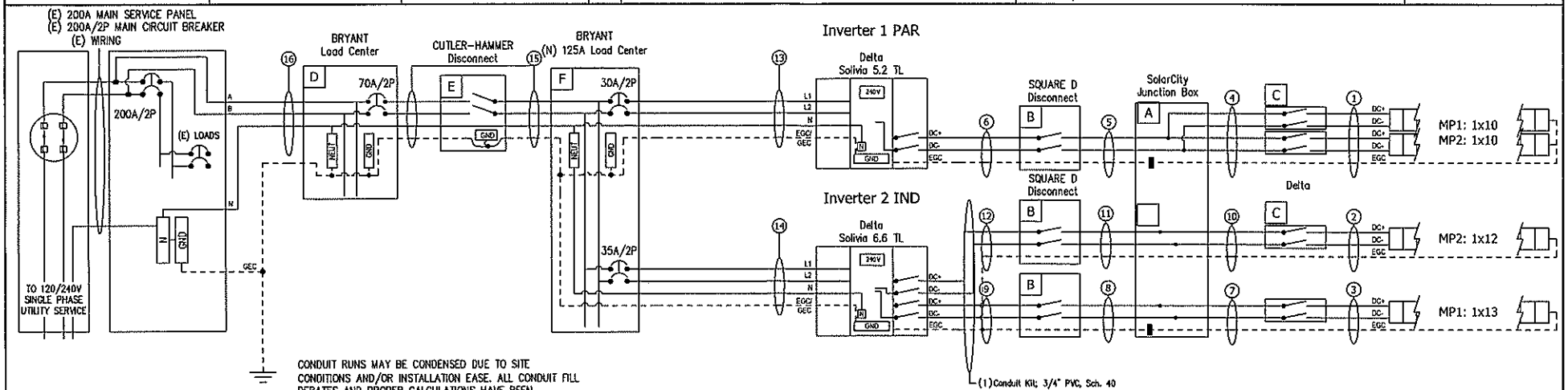
JOB NUMBER:	JB-2093964 00
MOUNTING SYSTEM:	ZS Comp V4 w Flashing-Insert
MODULES:	(45) Hanwha Q-Cells # Q.Peak-G4.1/SC300
INVERTER:	Multiple Inverters
CUSTOMER:	JERRY LAVERY 115 ELM AVE TAKOMA PARK, MD 20912
DESCRIPTION:	13.5 KW PV ARRAY
PAGE NAME:	STRUCTURAL VIEWS
DESIGN:	Kyle Lennon
SHEET:	3
REV:	
DATE:	11/28/2017

TESLA

GROUND SPECS	MAIN PANEL SPECS	GENERAL NOTES	INVERTER SPECS	MODULE SPECS	LICENSE
BOND (N) #8 GEC TO (E) GROUND ROD AT PANEL WITH IRREVERSIBLE CRIMP	Panel Number: TM4020C Meter Number: 1ND350446870 Underground Service Entrance	Inv 1: DC Ungrounded Inv 2: DC Ungrounded Tie-In: Supply Side Connection	INV 1 – (1) Delta # Solivia 5.2 TL LABEL: A Inverter; 5200W, 240V, 97.5% Inverter; 5200W, 240V/208V, 97.5%, PLC, Zigbee, RGM INV 2 – (1) Delta # Solivia 6.6 TL LABEL: B Inverter;6600W, 240V, 97.5%, Zigbee, PLC, RGM INV 3	– (45) Hanwha Q-Cells # Q.Peak-G4.1/SC300 PV Module; 300W,274.5PTC, 40MM, Black Frame, MC4, ZEP, 1000V Voc: 39.76 Vpmax: 32.41 Isc AND Imp ARE SHOWN IN THE DC STRINGS IDENTIFIER	#11805 MASTER ELECTRICIAN Nicholous Meyers



Voc* = MAX VOC AT MIN TEMP

POI – (2) ILSCO # IPC 4/0-2/0 Insulation Piercing Connector; Main 4/0-2, Tap 2/0-6
F – (1) BRYANT # BR48L125RP Load Center; 125A, 120/240V, NEMA 3R
– (1) CUTLER-HAMMER # BR230 Breaker; 30A/2P, 2 Spaces
– (1) CUTLER-HAMMER # BR235 Breaker; 35A/2P, 2 Spaces
SSC – SUPPLY SIDE CONNECTION. DISCONNECTING MEANS SHALL BE SUITABLE AS SERVICE EQUIPMENT AND SHALL BE RATED PER NEC.

