

ANN ARBOR HISTORIC DISTRICT COMMISSION

Staff Report

ADDRESS: 208 Murray Avenue, Application Number HDC19-203

DISTRICT: Old West Side Historic District

REPORT DATE: November 14, 2019

REPORT PREPARED BY: Jill Thacher, Historic Preservation Coordinator

REVIEW COMMITTEE DATE: Tuesday, November 12, 2019

OWNER

Name: Joan Hellmann
Address: 208 Murray Avenue
 Ann Arbor MI 48103
Phone: (734) 274-0773

APPLICANT

Homeland Builders/Solar
 4975 Miller
 Ann Arbor, MI 48103
 (313) 600-1066

BACKGROUND: This 1 ¾ story gable-fronter features a nearly full-width front porch with turned posts, wood lap siding, a gabled wall dormer on the north elevation, and a textured block foundation. It first appears in Polk directories in 1914 as the home of barber Leon Hathaway.

LOCATION: The property is located on the west side of Murray Avenue, south of West Washington and north of West Liberty Streets.

APPLICATION: The applicant seeks HDC approval to install a solar array centered on the south-facing roof of the house.

APPLICABLE REGULATIONS:

From the Secretary of the Interior's Standards for Rehabilitation:

- (2) The historic character of a property shall be retained and preserved. The removal of historic materials or alteration of features and spaces that characterize a property shall be avoided.
- (9) New additions, exterior alterations, or related new construction shall not destroy historic materials that characterize the property. The new work shall be differentiated from the old and shall be compatible with the massing, size, scale, and architectural features to protect the historic integrity of the property and its environment.



- (10) New additions and adjacent or related new construction shall be undertaken in such a manner that if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired.

From the Secretary of the Interior's Guidelines for Rehabilitating Historic Buildings:

Roofs

Recommended: Identifying, retaining, and preserving roofs--and their functional and decorative features—that are important in defining the overall historic character of the building.

Not Recommended: Changing the configuration of a roof by adding new features such as dormer windows, vents, or skylights so that the historic character is diminished.

Energy Efficiency

Recommended: Placing a new addition that may be necessary to increase energy efficiency on non-character-defining elevations.

Not Recommended: Designing a new addition which obscures, damages, or destroys character-defining features.

Mechanical Equipment

Recommended: Providing adequate structural support for new mechanical equipment.

Not Recommended: Failing to consider the weight and design of new mechanical equipment so that, as a result, historic structural members or finished surfaces are weakened or cracked.

Installing a new mechanical system so that character-defining structural or interior features are radically changed, damaged, or destroyed.

From the Ann Arbor Historic District Design Guidelines (other Guidelines may apply):

Solar

Appropriate: Mounting solar panels at grade or on ground pole mountings. In the absence of an appropriate ground-based mounting location, panels should be mounted on side or rear facing roof surfaces.

Installing mechanical and service equipment on the roof related to the solar units and their related devices so that they are inconspicuous from the public right-of-way and do not damage or obscure character-defining features.

For sloped roof installations, mounting solar panels parallel to and within 8" of roof surface.

Not Appropriate: Mounting solar panels and their related devices on primary elevations or roofs that face the primary elevation or in planes that are highly visible from the street view.

This location has the highest impact on the historic character of the historic building and all other options should be thoroughly explored.

Any other alteration or installation procedure that will cause irreversible changes to historic features or materials.

STAFF FINDINGS:

1. The application proposes to install an array of 8 solar panels on the south, side-facing roof. The total panel area is 13'3" wide by 11' tall. The panels would be centered on the roof, a foot below the chimney, three feet below the roof ridge, and a foot from the eave. The modules are black with black framing. The panels cover a little less than half of the roof surface, but since they are in the middle of the roof staff believes the panels will not be a visual distraction from the historic structure. The roof material is asphalt, and the work is reversible.
2. Staff believes that the materials and design of the solar panels are compatible with the existing structure, neighboring buildings, and the surrounding historic district, and meet both the Secretary of the Interior's Standards and the *Ann Arbor Historic District Design Guidelines*.

POSSIBLE MOTIONS: (Note that the motion is only a suggestion. The Review Committee, consisting of staff and at least two Commissioners, will meet with the applicant on site and then make a recommendation at the meeting.)

I move that the Commission issue a certificate of appropriateness for the application at 208 Murray Avenue, a contributing property in the Old West Side Historic District, to install a black-on-black solar array centered on the south-facing roof, as proposed. The work is compatible in exterior design, arrangement, texture, material and relationship to the rest of the building and the surrounding area and meets *The Secretary of the Interior's Standards for Rehabilitation* and *Guidelines for Rehabilitating Historic Buildings*, in particular standards 2, 9 and 10 and the guidelines for roofs, energy efficiency, and mechanical systems, as well as the *Ann Arbor Historic District Design Guidelines*, particularly as they pertain to solar installations.

MOTION WORKSHEET:

I move that the Commission issue a Certificate of Appropriateness for the work at 208 Murray Avenue in the Old West Side Historic District

_____ Provided the following condition(S) is (ARE) met: 1) STATE CONDITION(s)

The work is generally compatible with the size, scale, massing, and materials and meets the Secretary of the Interior's Standards for Rehabilitation, standard(S) number(S) (*circle all that apply*): 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

ATTACHMENTS: application, drawings, and technical information.

208 Murray Avenue (2008 Survey Photo)



Builder to pay for fee per H/O



HISTORIC DISTRICT COMMISSION

PLANNING AND DEVELOPMENT SERVICES

City Hall: 301 E. Huron St. Ann Arbor, MI 48104-6120
Mailing: P.O. Box 8647, Ann Arbor, MI 48107-8647
Phone: 734.794.6265 ext. 42608 ithacher@a2gov.org
Fax: 734.994.8460

OFFICE USE ONLY	
Permit Number	HDC# <u>19-203</u>
	BLDG#
DATE STAMP	
CITY OF ANN ARBOR RECEIVED	
OCT 21 2019	
PLANNING & DEVELOPMENT SERVICES	

APPLICATION MUST BE FILLED OUT COMPLETELY

PROPERTY LOCATION/OWNER INFORMATION			
NAME OF PROPERTY OWNER <u>Joan Hellmann</u>		HISTORIC DISTRICT <u>YES</u>	
PROPERTY ADDRESS <u>208 Murray Ave</u>			CITY <u>ANN ARBOR</u>
ZIPCODE <u>48103</u>	DAYTIME PHONE NUMBER <u>(734) 274-0773</u>	EMAIL ADDRESS <u>hellmann@umich.edu</u>	
PROPERTY OWNER'S ADDRESS (IF DIFFERENT FROM ABOVE) <u>(same)</u>			CITY <u>—</u> STATE, ZIP <u>—</u>
PROPERTY OWNER'S SIGNATURE			
SIGN HERE	<u>Joan Hellmann</u>	PRINT NAME	<u>Joan Hellmann</u> DATE <u>10/21/19</u>
APPLICANT INFORMATION			
NAME OF APPLICANT (IF DIFFERENT FROM ABOVE) <u>Homeland Solar (aka, Homeland Bldrs of Michigan) - Dave Friedrichs</u>			
ADDRESS OF APPLICANT <u>4975 Miller</u>			CITY <u>Ann Arbor</u>
STATE <u>MI</u>	ZIPCODE <u>48103</u>	PHONE / CELL # <u>(313) 600-1066</u>	FAX No <u>(734) 663-8523</u>
EMAIL ADDRESS <u>dave@homelandsolar.com</u>			
APPLICANT'S SIGNATURE (if different from Property Owner)			
SIGN HERE	<u>David Friedrichs</u>	PRINT NAME	<u>X David Friedrichs</u> DATE <u>10/18/2019</u>
BUILDING USE - CHECK ALL THAT APPLY			
<input checked="" type="checkbox"/> SINGLE FAMILY	<input type="checkbox"/> DUPLEX	<input type="checkbox"/> RENTAL	<input type="checkbox"/> MULTIPLE FAMILY <input type="checkbox"/> COMMERCIAL <input type="checkbox"/> INSTITUTIONAL
PROPOSED WORK			
Describe in detail each proposed exterior alteration, improvement and/or repair (use additional paper, if necessary). <u>install all black-on-black solar panels on existing roof (see site plan and details in Expedited Bldg Permit file)</u>			
DESCRIBE CONDITIONS THAT JUSTIFY THE PROPOSED CHANGES:			
<u>Homeland has completed about a dozen similar solar installations in the Historic District of Ann Arbor, all satisfactory and in compliance with stipulations.</u>			
For Further Assistance With Required Attachments, please visit www.a2gov.org/hdc			



HISTORIC DISTRICT COMMISSION APPLICATION

FEE CHART

DESCRIPTION	
STAFF REVIEW FEES	FEE
Application for Staff Approval ✓	\$35.00
Work started without approvals	Additional \$50.00
HISTORIC DISTRICT COMMISSION FEES	
All other proposed work not listed below	\$100.00
Work started without approvals	Additional \$250.00
RESIDENTIAL – Single and 2-story Structure	
Addition: single story	\$300.00
Addition: taller than single story	\$550.00
New Structure - Accessory	\$100.00
New Structure – Principal	\$850.00
Replacement of single and 2-family window(s)	\$100 + \$25/window
COMMERCIAL – includes multi-family (3 or more unit) structures	
Additions	\$700.00
Replacement of multi-family and commercial window (s)	\$100 + \$50/window
Replacement of commercial storefront	\$250.00
DEMOLITION and RELOCATION	
Demolition of a contributing structure	\$1000.0
Demolition of a non-contributing structure	\$250.00
Relocation of a contributing structure	\$750.00
Relocation of a non-contributing structure	\$250.00

FOR COMMISSION REVIEWS:

- Application withdrawals made before public notice is published will qualify for a 50% refund of the application fee.
- Application withdrawals made after public notice is sent but before the public hearing will qualify for a 25% refund of the application fee.

INSTRUCTIONS FOR SUBMITTING APPLICATIONS

All HDC applications must be signed by the property owner and the applicant, if different, with the exception of staff approvals, which may be signed by only the applicant.

All completed HDC applications and their attachments may be submitted to Planning and Development Services by mail, in person (paper or digital), faxed, or via email to building@a2gov.org.

We accept CASH, CHECK, and all major credit cards. Checks should be made payable to "City of Ann Arbor"

HDC applications that are incomplete or not submitted with the required documentation or payment will not be processed or approved.

APPLICATION EXPIRATION

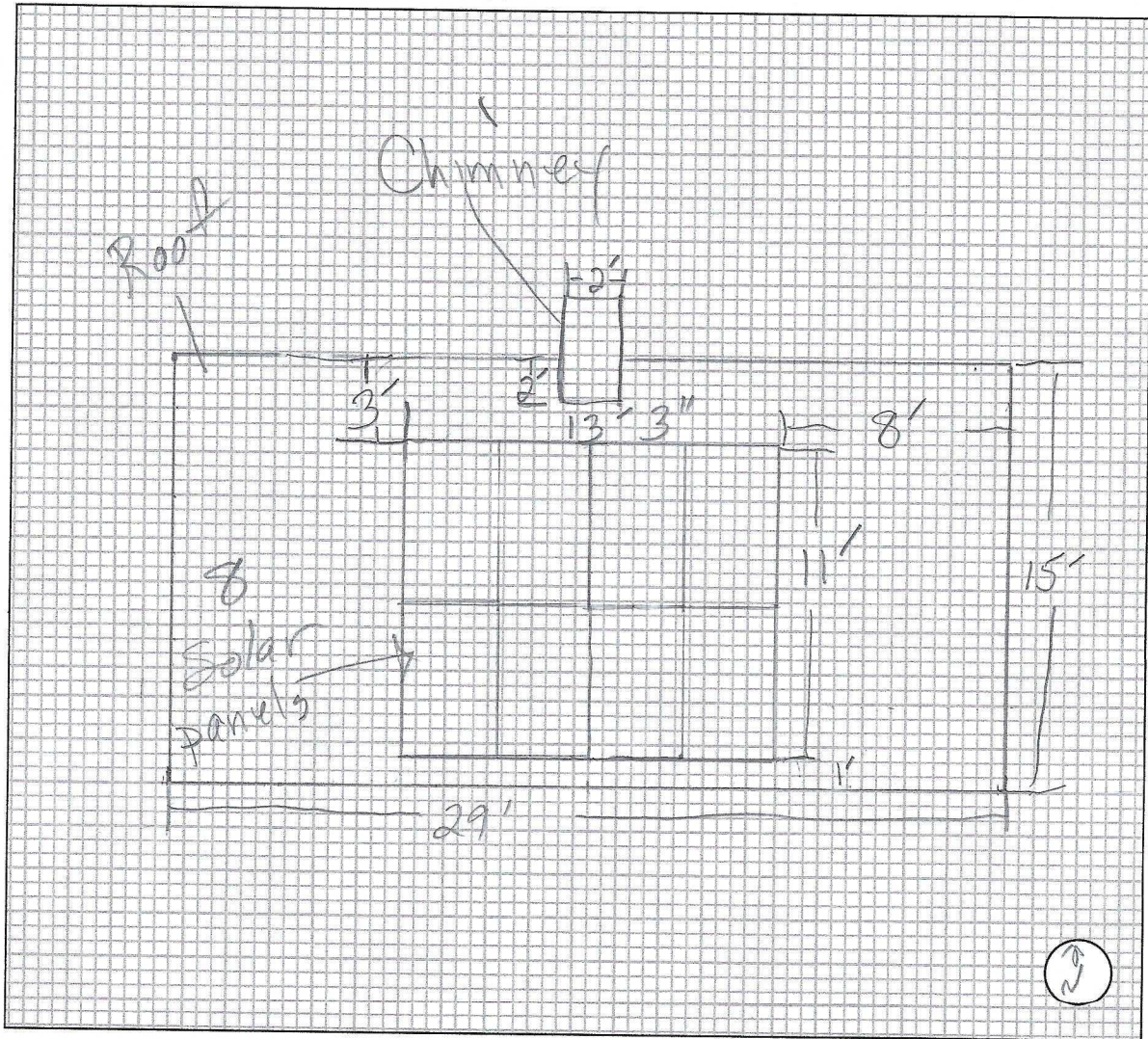
HDC applications expire three (3) years after the date of approval.

