CITY OF WASHINGTON

PLANNING & DEVELOPMENT DEPARTMENT
301 Walnut St. · Washington, IL 61571
Ph. 309-444-1135 · Fax 309-444-9779
http://www.washington-illinois.org
joliphant@ci.washington.il.us

MEMORANDUM

TO: Chairman Burdette and Planning & Zoning Commission
FROM: Jon R. Oliphant, AICP, Planning & Development Director
SUBJECT: Public Hearing – Varsha Chipala Special Use Request, 318 Court Drive
DATE: August 27, 2019

Summary: Varsha Chipala has submitted a special use application on behalf of Todd Young for the installation of a solar energy system on the detached garage at 318 Court Drive. The zoning code requires a special use be issued in order to install a roof-mount solar energy system on an accessory structure. Staff recommends approval of this request.

Background: The property is approximately 0.21 acres and is zoned R-1 (Single- and Two-Family Residential). A detached garage was constructed on the south side of the property in 2009. A 4.5 KW solar photovoltaic array is proposed to be located on the south-facing garage roof. The site plan submitted shows the installation would be comprised of 15 300-watt panels and cover approximately 31% of the roof.

An attached letter submitted by the contractor (Summit Solar Solutions) indicates the reason for placing the panels on the garage is take the most advantage of the possible sun on the south-facing roof. The west- and east facing roofs of the principal structure are not options because of the healthy trees in the front yard that would not allow for enough energy production to justify the cost.

Summit Solar Solutions has attested that the roof is capable of supporting the proposed array. The City's electrical inspector has reviewed the attachments and has consented to this construction if the special use is approved. While a building permit would need to be issued if the special use is approved, the submitted attachments are thus far in conformance with the solar energy regulations. It would be installed in accordance with the adopted 2012 International Building Code.

The proposed use would not appear to be detrimental to the public's health, safety, or general welfare nor would it diminish property values or the use and enjoyment of properties in the vicinity. Placing the array on the roof on the house does not appear to be worthwhile because of the limited sun that would produce the energy. Their placement on the south-facing garage roof would be the best fit to allow the owner to take advantage of the cost savings from the solar generation. Based on all of these factors, staff would recommend that the special use request be approved for the installation of the solar energy system on the accessory structure.

A public hearing has been scheduled on this topic at the September 4 Planning and Zoning Commission meeting.

Enclosures

CITY OF WASHINGTON

TAZEWELL COUNTY, ILLINOIS

LOCATION MAP

N
W E
S

Legend

- AG-1 (Agriculture)
- CE (Country Estates)
- R-1A (Single Family Residential)
- R-1 (1-2 Family Residential)
- R-2 (Multifamily Residential)
- C-1 (Local Retail)
- C-2 (General Retail)
- C-3 (Service Retail)
- I-1 (Light Industrial)
- I-2 (Heavy Industrial)

Prepared by the City of Washington Department of Planning and Development

Printed: August 27, 2019

CITY OF WASHINGTON

TAZEWELL COUNTY, ILLINOIS

LOCATION MAP

N
W E
S

Prepared by the City of Washington
Department of Planning and Development

Printed: August 27, 2019

SUMMIT SOLAR
[101 North Main Street, Suite 1004 Greenville, SC 29601]

08/06/19

TO: Jon Oliphant, AICP, CFM
Planning and Development Director
City of Washington
301 Walnut St.
Washington, IL 61571

We have entered into a contract with Todd Young to install a PV Solar Power Generation System at his residence 318 Court Drive. We understand that a Special Use Application for permitting is required in your jurisdiction, because the proposed solar system is designed to be mounted on a detached garage at the residence. We have already submitted a depiction of the proposed design with the initial application.

The system design requires that the modules/panels be mounted on the detached garage to obtain the radiant gain. The garage roof azimuth at 178 degrees is well suited to realize the maximum gain. We have evaluated the property and found that the house roof is not suitable for solar gain, due to the East facing roof planes and the West facing roof plane is not acceptable because of excessive shading from health hardwood trees.

Please free to contact me if you need further clarification.

Laurie Tazioli
Project Manager
Summit Solar
(815) 768-4765
(864) 250-0026 Ext 108
Office Hours: 8am-5pm EST

CITY OF WASHINGTON, ILLINOIS

APPLICATION FOR SPECIAL USE

To have a complete application for a special use, you must submit the following:

- Signed and completed application
- Plat showing subject property and all adjacent properties – See below for plat requirements
- Ownership documentation (lease, deed, mortgage, etc.)
- Accurate legal description obtained from the Warranty Deed
- Application fee of $100 payable to the City of Washington

Address or location of property: 318 Court Drive

Property Tax ID (PIN) number: 02 - 02 - 23 - 108 - 013

Current zoning classification of the property: _____

Current use of the property: SingIr Family residential

What is the Special Use for? Solar PV Installation on roof

How will you meet other requirements of the zoning code (such as parking or landscaping, if applicable)? _____

Name of Applicant: Varsha Chipala Satish Phone Number of Applicant: 864-250-0026 EXT 120

Address of Applicant: 101 N Main St. Ste. 1004, Greenville, SC 29601

Owner of Property: Todd Young

Address of Owner: 318 Court Drive, Washington, IL 61571

I would like to receive correspondence by: ___ Mail ✓ Email Email address: permitsIL@mysummitsolar.com

PLAT REQUIREMENTS: Your special use plat must show:

- Building or site plan layout and locations of proposed special uses, including square footage
- Adjacent properties, rights-of-way, streets, roads, railroads, waterways, and other physical features

PUBLIC HEARING: Your case will be referred with staff's recommendation to the next regularly scheduled Planning and Zoning Commission meeting for a public hearing. The Planning and Zoning Commission meets the first Wednesday of every month at 6:30 p.m at the Washington District Library meeting room at 380 N. Wilmor Road. At the Planning and Zoning Commission meeting, you will present your request. A special use cannot be recommended by the Planning and Zoning Commission unless the Commission finds, based upon the application and evidence presented at the public hearing, that all of the following conditions have been met:

1) The special use will not be detrimental to or endanger the public health, safety, morals, comfort, or general welfare; 2) The special use will not be injurious to the use and enjoyment of other property in the immediate vicinity, or substantially diminish or impair property values; 3) The special use will not impede development of surrounding property; 4) Adequate utilities, access roads, drainage, or necessary facilities will be provided; 5) Adequate ingress and egress provided to minimize traffic congestion in public streets; 6) The special use will conform to all other application regulations of the zoning district; and 7) If the special use would not otherwise be acceptable, the Planning Commission may recommend certain conditions be met to make the use acceptable, such as, but not limited to: landscape screening or fencing, specific hours of operation, night lighting or lighting restrictions, parking area requirements, signage restraints, outdoor storage limitations.

Certification: *To the best of my knowledge, the information contained herein, and on the attachments, is true, accurate, and correct, and substantially represents the existing features and proposed features. Any error, misstatement, or misrepresentation of material fact or expression of material fact, with or without intention, shall constitute sufficient grounds for the revocation or denial of the proposed Special Use.*

Varsha Chipala — *Signature of Applicant* — 7/29/19 — *Date*

Diane Young (Jul 30, 2019) — *Signature of Owner* — Jul 30, 2019 — *Date*

After receiving a completed application, the City Clerk will file notice of your request with the local newspaper and with the adjoining property owners. If you have any questions, please contact Jon Oliphant, Planning & Development Director at (309) 444-1135.

FOR OFFICE USE ONLY Case No.: _____

Plat Submitted? Y / N Date: _____

Documentation of Authority Submitted: _____

Commission Action: _____

Fee Paid? Y / N / N/A Amount: _____ Date: _____

Landscaping Plan Submitted? Y / N / N/A Date: _____

Date to go before the Planning and Zoning Commission: _____

Ordinance Review: (first reading) _____ (second reading) _____

W CONSULTING

Scott E. Wyssling, PE, PP, CME

Wyssling Consulting
76 North Meadowbrook Drive
Alpine, UT 84004
office (201) 874-3483
swyssling@wysslingconsulting.com

July 9, 2019

Derek Landino, COO
Summit Solar
101 North Main Street Unit #202
Greenville, SC 29601

Re: Engineering Services
Young Residence
318 Court Drive, Washington, IL
4.500 kW System

Dear Mr. Landino:

Pursuant to your request, we have reviewed the following information regarding solar panel installation on the roof of the above referenced home:

1. Site Visit/Verification Form prepared by a Summit Solar representative identifying specific site information including size and spacing of rafters for the existing roof structure.
2. Design drawings of the proposed system including a site plan, roof plan and connection details for the solar panels. This information was prepared by Summit Solar and will be utilized for approval and construction of the proposed system.
3. Photographs of the interior and exterior of the roof system identifying existing structural members and their conditions.

Based on the above information we have evaluated the structural capacity of the existing roof system to support the additional loads imposed by the solar panels and have the following comments related to our review and evaluation:

Description of Residence:

The existing residence is typical wood framing construction with the roof system consisting of truss system with all chords constructed of 2 x 4 dimensional lumber at 24" on center. The attic space is unfinished and photos indicate that there was free access to visually inspect the size and condition of the roof rafters. All wood material utilized for the roof system is assumed to be Doug-Fir #2 or better with standard construction components. The existing roofing material consists of composite asphalt shingles. Photos of the dwelling also indicate that there is a permanent foundation.

A. Loading Criteria Used

- 115 MPH wind loading based on ASCE 7-10 Exposure Category "C" at a slope of 30 degrees
- 7 PSF = Dead Load roofing/framing Live Load = 20 PSF Snow Load = 30 PSF
- 3 PSF = Dead Load solar panels/mounting hardware

  Total Dead Load =10 PSF

The above values are within acceptable limits of recognized industry standards for similar structures in accordance with the (2015 IBC). Analysis performed of the existing roof structure utilizing the above loading criteria indicates that the existing rafters will support the additional panel loading without damage, if installed correctly.