AC

D – (1) BRYANT # BR24L70RP Load Center; 70A, 120/240V, NEMA 3R
– (1) CUTLER-HAMMER # BR270 Breaker; 70A/2P, 2 Spaces
E – (1) CUTLER-HAMMER # DG323URB Disconnect; 100A, 240Vac, Non-Fusible, NEMA 3R
– (1) CUTLER-HAMMER # DG100NB Ground/Neutral Kit; 60-100A, General Duty (DG)

B – (3) SQUARE D # HU361RB Disconnect; 30A, 600V, NEMA 3R
C – (4) Delta # Solivia Smart RSS Rapid Shutdown, 600V, 20A, NEMA 4X, MC4

DC

A – (1) SolarCity # 4-t 4 STRING JUNCTION BOX UNFUSED, GROUNDED, Black

13	(1) AWG #10, THWN-2, Black (1) AWG #10, THWN-2, Red (1) AWG #8, THWN-2, Green EGC/GEC Vmp = 240 VAC	– (1) AWG #10, THWN-2, White NEUTRAL – (1) Conduit Kit; 3/4" EMT	Imp = 21.6 AAC	9	(1) AWG #10, THWN-2, Black (1) AWG #10, THWN-2, White (1) AWG #10, THWN/THWN-2, Green EGC	Voc* = 589.24 VDC Isc = 9.77 ADC Vmp = 421.33 VDC Imp = 9.26 ADC	– (1) Conduit Kit; 3/4" EMT	
14	(1) AWG #8, THWN-2, Black (1) AWG #8, THWN-2, Red (1) AWG #8, THWN-2, Green EGC/GEC Vmp = 240 VAC	– (1) AWG #10, THWN-2, White NEUTRAL – (1) Conduit Kit; 3/4" EMT	Imp = 27.5 AAC	10	(2) AWG #10, PV Wire, 600V, Black (1) AWG #10, THWN/THWN-2, Green EGC (1) Conduit Kit; 3/4" EMT	Voc* = 543.92 VDC Isc = 9.77 ADC Vmp = 388.92 VDC Imp = 9.26 ADC		
15	(1) AWG #8, THWN-2, Black (1) AWG #8, THWN-2, Red (1) AWG #8, THWN-2, Green EGC/GEC Vmp = 240 VAC	– (1) AWG #8, THWN-2, White NEUTRAL – (1) Conduit Kit; 3/4" EMT	Imp = 49.1 AAC	11	(1) AWG #10, THWN-2, Black (1) AWG #10, THWN-2, Red (1) AWG #10, THWN/THWN-2, Green EGC	Voc* = 543.92 VDC Isc = 9.77 ADC Vmp = 388.92 VDC Imp = 9.26 ADC	– (1) Conduit Kit; 3/4" EMT	
16	(1) AWG #4, THWN-2, Black (1) AWG #4, THWN-2, RED (1) AWG #6, Solid Bare Copper GEC – (1) CONDUIT KIT 3/4" x 10' EMT Conduit	– (1) AWG #4, THWN-2, White NEUTRAL Vmp = 240 VAC	Imp = 49.1 AAC	12	(1) AWG #10, THWN-2, Black (1) AWG #10, THWN-2, White (1) AWG #10, THWN/THWN-2, Green EGC	Voc* = 543.92 VDC Isc = 9.77 ADC Vmp = 388.92 VDC Imp = 9.26 ADC	– (1) Conduit Kit; 3/4" EMT	

5	(1) AWG #8, THWN-2, Black (1) AWG #8, THWN-2, Red (1) AWG #10, THWN/THWN-2, Green EGC	Voc* = 453.26 VDC Isc = 19.54 ADC Vmp = 324.1 VDC Imp = 18.52 ADC	– (1) Conduit Kit; 3/4" EMT	1	(4) AWG #10, PV Wire, 600V, Black (1) AWG #10, THWN-2, Green EGC	Voc* = 453.26 VDC Isc = 9.77 ADC Vmp = 324.1 VDC Imp = 9.26 ADC		
6	(1) AWG #8, THWN-2, Black (1) AWG #8, THWN-2, White (1) AWG #10, THWN/THWN-2, Green EGC	Voc* = 453.26 VDC Isc = 19.54 ADC Vmp = 324.1 VDC Imp = 18.52 ADC	– (1) Conduit Kit; 3/4" EMT – (1) Conduit Kit; 3/4" PVC, Sch. 40	2	(2) AWG #10, PV Wire, 600V, Black (1) AWG #10, THWN-2, Green EGC	Voc* = 543.92 VDC Isc = 9.77 ADC Vmp = 388.92 VDC Imp = 9.26 ADC		
7	(2) AWG #10, PV Wire, 600V, Black (1) AWG #10, THWN/THWN-2, Green EGC (1) Conduit Kit; 3/4" EMT	Voc* = 589.24 VDC Isc = 9.77 ADC Vmp = 421.33 VDC Imp = 9.26 ADC		3	(2) AWG #10, PV Wire, 600V, Black (1) AWG #10, THWN-2, Green EGC	Voc* = 589.24 VDC Isc = 9.77 ADC Vmp = 421.33 VDC Imp = 9.26 ADC		
8	(1) AWG #10, THWN-2, Black (1) AWG #10, THWN-2, Red (1) AWG #10, THWN/THWN-2, Green EGC	Voc* = 589.24 VDC Isc = 9.77 ADC Vmp = 421.33 VDC Imp = 9.26 ADC	– (1) Conduit Kit; 3/4" EMT	4	(4) AWG #10, PV Wire, 600V, Black (1) AWG #10, THWN/THWN-2, Green EGC (1) Conduit Kit; 3/4" EMT	Voc* = 453.26 VDC Isc = 19.54 ADC Vmp = 324.1 VDC Imp = 18.52 ADC		

