

CERTIFICATE OF APPROPRIATENESS ALTERATION & ADDITON CHECKLIST



PLANNING &
DEVELOPMENT
DEPARTMENT

Well in advance of the COA application deadline contact staff to discuss your project and, if necessary, to make an appointment to meet with staff for a project consultation.

Complete all applicable items and submit with the COA application form. Staff can assist you in determining what items are required for your scope of work. An incomplete application may cause delays in processing or may be deferred to the next agenda. Application materials must clearly represent current and proposed conditions. Refer to Houston Code of Ordinances, Ch. 33 VII, Sec. 33-241 for approval criteria for alteration, rehabilitation, restoration and additions.

PROPERTY ADDRESS: 7634 Wynlea St.

BUILDING TYPE

- | | |
|---|--|
| <input checked="" type="checkbox"/> single-family residence | <input type="checkbox"/> garage |
| <input type="checkbox"/> multi-family residence | <input type="checkbox"/> carport |
| <input type="checkbox"/> commercial building | <input type="checkbox"/> accessory structure |
| <input type="checkbox"/> mixed use building | <input type="checkbox"/> other |
| <input type="checkbox"/> institutional building | |

ALTERATION TYPE

- | | |
|--|---|
| <input checked="" type="checkbox"/> addition | <input type="checkbox"/> roof |
| <input type="checkbox"/> foundation | <input type="checkbox"/> awning or canopy |
| <input type="checkbox"/> wall siding or cladding | <input type="checkbox"/> commercial sign |
| <input type="checkbox"/> windows or doors | <input type="checkbox"/> ramp or lift |
| <input type="checkbox"/> porch or balcony | <input type="checkbox"/> other |

WRITTEN DESCRIPTION

- property description, current conditions and any prior alterations or additions
- proposed work; plans to change any exterior features, and/or addition description
- current building material conditions and originality of any materials proposed to be repaired or replaced
- proposed new materials description; attach specification sheets if necessary

PHOTOGRAPHS

 label photos with description and location

- elevations of all sides
- detail photos of exterior elements subject to proposed work
- historical photos as evidence for restoration work

DRAWINGS

 scale like drawings the same; include all dimensions and drawing scale; label with cardinal directions

- | | |
|--|---|
| <input checked="" type="checkbox"/> current site plan | <input type="checkbox"/> demolition plan |
| <input checked="" type="checkbox"/> proposed site plan | <input type="checkbox"/> current roof plan |
| <input type="checkbox"/> current floor plans | <input type="checkbox"/> proposed roof plan |
| <input type="checkbox"/> proposed floor plans | <input type="checkbox"/> current elevations (all sides) |
| <input type="checkbox"/> current window and door schedule | <input type="checkbox"/> proposed elevations (all sides) |
| <input type="checkbox"/> proposed window and door schedule | <input type="checkbox"/> perspective and/or line of sight |

CERTIFICATE OF APPROPRIATENESS APPLICATION FORM



**PLANNING &
DEVELOPMENT
DEPARTMENT**

PROPERTY

Address 7634 Wynlea St. Houston, TX 77061
 Historic District / Landmark _____ HCAD # _____
 Subdivision Glenbrook valley Lot 12 Block 57

DESIGNATION TYPE

- Landmark
- Protected Landmark
- Archaeological Site
- Contributing
- Noncontributing
- Vacant

PROPOSED ACTION

- Alteration or Addition
- Restoration
- New Construction
- Relocation
- Demolition
- Excavation

DOCUMENTS

Application checklist for each proposed action and all applicable documentation listed within are attached

OWNER

Name Santiago Inchaurregui
 Company _____
 Mailing Address 7634 Wynlea St.
Houston, TX 77061
 Phone 409-795-1989
 Email _____

APPLICANT (if other than owner)

Name Emily Hoff
 Company Global Efficient Energy
 Mailing Address 21925 Franz Rd. #605
Katy, TX 77449
 Phone 682-626-5591 ext. 2443
 Email _____

Signature Santiago Inchaurregui
 Date 3/21/16

Signature Emily Hoff
 Date 3/21/16

ACKNOWLEDGEMENT OF RESPONSIBILITY

Requirements: A complete application includes all applicable information requested on checklists to provide a complete and accurate description of existing and proposed conditions. Preliminary review meeting or site visit with staff may be necessary to process the application. Owner contact information and signature is required. Late or incomplete applications will not be considered.

Deed Restrictions: You have verified that the work does not violate applicable deed restrictions.

Public Records: If attached materials are protected by copyright law, you grant the City of Houston, its officers, agencies, departments, and employees, non-exclusive rights to reproduce, distribute and publish copyrighted materials before the Houston Archaeological and Historical Commission, the Planning Commission, City Council, and other City of Houston commissions, agencies, and departments, on a City of Houston website, or other public forum for the purposes of application for a Certificate of Appropriateness or building permit, and other educational and not for profit purposes. You hereby represent that you possess the requisite permission or rights being conveyed here to the City.

Compliance: If granted, you agree to comply with all conditions of the COA. Revisions to approved work require staff review and may require a new application and HAHC approval. Failure to comply with the COA may result in project delays, fines or other penalties.

Planner _____ Application received ___/___/___ Application complete ___/___/___

CERTIFICATE OF APPROPRIATENESS APPLICATION INSTRUCTIONS



**PLANNING &
DEVELOPMENT
DEPARTMENT**

Well in advance of the COA application deadline contact staff to discuss your project, application requirements, and, if necessary, to make an appointment to meet with staff for a project consultation. Visit the **Historic Preservation Web Manual** for historic district profiles, project guidance and forms. www.houstontx.gov/HistoricPreservationManual

Historic Preservation Office
832.393.6556
historicpreservation@houstontx.gov

SUBMISSION INSTRUCTIONS

To submit application to Planning Department:

- email documents to historicpreservation@houstontx.gov (attachments must be less than 10MB)
- send a Dropbox shared folder invitation to historicpreservation@houstontx.gov, or
- contact staff to set up an appointment to drop off a disc or flash drive.

MEETING SCHEDULE

- Applications are due **22 calendar days** in advance of the HAHC meeting by **12 PM (noon)** on the deadline date. Exception: revisions to items deferred or denied at the previous HAHC meeting are due 15 days in advance of the scheduled meeting.
- **Application deadlines are firm.** All materials must be submitted by the deadline to be considered at the following HAHC meeting. Designs must be final at time of application; revisions will not be accepted after the deadline.
- HAHC will not accept new material or redesigns presented at the HAHC meeting. Deferral until the following month's meeting may be necessary in such cases to allow for adequate review by staff and commissioners.
- HAHC monthly meetings are held at 3:00 PM at City Hall Annex, 900 Bagby Street, City Council Chambers, Public Level.

2016 Meeting Dates (Thursdays unless noted otherwise)	COA Application Deadlines	Demolition / Relocation Posted Sign Deadlines
January 28	January 6	January 18
February 25	February 3	February 15
March 24	March 2	March 14
April 21	March 30	April 11
May 19	April 27	May 9
June 16	May 25	June 6
July 28	July 6	July 18
August 25	August 3	August 15
September 22	August 31	September 12
October 20	September 28	October 10
November 17	October 26	November 7
December 14 (Wednesday)	November 22	December 4

CERTIFICATE OF APPROPRIATENESS APPLICATION INSTRUCTIONS



PLANNING &
DEVELOPMENT
DEPARTMENT

DEFINITIONS

✓ **Addition:** any expansion to an existing building, structure or object.

Alteration: any change to the exterior of a building or structure, including adding, moving, removing or replacing an exterior feature.

Demolition: an act or process that destroys in whole, or a majority of, any building, structure, object or site.

Excavation: to expose, uncover, or remove by digging, cutting or hollowing out.

Exterior Feature: an element of the architectural character and the general arrangement of the external portion of a building, structure or object, including building materials and parts of the exterior wall assembly such as walls studs, interior shiplap and the foundation

Mandatory Repair: a repair of a building or structure that is necessary to comply with Article IX, Ch. 10, Houston Code of Ordinances, as evidenced by an order of the hearing official or the building and standards commission or by a citation.

New Construction: the erection of a new building, structure, or object, on a lot, site, or other property.

Relocation: any change in the location of a building, structure, or object.

Restoration: accurately recovering the form and detail of a building, structure, object, or site and its setting as it appeared at a particular period of time by means of the removal of later work, or by the replacement of missing earlier work, or both.

Emily Hoff

From: [REDACTED]
Sent: Tuesday, March 01, 2016 2:51 PM
To: [REDACTED]
Cc: Emily Hoff
Subject: Re: Glenbrook Valley ARB: 7634 Wynlea Solar Panel Project

Thank you for contacting the Glenbrook Valley Civic Club Architectural Review Board about installation of solar panels at 7634 Wynlea.

The role of the board is to review projects to ensure that they are in accordance with the deed restrictions and to offer advice on the permitting process with the City of Houston. The property is in the Glenbrook Valley Historic District and part of the permitting process requires applying for a Certificate of Appropriateness.

The proposed installation of solar panels does not violate any deed restrictions and is acceptable. The installation of solar panels will require a Certificate of Appropriateness from the Houston Archeological and Historical Commission and a permit from the City of Houston.

Mike Morse
For the Glenbrook Valley Civic Club Architectural Review Board

On Feb 25, 2016, at 10:41 AM, Mike Morse <morsem@icloud.com> wrote:

Thank you for contacting the Glenbrook Valley Civic Club Architectural Review Board about the installation of solar panels at 7634 Wynlea.

I will circulate the material to the board and provide you with comments.