B. Solar Panel Anchorage

1. The solar panels shall be mounted in accordance with the most recent "*Ecolibrium Solar Installation Manual*", which can be found on the Ecolibrium Solar website (*http://ecolibriumsolar.com/*). If during solar panel installation, the roof framing members appear unstable or deflect non-uniformly, our office should be notified before proceeding with the installation.
2. Maximum allowable pullout per lag screw is 235 lbs/inch of penetration as identified in the National Design Standards (NDS) of timber construction specifications for Doug-Fir (North Lumber) *assumed*. Based on our evaluation, the pullout value, utilizing a penetration depth of 2 ½", is less than what is allowable per connection and therefore is adequate. Based on the variable factors for the existing roof framing and installation tolerances, using a thread depth of 2 ½" with a minimum size of 5/16" lag screw per attachment point for panel anchor mounts should be adequate with a sufficient factor of safety.
3. Considering the roof slopes, the size, spacing, condition of roof, the panel supports shall be placed no greater than 48" o/c.
4. Panel supports connections shall be staggered to distribute load to adjacent trusses.

Based on the above evaluation, it is the opinion of this office that with appropriate panel anchors being utilized the roof system will adequately support the additional loading imposed by the solar panels. This evaluation is in conformance with the 2015 IBC, current industry and standards, and based on information supplied to us at the time of this report.

Should you have any questions regarding the above or if you require further information do not hesitate to contact me.

Very truly yours,

Scott E. Wyssling, PE
Illinois License No. 62070644

SUMMIT SOLAR

CONTRACTOR INFORMATION:

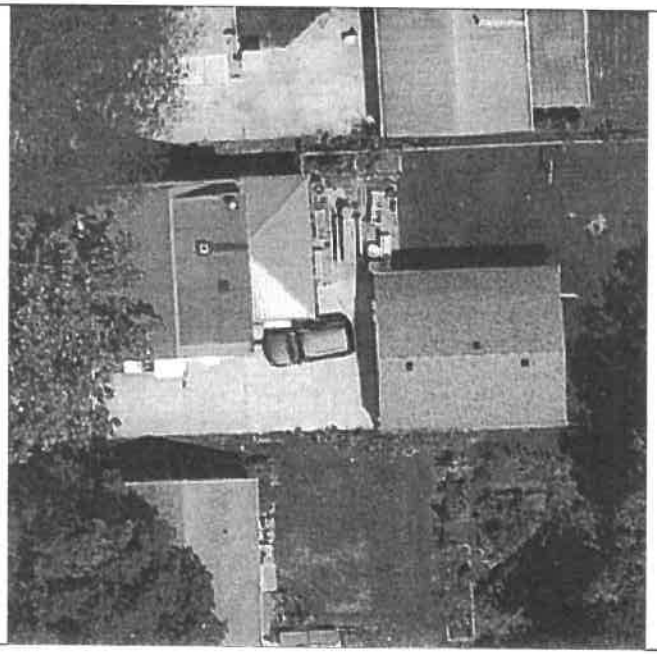
SUMMIT SOLAR
101 N MAIN ST.UNIT 202
GREENVILLE, SC 29601

SITE INFORMATION:
Todd Young
318 Court Drive, Washington, IL 61571
DC SYSTEM SIZE: 4.5 kW DC
AC SYSTEM SIZE: 3.6 kW AC
(15) Heliene 60M-HBLK 300W PV MODULES
(15) Enphase IQ7-60-2-US MICRO INVERTER(S)

DATE: July 9, 2019

PAGE:	SHEET NAME:
PV01	COVER PAGE
DRAWN BY: SolarCAD	VERSION: 0

AERIAL VIEW:



STREET VIEW:

SHEET INDEX:

LICENSED PROFESSIONAL ENGINEER
SCOTT E. WYSLING
STATE OF ILLINOIS

GENERAL NOTES:

1. INSTALLATION OF SOLAR PHOTOVOLTAIC SYSTEM SHALL BE IN ACCORDANCE WITH NEC ARTICLE 690, AND ALL OTHER APPLICABLE NEC CODES WHERE NOTED OR EXISTING.
2. PROPER ACCESS AND WORKING CLEARANCE AROUND EXISTING AND PROPOSED ELECTRICAL EQUIPMENT WILL COMPLY WITH NEC ARTICLE 110.
3. ALL CONDUCTORS, INCLUDING THE GROUNDING ELECTRODE CONDUCTOR SHALL BE PROTECTED FROM PHYSICAL DAMAGE IN ACCORDANCE WITH NEC ARTICLE 250.
4. THE PV MODULES ARE CONSIDERED NON-COMBUSTIBLE; THIS SYSTEM IS UTILITY INTERACTIVE PER UL 1741 AND DOES NOT INCLUDE STORAGE BATTERIES OR OTHER ALTERNATIVE STORAGE SOURCES.
5. ALL DC WIRES SHALL BE SIZED ACCORDING TO [NEC 690.8]
6. DC CONDUCTORS SHALL BE WITHIN PROTECTED RACEWAYS IN ACCORDANCE WITH [NEC 690.31]
7. ALL SIGNAGE TO BE PLACED IN ACCORDANCE WITH LOCAL JURISDICTIONAL BUILDING CODE.
8. PV MODULES TO BE RATED UL 1703 CLASS C FIRE RATING OR BETTER.
9. ALL EQUIPMENT TO BE CERTIFIED BY A NATIONALLY RECOGNIZED TESTING LABORATORY.

DESCRIPTION OF DESIGN:
INSTALLATION OF GRID -TIED, UTILITY INTERACTIVE PHOTOVOLTAIC SYSTEM

EQUIPMENT:
DC SYSTEM SIZE: 4.5kW DC
PV MODULES: (15) Heliene 60M-HBLK 300W
INVERTER(S): (15) Enphase IQ7-60-2-US
RACKING: ECO-X FLUSH MOUNT RAILING & ROOF ATTACHMENT SYSTEM - 48 O.C.

APPLICABLE GOVERNING CODES:

2011 NEC
2012 IBC
2012 IRC
2012 IFC

SITE SPECIFICATIONS:

OCCUPANCY: R-3
ZONING: RESIDENTIAL
EXPOSURE CATEGORY: C

SUMMIT SOLAR

CONTRACTOR INFORMATION:

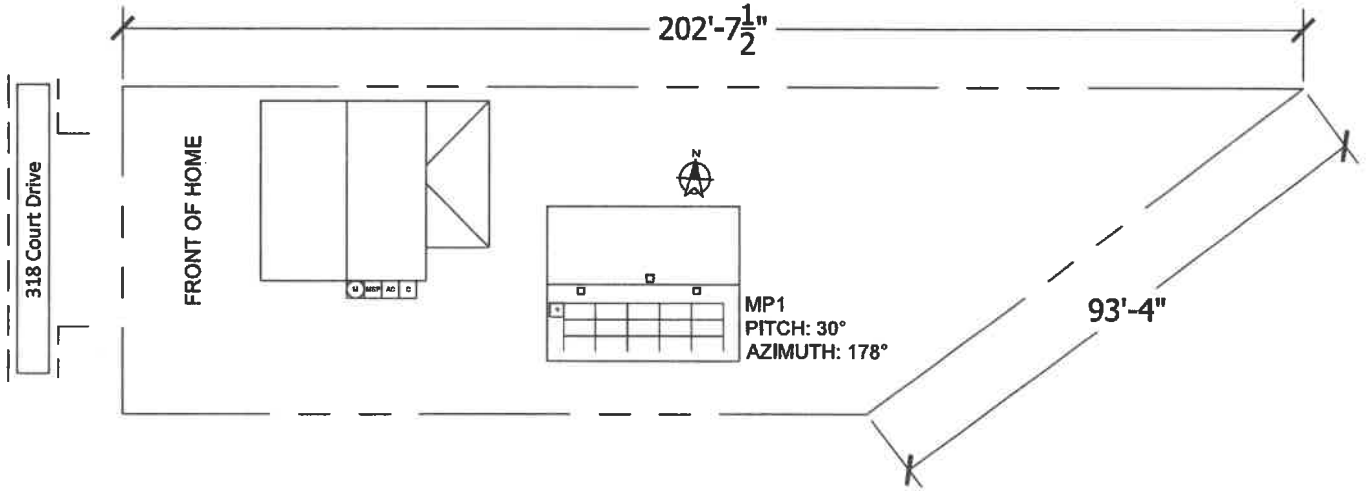
SUMMIT SOLAR
101 N MAIN ST,UNIT 202
GREENVILLE, SC 29601

SITE INFORMATION:
Todd Young
318 Court Drive, Washington, IL 61571
DC SYSTEM SIZE: 4.5 kW DC
AC SYSTEM SIZE: 3.6 kW AC
(15) Heliene 60M-HBLK 300W PV MODULES
(15) Enphase IQ7-60-2-US MICRO INVERTER(S)

DATE: July 9, 2019

PAGE: PV02
SHEET NAME: PROPERTY PLAN

DRAWN BY: SolaCAD
VERSION: 0



EQUIPMENT LEGEND:

- M — UTILITY METER
- MSP — MAIN SERVICE PANEL
- AC — VISIBLE, LOCKABLE, LABELED AC DISCONNECT
- PV — METER SOCKET (FOR UTILITY PV METER)
- INV — INVERTER
- C — COMBINER BOX
- LC — LOAD CENTER
- FIRE SETBACK (3' TYP)
- PROPERTY LINE