OFFICE USE ONLY

Date of Hearing:		
Action	<input type="checkbox"/> HDC COA	<input type="checkbox"/> HDC Denial
	<input type="checkbox"/> HDC NTP	<input type="checkbox"/> Staff COA
Staff Signature		
Comments		
Fee:	\$ _____	
Payment Type	<input type="checkbox"/> Check: # _____ <input type="checkbox"/> Cash <input type="checkbox"/> Credit Card	

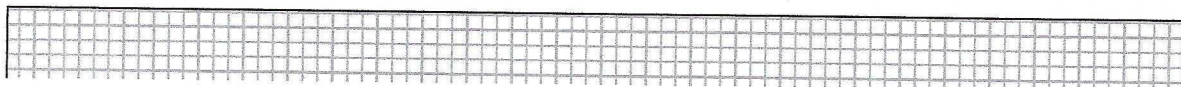
208 Murray
Ann Arbor, MI

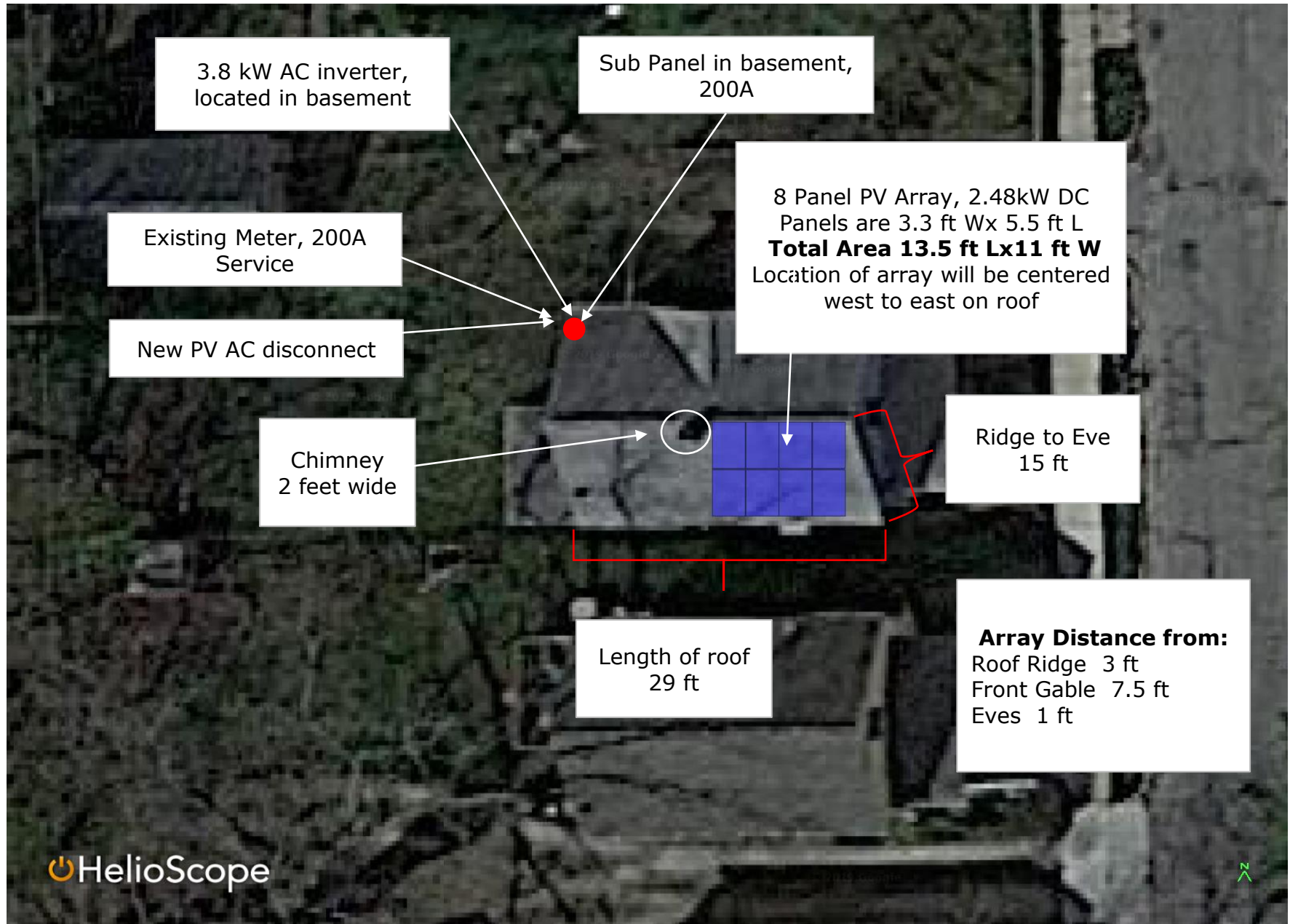
**Ann Arbor Historic District Commission
Residential Solar Panel Worksheet**



- | | |
|---|--------------------------------|
| 1. Drawing scale: 1 square = | <u>6"</u> |
| 2. Roof pitch(es) | <u>12/12</u> |
| 3. Roof color and material | <u>Gray, single</u> |
| 4. Solar panel color | <u>Black</u> |
| 5. Frame color | <u>Black</u> |
| 6. Size of individual panel(s) | <u>65.55 x 39.45 x 1.38 in</u> |
| 7. Overall dimensions of installation | <u>13' 3" x 11'</u> |
| 8. Sketch Lot plan and provide Lot dimensions | |
| 9. Show Building footprint and Roof ridge(s) | |
| 10. Label approximate distances to property lines | |
| 11. Identify north/south | |
| 12. Indicate location of adjacent street(s) | |
| 13. Show significant roof accessories (dormers, chimneys) | |

**Ann Arbor Historic District Commission
Residential Solar Panel Worksheet**





IronRidge Racking Design

Hellmann (#560438)
pitched roof

 **IRONRIDGE**
28357 INDUSTRIAL BLVD., HAYWARD, CA 94545

Project Details			
Name	Hellmann	Date	10/18/2019
Location	Ann Arbor, Ann Arbor, MI, 48103	Total modules	8
Module	Jinko: JKM310M-60L (35mm)	Total watts	2,480
Dimensions	65.55" x 39.45" x 1.38" (1665.0mm x 1002.0mm x 35.0mm)	Attachments	16

System Weight	
Total system weight	387.5 lbs
Weight/attachment	24.2 lbs
Racking weight	52.3 lbs
Distributed weight	2.6 psf

Load Assumptions	
Wind exposure	B
Wind speed	110 mph
Ground snow load	20 psf
Attachment spacing	4.0'

Roof Information			
Roof material	Comp Shingle	Building height	15 ft
Roof attachment	L-Foot Only	Roof slope	18 °
Attachment hardware	Square	Risk category	II

Span Details XR100 - Portrait		
Zone	Max span	Max cantilever
1	6' 6"	2' 7"
2	6' 6"	2' 7"
3	6' 6"	2' 7"

Reaction Forces XR100 - Portrait			
Zone	Down (lbs)	Uplift (lbs)	Lateral (lbs)
1	226	92	66
2	226	192	66
3	226	304	66

Installer
Homeland Solar
4975 Miller
Ann Arbor, MI 48103
License #2102200014

Owner
Joan Hellmann
208 Murray Ave
Ann Arbor, MI 48103

drawn by
L. McFaul
11/6/2019



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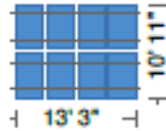
Layout Detail: Panel Layout, Mounting Points

Hellmann (#560438)
pitched roof

IRONRIDGE
28357 INDUSTRIAL BLVD., HAYWARD, CA 94545

Roof Section 1		
Definition	Roof Section Weights	Roof Section (all segments)
8 modules	Total weight: 387.5 lbs	Provided rail: 56' [4 x 14']
Portrait orientation	Weight/attachment: 24.2 lbs	Attachments: 16
Graphical entry	Total Area: 146.9 sq ft	Splices: 0
	Distributed weight: 2.6 psf	Clamps: 20

Diagram



Segments

Columns	Length	Cantilever	Cantilever Violations	Rail	Attachments	Splices	Clamps
4	13' 5"	8"	None	28' [2 x 14']	8	0	10
Row segment totals (x 2) →				56' [4 x 14']	16	0	20

Installer

Homeland Solar
4975 Miller
Ann Arbor, MI 48103
License #2102200014

Owner

Joan Hellmann
208 Murray Ave
Ann Arbor, MI 48103

drawn by
L. McFaul
11/6/2019

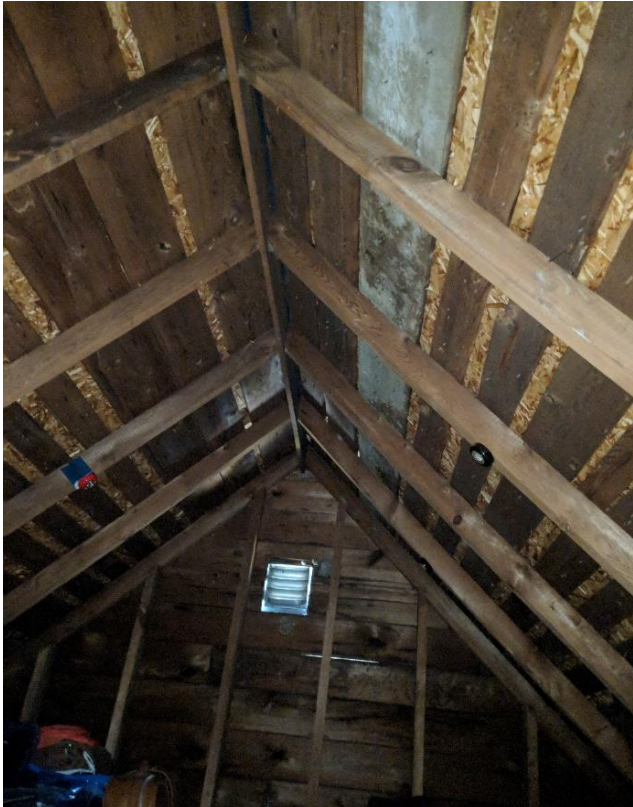
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Mounting Detail

Number of Mounting Points: 16

Roof Tech RT-Mini mounting feet, 4' spacing (typical), max 6'

Roof Framing Details



Roof Framing:
Attic, rafters are 2" x 4"@ 24" OC

Span Details XR100 - Portrait		
Zone	Max span	Max cantilever
1	6' 6"	2' 7"
2	6' 6"	2' 7"
3	6' 6"	2' 7"