Mike Morse
for the Glenbrook Valley Civic Club Architectural Review Board

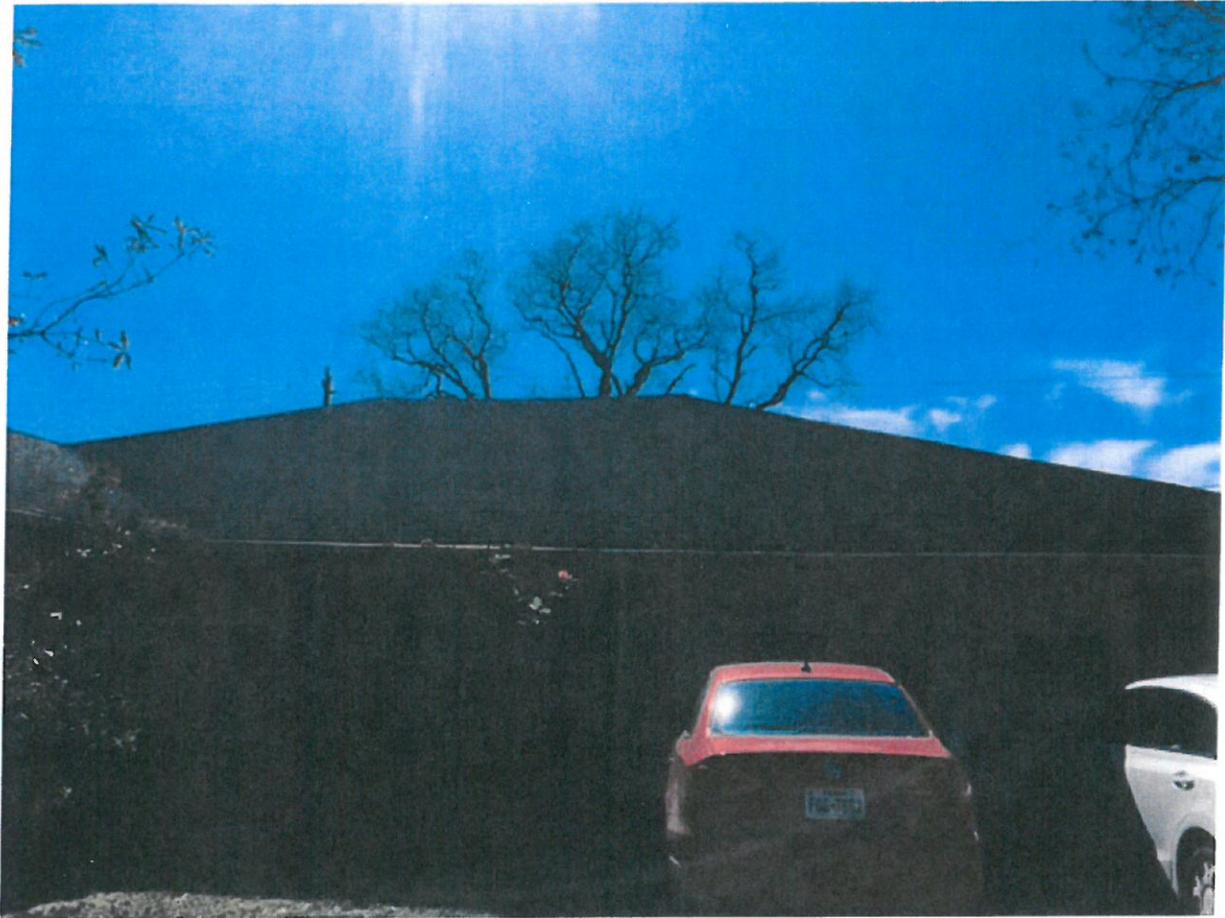
HOA APPROVAL

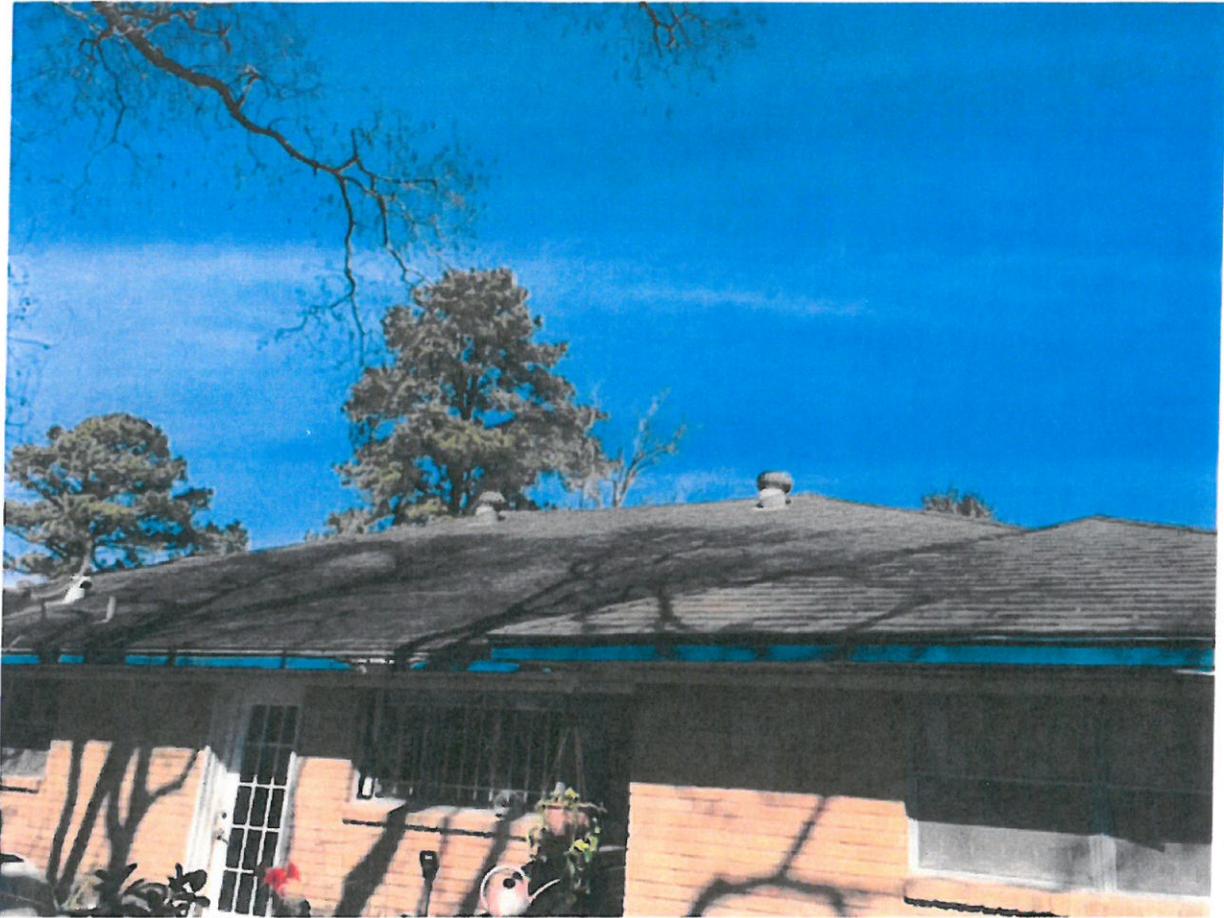


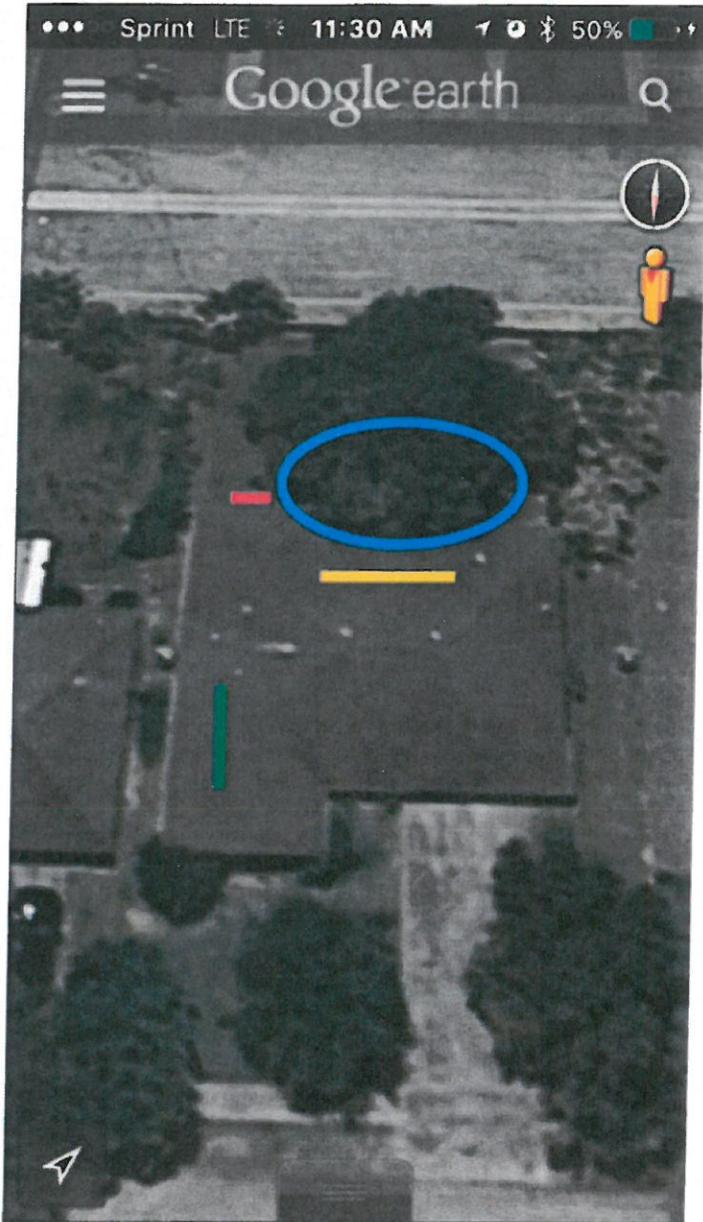
GLOBAL

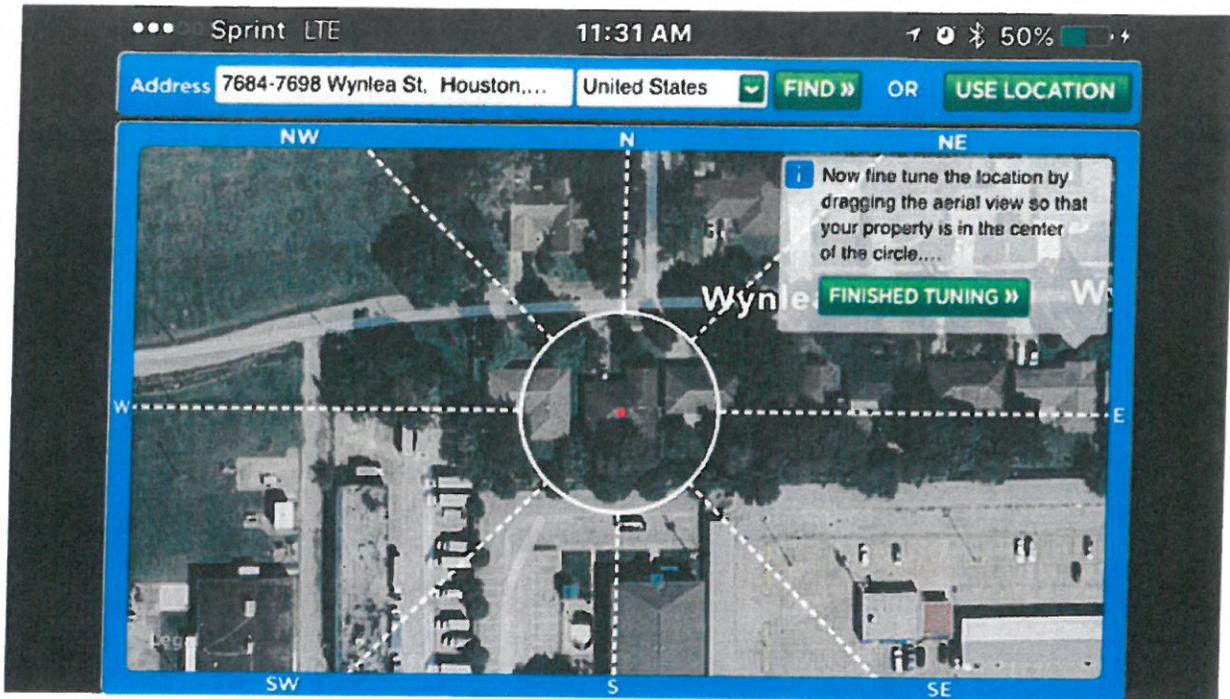
EFFICIENT ENERGY











Name:	<u>Santiago Inchaurregui</u>	W/DC:	<u>1250</u>	Panel Qty:	<u>(5) Solarworld SW260</u>
Address:	<u>7634 Wynlea Street</u>	Inveter(s):	<u>(5) Enphase M215 Micro Inverter</u>	Azimuth:	<u>98</u>
	<u>Houston, Texas 77061</u>	Tilt:	<u>28</u>		
Phone:	<u>409-795-1989</u>	Email Address:			



Power Meter
&
Solar disconnect

65"x39" Solar
Panel

APPROVED
FOR BUILDING PERMIT ONLY
CITY OF HOUSTON
CODE ENFORCEMENT DIVISION

Owner is responsible to
comply with the Building Code
in approved specifications
and all work shall be
done in accordance with the approved plans.
THIS PLAN SHALL BE KEPT
FOR INSPECTORS. SEPARATE
PERMIT FOR ELECTRICAL REQUIRED.