VISIBLE, LOCKABLE, LABELED AC DISCONNECT LOCATED WITHIN 10' OF UTILITY METER

SUMMIT SOLAR

CONTRACTOR INFORMATION:

SUMMIT SOLAR
101 N MAIN ST.UNIT 202
GREENVILLE, SC 29601

SITE INFORMATION:
Todd Young
318 Court Drive, Washington, IL 61571
DC SYSTEM SIZE: 4.5 kW DC
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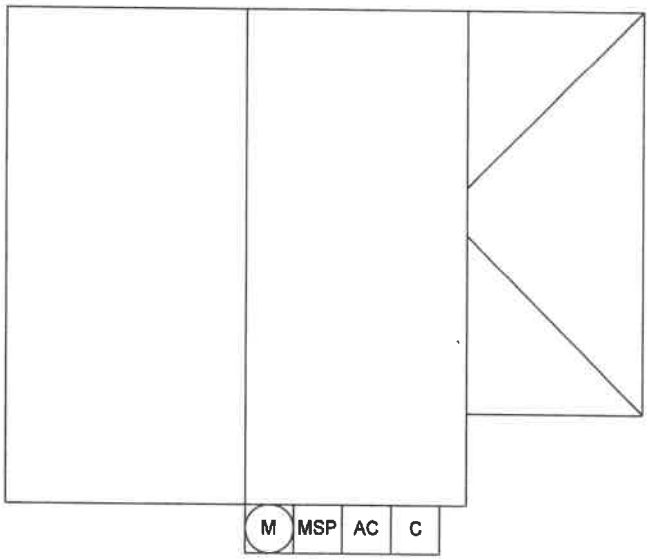
(15) Heliene 60M-HBLK 300W PV MODULES
(15) Enphase IQ7-60-2-US MICRO INVERTER(S)

DATE: July 9, 2019

PAGE:	SHEET NAME:
PV03	ROOF PLAN
DRAWN BY: SoloCAD	VERSION: 0

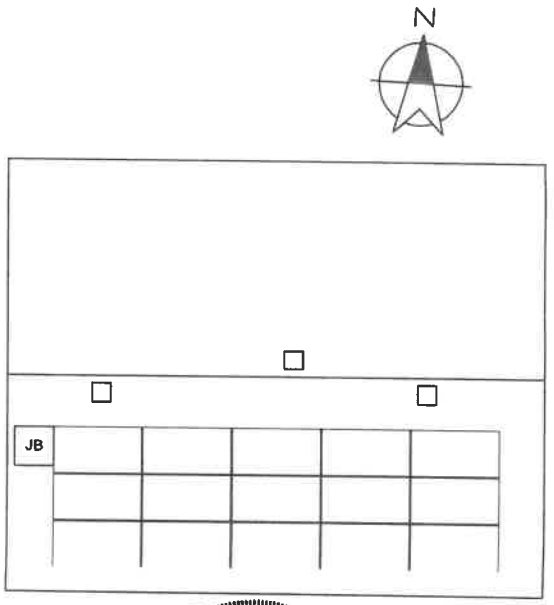
FRONT OF HOME



EQUIPMENT LEGEND:

- M — UTILITY METER
- MSP — MAIN SERVICE PANEL
- AC — VISIBLE, LOCKABLE, LABELED AC DISCONNECT
- PV — METER SOCKET (FOR UTILITY PV METER)
- INV — INVERTER
- C — COMBINER BOX
- LC — LOAD CENTER
- FIRE SETBACK (3' TYP)

VISIBLE, LOCKABLE,
LABELED AC DISCONNECT
LOCATED WITHIN 10'
OF UTILITY METER



MP1
PITCH: 30°
AZIMUTH: 178°

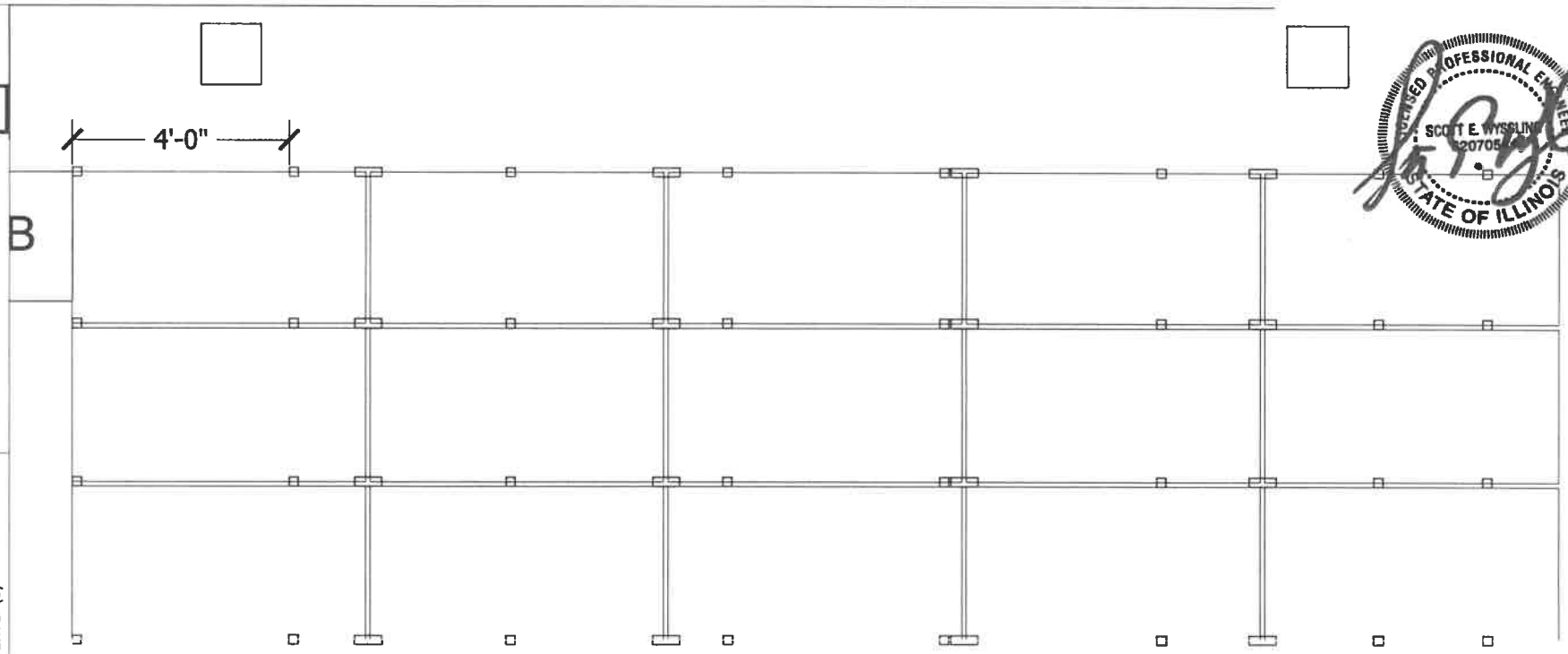
SUMMIT SOLAR

CONTRACTOR INFORMATION:

SUMMIT SOLAR
101 N MAIN ST.UNIT 202
GREENVILLE, SC 29601

SITE INFORMATION:
Todd Young
318 Court Drive, Washington, IL 61571
DC SYSTEM SIZE: 4.5 kW DC
AC SYSTEM SIZE: 3.6 kW AC

(15) Heliene 60M-HBLK 300W PV MODULES
(15) Enphase IQ7-60-2-US MICRO INVERTER(S)



PHOTOVOLTAIC ARRAY STRUCTURAL CRITERIA:	
ROOF ATTACHMENT COUNT:	32
PV MODULE COUNT:	15
ARRAY AREA:	MODULE COUNT * 18.06ft² = 270.9
ROOF AREA:	874 ft²
PERCENT OF ROOF COVERED:	31%
ARRAY WEIGHT:	MODULE COUNT * 50lbs = 750
DISTRIBUTED LOAD:	ARRAY LBS/ATTACHMENTS = 23.44
POINT LOAD: (lbs/ft²)	(ARRAY) WEIGHT/AREA = 2.77 lbs/ft²

MOUNTING EQUIPMENT QTY:	
ROOF ATTACHMENT COUNT:	(32)
PV MODULE COUNT:	(15)
MODULE/MID CLAMP COUNT:	(32)
SPLICE/COUPLER COUNT:	(16)
ATTACHMENT SPACING:	48"

FRAMING INFO:	
RAFTER SIZE:	2x4
RAFTER SPACING:	24"
FRAMING TYPE:	Manufactured Truss