Reaction Forces XR100 - Portrait			
Zone	Down (lbs)	Uplift (lbs)	Lateral (lbs)
1	226	92	66
2	226	192	66
3	226	304	66



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AI

drawn by
L. McFaul
11/6/2019



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**EXPEDITED SOLAR PERMIT
APPLICATION –
RESIDENTIAL PROJECTS ONLY**

CONSTRUCTION AND BUILDING

City Hall: 301 E. Huron St. Ann Arbor, MI 48104-6120
 Mailing: P.O. Box 8647, Ann Arbor, MI 48107-8647
 Phone: 734.794.6263 ext. 0 building@a2gov.org
 Fax: 734.994.8460

APPLICATION MUST BE FILLED OUT COMPLETELY

**AUTHORITY: PA. 230 of 1972, AS AMENDED
 PENALTY: PERMIT WILL NOT BE ISSUED**

10/25/19
 HDC 19-203

OFFICE USE ONLY	
Permit Number	BLDG# ELEC# <u>19-3335</u>
DATE STAMP	
CITY OF ANN ARBOR RECEIVED	
OCT 22 2019	

PLANNING & DEVELOPMENT SERVICES

-----TO BE COMPLETED BY CITY STAFF-----

Zoning Review required? <input type="checkbox"/> Yes <input type="checkbox"/> No	Electrical Review required? <input type="checkbox"/> Yes <input type="checkbox"/> No
Staff Initials: _____ Date: _____	Staff Initials: _____ Date: _____
Comments: _____	Comments: _____

-----TO BE COMPLETED BY APPLICANT-----

STEP 1 – Project Information

Project Applicant:	Homeland Builders of Michigan		
Property Owner Name:	Joan Hellmann		
Project Address:	208 Murray Ave		
Zoning District:	R2D2		
Property Setbacks: (Ground mounted PV)	Front:	Sides:	Rear:
PV System Description:	<input checked="" type="radio"/> Roof-mounted <input type="radio"/> Ground-mounted		

STEP 2 – Eligibility Checklist

To Determine If You Are Eligible, Please Answer The Questions Below.	Yes	No
1. PV system is designed and proposed for a detached single-family house.	<input checked="" type="radio"/>	<input type="radio"/>
2. Solar installation has a rated capacity of 12kw or less.	<input checked="" type="radio"/>	<input type="radio"/>
3. Solar installation is not subject to Historic District Commission approval.	<input checked="" type="radio"/>	<input type="radio"/>
4. Mounting system is engineered and designed for PV.	<input checked="" type="radio"/>	<input type="radio"/>
5. Solar installation is compliant with all applicable electrical and building codes.	<input checked="" type="radio"/>	<input type="radio"/>
6. The Solar Installation Contractor complies with all licensing and other requirements of the jurisdiction and the state.	<input checked="" type="radio"/>	<input type="radio"/>
7. The PV system and all components will be installed per the manufacturer's specifications.	<input checked="" type="radio"/>	<input type="radio"/>

HDC 19-203



EXPEDITED SOLAR PERMIT APPLICATION SOLAR PERMIT STRUCTURE WORKSHEET con't

To Determine If You Are Eligible, Please Answer The Questions Below.	Yes	No
8. The project will comply with adopted National Electrical Code requirements.	<input checked="" type="radio"/>	<input type="radio"/>
9. Home will be code compliant to setbacks and height after PV installation.	<input checked="" type="radio"/>	<input type="radio"/>
10. The roof has no more than a single layer of roof covering (in addition to the solar equipment). If no, please complete Solar Permit Structure Worksheet.	<input checked="" type="radio"/>	<input type="radio"/>
11. To address uplift, panels are mounted parallel to the roof surface with no more than an 18" gap between the module frame and roof surface. (Except for flat roofs, no portion of the system may exceed the highest point of the roof).	<input checked="" type="radio"/>	<input type="radio"/>
12. Panels are mounted at no higher than the roof ridge or apex of roof (applies only to pitched roofs).	<input checked="" type="radio"/>	<input type="radio"/>
13. Total dead load of panels, supports, mountings, raceways, and all other appurtenances weigh no more than one of the following. If YES , indicate which: <input checked="" type="checkbox"/> No more than three and one-half (3.5) pounds per square foot (PSF) <input type="checkbox"/> Frameless panels on at least 3/12 pitch roof weighing no more than four and one-half (4.5) PSF <input type="checkbox"/> Frameless panels on at least 5/12 pitch roof weighing no more than five (5.0) PSF	<input checked="" type="radio"/>	<input type="radio"/>
14. Supports for solar panels are installed to spread the dead load across as many roof-framing members as needed to ensure that at no point loads in excess of fifty (50) pounds are created. (Distributed weight of less than 5 pounds per sqft).	<input checked="" type="radio"/>	<input type="radio"/>
15. Method and type of all weatherproofing roof penetrations are provided.	<input checked="" type="radio"/>	<input type="radio"/>
16. Completed solar structural worksheet	<input checked="" type="radio"/>	<input type="radio"/>
17. This document shall be submitted with an Electrical Permit	<input checked="" type="radio"/>	<input type="radio"/>
Comments:		

- ➔ A Building Permit is required: If you answered "No" to any of Questions 1-17, you are not eligible to participate in the expedited permitting process and must go through the standard permitting process dictated by the municipality.
- If you answered "No" to any of Questions 10-17, you must provide a letter from a Professional Engineer or Registered Architect certifying that the existing structure can support the additional weight and wind loads of the solar energy system.
- ➔ If you answered "Yes" to all of the above questions, please sign below to affirm that all answers are correct, and that you have met all the conditions and requirements to participate in this expedited process.

Property Owner's Signature

David W. Fridrich

Date

10/18/2019

Solar Installation Contractor Signature

Date



EXPEDITED SOLAR PERMIT APPLICATION SOLAR PERMIT STRUCTURE WORKSHEET con't

STEP 3 - Additional Information

Existing Use: One (1) and two (2) Family Dwellings Only

Provide the total system
capacity rating (sum of

all panels): PV System: 2.48 kW-DC

SOLAR INSTALLATION CONTRACTOR

BUSINESS NAME: Homeland Builders of Michigan	
BUSINESS ADDRESS: 4975 Miller Rd, Ann Arbor, MI 48103	
CONTACT NAME: Linda McFaul	CONTACT PHONE NUMBER: (734)790-8997



SOLAR PV STANDARD PLAN

ROOF PLAN
PROVIDE A ROOF PLAN SHOWING ALL EQUIPMENT,
DISCONNECTING MEANS & REQUIRED CLEARANCES

Project Address: 208 Murray Ave

Permit Number: _____



EXPEDITED SOLAR PERMIT APPLICATION

SOLAR PERMIT STRUCTURE WORKSHEET

City Hall: 301 E. Huron St. Ann Arbor, MI 48104-6120
Mailing: P.O. Box 8647, Ann Arbor, MI 48107-8647
Phone: 734.794.6263 ext. 0 building@a2gov.org
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WORKSHEET MUST BE FILLED OUT COMPLETELY

AUTHORITY: PA. 230 of 1972, AS AMENDED
PENALTY: PERMIT WILL NOT BE ISSUED

If array is roof mounted:

This section is for evaluating roof structural members that are site built. This includes rafter systems and site built trusses. Manufactured truss and roof joist systems, when installed with proper spacing, meet the roof structure requirements covered in item 2 below.

1. Roof construction: Rafters Trusses Other: _____
2. Describe site-built rafter or site-built truss system:
 - a. Rafter size: 2 x 4 inches
 - b. Rafter spacing: 24 inches off center
 - c. Lumber species: pine
 - d. Maximum unsupported span: 6 feet, 0 inches
 - e. Are the rafters over-spanned? (see the IRC span tables):
 - Yes
 - No

If **Yes**, complete the rest of the section.

3. If the roof system has the following (a through c, below):
 - a. over-spanned rafters or trusses,
 - b. the array over 5lbs/ft² on any roof construction, or
 - c. the attachments with a dead load exceeding 45 lbs per attachment;

Then, a Building Permit is **Required** – include the following below, with your application:

- i. A framing plan that shows details for how you will strengthen the rafters using span tables, as applicable.
- ii. Confirmation certified by a design professional that the roof structure will support the array.

*If an array is ground mounted **and** under 200 sqft, then a building permit is not required only an electrical permit. Please contact Zoning Compliance Officer; Jon Barrett - 734.794.6265*

4. What is the existing roof material?

Shingles

5. Provide method and type of weatherproofing for roof penetrations (i.e. flashing, caulk).

Roof Tech E-mount



EXPEDITED SOLAR PERMIT APPLICATION SOLAR PERMIT STRUCTURE WORKSHEET con't

6. Is the mounting structure an engineered product designed to mount PV modules?

Yes

No

If no, provide details of structural attachment in a letter certified by a design professional.

7. For manufacturing mounting systems, provide the following information about the mounting system:

- a. Mounting System Manufacturer Iron Ridge
- b. Product Name and Model Number XR100
- c. Total Weight of PV Modules and Rails 387.50 lbs.
- d. Total Number of Attachment Points 16
- e. Weight per Attachment Point (c ÷ d) 24 lbs.
- f. Maximum Spacing Between Attachment Points on a Rail 78 inches
(see product manual for maximum spacing allowed based on maximum design wind speed)
- g. Total Surface Area of PV Modules (square feet) 146.9 ft²
- h. Distributed Weight of PV Module on Roof (c ÷ g) 2.6 lbs./ft²

8. Indicate quantity, brand, make and model of the:

Inverter(s):

<u>1</u>	<u>SolarEdge</u>	<u>SE3800H-US</u>
Quantity	Make	Model

Modules:

<u>8</u>	<u>Jinko</u>	<u>JKM310M-60</u>
Quantity	Make	Model

Please sign below to affirm that all answers are correct and that you have met all the conditions and requirements to participate in this expedited process.

Property Owner's Signature

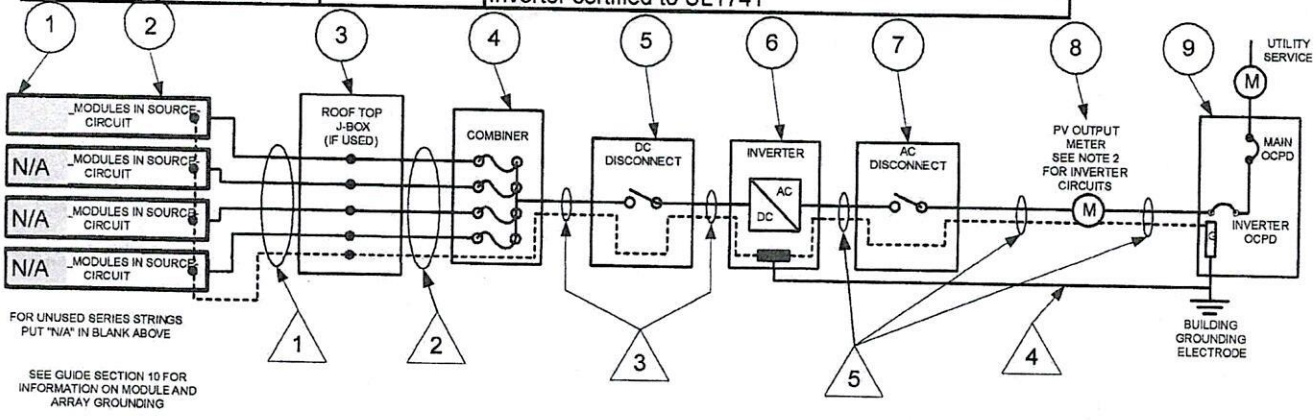
Date

Solar Installation Contractor Signature

10/18/2019

Date

EQUIPMENT SCHEDULE			
TAG	DESCRIPTION	PART NUMBER	NOTES
1	SOLAR PV MODULE		Jinko 310 W, 8 Panels, 2.48 kW DC
2	PV ARRAY		SolarEdge Power Optimizer P320
3	J-BOX (IF USED)		
4	COMBINER (IF USED)		
5	DC DISCONNECT		SolarEdge SE3800H-US, integral DC disconnect
6	DC/AC INVERTER		SolarEdge SE3800H-US
7	AC DISCONNECT (IF USED)		NEMA 3R, non-fused, 30A
8	GEN METER (IF USED)		
9	SERVICE PANEL		200A
	METHOD FOR RAPID SHUTDOWN		Inverter certified to UL1741