NO. 384

With current location on the roof the Est. Avg. Year AC
Energy (kWh) = 1,482 Most efficient by more than 10%

- Solar panel is 65"x39" and 2" thick
- Solar panel matches the slope of the roof
- Solar panel is mounted on the roof and will not extend above the roof line
- Solar panel will be installed approx. 5" above the shingles
- Solar panel is black in color and has black mounting brackets and frame.

STATE OF TEXAS
★
ROGER L. BLAIR
110564
LICENSED
PROFESSIONAL ENGINEER

Rog Blair

Feb 20, 2016
Texas Firm No. F-15209

Santiago Inchaurregui
7634 Wynlea Street
Houston, Texas 77061

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FOR BUILDING PERMITS ONLY

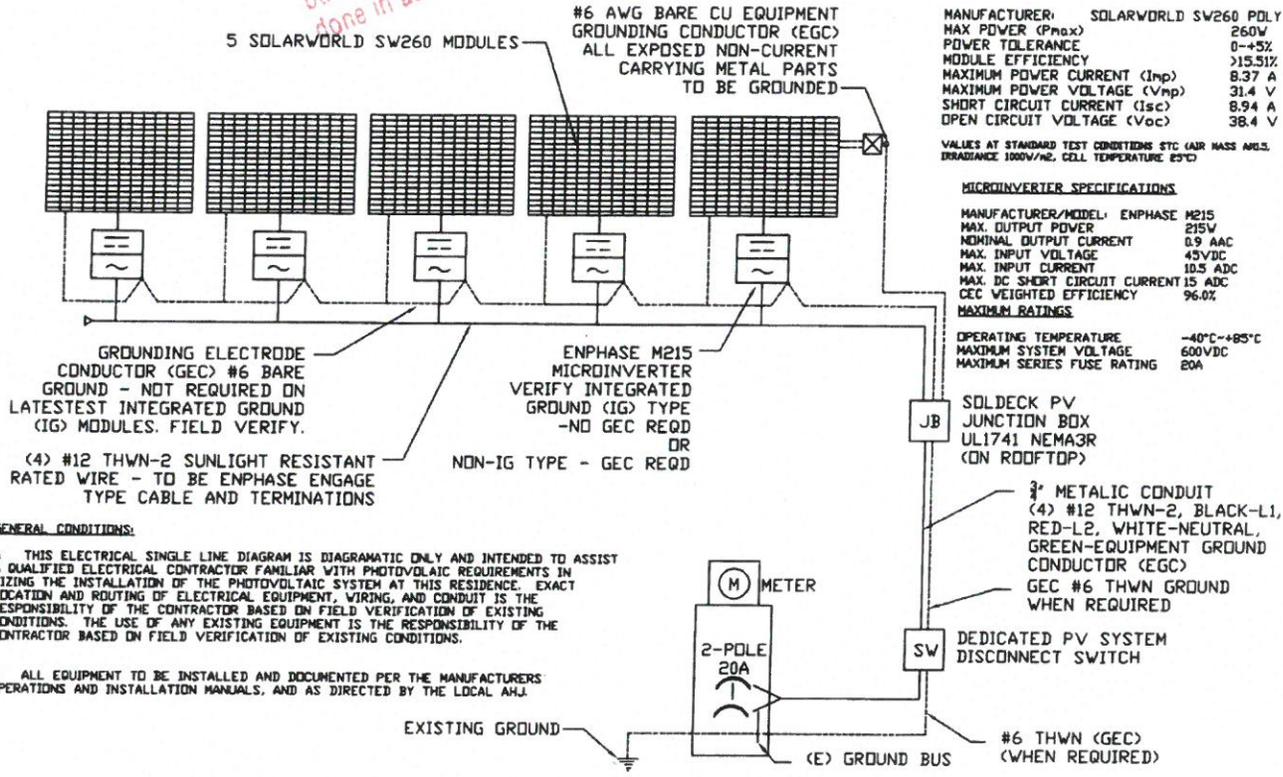
APPROVED ELECTRICAL PLAN

ALL CODES AND SPECIFICATIONS TO BE IN ACCORDANCE WITH CURRENT NATIONAL ELECTRICAL CODE & CITY BUILDING CODE. THIS PLAN SHALL BE KEPT ON JOB FOR INSPECTORS. SEPARATE PERMIT FOR ELECTRICAL REQUIRED.

NO. 384



SINGLE LINE DIAGRAM



- NOTES:**
- EQUIPMENT SHALL BE INSTALLED IN ACCORDANCE WITH 2014 NEC ARTICLE 690.
 - CONDUCTORS ARE TO BE COPPER UNLESS OTHERWISE NOTED AND COMPLY WITH 2014 NEC 110.14.
 - ALL PV SYSTEM COMPONENTS SHALL BE LISTED AND COMPLY WITH UL1703 AND UL1741.
 - WIRING MATERIALS NOT PROTECTED IN CONDUIT SHALL BE SUITABLE FOR SUN EXPOSURE AND WET LOCATIONS.
 - CIRCUIT BREAKER TO BE SUITABLE PER 2014 NEC 690.64 (BX5).
 - THE EQUIPMENT GROUNDING CONDUCTOR SHALL BE CONTINUOUS PER 2014 NEC 690.48.
 - THE EQUIPMENT GROUNDING CONDUCTOR SHALL BE INSTALLED IN ACCORDANCE WITH 2014 NEC 690.43, 690.45 AND 250.122.
 - THE GROUNDING ELECTRODE CONDUCTOR SHALL BE CONTINUOUS PER 2014 NEC 250.64 (C) AND 690.47 (A), (WHEN REQUIRED).
 - LABEL SOLAR MODULES AND POWER INVERTERS WITH LISTING AGENCY NAME AND NUMBER PER 2014 NEC 110.3 (B).
 - BACKFED PV BREAKER SHALL BE INSTALLED AT THE OPPOSITE END OF THE BUS BAR FROM THE MAIN BREAKER.
 - AC DISCONNECT SHALL BE EXTERNALLY OPERATED KNIFE BLADE TYPE AND LOCKABLE IN THE "ON" AND "OFF" POSITIONS. VISIBLE DESIGNATIONS TO BE DIRECTLY ACCESSIBLE TO THE UTILITY.
 - ENPHASE MICROINVERTERS ARE RAPID SHUTDOWN COMPLIANT PER 2014 NEC ARTICLE 690.12.
 - RAPID SHUTDOWN PLAQUE SHALL BE INSTALLED PER 2014 NEC 690.56 (C).

MAXIMUM TOTAL CURRENTS PRODUCED	
2 MODULES	- 1.8 AMPS
3 MODULES	- 2.7 AMPS
4 MODULES	- 3.6 AMPS
5 MODULES	- 4.5 AMPS
6 MODULES	- 5.4 AMPS
7 MODULES	- 6.3 AMPS
8 MODULES	- 7.2 AMPS

Caiman Engineering Inc. 16922 Old Washington Rd Nevada City, CA 95959 Texas Firm No. F-15209 530-478-9500	GLOBAL EFFICIENT ENERGY 2320 GRAVEL DR FORT WORTH TX 76118 682-626-5593	SINGLE LINE DIAGRAM PHOTOVOLTAIC SYSTEM 240 VAC SINGLE PHASE 5 ENPHASE M215 INVERTER 5 SOLARWORLD SW260 PV PANELS 260 WATT NOMINAL
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ENGINEERING, INC.

Firm # 15209

16922 Old Washington Road
Nevada City, CA 95959

City of Houston
P.O. Box 1562
Houston, TX 77251

February 9, 2016

Subject: Inchaurregui Roof Mounted Solar Array
7634 Wynlea Street Houston, Texas 77061
Caiman Engineering Job No 16-116
Roof Mounted Solar Array Structural Certification

The solar array consisting of five Solarworld SW260 modules and Enphase M215 microinverters to be mounted on the above referenced residence has been evaluated and found to be in compliance with the 2012 International Residential Code (IRC) as amended by the City of Houston and the 2012 International Building Code with City of Houston Amendments. The existing roof structure has been found to be capable of supporting the additional dead load of the panels as well as additional loads identified in Chapter 16 of the 2012 IRC and IBC. **Furthermore, the rail system has been certified to withstand up to 139 mph, 3 second burst wind loads per a Certification Letter from Caiman Engineering dated February 2, 2016.**

- The equipment (PV panels) eliminates the probability of people walking on the roof **within the equipment footprint** thereby effectively eliminating the live load **in the area of the equipment**. Since the design live load under 2012 International Code for a roof is 20 psf and the equipment weight of 2.51 psf, it is my professional opinion that the existing roof system, designed for a minimum of 20 psf live load can handle the additional dead load of 2.51 psf.
- The same wind load can be expected for the solar array as with the original roof structure as the pitch of the array is the same as the original roof pitch. It is my professional opinion and experience that standard attachments provide a significant factor of safety to overcome uplift from wind and shear from weight.

If you have any questions, please don't hesitate to call me at 530-478-9500.

Sincerely,



Roger Blair P.E.
Caiman Engineering Inc.
Caiman Engineering Firm No. F-15209

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FOR BUILDING PERMIT ONLY
CITY OF HOUSTON
CODE ENFORCEMENT DIVISION

The owner is responsible for the accuracy of the information provided and for compliance with the Building Code. Such approved plans and specifications shall not be altered, modified, or changed or altered without authorization from the building official, and all work shall be done in accordance with the approved plans.

NO. 35A



Firm # 15209

16922 Old Washington Road
Nevada City, CA 95959
530.478.9500

February 2, 2016

To whom it may concern:

Subject: **Ironridge Rail and Attachment Evaluation and Certification**

The above referenced products were evaluated current codes referenced below. The evaluation references Starling Madison Lofquist Structural Engineering Report dated December 18, 2014 (report attached). The report contains tables for all roof zones, wind speeds, wind exposures, snow loads and roof slopes. These tables shall be used for each specific site location and roof conditions to determine the maximum span of the rail and therefore the spacing of the attachments. The tables have spans for wind speeds between 100 mph and 170 mph. Additionally, the original report has tables for a maximum module length of 67.5" as well as another series of tables for maximum module length of 78.5". For simplicity, only the tables for maximum module length of 67.5" has been included with this letter.