DATE: July 9, 2019

PAGE: PV04 — SHEET NAME: ROOF ATTACHMENTS + BOM

DRAWN BY: SolarCAD — VERSION: 0

SUMMIT SOLAR

CONTRACTOR INFORMATION:
SUMMIT SOLAR
101 N MAIN ST.UNIT 202
GREENVILLE, SC 29601

SITE INFORMATION:
Todd Young
318 Court Drive, Washington, IL 61571
DC SYSTEM SIZE: 4.5 kW DC
AC SYSTEM SIZE: 3.6 kW AC
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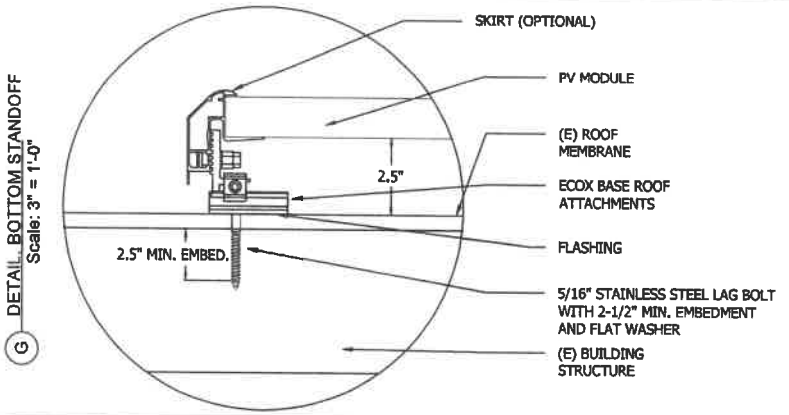
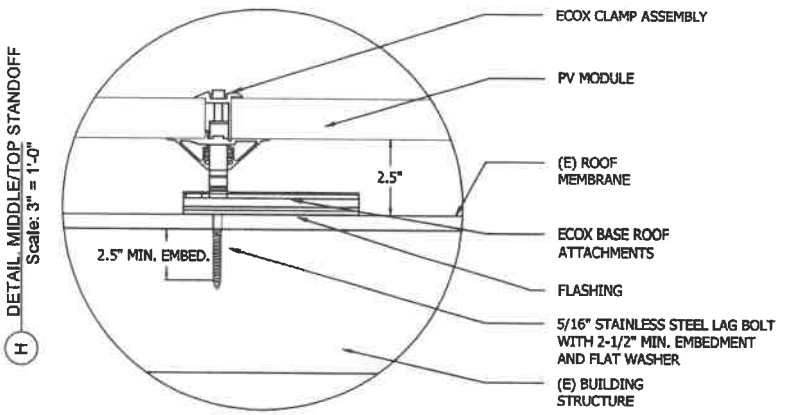
(15) Enphase IQ7-60-2-US MICRO INVERTER(S)

DATE: July 9, 2019

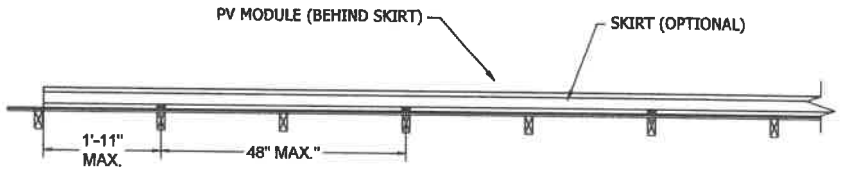
PAGE:	SHEET NAME:
PV05	MOUNTING DETAIL
DRAWN BY: SolarCAD	VERSION: 0



G DETAIL, BOTTOM STANDOFF
Scale: 3" = 1'-0"

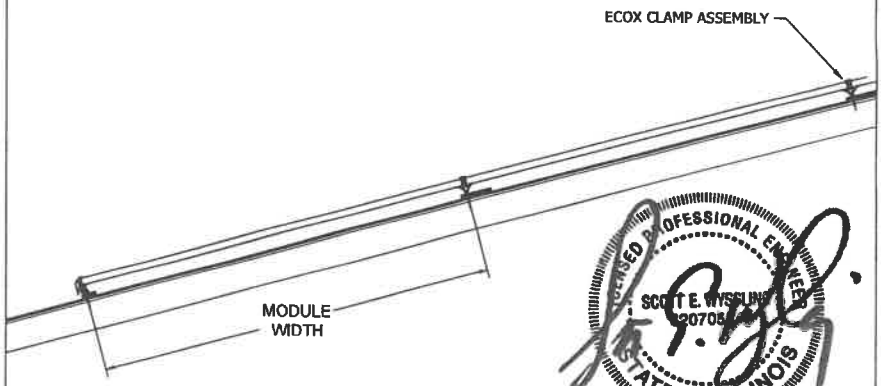


H DETAIL, MIDDLE/TOP STANDOFF
Scale: 3" = 1'-0"



FRONT VIEW

ROOF TYPE: Composition Shingle



SIDE VIEW

LICENSED PROFESSIONAL ENGINEER
SCOTT E. WYSLING
20705
STATE OF ILLINOIS

PHOTOVOLTAIC ARRAY STRUCTURAL CRITERIA:

ROOF ATTACHMENT COUNT:	32
PV MODULE COUNT:	15
ARRAY AREA:	MODULE COUNT * 18.06ft² = 270.9
ROOF AREA:	874 ft²
PERCENT OF ROOF COVERED:	31%
ARRAY WEIGHT:	MODULE COUNT * 50lbs = 750
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MOUNTING EQUIPMENT QTY:

ROOF ATTACHMENT COUNT:	(32)
PV MODULE COUNT:	(15)
MODULE/MID CLAMP COUNT:	(32)
SPLICE/COUPLER COUNT:	(16)
ATTACHMENT SPACING:	48"

FRAMING INFO:

RAFTER SIZE:	2x4
RAFTER SPACING:	24"
FRAMING TYPE:	Manufactured Truss

SUMMIT SOLAR

CONTRACTOR INFORMATION:
SUMMIT SOLAR
101 N MAIN ST.UNIT 202
GREENVILLE, SC 29601

SITE INFORMATION:
Todd Young
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DC SYSTEM SIZE: 4.5 kW DC
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(15) Enphase IQ7-60-2-US MICRO INVERTER(S)

DATE: July 9, 2019

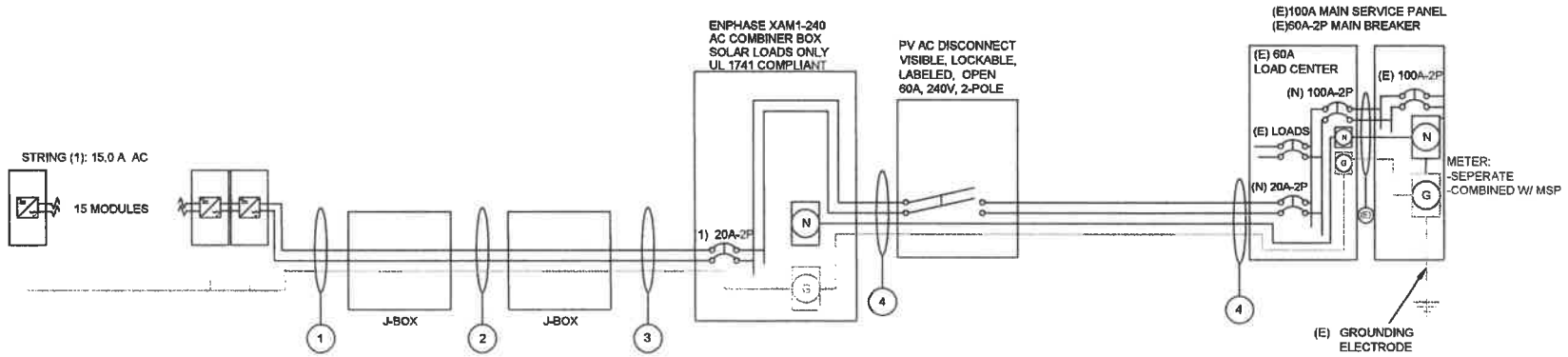
PAGE: PV06 SHEET NAME: ELECTRICAL DIAGRAM

DRAWN BY: SolarCAD | VERSION: 0

WIRE SCHEDULE

1	(1) 12-2 TC-ER, THWN-2, COPPER (OR CODE APPROVED EQUIVALENT) (1) 6 AWG BARE, COPPER (GROUND)	2	(1) 10 AWG THHN/THWN, or 10/2 NM-B COPPER - (L1) (1) 10 AWG THHN/THWN, or 10/2 NM-B COPPER - (L2) (1) 10 AWG THHN/THWN, or 10/2 NM-B COPPER - (GROUND) (1) 3/4" FMC or 3/4" EMT CONDUIT (OR CODE APPROVED EQUIVALENT)	3	(1) 10 AWG THHN/THWN - COPPER - (L1) (1) 10 AWG THHN/THWN - COPPER - (L2) (1) 10 AWG THHN, OR THWN-2 COPPER (GROUND) (1) 3/4" EMT CONDUIT (OR CODE APPROVED EQUIVALENT)	4	(1) 6 AWG THHN/THWN - COPPER - (L1) (1) 6 AWG THHN/THWN - COPPER - (L2) (1) 6 AWG THHN/THWN - COPPER - (NEUTRAL) (1) 8 AWG THHN/THWN - COPPER - (GROUND) (1) 1" EMT CONDUIT (OR CODE APPROVED EQUIVALENT)

UTILITY PROVIDER:
Ameren



INTERCONNECTION NOTES:
1. INTERCONNECTION SIZING, LIMITATIONS AND COMPLIANCE DETERMINED IN ACCORDANCE WITH [NEC 705.12], AND [NEC 690.64].
3. GROUND FAULT PROTECTION IN ACCORDANCE WITH [NEC 215.9], [NEC 230.95] AND [NEC 690.5]
4. ALL EQUIPMENT TO BE RATED FOR BACKFEEDING.

DISCONNECT NOTES
1. DISCONNECTING SWITCHES SHALL BE WIRED SUCH THAT WHEN THE SWITCH IS OPENED THE CONDUCTORS REMAINING LIVE ARE CONNECTED TO THE TERMINALS MARKED "LINE SIDE" (TYPICALLY THE UPPER TERMINALS)
2. AC DISCONNECT MUST BE ACCESSIBLE TO QUALIFIED UTILITY PERSONNEL, BE LOCKABLE, AND BE A VISIBLE-BREAK SWITCH

GROUNDING & GENERAL NOTES:
1. A SECOND FACILITY GROUNDING ELECTRODE IS NOT REQUIRED PER [NEC 690.47(C)(3)]
2. PV INVERTER IS UNGROUNDED, TRANSFORMER-LESS TYPE.
3. DC GEC AND AC EGC TO REMAIN UNSPLICED, OR SPLICED TO EXISTING ELECTRODE
4. ANY EXISTING WIRING INVOLVED WITH PV SYSTEM CONNECTION THAT IS FOUND TO BE INADEQUATE PER CODE SHALL BE CORRECTED PRIOR TO FINAL INSPECTION.
5. JUNCTION BOX QUANTITY AND PLACEMENT FOR REPRESENTATION OF WIRE TRANSITIONS ONLY, AND FIELD CONDITIONS MAY REQUIRE ALTERNATE QUANTITIES AS DETERMINED AT TIME OF INSTALLATION.