STANDARD ELECTRICAL DIAGRAM FOR SMALL-SCALE, SINGLE-PHASE PV SYSTEMS		
SITE NAME: Hellmann		
SITE ADDRESS: 208 Murray Ave		
SYSTEM AC SIZE: 3.8 kW		
CONTRACTOR / ENG. NAME: Homeland Builders of Michigan		
CONTRACTOR / ENG. ADDRESS: 4975 Miller Rd, Ann Arbor, MI 48103		
CONTRACTOR / ENG. LIC #: 2102200014		EXPIRATION DATE: 5/31/2020
DRAWN BY: M. Dorogi	DATE: 10/18/2019	DRAWING NO:

CONDUIT AND CONDUCTOR SCHEDULE					
TAG	DESCRIPTION OF CONDUCTOR TYPE	Cond. Gauge	# of Conductors	Conduit Type	Conduit Size
1	CONDUCTOR TYPE: USE-2 or PV WIRE		2		
	BARE COPPER EQ. GND. COND. (EGC)		1		
2	CONDUCTOR TYPE: THWN-2 or XHHW-2		2		
3	CONDUCTOR TYPE: THWN-2 or XHHW-2		2		
	INSULATED EGC		1		
4	DC GROUNDING ELECTRODE COND.		1		
5	CONDUCTOR TYPE: THWN-2 or XHHW-2		2		
	INSULATED EGC		1		

PV MODULE RATINGS

MODULE MAKE	Jinko
MODULE MODEL	JKM310M-60
MAX. POWER POINT CURRENT (Imp)	9.4
MAX. POWER POINT VOLTAGE (Vmp)	33
OPEN-CIRCUIT VOLTAGE (Voc)	40.5
SHORT-CIRCUIT CURRENT (Isc)	9.92
MAX. SERIES FUSE (OCPD)	15A
MAX. POWER (Pmax)	310
MAX. VOLTAGE (TYP 600 VDC)	1000V

NOTES FOR ALL DRAWINGS

OCPD=OVERCURRENT PROTECTION DEVICE

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

INVERTER RATINGS

INVERTER MAKE	SolarEdge
INVERTER MODEL	SE3800H-US
MAX. DC VOLT RATING	380
MAX POWER @40°C	3800
NOMINAL AC VOLTAGE	240
MAX AC CURRENT	16
MAX OCPD	30

LABELS PER ARTICLE 690 OF NEC

SIGN FOR DC DISCONNECT	
PHOTOVOLTAIC POWER SOURCE	
RATED MPP CURRENT	14A
RATED MPP VOLTAGE	350V
MAX. SYSTEM VOLTAGE	500V
MAX CIRCUIT CURRENT	45A
WARNING ELECTRICAL SHOCK HAZARD-LINE AND LOAD MAY BE ENERGIZED IN OPEN POSITION	
SIGN FOR INVERTER OCPD AND AC DISCONNECT (IF USED)	
AC POINT OF CONNECTION	
AC OUTPUT CURRENT	16A
NOMINAL AC VOLTAGE	240V

NOTES FOR ARRAY CIRCUIT WIRING

- 1) LOWEST EXPECT AMBIENT TEMPERATURE BASED ON ASHRAE MINIMUM MEAN EXTREME DRY BULB TEMPERATURE FOR ASHRAE LOCATION MOST SIMILAR TO INSTALLATION. LOWEST EXPECTED AMBIENT TEMP 0 °C
- 2) HIGHEST CONTINUOUS AMBIENT TEMPERATURE BASED ON ASHRAE HIGHEST MONTH 2% DRY BULB TEMPERATURE FOR ASHRAE LOCATION MOST SIMILAR TO INSTALLATION LOCATION. HIGHEST CONTINUOUS TEMPERATURE 34 °C
- 3) 2005 ASHRAE FUNDAMENTALS 2% DESIGN TEMPERATURES DO NOT EXCEED 47°C IN THE UNITED STATES (PALM SPRINGS, CA IS 44.1°C). FOR LESS THAN 9 CURRENT-CARRYING CONDUCTORS IN ROOF-MOUNTED SUNLIT CONDUIT AT LEAST 1/2" ABOVE ROOF AND USING THE OUTDOOR DESIGN TEMPERATURE OF 47°C OR LESS (ALL OF UNITED STATES),
 - a) 12 AWG 90°C CONDUCTORS ARE GENERALLY ACCEPTABLE FOR MODULES WITH Isc OF 7.68 AMPS OR LESS WHEN PROTECTED BY A 12 AMP OR SMALLER FUSE
 - b) 10 AWG 90°C CONDUCTORS ARE GENERALLY ACCEPTABLE FOR MODULES WITH Isc OF 9.6 AMPS OR LESS WHEN PROTECTED BY A 15 AMP OR SMALLER FUSE

NOTES FOR INVERTER CIRCUITS

- 1) IF UTILITY REQUIRES A VISIBLE-BREAK SWITCH, DOES THIS SWITCH MEET THE REQUIREMENT? Yes
- 2) IF GENERATION METER REQUIRED, DOES THIS METER SOCKET MEET THE REQUIREMENT? Yes
- 3) SIZE PHOTOVOLTAIC POWER SOURCE (DC) CONDUCTORS BASED ON MAX CURRENT ON 690.53 SIGN OR OCPD RATING AT DISCONNECT (IF SUPPLIED)
- 4) SIZE INVERTER OUTPUT CIRCUIT (AC) CONDUCTORS ACCORDING TO INVERTER OCPD AMP RATING
- 5) TOTAL OF 1 INVERTER OCPD(S), ONE FOR EACH INVERTER. DOES TOTAL SUPPLY BREAKERS COMPLY WITH 120% BUSBAR EXCEPTION IN 690.64(B)(2)(a)? Yes

STANDARD ELECTRICAL DIAGRAM FOR SMALL-SCALE, SINGLE-PHASE PV SYSTEMS

SITE NAME: Hellmann		
SITE ADDRESS: 208 Murray Ave		
SYSTEM AC SIZE: 3.8 kW		
CONTRACTOR / ENG. NAME: Homeland Builders of Michigan		
CONTRACTOR / ENG. ADDRESS: 4975 Miller Rd, Ann Arbor, MI 48103		
CONTRACTOR / ENG. LIC # : 2102200014	EXPIRATION DATE: 5/31/2020	
DRAWN BY: M. Dorogi	DATE: 10/18/2019	DRAWING NO.:



ELECTRICAL PERMIT APPLICATION

CONSTRUCTION AND BUILDING

City Hall: 301 E. Huron St. Ann Arbor, MI 48104-6120

Mailing: P.O. Box 8647, Ann Arbor, MI 48107-8647

Phone: 734.794.6263 ext. 0

building@a2gov.org

Fax: 734.994.8460

OFFICE USE ONLY	
Permit Number	ELEC# 19-3335
DATE STAMP	
CITY OF ANN ARBOR RECEIVED	
OCT 22 2019	

APPLICATION MUST BE FILLED OUT COMPLETELY

AUTHORITY: PA. 230 of 1972, AS AMENDED

PENALTY: PERMIT WILL NOT BE ISSUED

PROPERTY LOCATION/OWNER INFORMATION

PLANNING & DEVELOPMENT SERVICES

PROPERTY ADDRESS (Street No. and Name)		APT/SUITE #	
208 Murray Ave			
CITY	ZIPCODE	Is this a Rental Property? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes, # of Units: _____	
Ann Arbor	48103		
NAME OF OWNER		PHONE/CELL # (AREA CODE)	
Joan Hellmann		734-274-0773	

APPLICANT INFORMATION

WHO IS APPLYING FOR PERMIT?		NAME AND / OR COMPANY		
<input type="checkbox"/> OWNER	<input checked="" type="checkbox"/> CONTRACTOR	Neff Mechanical		
PHONE / CELL # (AREA CODE)		EMAIL		
(734)320-5528		neffmech@yahoo.com		
ADDRESS		CITY	STATE	ZIPCODE
515 Keech		Ann Arbor	MI	
MASTER ELECTRICIAN LICENSE #		EXPIRY DATE	CONTRACTOR LICENSE #	EXPIRY DATE
6210159		12/31/19	6108312	12/31/2021
FEDERAL EMPLOYER I.D. # (OR REASON FOR EXEMPTION)				
38-3116498				
WORKERS COMPENSATION INSURANCE CARRIER (OR REASON FOR EXEMPTION)			MESC EMPLOYEE #	
Auto Owners			1302132	

TYPE OF JOB / PROJECT INFORMATION - COMPLETE ALL INFORMATION BELOW

Is a Building Permit <u>required</u> for this project?		<input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes, Permit: BLDG# _____	<input type="checkbox"/> N/A
<input checked="" type="checkbox"/> SINGLE FAMILY	<input type="checkbox"/> NEW	<input type="checkbox"/> TENANT FINISH	<input type="checkbox"/> ADDITION	
<input type="checkbox"/> OTHER	<input type="checkbox"/> EXISTING	<input type="checkbox"/> SPECIAL INSPECTION	<input type="checkbox"/> ALTERATION	

WORK DESCRIPTION:

wire solar panels

PLAN REVIEW REQUIREMENTS (PLANS MUST BE SUBMITTED WITH AN APPLICATION, EXCEPT AS LISTED BELOW)

PLANS ARE NOT REQUIRED FOR THE FOLLOWING:

- When the electrical system rating does not exceed 400 amps and the building is not over 3,500 square feet in area.
- Alterations and repair work determined by the electrical official to be minor in nature.
- Work completed by a governmental subdivision or state agency costing less than \$15,000.00.

The administrative authority may request plans for projects that include unusual design.

What is the rating of the service or feeder in ampere: 200A What is the building size in square footage? 1000

PLANS ARE REQUIRED FOR ALL OTHER BUILDING TYPES and shall be prepared by or under the direct supervision of an architect or engineer licensed pursuant to PA 299 of 1980 and shall bear that architect's or engineer's seal and signature.

HAVE ELECTRICAL PLANS BEEN SUBMITTED: YES NO NOT REQUIRED SUBMITTED WITH BUILDING PERMIT APPLICATION

HOMEOWNER AFFIDAVIT

I hereby certify the electrical work described on this permit application shall be installed by myself in my own home in which I am living or about to occupy. All work shall be installed in accordance with the State Code and shall not be enclosed, covered up, or put into operation until it has been inspected and approved by the City Electrical Inspector. I will cooperate with the City Electrical Inspector and assume responsibility to arrange for necessary inspections.

APPLICANT SIGNATURE

Section 23A of the State Construction Code Act of 1972, 1972 PA 230, MCL 125.1523A, prohibits a person from conspiring to circumvent the licensing requirements of this state relating to persons who are to perform work on a residential building or a residential structure. Violators of section 23A are subjected to civil fines. I agree this permit is only for the work described, and does not grant permission for additional or related work which requires separate permits. I hereby certify that the proposed work is authorized by the owner, and that I am authorized by the owner to make this application as his/her authorized agent. I agree to conform to all applicable laws of the State of Michigan and the local jurisdiction. All information on this permit application is accurate to the best of my knowledge.

SIGN

x

PRINT

x Timothy Neff

DATE

10/18/2019

Signature of Contractor or Homeowner (Homeowner signature indicates compliance with Homeowner Affidavit)

FEE CHART				
Enter the number of items being installed, multiply by the unit piece and add each for the total permit fee.		QTY	UNIT PRICE	TOTAL
PERMIT ISSUANCE				
001	Basic Application Fee * (nonrefundable, NO inspections included)	1	\$15.00	\$15.00
002	Inspections (each)	1	\$35.00	35.00
UNIT FEE INSPECTION				
003	Appliance New / Re-connects (e.g. furnace, AC, water heater, etc.)		\$25.00	
004	Branch Circuits, <u>less</u> than 208 Volts		\$7.00	
005	Branch Circuits, 208 Volts or <u>over</u>		\$20.00	
006	Generator with Transfer Switch		\$40.00	
007	Grounding Connection (Rebar grounding)		\$25.00	
008	Interruptible Air Conditioning Panel		\$35.00	
009	Light Fixtures / Receptacles (Grps of 10)		\$25.00	
010	Light Pole Base (each)		\$5.00	
011	Low Voltage HVAC wiring.		\$25.00	
012	Motor / Transformer		\$25.00	
013	Permanent Appliances (i.e. built-in; dishwasher, microwave, stove, garbage disposal, etc.)		\$10.00	
014	Power Feeders		\$10.00	
015	Service Panels <u>up to</u> 400 amp / panel		\$45.00	
016	Service Panels <u>over</u> 400 amp / panel		\$65.00	
018	Sign Connection		\$25.00	
019	Swimming Pools, Spas, Hot Tubs		\$25.00	
020	Temporary Service (Includes outdoor meter)		\$20.00	
021	Other misc. wiring or code repairs as		\$25.00	
RESIDENTIAL ONLY				
022	Smoke Alarms		\$25.00	
023	Solar Panel per set of three (3) panels	3	\$0.00	0.00
COMMERCIAL ONLY				
024	Solar Panel per set of three (3) panels		\$20.00	
OTHER INSPECTIONS AND FEES				
025	Work without Permit**		\$130.00	
026	Onsite Consultation with Inspector		\$35.00	
027	Special or Overtime Inspection		\$130.00	
028	Contractor Registration / Re-registration		\$15.00	
TOTAL PERMIT FEES:			\$	

Please note: New Fees have been introduced above.
 *Basic Application fee no longer include one (1) inspection.
 **Investigations conducted as part of a complaint for work without a permit.