Following are the components covered under this evaluation:

- XR10 rail
- FlashFoot anchor for composition shingle roof with slotted L-feet
- Standoffs attachments for tile roof and tilt mount with slotted L-feet
- Tilt legs for tilt mount system

Cut sheets for the components are attached to this letter.

Analysis criteria were based on the following:

- Code requirements of the International Building Code, 2012 Edition (IBC) as amended by the City of Houston.
- Loads developed by using ASCE 07-10 Minimum Design Loads for Buildings and Other Structures.
- Wind design procedure based on section 30.5, Method 2 - Part 2 Components and Cladding - Low Rise Buildings (Simplified)
- Maximum wind design speed 170 mph
- Maximum ground snow load 90 psf
- Mean height of building 30ft.
- Risk Category I
- Provide 2" clearance between the roof and the rail
- End cantilever span (max) = $0.40 \times$ maximum span for tables
- No rail splices in end spans
- No rail splices in the middle 1/3 of the interior spans
- Single simple span(s). Spans listed in the tables may be increased by 8% for continuous rails of 3 or more spans.
- For slopes greater than 45° , the 28° to 45° roof slope tables may be used.

The rail runs perpendicular to the long edge of the solar modules, with two (2) rails per module at support points recommended by the module manufacturer.

Ironridge Rail and Attachment Evaluation and Certification

Caiman Engineering

Page 2

February 2, 2016

If you have any questions, please don't hesitate to call me at 530-478-9500.

Sincerely,



Roger Blair P.E.
Caiman Engineering Inc.
Caiman Engineering Firm No. F-15209

APPROVED
FOR BUILDING PERMIT ONLY
CITY OF HOUSTON
CODE ENFORCEMENT DIVISION

The owner is responsible for compliance with the building code. Such approved plans and specifications shall not be changed, modified or altered without authorizations from the building official, and all work shall be done in accordance with the approved plans.

NO. 35A



Starling Madison Lofquist, Inc.
Consulting Structural and Forensic Engineers

5224 South 39th Street, Phoenix, Arizona 85040
tel: (602) 438-2500 fax: (602) 438-2505 ROC#291316 www.smleng.com

IronRidge
1495 Zephyr Ave
Hayward, CA 94544

December 18, 2014
Page 1 of 20

Attn: Mr. David F. Taggart, Vice President Products

Subject: IronRidge XR10 Rail, Roof Flush Mounting System – Structural Analysis

Dear Sir:

We have analyzed the IronRidge XR10 Rail for the subject solar module support system and determined that, for the configurations and criteria described below, it is in compliance with the applicable sections of the following Reference Documents:

Codes: ASCE/SEI 7-10 Min. Design Loads for Buildings & Other Structures
International Building Code 2012 Edition

Other: AC428, Acceptance Criteria for Modular Framing Systems Used to Support PV
Modules, dated Effective November 1, 2012 by ICC-ES
Aluminum Design Manual, 2010 Edition

The IronRidge XR10 Rail is an extruded aluminum section with an overall depth of 1.75 in. and a net area of 0.363 sq.in. The rails are used to support solar modules, typically, on the roof of a building. See Exhibit A – attached. The rails are clamped to aluminum angle brackets that are either attached directly to the roof framing or attached to a stand that is screwed to the roof framing. The rails are mounted across the slope with a small clearance (flush mounting) to the underlying roof structure. The installed solar modules are at the same slope as the underlying roof structure.

All loads are transferred to the roof framing through the angle brackets by simple bi-axial flexure of the rails. The maximum span of the rails is governed by either the mid-span flexural stresses or the deflection requirement that the rail not come into contact with the roof.

The effect of seismic loads (for all design categories A-F) have been determined to be less than the effect due to wind loads in all load conditions and combinations. Therefore, the maximum allowable spans for common load cases are shown in the tables below. Tables 1A-9A are for modules with a maximum long dimension of 67.5 inches and Tables 1B-9B are for modules with a maximum long dimension of 78.5 inches.

Table 1A - MAXIMUM SPANS (in) - Roof Slope 0° to 6° - Wind Zone 1 (67.5" Max Module Length)											
XR10 Rail	Wind Speed	Ground Snow Load									
Exposure	mph	0 psf	10 psf	20 psf	30 psf	40 psf	50 psf	60 psf	70 psf	80 psf	90 psf
Category B	100	81	69	58	54	49	44	40	37	35	33
	105	81	69	58	54	49	44	40	37	35	33
	110	81	69	58	54	49	44	40	37	35	33
	120	81	69	58	54	49	44	40	37	35	33
	130	76	69	58	54	49	44	40	37	35	33
	140	70	69	58	54	49	44	40	37	35	33
	150	65	65	58	54	49	44	40	37	35	33
	160	61	61	58	54	49	44	40	37	35	33
Category C	170	57	57	57	54	49	44	40	37	35	33
	100	81	69	58	54	49	44	40	37	35	33
	105	79	69	58	54	49	44	40	37	35	33
	110	76	69	58	54	49	44	40	37	35	33
	120	69	69	58	54	49	44	40	37	35	33
	130	64	64	58	54	49	44	40	37	35	33
	140	59	59	58	54	49	44	40	37	35	33
	150	55	55	55	54	49	44	40	37	35	33
Category D	160	51	51	51	51	49	44	40	37	35	33
	170	48	48	48	48	48	44	40	37	35	33
	100	76	69	58	54	49	44	40	37	35	33
	105	73	69	58	54	49	44	40	37	35	33
	110	69	69	58	54	49	44	40	37	35	33
	120	63	63	58	54	49	44	40	37	35	33
	130	58	58	58	54	49	44	40	37	35	33
	140	54	54	54	54	49	44	40	37	35	33
150	50	50	50	50	49	44	40	37	35	33	
160	47	47	47	47	47	44	40	37	35	33	
170	44	44	44	44	44	44	40	37	35	33	

Notes – see page 20

Table 2A - MAXIMUM SPANS (in) - Roof Slope 0° to 6° - Wind Zone 2 (67.5" Max Module Length)											
XR10 Rail	Wind Speed	Ground Snow Load									
Exposure	mph	0 psf	10 psf	20 psf	30 psf	40 psf	50 psf	60 psf	70 psf	80 psf	90 psf
Category B	100	73	69	58	54	49	44	40	37	35	33
	105	70	69	58	54	49	44	40	37	35	33
	110	66	66	58	54	49	44	40	37	35	33
	120	61	61	58	54	49	44	40	37	35	33
	130	56	56	56	54	49	44	40	37	35	33
	140	52	52	52	52	49	44	40	37	35	33
	150	48	48	48	48	48	44	40	37	35	33
	160	45	45	45	45	45	44	40	37	35	33
	170	43	43	43	43	43	43	40	37	35	33
Category C	100	62	62	58	54	49	44	40	37	35	33
	105	59	59	58	54	49	44	40	37	35	33
	110	56	56	56	54	49	44	40	37	35	33
	120	51	51	51	51	49	44	40	37	35	33
	130	47	47	47	47	47	44	40	37	35	33
	140	44	44	44	44	44	44	40	37	35	33
	150	41	41	41	41	41	41	40	37	35	33
	160	38	38	38	38	38	38	38	37	35	33
	170	36	36	36	36	36	36	36	36	35	33
Category D	100	56	56	56	54	49	44	40	37	35	33
	105	54	54	54	54	49	44	40	37	35	33
	110	51	51	51	51	49	44	40	37	35	33
	120	47	47	47	47	47	44	40	37	35	33
	130	43	43	43	43	43	43	40	37	35	33
	140	40	40	40	40	40	40	40	37	35	33
	150	37	37	37	37	37	37	37	37	35	33
	160	35	35	35	35	35	35	35	35	35	33
	170	33	33	33	33	33	33	33	33	33	33

Notes – see page 20

Table 3A - MAXIMUM SPANS (in) - Roof Slope 0° to 6° - Wind Zone 3 (67.5" Max Module Length)											
XR10 Rail	Wind Speed	Ground Snow Load									
Exposure	mph	0 psf	10 psf	20 psf	30 psf	40 psf	50 psf	60 psf	70 psf	80 psf	90 psf
Category B	100	58	58	58	54	49	44	40	37	35	33
	105	56	56	56	54	49	44	40	37	35	33
	110	53	53	53	53	49	44	40	37	35	33
	120	48	48	48	48	48	44	40	37	35	33
	130	45	45	45	45	45	44	40	37	35	33
	140	41	41	41	41	41	41	40	37	35	33
	150	39	39	39	39	39	39	39	37	35	33
	160	36	36	36	36	36	36	36	36	35	33
Category C	100	49	49	49	49	49	44	40	37	35	33
	105	47	47	47	47	47	44	40	37	35	33
	110	45	45	45	45	45	44	40	37	35	33
	120	41	41	41	41	41	41	40	37	35	33
	130	38	38	38	38	38	38	38	37	35	33
	140	35	35	35	35	35	35	35	35	35	33
	150	32	32	32	32	32	32	32	32	32	32
	160	30	30	30	30	30	30	30	30	30	30
Category D	100	45	45	45	45	45	44	40	37	35	33
	105	43	43	43	43	43	43	40	37	35	33
	110	41	41	41	41	41	41	40	37	35	33
	120	37	37	37	37	37	37	37	37	35	33
	130	34	34	34	34	34	34	34	34	34	33
	140	32	32	32	32	32	32	32	32	32	32
	150	30	30	30	30	30	30	30	30	30	30
	160	28	28	28	28	28	28	28	28	28	28
170	26	26	26	26	26	26	26	26	26	26	

Notes – see page 20

Table 4A - MAXIMUM SPANS (in) - Roof Slope 7° to 27° - Wind Zone 1 (67.5" Max Module Length)											
XR10 Rail	Wind Speed	Ground Snow Load									
Exposure	mph	0 psf	10 psf	20 psf	30 psf	40 psf	50 psf	60 psf	70 psf	80 psf	90 psf
Category B	100	75	65	55	49	43	39	35	33	31	29
	105	75	65	55	49	43	39	35	33	31	29
	110	75	65	55	49	43	39	35	33	31	29
	120	75	65	55	49	43	39	35	33	31	29
	130	75	65	55	49	43	39	35	33	31	29
	140	71	65	55	49	43	39	35	33	31	29
	150	66	65	55	49	43	39	35	33	31	29
	160	62	62	54	48	43	39	35	33	31	29
Category C	170	59	59	53	47	43	39	35	33	31	29
	100	75	65	55	49	43	39	35	33	31	29
	105	75	65	55	49	43	39	35	33	31	29
	110	75	65	55	49	43	39	35	33	31	29
	120	70	65	55	49	43	39	35	33	31	29
	130	65	64	54	48	43	39	35	33	31	29
	140	60	60	53	48	43	39	35	33	31	29
	150	56	56	52	47	43	39	35	33	31	29
Category D	160	53	53	51	46	42	39	35	33	31	29
	170	50	50	50	45	41	38	35	33	31	29
	100	75	65	55	49	43	39	35	33	31	29
	105	73	65	55	49	43	39	35	33	31	29
	110	70	65	55	49	43	39	35	33	31	29
	120	64	64	54	48	43	39	35	33	31	29
	130	60	60	53	47	43	39	35	33	31	29
	140	55	55	52	46	42	39	35	33	31	29
Category D	150	52	52	50	46	42	39	35	33	31	29
	160	49	49	49	45	41	38	35	33	31	29
	170	46	46	46	44	40	37	35	33	31	29