VISIBLE, LOCKABLE, LABELED AC DISCONNECT LOCATED WITHIN 10' OF UTILITY METER

EQUIPMENT SCHEDULE:

TYPE:	QTY:	DESCRIPTION:	RATING:
MODULES:	(15)	Heliene 60M-HBLK 300W	300 W
INVERTERS:	(15)	Enphase IQ7-60-2-US	240 W
AC DISCONNECT(S):	(1)	PV AC DISCONNECT, 240V, 2-POLE	60 A

SUMMIT SOLAR

CONTRACTOR INFORMATION:
SUMMIT SOLAR
101 N MAIN ST.UNIT 202
GREENVILLE, SC 29601

SITE INFORMATION:
Todd Young
318 Court Drive, Washington, IL 61571
DC SYSTEM SIZE: 4.5 kW DC
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(15) Heliene 60M-HBLK 300W PV MODULES
(15) Enphase IQ7-60-2-US MICRO INVERTER(S)

DATE: July 9, 2019

PAGE:	SHEET NAME:
PV07	LABELS
DRAWN BY: SolaCAD	VERSION: 0

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

LABEL 1
AT EACH JUNCTION BOX, COMBINER BOX, DISCONNECT AND DEVICE WHERE ENERGIZED UNGROUNDED CONDUCTORS MAY BE EXPOSED DURING SERVICE.
[NEC. 690.35(F)]

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

LABEL 2
AT BUILDING OR STRUCTURE MAIN DISCONNECTING MEANS. MAY BE LOCATED AT AC DISCONNECT, &/OR MSP DEPENDENT ON METHOD OF INTERCONNECTION.
[NEC 690.17(E), NEC 705.22]

PHOTOVOLTAIC AC DISCONNECT
MAX AC OPERATING CURRENT = 15
NOMINAL AC OPERATING VOLTAGE = 240

LABEL 3
AT POINT OF INTERCONNECTION, MARKED AT DISCONNECTING MEANS. MAY BE LOCATED AT AC DISCONNECT &/OR MSP DEPENDENT ON METHOD OF INTERCONNECTION.
[NEC 690.54]

WARNING
DUEL POWER SOURCES.
SECOND SOURCE IS PV SYSTEM

LABEL 4
AT POINT OF INTERCONNECTION WITH MAIN SERVICE PANEL.
[NEC 705.12(D)(3)]

PHOTOVOLTAIC AC DISCONNECT

LABEL 5
AT EACH AC DISCONNECTING MEANS. MAY BE LOCATED AT AC DISCONNECT, &/OR MSP DEPENDENT ON METHOD OF INTERCONNECTION.
[NEC 690.13(B)]

WARNING: PHOTOVOLTAIC POWER SOURCE

LABEL 6
AT EXPOSED RACEWAYS, CABLE TRAYS, AND OTHER WIRING METHODS; SPACED AT MAXIMUM 10FT SECTION OR WHERE SEPARATED BY ENCLOSURES, WALLS, PARTITIONS, CEILINGS, OR FLOORS.
[NEC 690.31(G)(3)]

INTERACTIVE PHOTOVOLTAIC SYSTEM CONNECTED
PHOTOVOLTAIC SYSTEM DISCONNECT LOCATED AT SIDE OF HOUSE

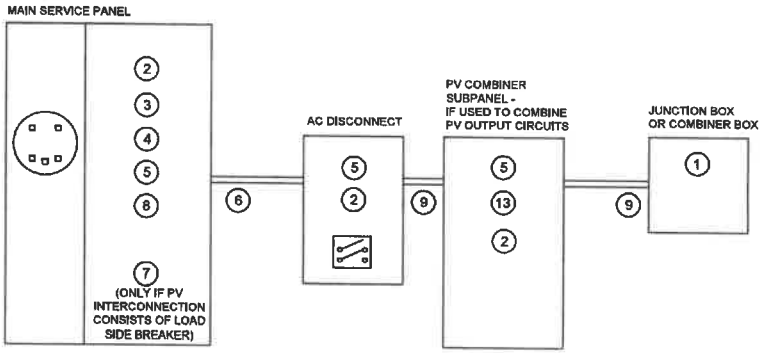
DIRECTORY PLAQUE
PERMANENT PLAQUE OR DIRECTORY PROVIDING THE LOCATION OF THE SERVICE DISCONNECTING MEANS AND THE PHOTOVOLTAIC SYSTEM DISCONNECTING MEANS IF NOT IN THE SAME LOCATION
[NEC 690.56(B)]

WARNING
PV INVERTER OUTPUT CONNECTION
DO NOT RELOCATE THIS OVERCURRENT DEVICE

LABEL 7
PLACED ADJACENT TO THE BACK-FED BREAKER FROM THE INVERTER IF TIE IN CONSISTS OF LOAD SIDE CONNECTION TO BUSBAR.
[NEC 705.12(D)(2)(3)(b)]

PHOTOVOLTAIC SYSTEM EQUIPPED WITH RAPID SHUTDOWN

LABEL 11
SIGN LOCATED AT UTILITY SERVICE EQUIPMENT
[NEC 690.56(C)]



LABELING NOTES:

LABELING DIAGRAM AND SPECIFIC LABELS ARE GUIDELINES ONLY. FIELD CONDITIONS AND INDIVIDUAL INSTALLS MAY VARY

LABELS TO BE INSTALLED IN COMPLIANCE WITH LOCAL NEC ADOPTION, AND APPLICABLE LOCAL GOVERNING CODES

1. LABELING REQUIREMENTS BASED ON THE 2011 NATIONAL ELECTRIC CODE, OSHA STANDARD 19010.145, ANSI Z535.
2. MATERIAL BASED ON THE REQUIREMENTS OF THE AUTHORITY HAVING JURISDICTION.
3. LABELS TO BE OF SUFFICIENT DURABILITY TO WITHSTAND THE ENVIRONMENT INVOLVED [NEC 110.21]
4. LABELS TO BE A MINIMUM LETTER HEIGHT OF 3/8", WHITE ON RED BACKGROUND; REFLECTIVE, AND PERMANENTLY AFFIXED [IFC 605.11.1.1]

SUMMIT SOLAR

CONTRACTOR INFORMATION:

SUMMIT SOLAR
101 N MAIN ST,UNIT 202
GREENVILLE, SC 29601

SITE INFORMATION:
Todd Young
318 Court Drive, Washington, IL 61571
DC SYSTEM SIZE: 4.5 kW DC
AC SYSTEM SIZE: 3.6 kW AC

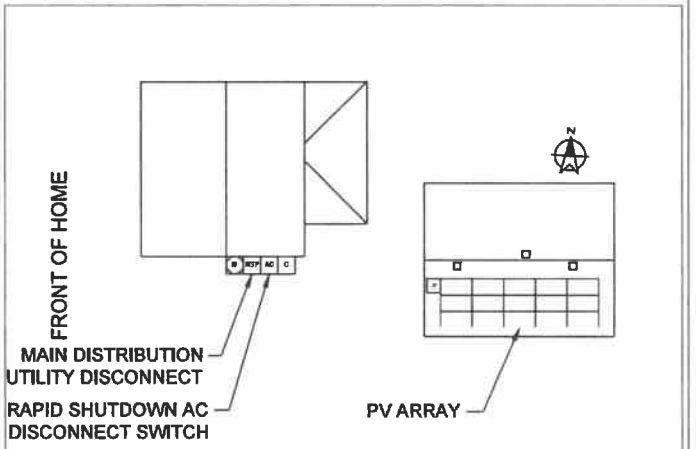
(15) Heliene 60M-HBLK 300W PV MODULES
(15) Enphase IQ7-60-2-US MICRO INVERTER(S)

DATE: July 9, 2019

PAGE:	SHEET NAME:
PV08	PLACARD
DRAWN BY: SaleCAD	VERSION: 0

CAUTION

POWER TO THIS BUILDING IS ALSO SUPPLIED FROM ROOF MOUNTED SOLAR ARRAYS WITH SAFETY DISCONNECTS AS SHOWN:



318 Court Drive, IL Washington 61571

DIRECTORY

PERMANENT PLAQUE OR DIRECTORY PROVIDING THE LOCATION OF THE SERVICE DISCONNECTING MEANS AND THE PHOTOVOLTAIC SYSTEM.