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JOB NUMBER: JB-2093964 00
MOUNTING SYSTEM: Z5 Comp V4 w Flashing-Insert
MODULES: (45) Hanwha Q-Cells # Q.Peak-G4.1/SC300
INVERTER: Multiple Inverters

CUSTOMER:
JERRY LAVERY
115 ELM AVE
TAKOMA PARK, MD 20912

DESCRIPTION: 13.5 KW PV ARRAY
PAGE NAME: THREE LINE DIAGRAM

DESIGN: Kyle Lennon
SHEET: 4 REV: DATE: 11/28/2017

TESLA

WARNING: PHOTOVOLTAIC POWER SOURCE

Label Location:
(C)(CB)(JB)
Per Code:
NEC 690.31.G.3

PHOTOVOLTAIC DC DISCONNECT

Label Location:
(DC) (INV)
Per Code:
NEC 690.14.C.2

MAXIMUM POWER-POINT CURRENT (Imp) ___ A
MAXIMUM POWER-POINT VOLTAGE (Vmp) ___ V
MAXIMUM SYSTEM VOLTAGE (Voc) ___ V
SHORT-CIRCUIT CURRENT (Isc) ___ A

Label Location:
(DC) (INV)
Per Code:
NEC 690.53

WARNING
ELECTRIC SHOCK HAZARD
IF A GROUND FAULT IS INDICATED
NORMALLY GROUNDED
CONDUCTORS MAY BE
UNGROUNDED AND ENERGIZED

Label Location:
(DC) (INV)
Per Code:
NEC 690.5(C)

WARNING
ELECTRICAL SHOCK HAZARD
DO NOT TOUCH TERMINALS
TERMINALS ON BOTH LINE AND
LOAD SIDES MAY BE ENERGIZED
IN THE OPEN POSITION
DC VOLTAGE IS
ALWAYS PRESENT WHEN
SOLAR MODULES ARE
EXPOSED TO SUNLIGHT

Label Location:
(DC) (CB)
Per Code:
NEC 690.17(4)

PHOTOVOLTAIC AC DISCONNECT

Label Location:
(AC) (POI)
Per Code:
NEC 690.14.C.2

MAXIMUM AC OPERATING CURRENT ___ A
MAXIMUM AC OPERATING VOLTAGE ___ V

Label Location:
(AC) (POI)
Per Code:
NEC 690.54

WARNING
ELECTRIC SHOCK HAZARD
DO NOT TOUCH TERMINALS
TERMINALS ON BOTH LINE AND
LOAD SIDES MAY BE ENERGIZED
IN THE OPEN POSITION

Label Location:
(AC)(POI)
Per Code:
NEC 690.17.E

PHOTOVOLTAIC SYSTEM
EQUIPPED WITH RAPID
SHUTDOWN

Label Location:
(INV)
Per Code:
CEC 690.56(C)

WARNING
INVERTER OUTPUT
CONNECTION
DO NOT RELOCATE
THIS OVERCURRENT
DEVICE

Label Location:
(POI)
Per Code:
NEC 690.64.B.7

CAUTION
PHOTOVOLTAIC SYSTEM
CIRCUIT IS BACKFED

Label Location:
(D) (POI)
Per Code:
NEC 690.64.B.4

CAUTION
DUAL POWER SOURCE
SECOND SOURCE IS
PHOTOVOLTAIC SYSTEM

Label Location:
(POI)
Per Code:
NEC 690.64.B.4

PHOTOVOLTAIC POINT OF INTERCONNECTION
WARNING: ELECTRIC SHOCK HAZARD. DO NOT TOUCH TERMINALS. TERMINALS ON BOTH THE LINE AND LOAD SIDE MAY BE ENERGIZED IN THE OPEN POSITION. FOR SERVICE DE-ENERGIZE BOTH SOURCE AND MAIN BREAKER.
PV POWER SOURCE
MAXIMUM AC OPERATING CURRENT ___ A
MAXIMUM AC OPERATING VOLTAGE ___ V