Notes – see page 20

Table 5A - MAXIMUM SPANS (in) - Roof Slope 7° to 27° - Wind Zone 2 (67.5" Max Module Length)											
XR10 Rail	Wind Speed	Ground Snow Load									
Exposure	mph	0 psf	10 psf	20 psf	30 psf	40 psf	50 psf	60 psf	70 psf	80 psf	90 psf
Category B	100	72	65	55	49	43	39	35	33	31	29
	105	69	65	55	49	43	39	35	33	31	29
	110	66	65	55	49	43	39	35	33	31	29
	120	60	60	55	49	43	39	35	33	31	29
	130	56	56	55	49	43	39	35	33	31	29
	140	52	52	52	49	43	39	35	33	31	29
	150	49	49	49	49	43	39	35	33	31	29
	160	46	46	46	46	43	39	35	33	31	29
	170	43	43	43	43	43	39	35	33	31	29
Category C	100	61	61	55	49	43	39	35	33	31	29
	105	58	58	55	49	43	39	35	33	31	29
	110	56	56	55	49	43	39	35	33	31	29
	120	51	51	51	49	43	39	35	33	31	29
	130	48	48	48	48	43	39	35	33	31	29
	140	44	44	44	44	43	39	35	33	31	29
	150	41	41	41	41	41	39	35	33	31	29
	160	39	39	39	39	39	39	35	33	31	29
170	36	36	36	36	36	36	35	33	31	29	
Category D	100	56	56	55	49	43	39	35	33	31	29
	105	54	54	54	49	43	39	35	33	31	29
	110	52	52	52	49	43	39	35	33	31	29
	120	47	47	47	47	43	39	35	33	31	29
	130	44	44	44	44	43	39	35	33	31	29
	140	41	41	41	41	41	39	35	33	31	29
	150	38	38	38	38	38	38	35	33	31	29
	160	36	36	36	36	36	36	35	33	31	29
	170	33	33	33	33	33	33	33	33	31	29

Notes – see page 20

Table 6A - MAXIMUM SPANS (in) - Roof Slope 7° to 27° - Wind Zone 3 (67.5" Max Module Length)

XR10 Rail	Wind Speed	Ground Snow Load										
		0 psf	10 psf	20 psf	30 psf	40 psf	50 psf	60 psf	70 psf	80 psf	90 psf	
Exposure	mph											
Category B	100	59	59	55	49	43	39	35	33	31	29	
	105	56	56	55	49	43	39	35	33	31	29	
	110	54	54	54	49	43	39	35	33	31	29	
	120	49	49	49	49	43	39	35	33	31	29	
	130	46	46	46	46	43	39	35	33	31	29	
	140	42	42	42	42	42	39	35	33	31	29	
	150	40	40	40	40	40	39	35	33	31	29	
	160	37	37	37	37	37	37	35	33	31	29	
Category C	100	50	50	50	49	43	39	35	33	31	29	
	105	48	48	48	48	43	39	35	33	31	29	
	110	45	45	45	45	43	39	35	33	31	29	
	120	42	42	42	42	42	39	35	33	31	29	
	130	39	39	39	39	39	39	35	33	31	29	
	140	36	36	36	36	36	36	35	33	31	29	
	150	33	33	33	33	33	33	33	33	31	29	
	160	31	31	31	31	31	31	31	31	31	29	
Category D	100	46	46	46	46	43	39	35	33	31	29	
	105	44	44	44	44	43	39	35	33	31	29	
	110	42	42	42	42	42	39	35	33	31	29	
	120	38	38	38	38	38	38	35	33	31	29	
	130	35	35	35	35	35	35	35	33	31	29	
	140	33	33	33	33	33	33	33	33	31	29	
	150	31	31	31	31	31	31	31	31	31	29	
	160	29	29	29	29	29	29	29	29	29	29	
170	27	27	27	27	27	27	27	27	27	27		

Notes – see page 20

Table 7A - MAXIMUM SPANS (in) - Roof Slope 28° to 45° - Wind Zone 1 (67.5" Max Module Length)

XR10 Rail	Wind Speed	Ground Snow Load									
		0 psf	10 psf	20 psf	30 psf	40 psf	50 psf	60 psf	70 psf	80 psf	90 psf
Category B	100	72	66	57	51	45	41	38	35	33	31
	105	72	66	57	51	45	41	38	35	33	31
	110	71	65	57	50	45	41	38	35	33	31
	120	67	63	55	49	45	41	38	35	33	31
	130	64	61	54	48	44	41	38	35	33	31
	140	61	59	52	47	43	40	38	35	33	31
	150	58	57	51	46	43	40	37	35	33	31
	160	55	55	49	45	42	39	37	35	33	31
	170	53	53	48	44	41	38	36	34	33	31
Category C	100	68	63	55	50	45	41	38	35	33	31
	105	66	62	54	49	45	41	38	35	33	31
	110	64	61	54	48	44	41	38	35	33	31
	120	60	58	52	47	43	40	38	35	33	31
	130	57	56	50	46	42	39	37	35	33	31
	140	54	54	48	44	41	39	37	35	33	31
	150	51	51	47	43	40	38	36	34	33	31
	160	48	48	45	42	39	37	35	33	32	31
	170	46	46	44	41	38	36	34	33	31	30
Category D	100	64	61	54	48	44	41	38	35	33	31
	105	62	60	53	48	44	41	38	35	33	31
	110	60	58	52	47	43	40	38	35	33	31
	120	56	56	50	46	42	39	37	35	33	31
	130	53	53	48	44	41	39	36	35	33	31
	140	50	50	46	43	40	38	36	34	32	31
	150	47	47	45	41	39	37	35	33	32	31
	160	45	45	43	40	38	36	34	33	31	30
	170	43	43	41	39	37	35	33	32	31	29

Notes – see page 20

Table 8A - MAXIMUM SPANS (in) - Roof Slope 28° to 45° - Wind Zone 2 (67.5" Max Module Length)

XR10 Rail	Wind Speed	Ground Snow Load									
		0 psf	10 psf	20 psf	30 psf	40 psf	50 psf	60 psf	70 psf	80 psf	90 psf
Category B	100	72	66	57	51	45	41	38	35	33	31
	105	72	66	57	51	45	41	38	35	33	31
	110	71	65	57	50	45	41	38	35	33	31
	120	67	63	55	49	45	41	38	35	33	31
	130	64	61	54	48	44	41	38	35	33	31
	140	60	59	52	47	43	40	38	35	33	31
	150	56	56	51	46	43	40	37	35	33	31
	160	53	53	49	45	42	39	37	35	33	31
	170	50	50	48	44	41	38	36	34	33	31
Category C	100	68	63	55	50	45	41	38	35	33	31
	105	66	62	54	49	45	41	38	35	33	31
	110	64	61	54	48	44	41	38	35	33	31
	120	59	58	52	47	43	40	38	35	33	31
	130	55	55	50	46	42	39	37	35	33	31
	140	51	51	48	44	41	39	37	35	33	31
	150	48	48	47	43	40	38	36	34	33	31
	160	45	45	45	42	39	37	35	33	32	31
	170	43	43	43	41	38	36	34	33	31	30
Category D	100	64	61	54	48	44	41	38	35	33	31
	105	62	60	53	48	44	41	38	35	33	31
	110	59	58	52	47	43	40	38	35	33	31
	120	55	55	50	46	42	39	37	35	33	31
	130	51	51	48	44	41	39	36	35	33	31
	140	47	47	46	43	40	38	36	34	32	31
	150	44	44	44	41	39	37	35	33	32	31
	160	42	42	42	40	38	36	34	33	31	30
	170	39	39	39	39	37	35	33	32	31	29

Notes – see page 20

Table 9A - MAXIMUM SPANS (in) - Roof Slope 28° to 45° - Wind Zone 3 (67.5" Max Module Length)											
XR10 Rail	Wind Speed	Ground Snow Load									
Exposure	mph	0 psf	10 psf	20 psf	30 psf	40 psf	50 psf	60 psf	70 psf	80 psf	90 psf
Category B	100	72	66	57	51	45	41	38	35	33	31
	105	72	66	57	51	45	41	38	35	33	31
	110	71	65	57	50	45	41	38	35	33	31
	120	67	63	55	49	45	41	38	35	33	31
	130	64	61	54	48	44	41	38	35	33	31
	140	60	59	52	47	43	40	38	35	33	31
	150	56	56	51	46	43	40	37	35	33	31
	160	53	53	49	45	42	39	37	35	33	31
Category C	170	50	50	48	44	41	38	36	34	33	31
	100	68	63	55	50	45	41	38	35	33	31
	105	66	62	54	49	45	41	38	35	33	31
	110	64	61	54	48	44	41	38	35	33	31
	120	59	58	52	47	43	40	38	35	33	31
	130	55	55	50	46	42	39	37	35	33	31
	140	51	51	48	44	41	39	37	35	33	31
	150	48	48	47	43	40	38	36	34	33	31
Category D	160	45	45	45	42	39	37	35	33	32	31
	170	43	43	43	41	38	36	34	33	31	30
	100	64	61	54	48	44	41	38	35	33	31
	105	62	60	53	48	44	41	38	35	33	31
	110	59	58	52	47	43	40	38	35	33	31
	120	55	55	50	46	42	39	37	35	33	31
	130	51	51	48	44	41	39	36	35	33	31
	140	47	47	46	43	40	38	36	34	32	31
Category D	150	44	44	44	41	39	37	35	33	32	31
	160	42	42	42	40	38	36	34	33	31	30
	170	39	39	39	39	37	35	33	32	31	29

Notes – see page 20

Notes – Tabulated values are based on the following criteria:

1. Building mean roof height = 30 ft
2. Risk Category I
3. Solar maximum module long dimension is 67.5 inches for Tables 1A-9A and 78.5 inches for Tables 1B-9B.
4. Provide 2 in. clear between roof and rail
5. End cantilever span (max) = 0.40 x maximum span from above tables
6. No rail splices in end spans
7. No rail splices in middle 1/3 of interior spans
8. Single simple span(s). Spans listed in the tables above may be multiplied by 1.08 for continuous rails of 3 or more spans.

Our analysis assumes that the rails, including the connections and associated hardware, are installed in a workmanlike manner in accordance with the “IronRidge Roof Mount Installation Manual” by IronRidge and generally accepted standards of construction practice. Additional information is available at the IronRidge web site, IronRidge.com. Verification of PV Module capacity to support the loads associated with the given array shall be the responsibility of the Contractor or Owner and not IronRidge or Starling Madison Lofquist.