Save

Print

Clear

INSTRUCTIONS FOR SUBMITTING APPLICATIONS

Incomplete or illegible forms **WILL NOT** be accepted. Electrical work will not be started until the application for the permit has been filed with our office. All installations shall be in conformance with the State Electrical code. **No work shall be concealed until it has been inspected and approved.**

All Permits **MUST** be signed by either the Homeowner, License Holder, Qualifying Officer or Owner of the contracting company.

Permit Applications can be submitted to the City of Ann Arbor Construction and Building Services by mail or in person. We also accept email, fax, or scanned copies of completed applications.

We accept CASH, CHECK, and all major credit cards. Checks should be made payable to "City of Ann Arbor"

Permit applications not submitted with the required documents or payments cannot be issued until such is provided.

CONTRACTOR REGISTRATION

You must provide the following to register with the City of Ann Arbor:

1. Copy of the current Contractor's License and Master Electrician's License.
2. Copy of a **clear** picture of Driver's License of the person the license has been issued to.
3. Letter (s) of authorization from qualifying agent (s) of the company, if not the License Holder / Owner of the Company.

PERMIT EXPIRATION

A permit remains valid as long as work is progressing and inspections are requested and being conducted. Any and all permits will be closed when no inspections are requested and conducted within six (6) months (180 days) of the date of issuance or the date of the previous inspection.

EXPIRED PERMITS CANNOT BE REFUNDED. ELIGIBLE EXPIRED PERMITS WILL BE SUBJECT TO A FEE OF \$35.00 TO RE-OPEN.

SCHEDULING INSPECTIONS

Contact the City of Ann Arbor Construction and Building Services Department, **24 hours in advance and no later than 2:30 pm for next day inspections.**

When ready for an inspection:

- Log onto www.a2gov.org/permits and schedule online through eTrakIT or call (734) 794-6263 ext. 0
- Same day cancellation (s) **will** result in a full inspection fee charge of \$35.00 each time.

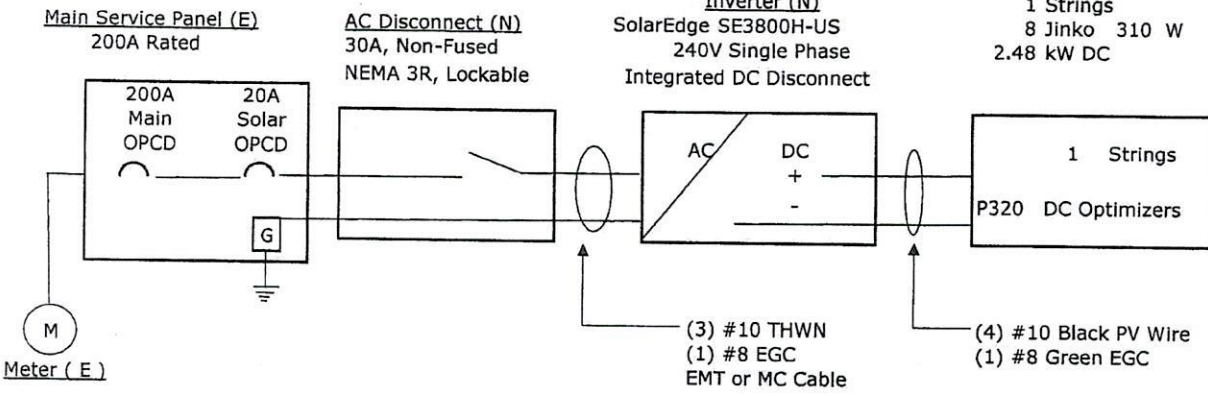
You will need your job address and permit number ready to schedule the inspection

OFFICE USE ONLY

Permit Fee:	\$ _____	<input type="checkbox"/> M	<input type="checkbox"/> F
		<input type="checkbox"/> E	<input type="checkbox"/> OC
Payment Type	<input type="checkbox"/> Check: # _____ <input type="checkbox"/> Cash <input type="checkbox"/> Credit Card		

(N) = New
(E) = Existing

Electrical One Line
All work to comply with the 2017 Michigan Electrical Code



PV Array (N)
1 Strings
8 Jinko 310 W
2.48 kW DC

Installer
Homeland Solar
4975 Miller
Ann Arbor, MI 48103
License #2102200014

Owner
Joan Hellmann
208 Murray Ave
Ann Arbor, MI 48103

drawn by
L. McFaul
10/16/2019



HOMELAND SOLAR
Own Your Own Power™
Residential • Commercial • Municipal

Key Manufacturers:
-Solar Panels
Jinko Solar (U.S.) Inc
595 Market St, Suite 2200
San Francisco, CA 94105
-Inverter
SolarEdge Technologies
47505 Seabridge Dr.
Fremont, CA 94538
-Racking
IronRidge
1495 Zephyr Avenue
Hayward, CA 94544
All components are UL listed and CEC Certified, where warranted.

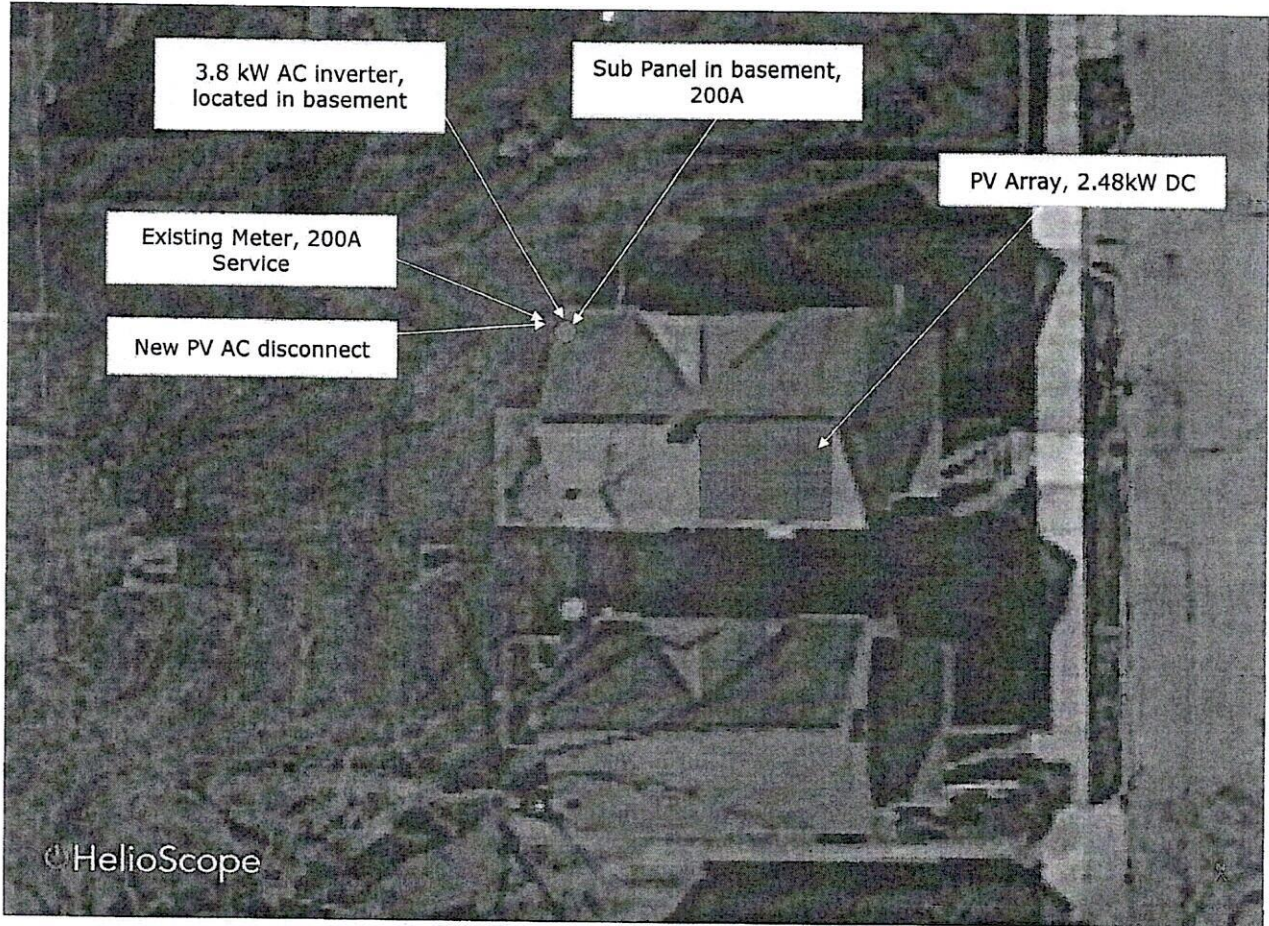
Inverter Ratings
SolarEdge SE3800H-US
Input: 10.5A @ 380 V DC
Output: 16A @ 240 V AC
UL1741, UL1699B, UL1998,
CSA 22.2

Module Ratings
Jinko JKM310M-60
Pmax(W) 310
Vmp(V) 33
Imp(A) 9.4
Voc(V) 40.5
Isc(A) 9.92

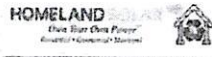
System Configuration
DC kW STC: 2.48
AC kW: 3.8
Operating AC Voltage: 240
Operating DC Voltage: 380
Number of Strings: 1
Modules per String: 8
Module: JKM310M-60
Number of Inverters: 1
Inverter: SE3800H-US
Optimizer: P320
Main Breaker Rating: 200A
PV Breaker Rating: 20A

Electrical Notes:
1. All modules and rails will be grounded per code and per manufacturers instructions.
2. If existing grounding electrode cannot be verified, contractor shall install supplemental grounding electrode.
3. System will be commissioned by utility per Interconnection Agreement.