(ALL PLAQUES AND SIGNAGE WILL BE INSTALLED AS OUTLINED WITHIN: NEC 690.56(B)&(C), [NEC 705.10])

SUMMIT SOLAR

CONTRACTOR INFORMATION:
SUMMIT SOLAR
101 N MAIN ST.UNIT 202
GREENVILLE, SC 29601

SITE PHOTOS:

SITE INFORMATION:
Todd Young
318 Court Drive, Washington, IL 61571
DC SYSTEM SIZE: 4.5 kW DC
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(15) Heliene 60M-HBLK 300W PV MODULES
(15) Enphase IQ7-60-2-US MICRO INVERTER(S)

DATE: July 9, 2019

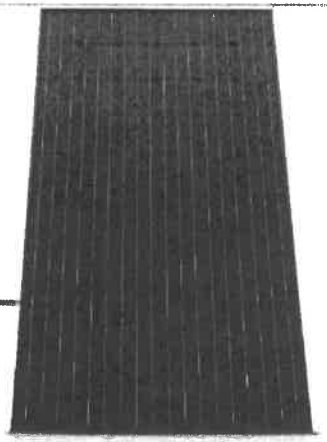
PAGE: PV09
SHEET NAME: SITE PHOTOS
DRAWN BY: SolarCAD
VERSION: 0

MONO

HELIENE

60M-HBLK

60 CELL MONOCRYSTALLINE MODULE



305 Wp
MAX POWER OUPUT

18.6%
MAX EFFICIENCY

10 YEAR
PRODUCT WARRANTY

25 YEAR
LINEAR PERFORMANCE GUARANTEE

- H-BLACK INTEGRATION - BLACK FRAME & BACKSHEET
- PERFECT FOR HIGH VISIBILITY INSTALLATIONS
- MANUFACTURED ACCORDING TO INTERNATIONAL QUALITY SYSTEM STANDARDS: ISO9001
- GUARANTEED POSITIVE POWER SORTING: [-0 : +4.99 WP]

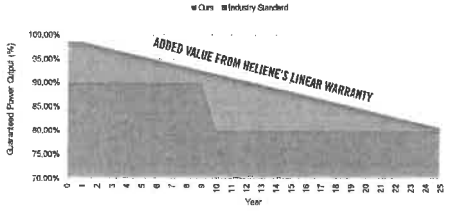
HELIENE INC. IS A PREMIER SOLAR MODULE MANUFACTURER, SERVICING THE GROWING SOLAR ENERGY MARKETS OF NORTH AMERICA.

COMBINING PROVEN EUROPEAN TECHNOLOGY WITH NORTH AMERICAN INGENUITY ALLOWS HELIENE TO MAKE A REAL COMMITMENT IN PROVIDING SMARTER ENERGY CHOICES FOR THE FUTURE.

HELIENE
www.heliene.com

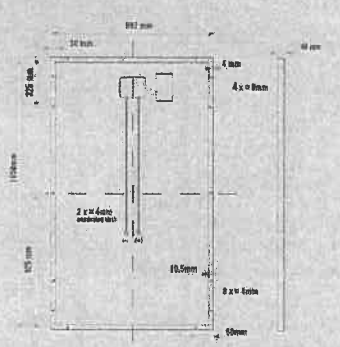
LINEAR PERFORMANCE GUARANTEE

10 YEAR WORKMANSHIP WARRANTY • 25 YEAR LINEAR PERFORMANCE GUARANTEE

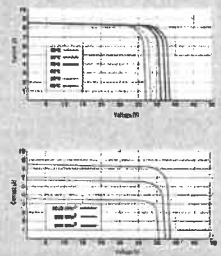


60M

DIMENSIONS FOR HELIENE 60M SERIES MODULES



I-V CURVE FOR HELIENE 60M SERIES



CERTIFICATIONS

ELECTRICAL DATA (STC)

Peak Rated Power	P_{max} (W)	305	300	295	290	285
Maximum Power Voltage	V_{mp} (V)	33.44	33.40	32.84	32.54	32.24
Maximum Power Current	I_{mp} (A)	9.20	9.13	8.66	8.99	8.92
Open Circuit Voltage	V_{oc} (V)	39.98	39.83	39.66	39.53	39.38
Short Circuit Current	Isc (A)	9.87	9.59	9.51	9.42	9.34
Module Efficiency *	Eff (%)	18.6	18.3	18.0	17.7	17.4
Maximum Series Fuse Rating	MF (A)	20	15	15	15	15
Power Output Tolerance		[-0 , +4.99] Wp				

STC - Standard Test Conditions: Irradiation 1000 W/m2 - Air mass AM 1.5 - Cell temperature 25 °C
* Calculated using maximum power based on full positive output tolerance [-0 , +4.99] Wp

MECHANICAL DATA

Dimensions (L x W x D)	1650 x 992 x 40 mm (65 x 39 x 1.6 inch)
Weight*	19.9 kg (43.9 lbs)
Output Cables	1.0 m (39.4 inch) symmetrical cables with MC4 type connectors
Junction Box	IP-67 rated with bypass diodes
Frame	Double webbed 15 micron anodized aluminium alloy
Front Glass	Low-iron content, high-transmission PV solar glass
Solar Cells	60 Monocrystalline cells (156 x 156 mm)

* Calculated using 3.2mm PV glass, if 4mm profile is requested weight load will vary

CERTIFICATIONS

UL Certification	ULC/ORD-C1703-1, UL1703
IEC Certification	Optional

All Heliene modules are certified under the California Energy Commision (CEC) Listing Report

TEMPERATURE RATINGS

Nominal Operating Cell Temperature (NOCT)	+45°C (±2°C)
Temperature Coefficient of P_{max}	-0.39%/°C
Temperature Coefficient of V_{oc}	-0.31%/°C
Temperature Coefficient of I_{sc}	0.045%/°C

PACKAGING CONFIGURATION

Modules per box:	26 pieces
Modules per 53' trailer:	936 pieces

MAXIMUM RATINGS

Operational Temperature	-40°C - +85°C
Max System Voltage	1000V (*1500V) *Optional

WARRANTY

10 Year Manufacturer's Workmanship Warranty

25 Year Linear Power Guarantee

(Refer to product warranty page for details)

HELIENE

CAUTION: READ SAFETY AND INSTALLATION INSTRUCTIONS BEFORE USING THE PRODUCT.
Specifications included in this datasheet are subject to change without notice.

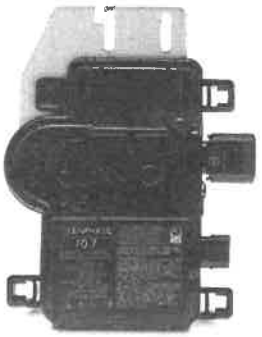
Data Sheet
Enphase Microinverters
Region: AMERICAS

Enphase IQ 7 and IQ 7+ Microinverters

The high-powered smart grid-ready **Enphase IQ 7 Micro™** and **Enphase IQ 7+ Micro™** dramatically simplify the installation process while achieving the highest system efficiency.

Part of the Enphase IQ System, the IQ 7 and IQ 7+ Microinverters integrate with the Enphase IQ Envoy™, Enphase IQ Battery™, and the Enphase Enlighten™ monitoring and analysis software.

IQ Series Microinverters extend the reliability standards set forth by previous generations and undergo over a million hours of power-on testing, enabling Enphase to provide an industry-leading warranty of up to 25 years.



Easy to Install

- Lightweight and simple
- Faster installation with improved, lighter two-wire cabling
- Built-in rapid shutdown compliant (NEC 2014 & 2017)

Productive and Reliable

- Optimized for high powered 60-cell and 72-cell* modules
- More than a million hours of testing
- Class II double-insulated enclosure
- UL listed

Smart Grid Ready

- Complies with advanced grid support, voltage and frequency ride-through requirements
- Remotely updates to respond to changing grid requirements
- Configurable for varying grid profiles
- Meets CA Rule 21 (UL 1741-SA)

* The IQ 7+ Micro is required to support 72-cell modules.

To learn more about Enphase offerings, visit **enphase.com**

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Enphase IQ 7 and IQ 7+ Microinverters

INPUT DATA (DC)	IQ7-60-2-US / IQ7-60-B-US		IQ7PLUS-72-2-US / IQ7PLUS-72-B-US	
Commonly used module pairings[1]	235 W - 350 W +		235 W - 440 W +	
Module compatibility	60-cell PV modules only		60-cell and 72-cell PV modules	
Maximum input DC voltage	48 V		60 V	
Peak power tracking voltage	27 V - 37 V		27 V - 45 V	
Operating range	16 V - 48 V		16 V - 60 V	
Min/Max start voltage	22 V / 48 V		22 V / 60 V	
Max DC short circuit current (module Isc)	15 A		15 A	
Overvoltage class DC port	II		II	
DC port backfeed current	0 A		0 A	
PV array configuration	1 x 1 ungrounded array; No additional DC side protection required; AC side protection requires max 20A per branch circuit			
OUTPUT DATA (AC)	**IQ 7 Microinverter**		**IQ 7+ Microinverter**	
Peak output power	250 VA		295 VA	
Maximum continuous output power	240 VA		290 VA	
Nominal (L-L) voltage/range[2]	240 V / 211-264 V	208 V / 183-229 V	240 V / 211-264 V	208 V / 183-229 V
Maximum continuous output current	1.0 A (240 V)	1.15 A (208 V)	1.21 A (240 V)	1.39 A (208 V)
Nominal frequency	60 Hz		60 Hz	
Extended frequency range	47 - 68 Hz		47 - 68 Hz	
AC short circuit fault current over 3 cycles	5.8 Arms		5.8 Arms	
Maximum units per 20 A (L-L) branch circuit[3]	16 (240 VAC)	13 (208 VAC)	13 (240 VAC)	11 (208 VAC)
Overvoltage class AC port	III		III	
AC port backfeed current	0 A		0 A	
Power factor setting	1.0		1.0	
Power factor (adjustable)	0.7 leading ... 0.7 lagging		0.7 leading ... 0.7 lagging	
EFFICIENCY	**@240 V**	**@208 V**	**@240 V**	**@208 V**
Peak CEC efficiency	97.6 %	97.6 %	97.5 %	97.3 %
CEC weighted efficiency	97.0 %	97.0 %	97.0 %	97.0 %
MECHANICAL DATA				
Ambient temperature range	-40°C to +65°C			
Relative humidity range	4% to 100% (condensing)			
Connector type (IQ7-60-2-US & IQ7PLUS-72-2-US)	MC4 (or Amphenol H4 UTX with additional Q-DCC-5 adapter)			
Connector type (IQ7-60-B-US & IQ7PLUS-72-B-US)	Friends PV2 (MC4 intermateable). Adaptors for modules with MC4 or UTX connectors: - PV2 to MC4: order ECA-S20-S22 - PV2 to UTX: order ECA-S20-S25			
Dimensions (WxHxD)	212 mm x 175 mm x 30.2 mm (without bracket)			
Weight	1.08 kg (2.38 lbs)			
Cooling	Natural convection - No fans			
Approved for wet locations	Yes			
Pollution degree	PD3			
Enclosure	Class II double-insulated, corrosion resistant polymeric enclosure			
Environmental category / UV exposure rating	NEMA Type 6 / outdoor			
FEATURES				
Communication	Power Line Communication (PLC)			
Monitoring	Enlighten Manager and MyEnlighten monitoring options. Both options require installation of an Enphase IQ Envoy.			
Disconnecting means	The AC and DC connectors have been evaluated and approved by UL for use as the load-break disconnect required by NEC 690.			
Compliance	CA Rule 21 (UL 1741-SA) UL 62109-1, UL1741/IEEE1547, FCC Part 15 Class B, ICES-0003 Class B, CAN/CSA-C22.2 NO. 107.1-01 This product is UL Listed as PV Rapid Shut Down Equipment and conforms with NEC-2014 and NEC-2017 section 690.12 and C22.1-2015 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according manufacturer's instructions.			