The adequacy of the supporting roof framing is to be determined by others.

Please feel free to contact me at your convenience if you have any questions.

Respectfully yours,

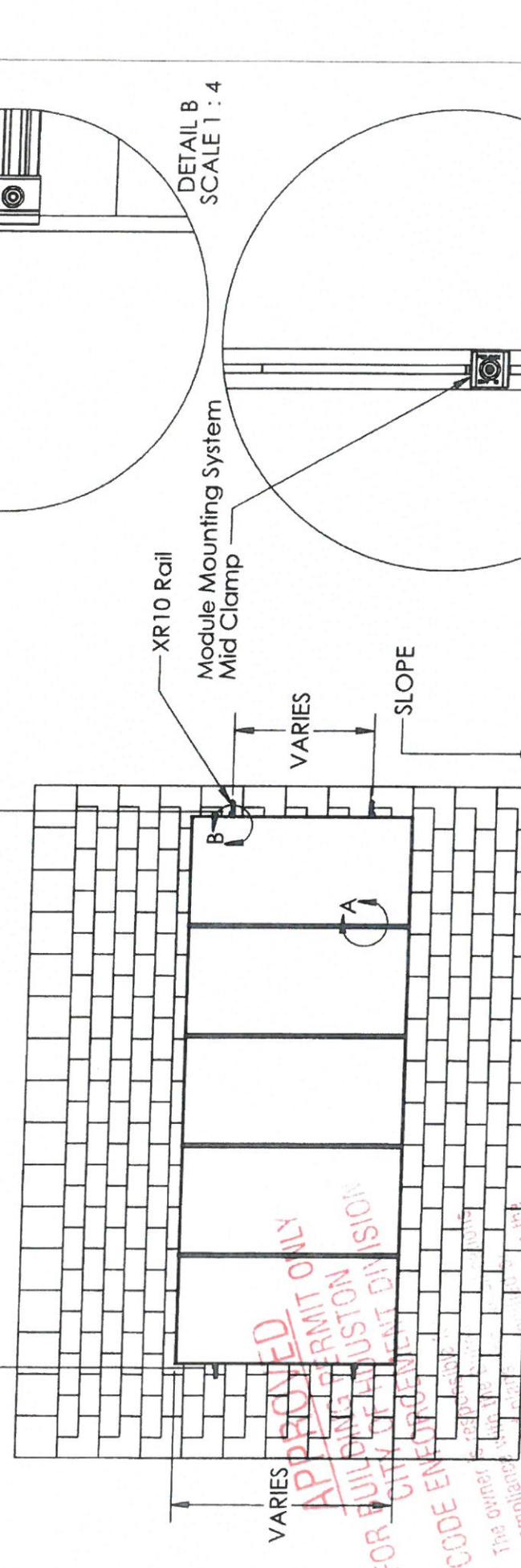
Tres Warner, P.E.
Design Division Manager



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The owner is responsible for the accuracy of the information provided. Such approved plans and specifications shall not be changed, modified or altered without authorizations from the building official, and all work shall be done in accordance with the approved plans
NO. 35A

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REV.	DESCRIPTION	DATE	APPROVED
A	INITIAL RELEASE	05/28/2014	SO



Oct 8, 2015
Caiman Engineering Firm No. F-15209



DRAWN		SO	05/28/2014
CHECKED		SM	05/28/2014
ENG. APPR.		-	-
MFG. APPR.		-	-
O.A.		-	-

COMMENTS:

DO NOT SCALE DRAWING

SIZE	DWG. NO.	REV.
A		A

XR10 ROOF MOUNT FLUSH

SCALE: 1/4"

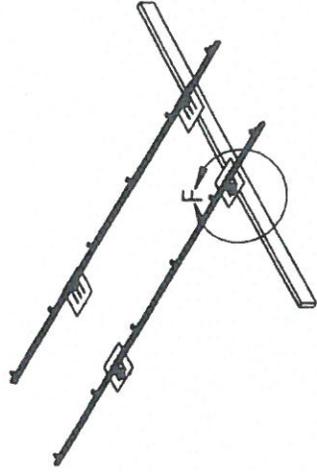
WEIGHT:

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CITY OF HOUSTON
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The owner shall be responsible for obtaining all necessary permits and approvals. Such applications shall be prepared in accordance with the applicable code requirements. The owner shall be responsible for obtaining all necessary permits and approvals. Such applications shall be prepared in accordance with the applicable code requirements. The owner shall be responsible for obtaining all necessary permits and approvals. Such applications shall be prepared in accordance with the applicable code requirements.

NO 35A
PLAN VIEW
SCALE 1:40

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XR10 Rail

L-FOOT

FLASHFOOT
(Or Alternate flashing)

ROOF FRAMING
(BY OTHERS)

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CODE ENFORCEMENT DIVISION
The original drawings were approved on 10/8/15
Sheet No. 35A
altered when drawings were approved from the
building official, and all work shall be
done in accordance with the approved plans.
NO. 35A



Oct 8, 2015

Caiman Engineering Firm No. F-15209



XR10 ROOF MOUNT FLUSH

SHEET NO.	REV.
A	A
SCALE: 3/8"	WEIGHT:

COMMENTS:
DO NOT SCALE DRAWING

DETAIL F
SCALE 1 : 5

EXHIBIT A - page 3 of 3

XR Rails

XR10 Rail



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

- 6' spanning capability
- Moderate load capability
- Clear anodized finish

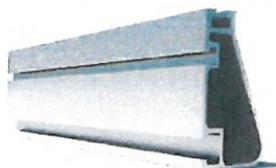
XR100 Rail



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

Internal Splices



All rails use internal splices for seamless connections.

- Self-tapping screws
- Varying versions for rails
- Grounding Straps offered

Attachments

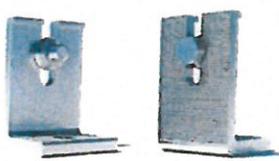
FlashFoot



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

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

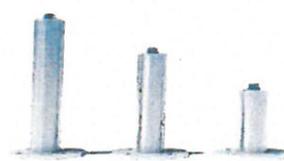
Slotted L-Feet



Drop-in design for rapid rail attachment.

- High-friction serrated face
- Heavy-duty profile shape
- Clear & black anod. finish

Standoffs



Raise flush or tilted systems to various heights.

- Works with vent flashing
- Ships pre-assembled
- Lengths from 3" to 9"

Tilt Legs

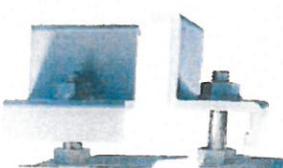


Tilt assembly to desired angle, up to 45 degrees.

- Attaches directly to rail
- Ships with all hardware
- Fixed and adjustable

Clamps & Grounding

End Clamps



Slide in clamps and secure modules at ends of rails.

- Clear and black anod.
- Sizes from 1.22" to 2.3"
- Optional Under Clamps

Mid Clamps



Attach and ground modules in the middle of the rail.

- Parallel bonding T-bolt
- Reusable up to 10 times
- Mill & black stainless

Grounding Lugs



Ground system using the rail's top slot.

- No clips or washers
- Eliminates pre-drilling
- Easy top-slot mounting

Accessories

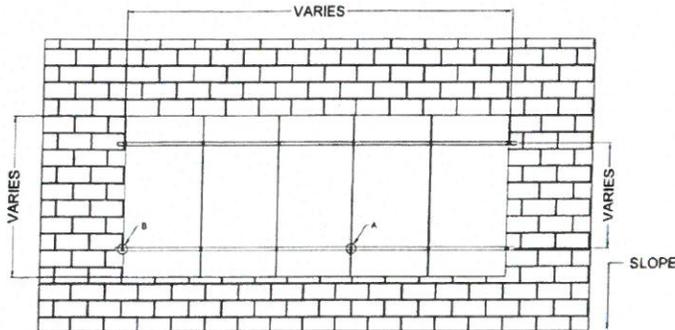


Provide a finished and organized look for rails.

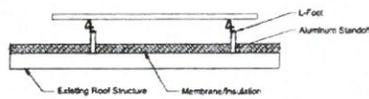
- Snap-in Wire Clips
- Perfected End Caps
- UV-protected polymer

Assembly CAD Details

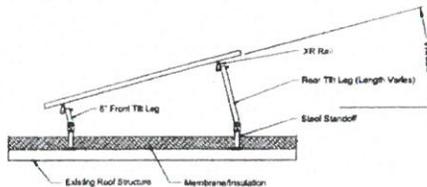
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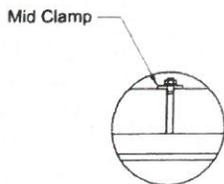
Typical Flush Mount Array - Plan View
1/2" = 1'-0"



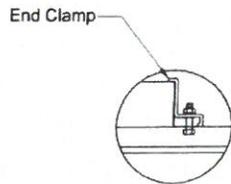
Section - Flush Mount - Flat Roof
3/4" = 1'-0"



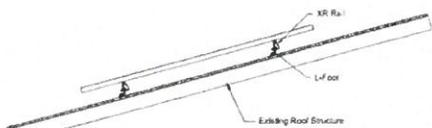
Section - Tilt Mount - Flat Roof
3/4" = 1'-0"



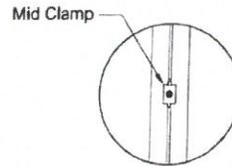
Detail D - Mid Clamp to Rail - Elevation
6" = 1'-0"



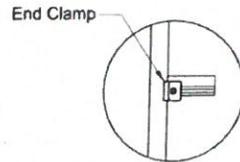
Detail E - End Clamp to Rail - Elev.
6" = 1'-0"



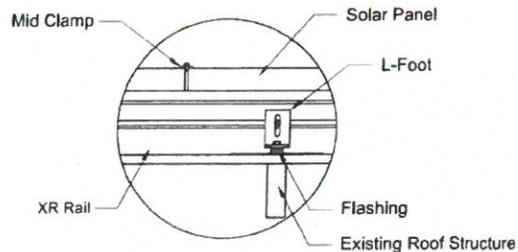
Section - Flush Mount - Sloped Roof
3/4" = 1'-0"



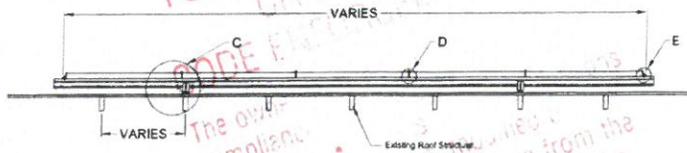
Detail A - Mid Clamp to Rail - Plan
3" = 1'-0"



Detail B - End Clamp to Rail - Plan
3" = 1'-0"



Detail C - Typical Roof Connection
3" = 1'-0"



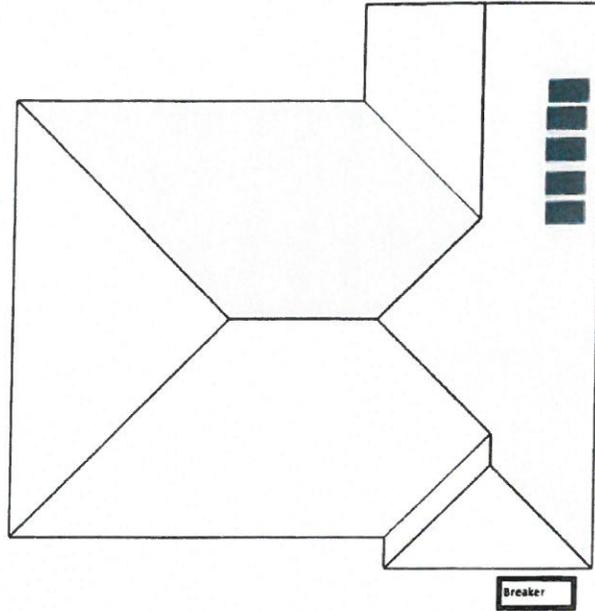
Typical Flush Mount Array - Elevation
3/4" = 1'-0"



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CITY OF HOUSTON
ENGINEERING DIVISION
The owner shall be responsible for ensuring that all work shall be altered without authorization from the building official, and all work shall be done in accordance with the approved plans.
NO. 35A
2015 v1-71

7634 Wynlea St, Houston, TX 77061-2800



In this 3D model, facets appear as semi-transparent to reveal overhangs.