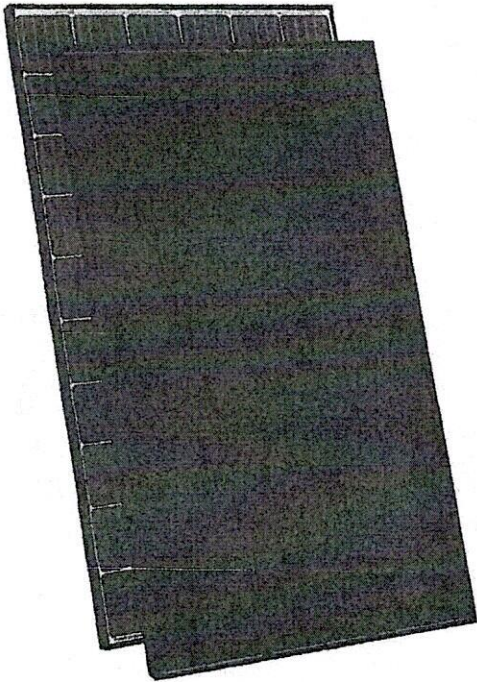
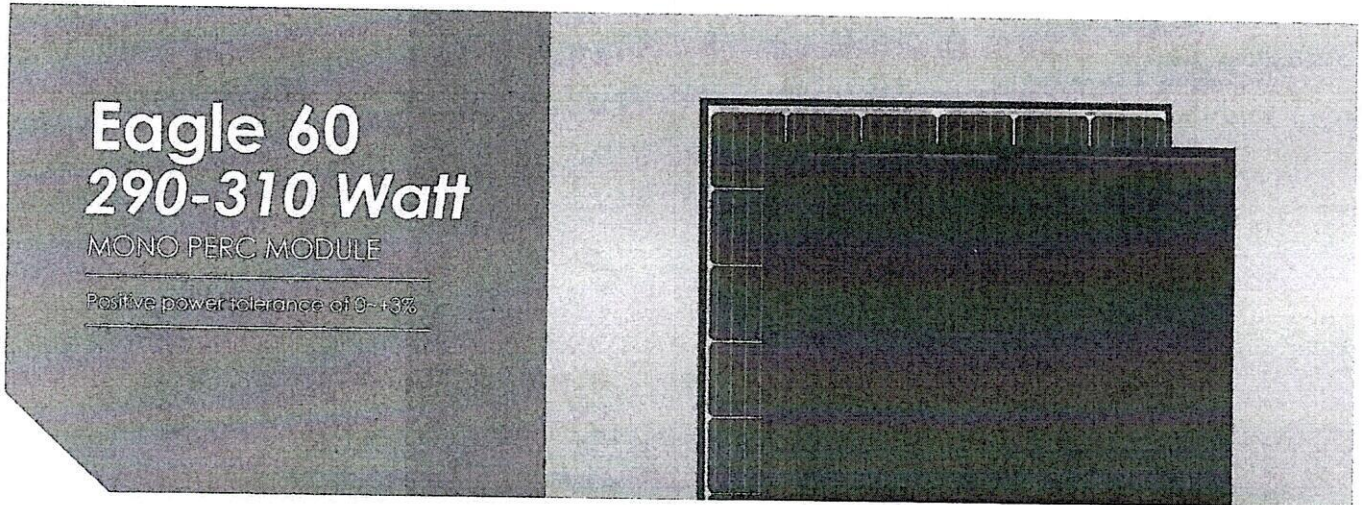
Site Plan Joan Hellmann , 208 Murray Ave , Ann Arbor, MI 48103



Mark Dorogi
(734)846-8911



10/18/2019



KEY FEATURES



Innovative Solar Cells

Five busbar monocrystalline PERC cell technology improves module efficiency



High Efficiency

Higher module conversion efficiency (up to 18.94%) due to Passivated Emitter Rear Contact (PERC) technology



PID Free

World's 1st PID-Free module



Low-Light Performance

Advanced glass technology improves light absorption and retention



Strength and Durability

Certified for high snow (5400Pa) and wind (2400Pa) loads



Weather Resistance

Certified for salt mist and ammonia resistance

- ISO9001:2008 Quality Standards
- ISO14001:2004 Environmental Standards
- OHSAS18001 Occupational Health & Safety Standards

Nomenclature:

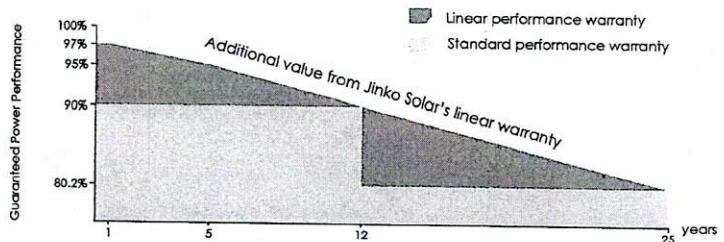
JKM310M - 60B

Code	Backsheet
null	White
B	Black

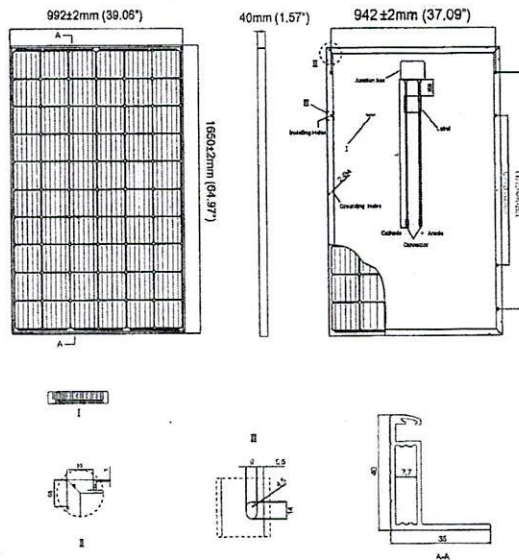


LINEAR PERFORMANCE WARRANTY

10 Year Product Warranty • 25 Year Linear Power Warranty



Engineering Drawings

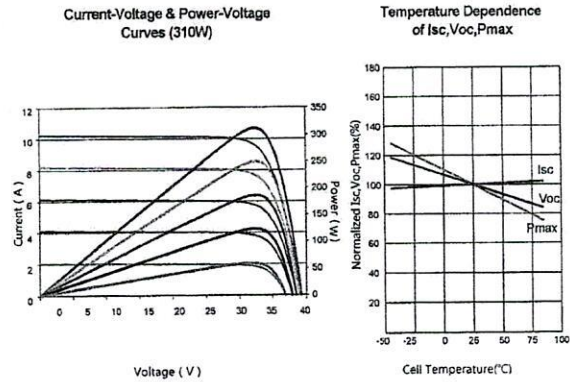


Packaging Configurations

(Two boxes=One Pallet)

26 pcs/box , 52 pcs/pallet, 728 pcs/40'HQ Container

Electrical Performance & Temperature Dependence



Mechanical Characteristics

Cell Type	Monocrystalline PERC 156×156mm (6 inch)
No. of Cells	60 (6×10)
Dimensions	1650×992×40mm (64.97×39.06×1.57 inch)
Weight	18.5 kg (40.8 lbs.)
Front Glass	3.2mm, Anti-reflection Coating, High Transmission, Low Iron, Tempered Glass
Frame	Anodized Aluminium Alloy (Black)
Junction Box	IP67 Rated
Output Cables	12 AWG, Length: 900mm (35.43 inch)
Fire Type	Type 1

SPECIFICATIONS

Module Type	JKM290M-60		JKM295M-60		JKM300M-60		JKM305M-60		JKM310M-60	
	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT
Maximum Power (Pmax)	290Wp	216Wp	295Wp	220Wp	300Wp	224Wp	305Wp	227Wp	310Wp	231Wp
Maximum Power Voltage (Vmp)	32.2V	30.2V	32.4V	30.4V	32.6V	30.6V	32.8V	30.8V	33.0V	31.0V
Maximum Power Current (Imp)	9.02A	7.15A	9.10A	7.24A	9.21A	7.32A	9.30A	7.40A	9.40A	7.49A
Open-circuit Voltage (Voc)	39.5V	38.6V	39.7V	36.8V	40.1V	37.0V	40.3V	37.2V	40.5V	37.4V
Short-circuit Current (Isc)	9.55A	7.81A	9.61A	7.89A	9.72A	8.01A	9.83A	8.12A	9.92A	8.20A
Module Efficiency STC (%)	17.72%		18.02%		18.33%		18.63%		18.94%	
Operating Temperature (°C)	-40°C~+85°C									
Maximum System Voltage	1000VDC (UL and IEC)									
Maximum Series Fuse Rating	20A									
Power Tolerance	0~+3%									
Temperature Coefficients of Pmax	-0.39%/°C									
Temperature Coefficients of Voc	-0.29%/°C									
Temperature Coefficients of Isc	0.048%/°C									
Nominal Operating Cell Temperature (NOCT)	45±2°C									

* STC: ☀ Irradiance 1000W/m² 📱 Cell Temperature 25°C ☁ AM=1.5

NOCT: ☀ Irradiance 800W/m² 📱 Ambient Temperature 20°C ☁ AM=1.5 🌬 Wind Speed 1m/s

* Power measurement tolerance: ± 3%

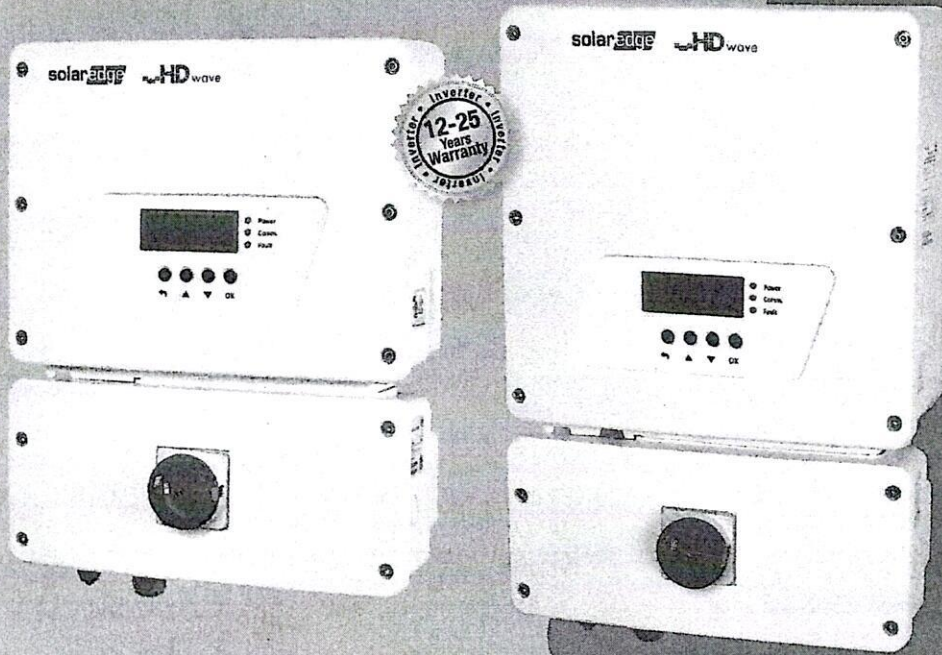
CAUTION: READ SAFETY AND INSTALLATION INSTRUCTIONS BEFORE USING THE PRODUCT.
© Jinko Solar Co., Ltd. All rights reserved. Specifications included in this datasheet are subject to change without notice.
US-MKT-310M-60_1.0_rev2017

solar^{edge}

Single Phase Inverter with HD-Wave Technology for North America

SE3000H-US / SE3800H-US / SE5000H-US /
SE6000H-US / SE7600H-US / SE10000H-US / SE11400H-US

INVERTERS



Optimized installation with HD-Wave technology

- ▣ Specifically designed to work with power optimizers
- ▣ Record-breaking efficiency
- ▣ Fixed voltage inverter for longer strings
- ▣ Integrated arc fault protection and rapid shutdown for NEC 2014 and 2017, per article 690.11 and 690.12
- ▣ UL1741 SA certified, for CPUC Rule 21 grid compliance
- ▣ Extremely small
- ▣ High reliability without any electrolytic capacitors
- ▣ Built-in module-level monitoring
- ▣ Outdoor and indoor installation
- ▣ Optional: Revenue grade data, ANSI C12.20 Class 0.5 (0.5% accuracy)

HD
wave



Single Phase Inverter

with HD-Wave Technology for North America
 SE3000H-US / SE3800H-US / SE5000H-US /
 SE6000H-US / SE7600H-US / SE10000H-US / SE11400H-US