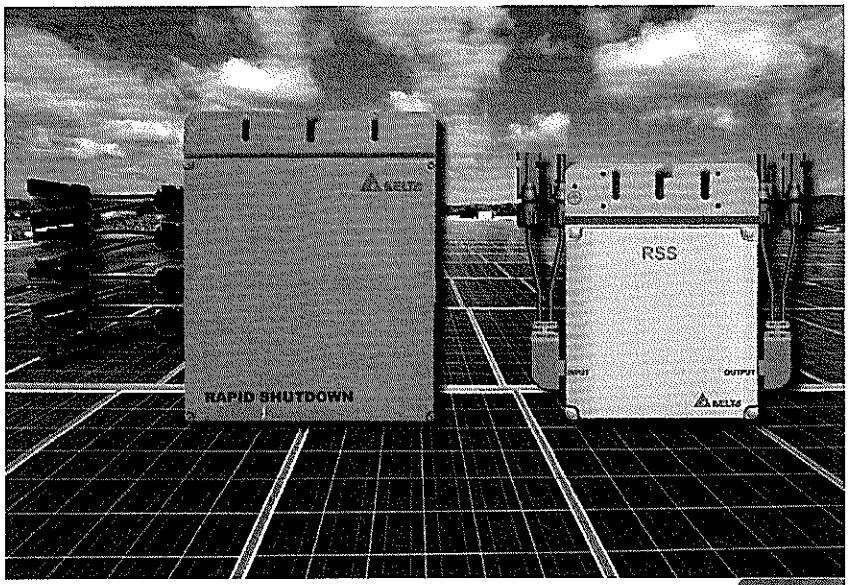
Label Location:
(POI)
Per Code:
NEC 690.17.4; NEC 690.54

WARNING
ELECTRIC SHOCK HAZARD
THE DC CONDUCTORS OF THIS
PHOTOVOLTAIC SYSTEM ARE
UNGROUNDED AND
MAY BE ENERGIZED

Label Location:
(DC) (INV)
Per Code:
NEC 690.35(F)
TO BE USED WHEN
INVERTER IS
UNGROUNDED

(AC): AC Disconnect
(C): Conduit
(CB): Combiner Box
(D): Distribution Panel
(DC): DC Disconnect
(IC): Interior Run Conduit
(INV): Inverter With Integrated DC Disconnect
(LC): Load Center
(M): Utility Meter
(POI): Point of Interconnection

Label Set



Rapid Shutdown Device
for Delta 3.0~7.6 TL Inverters

Delta's Rapid Shutdown Devices provide an automatic disconnect of 600VDC residential or small commericial PV array system, fully compliant with the Rapid Shutdown requirements of NEC 2014 article 690.12. It is compatible with Delta's single-phase residential inverters.

KEY FEATURES

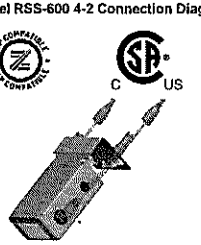
- NEMA 4X Protection
- Compact and Lightweight
- Rack Mount Installation
- Fast Connect with PV Connectors
- Compliant with NEC 2014 article 690.12
- PLC Communication (Model RSS-600 1-1 only)

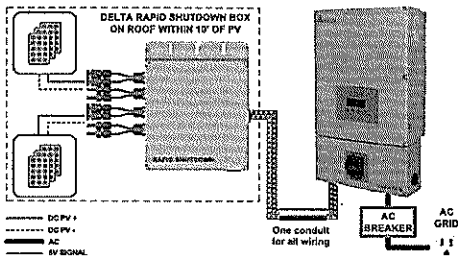
C SP US

www.delta-americas.com

DELTA

Model RSS-600 4-2 Connection Diagram:





Technical Specifications

Input Ratings		
Max System Voltage	600V DC	600V DC
Max Number of Input Circuit	1	4
Rated Input Current Per String	20A	10A
Fuse Rating	N/A	15A
Output Ratings		
Max Number of Output Circuit	1	2
Rated Output Current Per Circuit	20A	20A
Maximum Current Connected Conductor	25A	25A
Output Terminal Wire Size	10 AWG	12-6 AWG
Output Conduit Size	N/A	3/4" (two holes)
Control Signal Method	PLC Signal	6V Signal Wire
6V Signal Wire Voltage Rating	N/A	600V
6V Signal Wire Size Range	N/A	24-14 AWG
General Data		
Enclosure Size in Inches (H x W x D (mm))	7.87 x 5.91 x 2.09 (200 x 150 x 53)	12.44 x 10.04 x 2.16 (316 x 255 x 55)
Weight	2.86lbs (1.3kg)	6.6lbs (3.0kg)
Input Connectors	MC-4 PV Connector or Amphenol H4 PV Connector	MC-4 PV Connector or Amphenol H4 PV Connector
Output Connectors	MC-4 PV Connector or Amphenol H4 PV Connector	Screw Terminal Blocks
Operating Temperature	-40 ~ 158°F (-40 ~ 70°C)	-40 ~ 158°F (-40 ~ 70°C)
Storage Temperature	-40 ~ 185°F (-40 ~ 85°C)	-40 ~ 185°F (-40 ~ 85°C)
Humidity	0 ~ 100%	0 ~ 100%
Max. Operating Altitude	2000m above sea level	2000m above sea level
Warranty	10 Years	10 Years
Standard Compliance		
Enclosure Protection Rating	NEMA 4X	NEMA 4X
Safety	UL1741, CSA 22.2 107-1	UL1741, CSA 22.2 107-1
NEC Code	NEC 2014 Article 690.12	NEC 2014 Article 690.12