Report Details	Property Details	Report Contents
Report:13054958	Longitude = -95.2812791 Latitude = 29.6594386 Number of Stories <=1 Online map of property http://maps.google.com/maps?f=q&source=s_q&hl=en&geocode=&q=7634+Wynlea+St,Houston,TX,77061-2800	Images.....1 Notes Diagram.....4

Contact: Emily Hoff
Company: Global Efficient Energy

Address: 10690 Shadow Wood Dr. #106
Houston TX 77043
Phone: 713-306-4976

Measurements provided by www.eagleview.com



Certified Accurate
www.eagleview.com/Guarantee.aspx

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Images

The following aerial images show different angles of this structure for your reference.

Top View



Report: 13054958

Global Efficient Energy

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North Side



South Side



Report: 13054958

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East Side



West Side

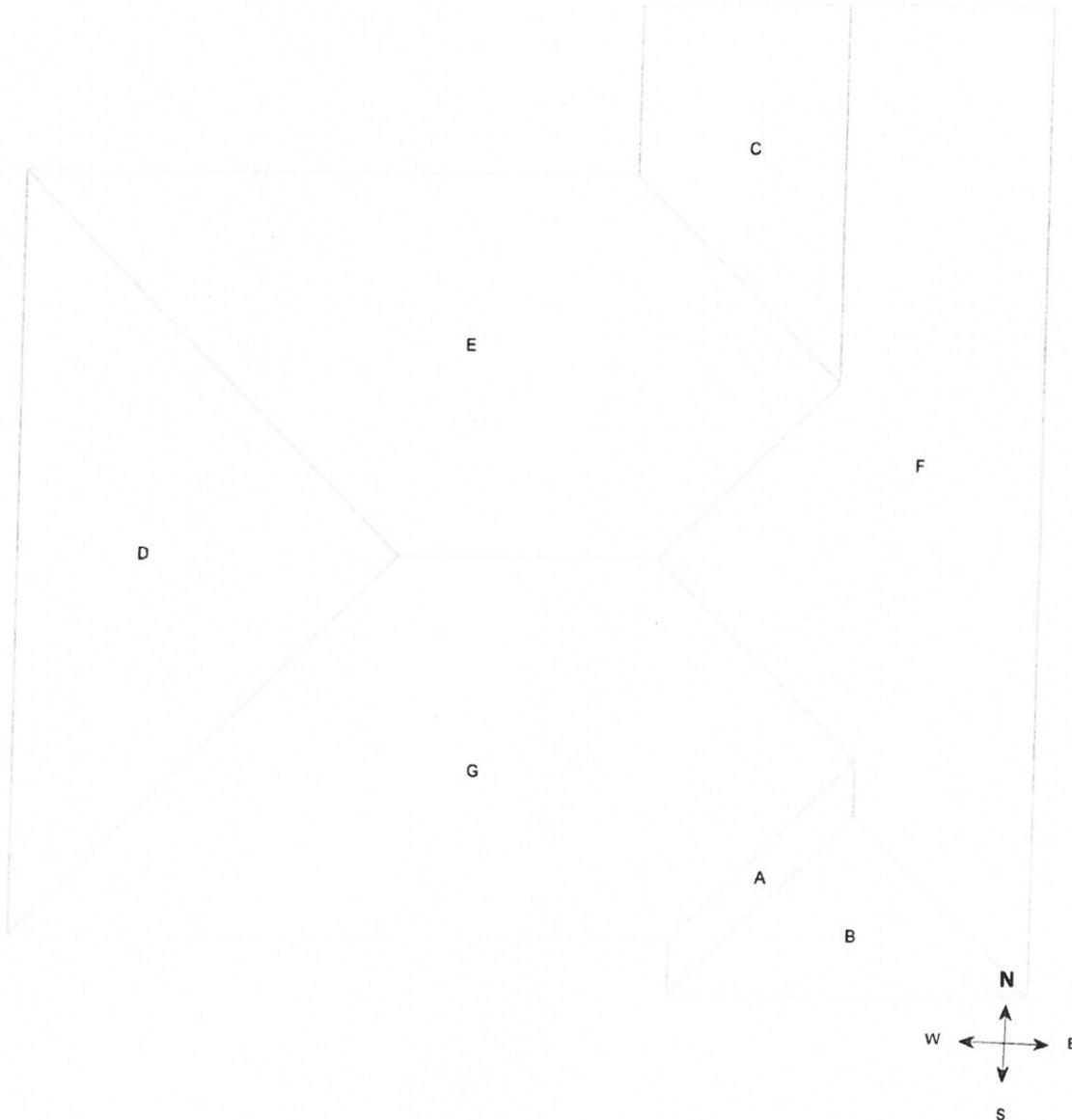


Report: 13054958

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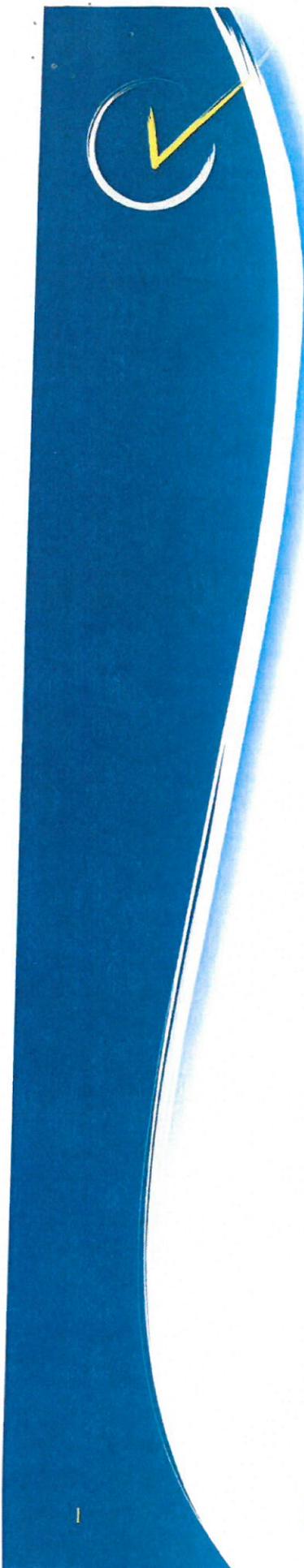
Notes Diagram

Roof facets are labeled from smallest to largest (A to Z) for easy reference.



Report: 13054958

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EXPEDITED PERMIT PROCESS FOR PV SYSTEMS MICRO-INVERTER

The Solar America Board for Codes and Standards (Solar ABCs) Expedited Permit Process provides a means to differentiate systems that can be permitted quickly and easily due to their similarity with the majority of small-scale PV systems. Those systems with unique characteristics may be handled with small additions to this Expedited Permit Process or may require much more information, depending on the uniqueness of the installation.

The following pages contain forms for the Micro-Inverter to use with the Expedited Permit Process. The Standard String, AC Module, and Supply-Side Connection forms are also available as interactive PDF files at www.solarabc.org/permitting. In jurisdictions that have adopted the Expedited Permit Process for PV Systems, these forms can be filled out electronically and submitted in either printed form and via email. An electronic format is used so that the supplied information is standardized and legible for the local jurisdiction.

EXPEDITED PERMIT PROCESS FOR SMALL-SCALE PV SYSTEMS MICRO-INVERTER

The information in this guideline is intended to help local jurisdictions and contractors identify when PV system installations are simple, needing only a basic review, and when an installation is more complex. It is likely that 50% -75% of all residential systems will comply with these simple criteria. For projects that fail to meet the simple criteria, resolution steps have been suggested to provide as a path to permit approval.

Required Information for Permit:

1. Site plan showing location of major components on the property. This drawing need not be exactly to scale, but it should represent relative location of components at site (see supplied example site plan). PV arrays on dwellings with a 3' perimeter space at ridge and sides may not need separate fire service review.
2. Electrical diagram showing PV array configuration, wiring system, overcurrent protection, inverter, disconnects, required signs, and ac connection to building (see supplied standard electrical diagram).
3. Specification sheets and installation manuals (if available) for all manufactured components including, but not limited to, PV modules, inverter(s), combiner box, disconnects, and mounting system.

Step 1: Structural Review of PV Array Mounting System

Is the array to be mounted on a defined, permitted roof structure? Yes No

If No due to non-compliant roof or a ground mount, submit completed worksheet for the structure WKS1.

Roof Information:

1. Is the roofing type lightweight (Yes = composition, lightweight masonry, metal, etc...) Yes, Composite Shingle

If No, submit completed worksheet for roof structure WKS1 (No = heavy masonry, slate, etc...).

2. Does the roof have a single roof covering? Yes No

If No, submit completed worksheet for roof structure WKS1.

3. Provide method and type of weatherproofing roof penetrations (e.g. flashing, caulk). Flashing and All Weather Roof Sealant

Mounting System Information:

1. Is the mounting structure an engineered product designed to mount PV modules with no more than an 18" gap beneath the module frames? Yes No

If No, provide details of structural attachment certified by a design professional.

2. For manufactured mounting systems, fill out information on the mounting system below:

a. Mounting System Manufacturer IronRidge Product Name and Model# XR10 Rail

b. Total Weight of PV Modules and Rails 263 lbs

c. Total Number of Attachment Points 12

d. Weight per Attachment Point (b ÷ c) 26.4 lbs (if greater than 45 lbs, see WKS1)

e. Maximum Spacing Between Attachment Points on a Rail 72 inches (see product manual for maximum spacing allowed based on maximum design wind speed)

f. Total Surface Area of PV Modules (square feet) 140.8 ft²

g. Distributed Weight of PV Module on Roof (b ÷ f) 2.9 lbs/ft²

If distributed weight of the PV system is greater than 5 lbs/ft², see WKS1.