	SE3000H-US	SE3800H-US	SE5000H-US	SE6000H-US	SE7600H-US	SE10000H-US	SE11400H-US	
OUTPUT								
Rated AC Power Output	3000	3800 @ 240V 3300 @ 208V	5000	6000 @ 240V 5000 @ 208V	7600	10000	11400	VA
Max. AC Power Output	3000	3800 @ 240V 3300 @ 208V	5000	6000 @ 240V 5000 @ 208V	7600	10000	11400	VA
AC Output Voltage Min.-Nom.-Max. (183 - 208 - 229)	-	✓	-	✓	-	-	-	Vac
AC Output Voltage Min.-Nom.-Max. (211 - 240 - 264)	✓	✓	✓	✓	✓	✓	✓	Vac
AC Frequency (Nominal)	59.3 - 60 - 60.5 ⁽¹⁾							Hz
Maximum Continuous Output Current 208V	-	16	-	24	-	-	-	A
Maximum Continuous Output Current @ 240V	12.5	16	21	25	32	42	47.5	A
GFDI Threshold	1							A
Utility Monitoring, Islanding Protection, Country Configurable Thresholds	Yes							
INPUT								
Maximum DC Power @ 240V	4650	5900	7750	9300	11800	15500	17650	W
Maximum DC Power @ 208V	-	5100	-	7750	-	-	-	
Transformer-less, Ungrounded	Yes							
Maximum Input Voltage	480							Vdc
Nominal DC Input Voltage	380							Vdc
Maximum Input Current 208V	-	9	-	13.5	-	-	-	Adc
Maximum Input Current @ 240V	8.5	10.5	13.5	16.5	20	27	30.5	Adc
Max. Input Short Circuit Current	45							Adc
Reverse-Polarity Protection	Yes							
Ground-Fault Isolation Detection	600ka Sensitivity							
Maximum Inverter Efficiency	99						99.2	%
CEC Weighted Efficiency	99							%
Nighttime Power Consumption	< 2.5							W
ADDITIONAL FEATURES								
Supported Communication Interfaces	RS485, Ethernet, ZigBee (optional), Cellular (optional)							
Revenue Grade Data, ANSI C12.20	Optional ⁽²⁾							
Rapid Shutdown - NEC 2014 and 2017 690.12	Automatic Rapid Shutdown upon AC Grid Disconnect							
STANDARD COMPLIANCE								
Safety	UL1741, UL1741 SA, UL1699B, CSA C22.2, Canadian AFCI according to T.I.L. M-07							
Grid Connection Standards	IEEE1547, Rule 21, Rule 14 (HI)							
Emissions	FCC Part 15 Class B							
INSTALLATION SPECIFICATIONS								
AC Output Conduit Size / AWG Range	3/4" minimum / 14-6 AWG					3/4" minimum / 14-4 AWG		
DC Input Conduit Size / # of Strings / AWG Range	3/4" minimum / 1-2 strings / 14-6 AWG					3/4" minimum / 1-3 strings / 14-6 AWG		
Dimensions with Safety Switch (HxWxD)	17.7 x 14.6 x 6.8 / 450 x 370 x 174					21.3 x 14.6 x 7.3 / 540 x 370 x 185		in / mm
Weight with Safety Switch	22 / 10	25.1 / 11.4	26.2 / 11.9	38.8 / 17.6				lb / kg
Noise	< 25			< 50				dBA
Cooling	Natural Convection			Natural convection				
Operating Temperature Range	-13 to +140 / -25 to +60 ⁽³⁾ (-40°F / -40°C option) ⁽⁴⁾							°F / °C
Protection Rating	NEMA 3R (Inverter with Safety Switch)							

⁽¹⁾ For other regional settings please contact SolarEdge support

⁽²⁾ Revenue grade inverter P/N: SExxxxH-US000NNC2

⁽³⁾ For power de-rating information refer to: <https://www.solaredge.com/sites/default/files/se-temperature-derating-note-na.pdf>

⁽⁴⁾ -40 version P/N: SExxxxH-US000NNU4

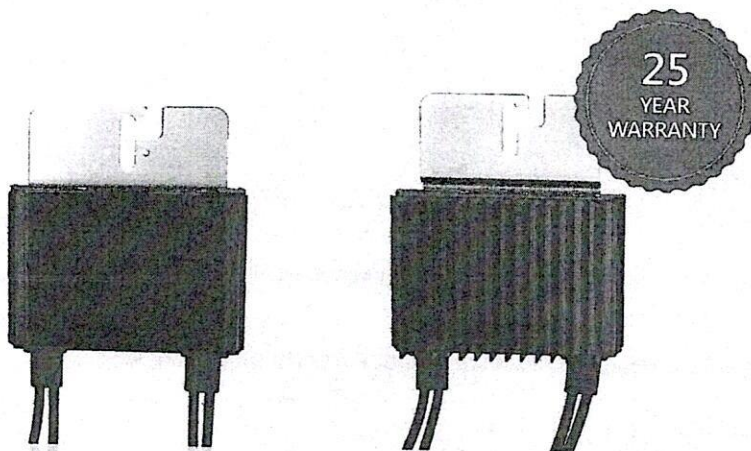


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Power Optimizer

For North America

P320 / P340 / P370 / P400 / P405 / P505



POWER OPTIMIZER

PV power optimization at the module-level

- // Specifically designed to work with SolarEdge inverters
- // Up to 25% more energy
- // Superior efficiency (99.5%)
- // Mitigates all types of module mismatch losses, from manufacturing tolerance to partial shading
- // Flexible system design for maximum space utilization
- // Fast installation with a single bolt
- // Next generation maintenance with module-level monitoring
- // Meets NEC requirements for arc fault protection (AFCI) and Photovoltaic Rapid Shutdown System (PVRSS)
- // Module-level voltage shutdown for installer and firefighter safety

/ Power Optimizer For North America

P320 / P340 / P370 / P400 / P405 / P505

Optimizer model (typical module compatibility)	P320 (for 60-cell modules)	P340 (for high- power 60-cell modules)	P370 (for higher- power 60 and 72-cell modules)	P400 (for 72 & 96- cell modules)	P405 (for thin film modules)	P505 (for higher current modules)
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INPUT

Rated Input DC Power ⁽¹⁾	320	340	370	400	405	505	W
Absolute Maximum Input Voltage (Voc at lowest temperature)	48		60	80	125 ⁽²⁾	83 ⁽²⁾	Vdc
MPPT Operating Range	8 - 48		8 - 60	8 - 80	12.5 - 105	12.5 - 83	Vdc
Maximum Short Circuit Current (Isc)	11			10.1		14	Adc
Maximum DC Input Current	13.75			12.63		17.5	Adc
Maximum Efficiency	99.5						%
Weighted Efficiency				98.8		98.6	%
Overvoltage Category	II						

OUTPUT DURING OPERATION (POWER OPTIMIZER CONNECTED TO OPERATING SOLAREEDGE INVERTER)

Maximum Output Current	15						Adc
Maximum Output Voltage	60			85			Vdc

OUTPUT DURING STANDBY (POWER OPTIMIZER DISCONNECTED FROM SOLAREEDGE INVERTER OR SOLAREEDGE INVERTER OFF)

Safety Output Voltage per Power Optimizer	1 ± 0.1						Vdc
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STANDARD COMPLIANCE

EMC	FCC Part15 Class B, IEC61000-6-2, IEC61000-6-3					
Safety	IEC62109-1 (class II safety), UL1741					
RoHS	Yes					

INSTALLATION SPECIFICATIONS

Maximum Allowed System Voltage	1000						Vdc
Compatible inverters	All SolarEdge Single Phase and Three Phase inverters						
Dimensions (W x L x H)	129 x 153 x 27.5 / 5.1 x 6 x 1.1		129 x 153 x 33.5 / 5.1 x 6 x 1.3	129 x 159 x 49.5 / 5.1 x 6.3 x 1.9	129 x 162 x 59 / 5.1 x 6.4 x 2.3		mm / in
Weight (including cables)	630 / 1.4		750 / 1.7	845 / 1.9	1064 / 2.3		gr / lb
Input Connector	MC4 ⁽³⁾						
Output Wire Type / Connector	Double Insulated; MC4						
Output Wire Length	0.95 / 3.0		1.2 / 3.9				m / ft
Input Wire Length	0.16 / 0.52						m / ft
Operating Temperature Range	-40 - +85 / -40 - +185						°C / °F
Protection Rating	IP68 / NEMA6P						
Relative Humidity	0 - 100						%

⁽¹⁾ Rated STC power of the module. Module of up to +5% power tolerance allowed

⁽²⁾ NEC 2017 requires max input voltage be not more than 80V

⁽³⁾ For other connector types please contact SolarEdge

PV System Design Using a SolarEdge Inverter ^{(1),(2)}		Single Phase HD-Wave	Single phase	Three Phase 208V	Three Phase 480V	W
		Minimum String Length (Power Optimizers)	P320, P340, P370, P400	8		
	P405 / P505	6		8	14	
Maximum String Length (Power Optimizers)		25		25	50 ⁽⁶⁾	
Maximum Power per String		5700 (6000 with SE7600-US - SE11400-US)	5250	6000 ⁽⁷⁾	12750 ⁽⁸⁾	
Parallel Strings of Different Lengths or Orientations		Yes				

⁽⁴⁾ For detailed string sizing information refer to: http://www.solaredge.com/sites/default/files/string_sizing_na.pdf

⁽⁵⁾ It is not allowed to mix P405/P505 with P320/P340/P370/P400 in one string

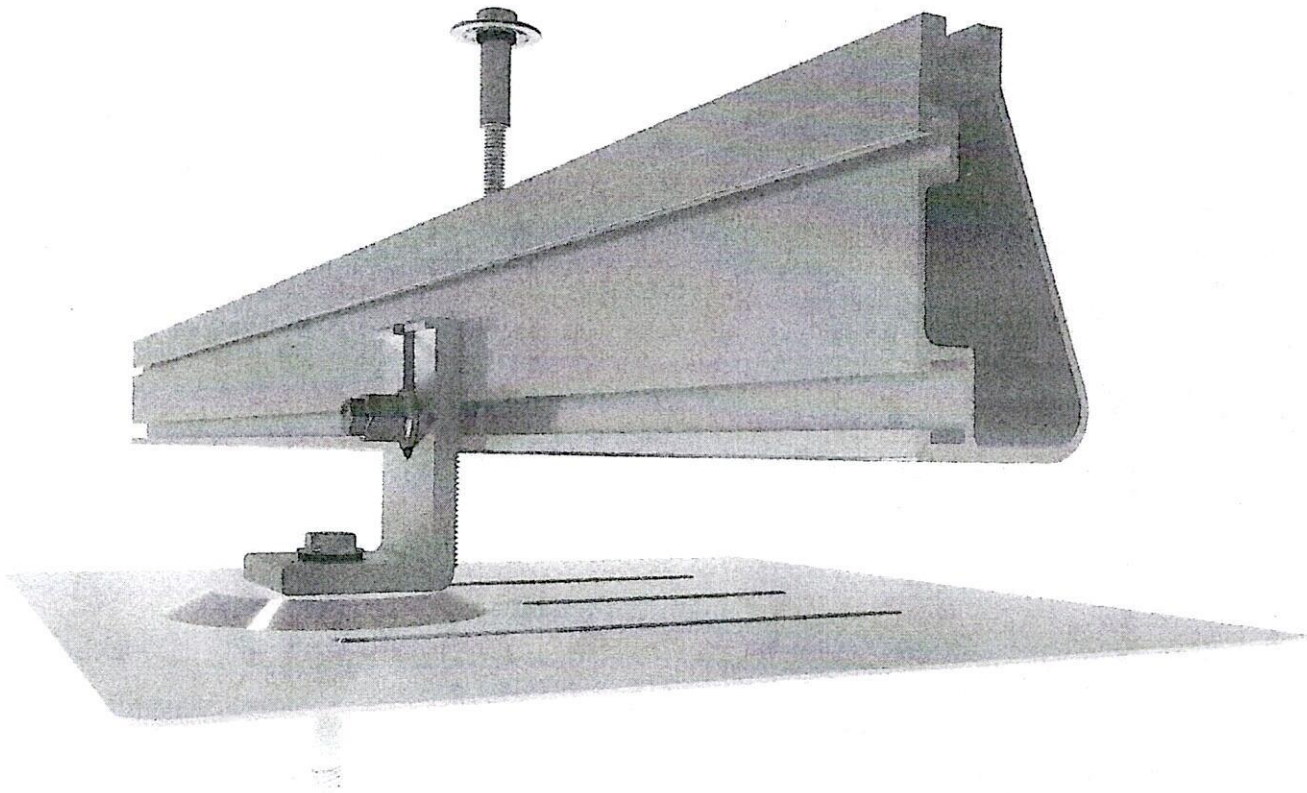
⁽⁶⁾ A string with more than 30 optimizers does not meet NEC rapid shutdown requirements; safety voltage will be above the 30V requirement

⁽⁷⁾ For SE14.4KUS/SE43.2KUS: It is allowed to install up to 6,500W per string when 3 strings are connected to the inverter (3 strings per unit for SE43.2KUS) and when the maximum power difference between the strings is up to 1,000W

⁽⁸⁾ For SE30KUS/SE33.3KUS/SE66.6KUS/SE100KUS: It is allowed to install up to 15,000W per string when 3 strings are connected to the inverter (3 strings per unit for SE66.6KUS/SE100KUS) and when the maximum power difference between the strings is up to 2,000W



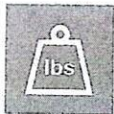
Flush Mount System



Built for solar's toughest roofs.

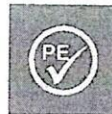
IronRidge builds the strongest mounting system for pitched roofs in solar. Every component has been tested to the limit and proven in extreme environments.

Our rigorous approach has led to unique structural features, such as curved rails and reinforced flashings, and is also why our products are fully certified, code compliant and backed by a 20-year warranty.



Strength Tested

All components evaluated for superior structural performance.