Delta Products Corporation, Inc.
46101 Fremont Blvd.
Fremont, CA 94538
Sales Email: Inverter.Sales@delta-corp.com
Support Email: Inverter.Support@delta-corp.com
Sales Hotline: +1-877-440-5851 or
+1-626-369-8021
Support Hotline: +1-877-442-4832
Support (Intl.): +1-626-369-8019
Monday to Friday from 7am to 5pm PST (apart from Holidays)

www.delta-americas.com/solarinverters

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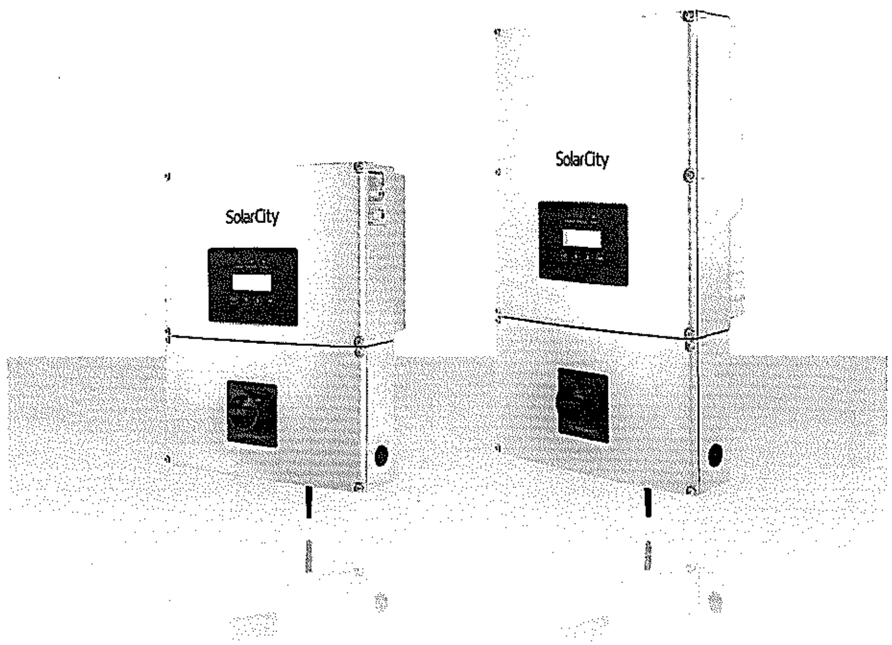


Solar Inverters

Transformerless (TL): 3.8 kW, 5.2 kW, 6.6 kW, 7.6 kW

- Wide Operating Voltage Range: 85 ~ 550V
- Wide Operating Temperature Range: -13 ~ 158°F (-25 ~ 70°C)
- High CEC Efficiency: 97.5%
- Integrated AFCI (Arc Fault Circuit Interruption)
- NEMA 4X plus Salt Mist Corrosion Protection
- Natural Convection Cooling
- Dual MPPT (5.2kW / 6.6kW / 7.6kW)
- Compact and Lightweight
- UL 1741 / IEEE 1547 / IEEE 1547.1 / CEC Listed /UL 1699B(Type 1) / NEC 690.11