1. No enforced DC/AC ratio. See the compatibility calculator at https://enphase.com/en-us/support/module-compatibility.
2. Nominal voltage range can be extended beyond nominal if required by the utility.
3. Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.

To learn more about Enphase offerings, visit **enphase.com**

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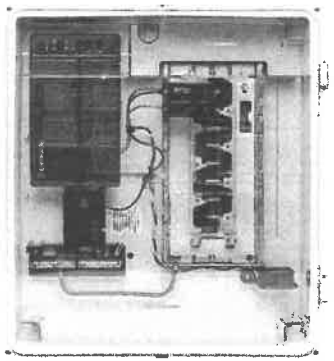
2018-05-24

Data Sheet
Enphase Networking

Enphase IQ Combiner+

(X-IQ-AM1-240-2)

The Enphase IQ Combiner+™ with Enphase IQ Envoy™ consolidates interconnection equipment into a single enclosure and streamlines PV and storage installations by providing a consistent, pre-wired solution for residential applications. It offers up to four 2-pole input circuits and Eaton BR series busbar assembly.



Smart

- Includes IQ Envoy for communication and control
- Flexible networking supports Wi-Fi, Ethernet, or cellular
- Provides production metering and optional consumption monitoring
- Supports installation of the Enphase Q Aggregator™

Simple

- Eaton BR series panelboard interior
- Up to four 2-pole branch circuits for 240 VAC plug-in breakers (not included)
- 80 A total PV or storage branch circuits

Reliable

- Durable NRTL-certified NEMA type 3R enclosure
- Five-year warranty
- UL listed

LISTED

To learn more about Enphase offerings, visit **enphase.com**

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Enphase IQ Combiner+

MODEL NUMBER	
IQ Combiner+ X-IQ-AM1-240-2	IQ Combiner+ with Enphase IQ Envoy™ for integrated revenue grade PV production metering (ANSI C12.20 +/- 0.5%) and optional* consumption monitoring (+/- 2.5%).
ACCESSORIES (order separately)	
Enphase Mobile Connect™ CELLMODEM-03 (4G / 12-year data plan) CELLMODEM-01 (3G / 5-year data plan) CELLMODEM-M1 (4G LTE CAT-M1 / 5-year data plan)	Plug and play industrial grade cellular modem with data plan for systems up to 60 microinverters. (Available in the US, Canada, Mexico, Puerto Rico, and the US Virgin Islands, where there is adequate cellular service in the installation area.)
Consumption Monitoring CT CT-200-SPLIT	Split core current transformers enable whole home consumption metering* (+/- 2.5%).
Circuit Breakers BRK-15A-2-240 BRK-20A-2-240	 Breaker, 2 pole, 15A, Eaton BR215 Breaker, 2 pole, 20A, Eaton BR220
ELECTRICAL SPECIFICATIONS	
Rating	Continuous duty
System voltage	240 VAC, 60 HZ
Eaton BR series busbar rating	125 A
Max. continuous current rating (output to grid)	65 A
Max. fuse/circuit rating (output)	90 A
Branch circuits (solar and/or storage)	Up to four 2-pole Eaton BR series Distributed Generation (DG) breakers only (not included)
Max. continuous current rating (input from PV)	64 A
Max. total branch circuit breaker rating (input)	80 A (any combination)
Production Metering CT	200 A solid core pre-installed and wired to IQ Envoy
MECHANICAL DATA	
Dimensions (WxHxD)	49.3 x 46.5 x 16.0 cm (19.4" x 18.3" x 6.3")
Weight	7.5 kg (16.5 lbs)
Ambient temperature range	-40° C to +46° C (-40° to 115° F)
Cooling	Natural convection, plus heat shield
Enclosure environmental rating	Outdoor, NRTL-certified, NEMA type 3R, polycarbonate construction
Wire sizes	• 20 A to 50 A breaker inputs: 14 to 4 AWG copper conductors • 60 A breaker branch input: 3 to 1/0 AWG copper conductors • Main lug combined output: 10 to 2/0 AWG copper conductors • Neutral and ground: 14 to 1/0 copper conductors Always follow local code requirements for conductor sizing.
Altitude	To 2000 meters (6,560 feet)
INTERNET CONNECTION OPTIONS	
Integrated Wi-Fi	802.11b/g/n
Ethernet	802.3, Cat5E (or Cat 6) UTP Ethernet cable - not included
Cellular	Optional, CELLMODEM-01 (3G) or CELLMODEM-03 (4G) (not included)
COMPLIANCE	
Compliance, Combiner	UL 1741 CAN/CSA C22.2 No. 107.1 47 CFR, Part 15, Class B, ICES 003 Production metering: ANSI C12.20 accuracy class 0.5 (PV production)
Compliance, IQ Envoy	UL 916 CAN/CSA C22.2 No. 61010-1

* Consumption monitoring is required for Enphase Storage Systems.

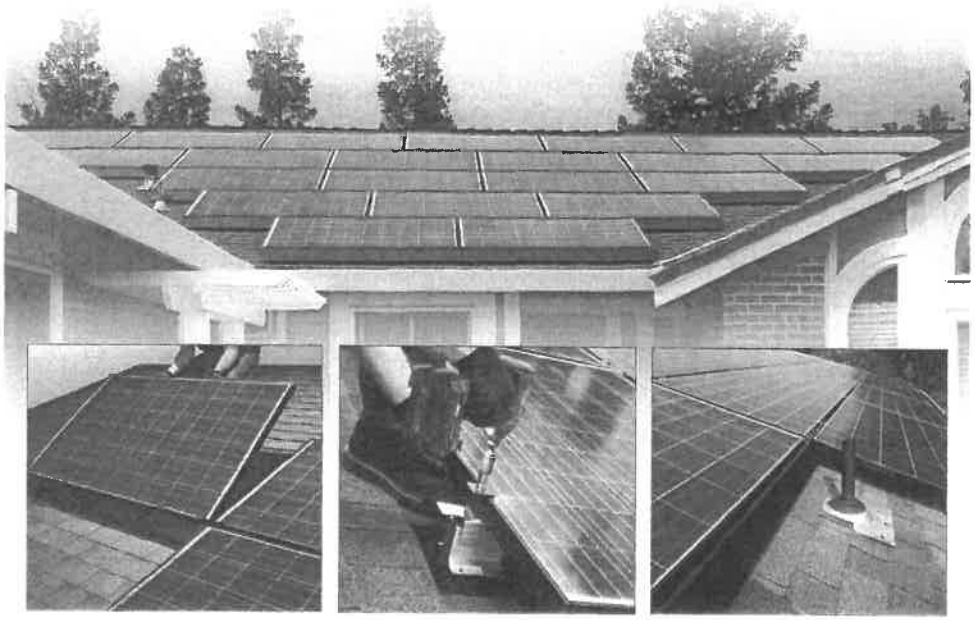
To learn more about Enphase offerings, visit **enphase.com**

2018-05-02

ENPHASE.

EcoX

The new EcoX is an innovative, rail-less racking system, proven to organize the installation process. The flexible design offers a clean aesthetic, simplified logistics, and delivers a higher quality installation at a lower cost per watt.



Fast.

Modules drop in from above and there is never a need to reach over or walk on modules. Pre-assembled components and quick connections make EcoX easy to install.

Simple.

Universal components mount to standard framed modules. With a single socket size and a wide range of adjustment, it is quick and easy to install any array with a clean, finished look.

Supported.

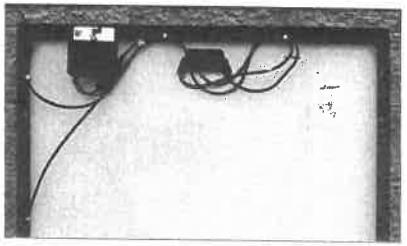
The Ecolibrium field support team offers on-site installation training and ongoing technical support. And from project planning to logistics to installation, we are dedicated to customer service.

sales@ecolibriumsolar.com | US: 740-249-1877 | www.ecolibriumsolar.com

Ecolibrium Solar

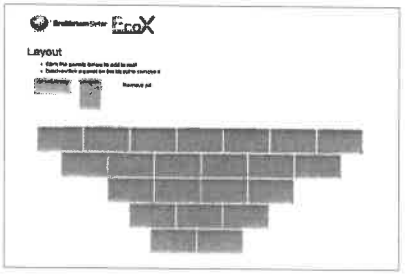
Aesthetic Design

A wide range of adjustment makes it easy to install a straight, level system. Components are designed to blend into the array, and the aesthetic skirt creates a finished look. Alternatively, a skirt free option is available to provide a more traditional look.