PE Certified

Pre-stamped engineering letters available in most states.



Class A Fire Rating

Certified to maintain the fire resistance rating of the existing roof.



Design Assistant

Online software makes it simple to create, share, and price projects.



UL 2703 Listed System

Meets newest effective UL 2703 standard.



20-Year Warranty

Twice the protection offered by competitors.

XR Rails

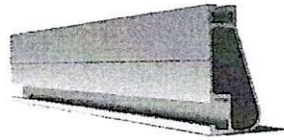
XR10 Rail



A low-profile mounting rail for regions with light snow.

- 6' spanning capability
- Moderate load capability
- Clear & black anod. finish

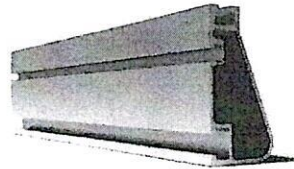
XR100 Rail



The ultimate residential solar mounting rail.

- 8' spanning capability
- Heavy load capability
- Clear & black anod. finish

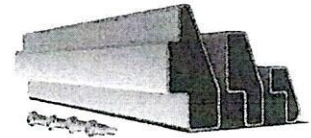
XR1000 Rail



A heavyweight mounting rail for commercial projects.

- 12' spanning capability
- Extreme load capability
- Clear anodized finish

Bonded Splices ☺

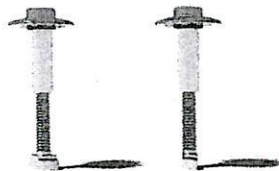


All rails use internal splices for seamless connections.

- Self-drilling screws
- Varying versions for rails
- Forms secure bonding

Clamps & Grounding

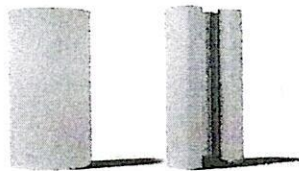
UFOs ☺



Universal Fastening Objects bond modules to rails.

- Fully assembled & lubed
- Single, universal size
- Clear & black finish

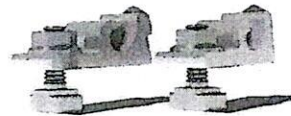
Stopper Sleeves ☺



Snap onto the UFO to turn into a bonded end clamp.

- Bonds modules to rails
- 6 different sizes
- Clear & black anod. finish

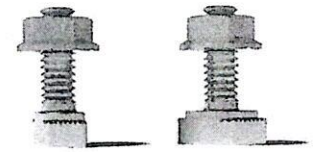
Grounding Lugs ☺



Connects array to equipment ground.

- Low profile
- Single tool installation
- Mounts in any direction

Microinverter Kit ☺

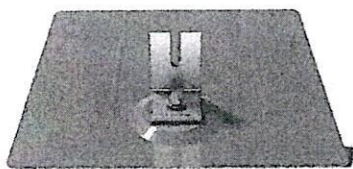


Mount MIs or POs to XR Rails.

- Bonds devices to rails
- Kit comes assembled
- Listed to UL 2703

Attachments

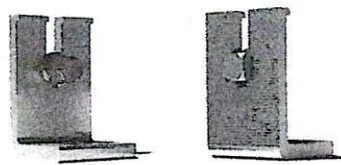
FlashFoot



Anchor, flash, and mount with all-in-one attachments.

- Ships with all hardware
- IBC & IRC compliant
- Certified with XR Rails

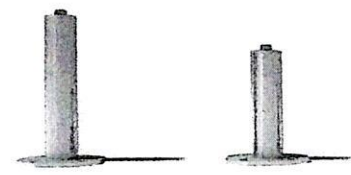
Bonded L-Feet ☺



Drop-in design for rapid rail attachment.

- Bonding hardware included
- Forms secure rail connection
- Clear & black anod. finish

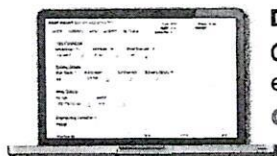
Standoffs



Raise Flush Mount System to various heights.

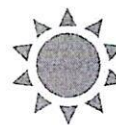
- Works with vent flashing
- Ships assembled
- 4" and 7" Lengths

Resources



Design Assistant

Go from rough layout to fully engineered system. For free. Go to IronRidge.com/design



NABCEP Certified Training

Earn free continuing education credits, while learning more about our systems. Go to IronRidge.com/training

Hellmann (#560438)
pitched roof

Project Details

Name	Hellmann	Date	10/18/2019
Location	Ann Arbor, Ann Arbor, MI, 48103	Total modules	8
Module	Jinko: JKM310M-60L (35mm)	Total watts	2,480
Dimensions	65.55" x 39.45" x 1.38" (1665.0mm x 1002.0mm x 35.0mm)	Attachments	16

System Weight

Total system weight	387.5 lbs
Weight/attachment	24.2 lbs
Racking weight	52.3 lbs
Distributed weight	2.6 psf

Load Assumptions

Wind exposure	B
Wind speed	110 mph
Ground snow load	20 psf
Attachment spacing	4.0'

Roof Information

Roof material	Comp Shingle	Building height	15 ft
Roof attachment	L-Foot Only	Roof slope	18 °
Attachment hardware	Square	Risk category	II

Span Details XR100 - Portrait

Zone	Max span	Max cantilever
1	6' 6"	2' 7"
2	6' 6"	2' 7"
3	6' 6"	2' 7"

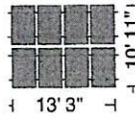
Reaction Forces XR100 - Portrait

Zone	Down (lbs)	Uplift (lbs)	Lateral (lbs)
1	226	92	66
2	226	192	66
3	226	304	66

Roof Section 1

Definition	Roof Section Weights	Roof Section (all segments)
8 modules	Total weight: 387.5 lbs	Provided rail: 56' [4 x 14']
Portrait orientation	Weight/attachment: 24.2 lbs	Attachments: 16
Graphical entry	Total Area: 146.9 sq ft	Splices: 0
	Distributed weight: 2.6 psf	Clamps: 20

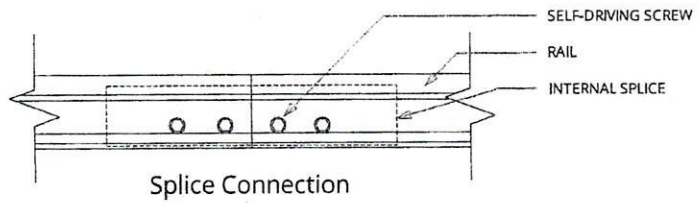
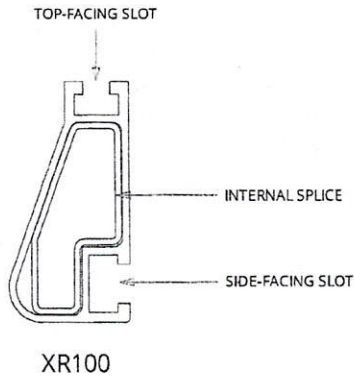
Diagram

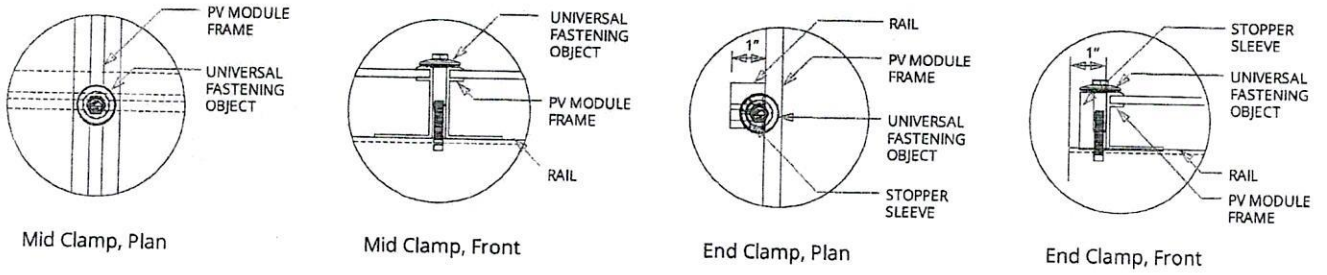


Segments

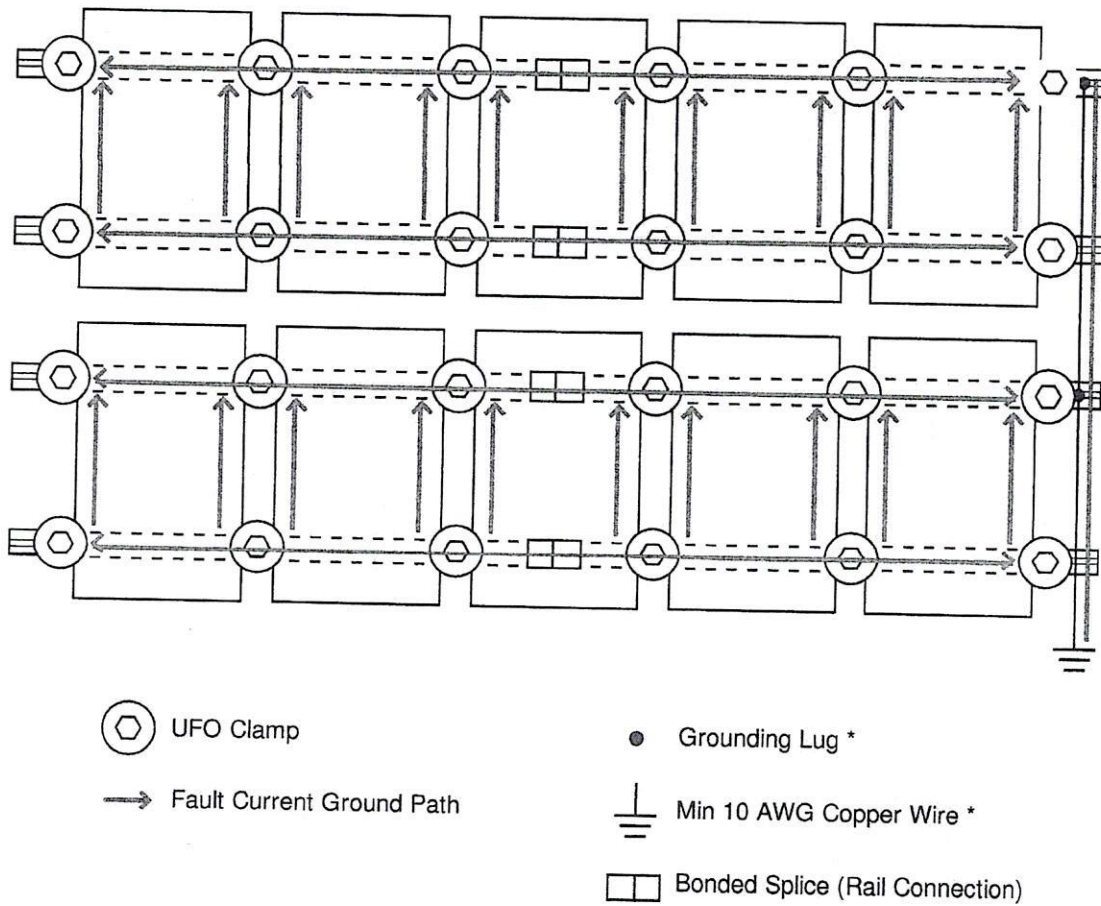
Columns	Length	Cantilever	Cantilever Violations	Rail	Attachments	Splices	Clamps
4	13' 5"	8"	None	28' [2 x 14']	8	0	10
Row segment totals (x 2) →				56' [4 x 14']	16	0	20

Splice Details





Grounding Diagram



* Grounding Lugs and Wire are not required in systems using Enphase microinverters.

Hellmann (#560438)

pitched roof

Bill of Materials

Part	Spares	Total Qty
Rails & Splices		
XR-100-168B XR100, Rail 168" (14 Feet) Black	0	4
Clamps & Grounding		
UFO-CL-01-B1 Universal Module Clamp, Black	0	20
UFO-STP-35MM-B1 Stopper Sleeve, 35MM, Black	0	8
XR-LUG-03-A1 Grounding Lug, Low Profile	0	2
Attachments		
LFT-03-B1 Slotted L-Foot, Black	0	16
BHW-SQ-02-A1 Square-Bolt Bonding Hardware	0	16
Accessories		
XR-100-CAP Kit, End Cap XR100 (10 sets per bag)	0	1
BHW-MI-01-A1 MicroInverter Bonding Hardware, T-Bolt	0	8