c US

DELTA

Delta Solar Inverters Datasheet for SolarCity

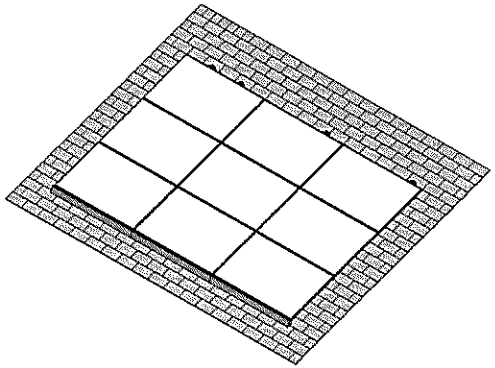
	SOLIVIA 3.0 TL	SOLIVIA 3.8 TL	SOLIVIA 5.2 TL	SOLIVIA 6.6 TL	SOLIVIA 7.6 TL
INPUT (DC)					
Max. System Voltage	600 V				
Nominal Voltage	360 V				
Operating Voltage Range	85 ~ 550 V				
Full Power MPPT Range	200 - 500 V				
Max. Usable Current	18.0 A	20.0 A	20.0 A per MPP tracker		
Max. Short Circuit Current @ STC	25.0 A per MPP tracker				
Max. Allowable Imbalance Power		-	4200 W	5000 W	6600 W
Allowed DC Loading Ratio	1.5				
DC Disconnect	Internal				
MPP Tracker	1			2	
Total Input String Available	2			4	
OUTPUT (AC)					
Nominal Power	3000 W	3800 W	5200 W	6600 W	7600 W
Max. Continuous Power	3000 W @ 208 V / 3000 W @ 240 V	3300 W @ 208 V / 3800 W @ 240 V	5200 W @ 208 V / 5200 W @ 240 V	6600 W @ 208 V / 6600 W @ 240 V	6600 W @ 208 V / 7600 W @ 240 V
Voltage Range	183 ~ 228 V @ 208 V / 211 ~ 264 V @ 240 V				
Nominal Current	14.4 A @ 208 V / 12.5 A @ 240 V	15.8 A @ 208 V / 15.8 A @ 240 V	24.0 A @ 208 V / 21.6 A @ 240 V	31.7 A @ 208 V / 27.5 A @ 240 V	31.7 A @ 208 V / 31.7 A @ 240 V
Nominal Frequency	60 Hz				
Frequency Range	59.3 ~ 60.5 Hz				
Adjustable Frequency Range	57.0 ~ 63.0 Hz				
Night Consumption	< 1.5 W				
Total Harmonic Distortion @ Nominal Power	< 3%				
Power Factor @ Nominal Power	> 0.99				
Adjustable Power Factor Range	0.85l ~ 0.85c				
Acoustic Noise Emission	<50 db(A) @ lm				
GENERAL SPECIFICATION					
Max. Efficiency	98%				
CEC Efficiency	97.5% @ 208V / 97.5% @ 240V				
Operating Temperature Range	-13 ~ 158°F (-25~70°C) | derating above 122°F (50°C)				
Storage Temperature Range	-40 ~ 185°F (-40 ~ 85°C)				
Humidity	0 ~ 100%				
Max. Operating Altitude	2000m above sea level				
MECHANICAL DESIGN					
Size (L x W x D) [illegible]	19.5 x 15.8 x 8.5 in (495 x 401 x 216 mm)		26.8 x 15.8 x 8.5 in (680 x 401 x 216 mm)		
Weight	43.0 lbs (19.5 kg)		65.0 lbs (29.5 kg)		
Cooling	Natural Convection				
AC Connector	Spring terminals in connection box				
Compatible Wiring Gauge in AC	AWG 12 ~ AWG 6 Copper (According to NEC 310.15)				
DC Connectors	2 pairs of spring terminals in connection box		4 pairs of spring terminals in connection box		
Compatible Wiring Gauge in DC	AWG 12 ~ AWG 6 Copper (According to NEC 690.8)				
Communication Interface	ZigBee				
Display	3 LEDs, 4-Line LCD				
Enclosure Material	Diecast Aluminum				
STANDARDS / DIRECTIVES					
Enclosure Protection Rating	NEMA 4X, IEC 60068-2-11 Salt mist				
Safety	UL 1741 Second Edition, CSA C22.2 No.107.1-01				
SW Approval	UL 1998				
Ground-Fault Protection	NEC 690.35, UL 1741 CRD				
Anti-Islanding Protection	IEEE 1547, IEEE 1547.1				
EMC	FCC part 15 Class B				
AFCI	UL 1699B (Type 1), NEC 690.11				
PV Rapid Shutdown	UL 1741 CRD PVRSS, NEC 690.12 (with SMART RSS)				
Integrated Meter	ANSI C12.1 (meet 1% Accuracy)				
Regulation of Grid Support	California Rule 21, HECO Compliant, IEEE1547				
WARRANTY					
Standard Warranty	10 years				

Delta Products Corporation, Inc.
46101 Fremont Blvd,
Fremont, CA 94538
Sales Email: inverter.sales@deltaww.com
Support Email: inverter.support@deltaww.com
Sales Hotline: +1-877-440-5851 or +1-626-369-8021
Support Hotline: +1-877-442-4832
Support (Intl.): +1-626-369-8019
Monday to Friday from 7 am to 5 pm PST (apart from Holidays)

DELTA

ZS Comp

for composition shingle roofs



Description

- PV mounting solution for composition shingle roofs
- Works with all Zep Compatible Modules
- Auto bonding UL-listed hardware creates structural and electrical bond
- ZS Comp has a UL 1703 Class "A" Fire Rating when installed using modules from any manufacturer certified as "Type 1" or "Type 2"