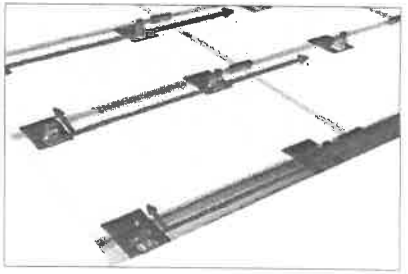
Cable Management

Whether installing with Microinverters, Power Optimizers, or String Inverters, EcoX provides wire management provisions to both prep the modules, and to route homerun or trunk cables throughout the array.



Flexible System Design

The EcoX Estimator is a powerful racking system design tool. The user inputs all site conditions and can layout multiple roof surfaces. The EcoX Estimator outputs a site specific design package with engineering specs and bill of materials.



Single Point Grounding

EcoX and approved modules create a continuously bonded system. The installer can connect a finished array to ground with a single bonding lug.

Technical Specifications	
Materials	Racking components: Aluminum, stainless hardware, dark bronze anodized upper surface, mill finish lower surfaces Flashings: Aluminum, black powder coated finish
Grounding/Bonding Validation	UL2703 - *see installation manual for specific module approvals*
Fire Resistance Validation	UL2703 - Class A, Type 1 and Type 2 modules
Mechanical Load Validation	UL2703 - *see installation manual for specific module approvals*
Flashing Validation	ICC-ES AC286/UL441 Rain Test for Roof Flashing
Adjustability	1" vertical range, 3.5" North/South range, connect anywhere in East/West direction
Warranty	15 years

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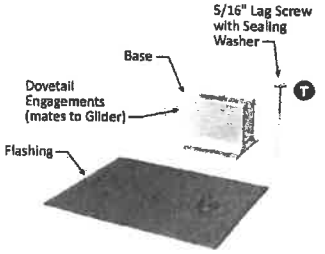
Ecolibrium Solar

Attachment Kit



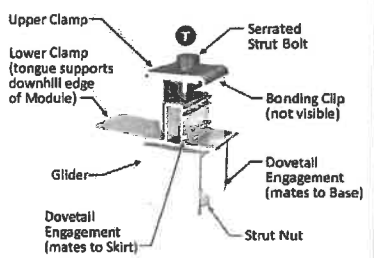
The Attachment Kit is secured to the roof and supports the array via the Clamp Assembly.

Its features include:

- Grooves along sides of Base are Dovetail Engagements which provide adjustability of the Clamp Assembly in *height* and *uphill-downhill* directions.
- Base is attached via a single Lag Screw.
- Lag Screw includes a factory pre-installed Sealing Washer.

T Torque Spec: 14 ft-lbs

Clamp Assembly

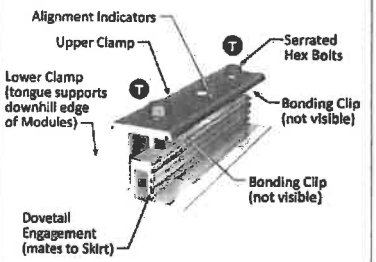


T Torque Spec: 14 ft-lbs

The Clamp Assembly is mounted to the Base of the Attachment Kit.

- Dovetail Engagement to Base for height and uphill/downhill adjustments.
- Upper and Lower Clamp secures edges of Modules
- Upper and Lower Clamp engage Skirt on Skirt row.
- Strut Bolt and Strut Nut secure Clamp Assembly to Base and Modules to Clamp Assembly.
- Factory installed Bond Clip bonds Skirt to Attachment Kit on south row, and Module to Attachment Kit on subsequent rows.

Coupling Assembly

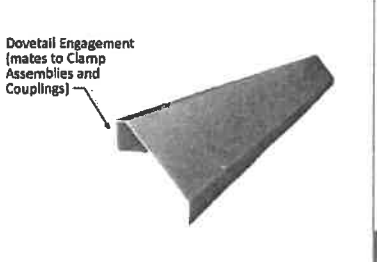


Couplings connect up to four Modules together.

- Couplings include indicator marks to set a 1/2" gap between Modules.
- On the first downhill row, Couplings secure adjacent Skirts at their joints.
- Factory installed Bond Clips (two per Coupling) bond Modules left and right.

T Torque Spec: 14 ft-lbs

Skirts (optional item)



Skirts are used on the first downhill row to enhance the appearance along the edge of the array.

- Dovetail Engagement positions height of and locks Skirt to Clamp Assemblies and Couplings.
- Factory cut to length to match specific Modules.
- Available in three configurations (height variances) to fit the most common Module sizes.

Power Accessory Bracket

Power Accessory Bracket mounts a micro-inverter or power optimizer to the Module.

- The serrated teeth ensure a secure connection to the module.
- The Power Accessory Bracket bonds the micro inverter or power optimizer to the Module.

T Torque Spec: 14 ft-lbs

Row to Row Bonding Clip

The Row to Row Bonding Clip bonds each row of modules to the next.

- Bonding Clip is added to the uphill side of one clamp per row.
- For systems using the skirt, Bonding Clip bonds skirt to first row of Modules.

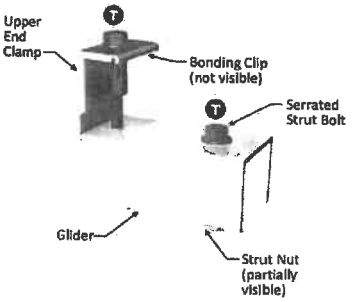
Junction Box Bracket

The Junction Box Bracket mounts to the Base, and acts as a support for a Junction Box.

- Can be installed to any base.
- Can be installed before or after modules are installed.

T Torque Spec: 10 ft-lbs

End Clamp

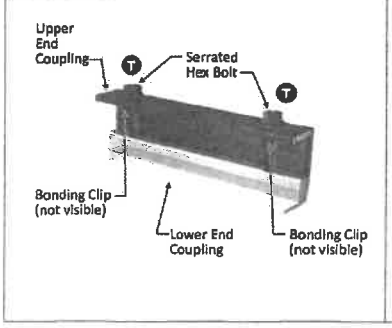


The End Clamp is mounted to the base on the downhill row, and may be used in place of the Skirt for a Skirt-Free installation.

- Dovetail Engagement to base for height and uphill/downhill adjustment.
- Upper End Clamp secures module.
- Integrated bonding clip bonds module to clamp and Attachment Kit.

T Torque Spec: 14 ft-lbs

End Coupling

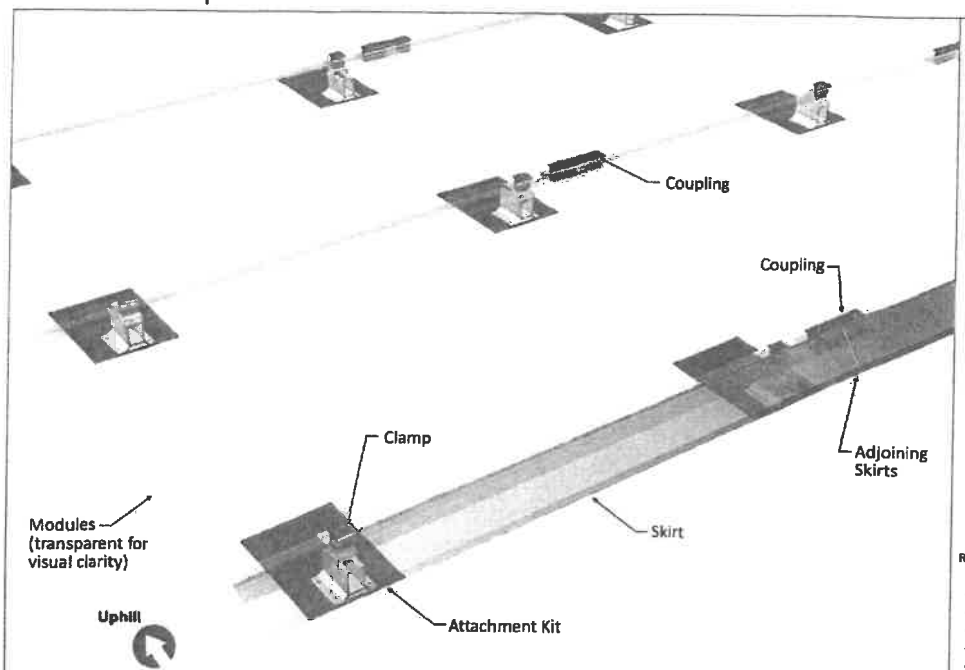


End Coupling connects two modules left to right.

- End Couplings include indicator marks to set a ½" gap between Modules.
- Factory installed Bonding Clips (two per End Coupling) bond modules left to right.

T Torque Spec: 14 ft-lbs

Overview of Components



Note: Rooftop and shingles not shown for clarity

The EcoX installation begins at the downhill edge of the roof and progresses uphill. Installation is sequential and requires minimal hand tools.

Installation steps:

1. Layout Array on rooftop.
2. Install Attachment Kits to rooftop.
3. Install the Junction Box Bracket.
4. Install Clamp Assemblies on downhill row.
5. Install the Skirts.
6. Install Couplings to Skirts.
7. Install Modules
8. Install Clamps and Couplings on uphill side of Modules.
9. Level the row of Modules.
10. Repeat Module install on subsequent rows.
11. Install additional Bonding Clips at one end of each row to complete row to row bonding.

Required Tools:

- Tape Measure
- Chalk Line
- Hammer
- Drill with 3/16" Bit
- Flat Roofing Bar
- Impact Driver
- 1/2" Socket
- String Line
- Torque Wrench
- Chalk