Specifications

- Designed for pitched roofs
- Installs in portrait and landscape orientations
- ZS Comp supports module wind uplift and snow load pressures to 50 psf per UL 2703
- Wind tunnel report to ASCE 7-05 and 7-10 standards
- ZS Comp grounding products are UL listed to UL 2703 and UL 467
- ZS Comp bonding products are UL listed to UL 2703
- Engineered for spans up to 72" and cantilevers up to 24"
- Zep wire management products listed to UL 1565 for wire positioning devices

zepsolar.com

This document does not create any express warranty by Zep Solar or about its products or services. Zep Solar's sole warranty is contained in the written product warranty for each product. The end-user documentation shipped with Zep Solar's products constitutes the sole specifications referred to in the product warranty. The customer is solely responsible for verifying the suitability of ZepSolar's products for each use. Specifications are subject to change without notice. Patents and Apps: zepats.com.

SolarCity | ZepSolar Next-Level PV Mounting Technology

Components

Mounting Block

Part No. 850-1633
Listed to UL 2703

Flashing Insert

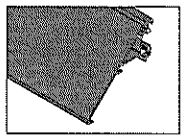
Part No. 850-1628
Listed to UL 2703

Captured Washer Lag

Part No. 850-1631-001
850-1631-002
850-1631-003
850-1631-004

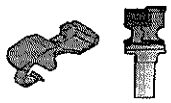
Leveling Foot

Part No. 850-1397
Listed to UL 2703



Array Skirt

Part No. 850-1608 or 500-0113
Listed to UL 2703

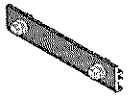


Grip

Part No. 850-1606 or 850-1421
Listed to UL 2703

End Cap

Part No.
(L) 850-1586 or 850-1460
(R) 850-1588 or 850-1467



Interlock

Part No. 850-1388 or 850-1613
Listed to UL 2703

Ground Zep V2

Part No. 850-1511
Listed to UL 467 and UL 2703

DC Wire Clip

Part No. 850-1509
Listed to UL 1565

zepsolar.com

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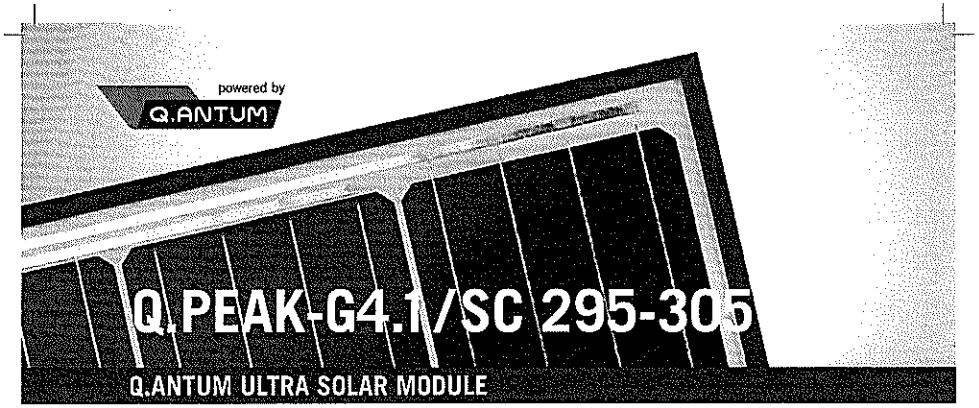
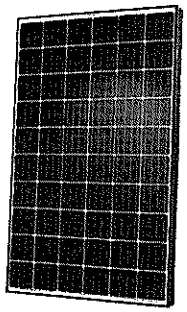


Q.PEAK-G4.1/SC 295-305

Q.ANTUM ULTRA SOLAR MODULE

The new high-performance module Q.PEAK-G4.1/SC is the ideal solution for all applications thanks to its innovative cell technology Q.ANTUM ULTRA and a black Zep Compatible™ frame design for improved aesthetics, easy installation and increased safety. The world-record cell design was developed to achieve the best performance under real conditions – even with low radiation intensity and on clear, hot summer days.



LOW ELECTRICITY GENERATION COSTS
Higher yield per surface area and lower BOS costs thanks to higher power classes and an efficiency rate of up to 18.6%.

INNOVATIVE ALL-WEATHER TECHNOLOGY
Optimal yields, whatever the weather with excellent low-light and temperature behavior.

ENDURING HIGH PERFORMANCE
Long-term yield security with Anti-PID Technology[1], Hot-Spot-Protect and Traceable Quality Tra.Q™.

A RELIABLE INVESTMENT
Inclusive 12-year product warranty and 25-year linear performance guarantee[2].

THE IDEAL SOLUTION FOR:

Rooftop arrays on residential buildings

Engineered in Germany

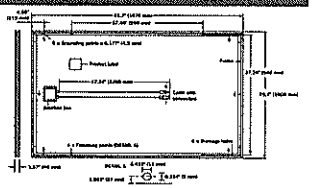
[1] APT test conditions: Cells at -1500V against grounded, with conductive metal foil covered module surface, 25°C, 168h

[2] See data sheet on rear for further information.

Q CELLS

MECHANICAL SPECIFICATION

Format	65.7in x 39.4in x 1.57in (including frame) (1670mm x 1000mm x 40mm)
Weight	44.09lbs (20.0kg)
Front Cover	0.13in (3.2mm) thermally pre-stressed glass with anti-reflection technology
Back Cover	Composite film
Frame	Black anodized aluminium
Cell	6 x 10 monocrystalline Q.ANTUM ULTRA solar cells
Junction box	2.60-3.03in x 4.37-3.54in x 0.59-0.75in (66-77mm x 111-90mm x 15-19mm), Protection class IP67, with bypass diodes
Cable	4mm² Solar cable; (+) 47.24in (1200mm), (-) 47.24in (1200mm)
Connector	Multi-Contact MC4, IP68

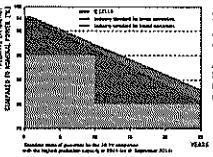


ELECTRICAL CHARACTERISTICS

POWER CLASS			295	300	305
MINIMUM PERFORMANCE AT STANDARD TEST CONDITIONS, STC[1] (POWER TOLERANCE +5W / -0W)					
Minimum	Power at MPP[2]	P_{MPP} [W]	295	300	305
	Short Circuit Current*	I_{SC} [A]	9.70	9.77	9.84
	Open Circuit Voltage*	V_{OC} [V]	39.48	39.76	40.05
	Current at MPP*	I_{MPP} [A]	9.17	9.26	9.36
	Voltage at MPP*	V_{MPP} [V]	32.19	32.41	32.62
	Efficiency[2]	η [%]	≥17.7	≥18.0	≥18.3
MINIMUM PERFORMANCE AT NORMAL OPERATING CONDITIONS, NOCT[1]					
Minimum	Power at MPP*	P_{MPP} [W]	218.1	221.8	225.5
	Short Circuit Current*	I_{SC} [A]	7.82	7.88	7.94
	Open Circuit Voltage*	V_{OC} [V]	36.92	37.19	37.46
	Current at MPP*	I_{MPP} [A]	7.20	7.27	7.35
	Voltage at MPP*	V_{MPP} [V]	30.30	30.49	30.67

[1] 1000 W/m², 25 °C, spectrum AM 1.5G [2] Measurement tolerances STC ± 3 %; NOCT ± 5 % [3] 800 W/m², NOCT, spectrum AM 1.5G * typical values, actual values may differ

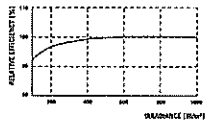
Q CELLS PERFORMANCE WARRANTY



At least 98% of nominal power during first year. Thereafter max. 0.5% degradation per year. At least 92.6% of nominal power up to 10 years. At least 83.6% of nominal power up to 25 years.

All data within measurement tolerances. Full warranties in accordance with the warranty terms of the Q CELLS sales organization of your respective country.

PERFORMANCE AT LOW IRRADIANCE



Typical module performance under low irradiance conditions in comparison to STC conditions (25 °C, 1000 W/m²).

TEMPERATURE COEFFICIENTS

Temperature Coefficient of I_{SC}	α	[%/K]	+0.04	Temperature Coefficient of V_{OC}	β	[%/K]	-0.28
Temperature Coefficient of P_{MPP}	γ	[%/K]	-0.39	Normal Operating Cell Temperature	NOCT	[°F]	113 ±5.4 (45 ±3°C)

PROPERTIES FOR SYSTEM DESIGN

Maximum System Voltage V_{SYS}	[V]	1000 (IEC) / 1000 (UL)	Safety Class	II
Maximum Series Fuse Rating	[A DC]	20	Fire Rating	C (IEC) / TYPE 1 (UL)
Design load, push (UL)[3]	[lbs/ft²]	75 (3600Pa)	Permitted module temperature on continuous duty	-40°F up to +185°F (-40°C up to +85°C)
Design load, pull (UL)[3]	[lbs/ft²]	55.6 (2666Pa)	[3] see installation manual	

QUALIFICATIONS AND CERTIFICATES

UL 1703; CE-compliant;
IEC 61215 (Ed.2); IEC 61730 (Ed.1) application class A

PACKAGING INFORMATION

Number of Modules per Pallet	26
Number of Pallets per 53' Container	32
Number of Pallets per 40' Container	26
Pallet Dimensions (L x W x H)	68.7in x 45.3in x 46.1in (1745mm x 1150mm x 1170mm)
Pallet Weight	1254lbs (569kg)

NOTE: installation instructions must be followed. See the installation and operating manual or contact our technical service department for further information on approved installation and use of this product.

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