Step 2: Electrical Review of PV System (Calculations for Electrical Diagram)

In order for a PV system to be considered for an expedited permit process, the following must apply:

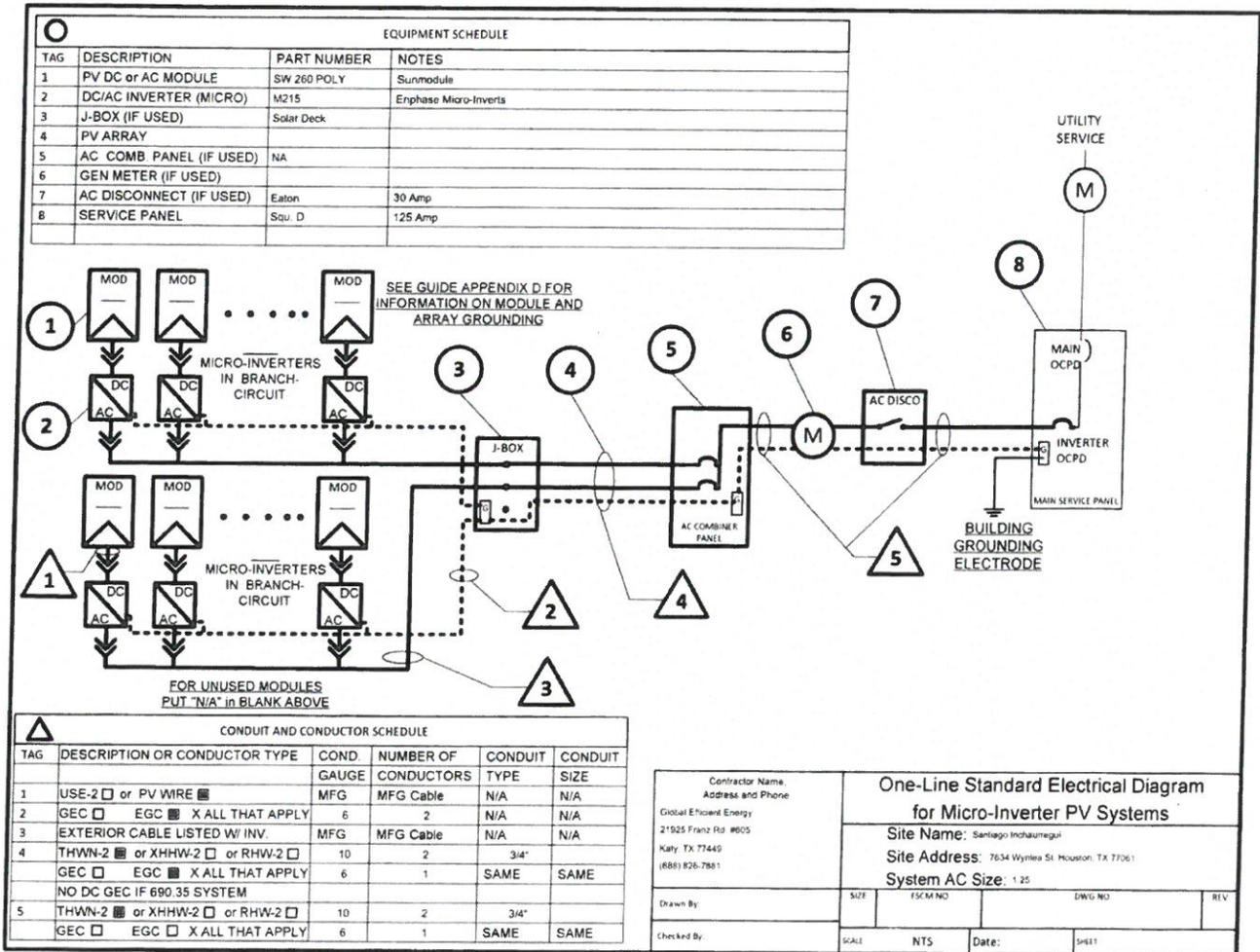
1. PV modules, utility-interactive inverters, and combiner boxes are identified for use in PV systems.
2. The PV array is composed of 4 series strings or less per inverter.
3. The total inverter capacity has a continuous ac power output 13,440 Watts or less
4. The ac interconnection point is on the load side of service disconnecting means (690.64(B)).
5. One of the standard electrical diagrams (E1.1, E1.1a, E1.1b, or E1.1c) can be used to accurately represent the PV system. Interactive PDF diagrams are available at www.solarabcs.org/permitting

Fill out the standard electrical diagram completely. A guide to the electrical diagram is provided to help the applicant understand each blank to fill in. If the electrical system is more complex than the standard electrical diagram can effectively communicate, provide an alternative diagram with appropriate detail.

MICRO-INVERTER SITE PLAN

Contractor Name, Address and Phone Global Efficient Energy 21925 Franz Rd #605 Katy, TX 77449 (888) 826-7881		Site Plan for Small-Scale, Single-Phase PV Systems		
		Site Name: Santiago Inchaurregui Site Address: 7634 Wynlea St Houston, TX 77061 System AC Size: 1.25		
Drawn By:	SIZE	FSCM NO	DWG NO	REV
Checked By:	SCALE	NTS	Date:	SHEET

MICRO-INVERTER ELECTRICAL DIAGRAM



NOTES FOR MICRO-INVERTER ELECTRICAL DIAGRAM

PV MODULE RATINGS @ STC (Guide Section 5)

MODULE MAKE	Sunmodule Pro-Series
MODULE MODEL	SW 260 POLY
MAX POWER-POINT CURRENT (I_{mp})	8.37 Amp
MAX POWER-POINT VOLTAGE (V_{mp})	31.4 V
OPEN-CIRCUIT VOLTAGE (V_{oc})	38.4 V
SHORT-CIRCUIT CURRENT (I_{sc})	8.94 Amp
MAX SERIES FUSE (OCPD)	20 Amp
MAXIMUM POWER (P_{max})	260 wP
MAX VOLTAGE (TYP 600V _{dc})	600
VOC TEMP COEFF (mV/°C □ or %/°C ■)	-0.31
IF COEFF SUPPLIED, CIRCLE UNITS	

NOTES FOR ALL DRAWINGS:

OCPD = OVERCURRENT PROTECTION DEVICE
 NATIONAL ELECTRICAL CODE® REFERENCES SHOWN AS (NEC XXX.XX)

INVERTER RATINGS (Guide Section 4)

INVERTER MAKE	Enphase	
INVERTER MODEL	M215	
MAX DC VOLT RATING		264 V
MAX POWER @ 40°C		255 Watt
NOMINAL AC VOLTAGE		240 V
MAX AC CURRENT		15.3 Amp
MAX OCPD RATING		20 Amp

SIGNS-SEE GUIDE SECTION 7

SIGN FOR DC DISCONNECT

No sign necessary since 690.51 marking on PV module covers needed information

SIGN FOR INVERTER OCPD AND AC DISCONNECT (IF USED)

SOLAR PV SYSTEM AC POINT OF CONNECTION	
AC OUTPUT CURRENT	7.2 Amp
NOMINAL AC VOLTAGE	240
THIS PANEL FED BY MULTIPLE SOURCES (UTILITY AND SOLAR)	

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

- 1) LOWEST EXPECT AMBIENT TEMPERATURE BASED ON ASHRAE MINIMUM MEAN EXTREME DRY BULB TEMPERATURE FOR ASHRAE LOCATION MOST SIMILAR TO INSTALLATION LOCATION. LOWEST EXPECTED AMBIENT TEMP -3 °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 36 °C
- 2) 2009 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 0.5" ABOVE ROOF AND USING THE OUTDOOR DESIGN TEMPERATURE OF 47°C OR LESS (ALL OF UNITED STATES).
 - a) 12 AWG, 90°C CONDUCTORS ARE GENERALLY ACCEPTABLE FOR MODULES WITH I_{sc} 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 I_{sc} OF 9.6 AMPS OR LESS WHEN PROTECTED BY A 15-AMP OR SMALLER FUSE

NOTES FOR INVERTER CIRCUITS (Guide Section 8 and 9)

- 1) IF UTILITY REQUIRES A VISIBLE-BREAK SWITCH, DOES THIS SWITCH MEET THE REQUIREMENT? YES NO N/A
- 2) IF GENERATION METER REQUIRED, DOES THIS METER SOCKET MEET THE REQUIREMENT? YES NO N/A
- 3) SIZE PHOTOVOLTAIC POWER SOURCE (DC) CONDUCTORS BASED ON MAX CURRENT ON NEC 690.53 SIGN OR OCPD RATING AT DISCONNECT
- 4) SIZE INVERTER OUTPUT CIRCUIT (AC) CONDUCTORS ACCORDING TO INVERTER OCPD AMPERE RATING (See Guide Section 9)
- 5) TOTAL OF 1 INVERTER OUTPUT CIRCUIT OCPD(S), ONE FOR EACH MICRO-INVERTER CIRCUIT. DOES TOTAL SUPPLY BREAKERS COMPLY WITH 120% BUSBAR EXCEPTION IN 690.64(B)(2)(a)? YES NO

Contractor Name: Address and Phone		Notes for One-Line Standard Electrical Diagram for Single-Phase PV Systems	
Global Efficient Energy 21925 Franz Rd #605 Katy, TX 77449 (888) 826-7881			
Site Name: Santiago Inchaurregui		Site Address: 7634 Wynlea St Houston, TX 77061	
System AC Size: 2 kW			
Drawn By:	SIZE	FSCM NO	DWG NO
Checked By:	SCALE	NTS	Date:



CenterPoint Energy
P O Box 1700
Houston, TX 77251-1700

IF YOU ARE APPLYING FOR DISTRIBUTED GENERATION, PLEASE FOLLOW THE INSTRUCTIONS IN THE PARAGRAPHS BELOW. YOU WILL NEED TO COMPLETE AND SIGN AND THEN MAIL, FAX, OR EMAIL THE "APPLICATION FOR INTERCONNECTION AND PARALLEL OPERATION OF DISTRIBUTED GENERATION WITH THE UTILITY SYSTEM" AND "APPLICATION AND STUDY FEES ADDENDUM" TO THE ADDRESS, FAX NUMBER, OR EMAIL ADDRESS LISTED BELOW. DO NOT SEND IN THE "AGREEMENT FOR INTERCONNECTION AND PARALLEL OPERATION OF DISTRIBUTED GENERATION" AT THIS TIME.

IF YOU WERE REQUESTED TO COMPLETE AN "AGREEMENT FOR INTERCONNECTION AND PARALLEL OPERATION OF DISTRIBUTED GENERATION," PLEASE COMPLETE THE HIGHLIGHTED AREAS AND THEN PRINT AND SIGN IN THE TWO PLACES AND THEN MAIL, FAX, OR EMAIL THE "AGREEMENT FOR INTERCONNECTION AND PARALLEL OPERATION OF DISTRIBUTED GENERATION" TO THE ADDRESS, FAX NUMBER, OR EMAIL ADDRESS LISTED BELOW.

To run any distributed generation (DG) device that is connected to the CenterPoint Energy (CNP) system, you will first have to complete an application. You can go to our website

www.centerpointenergy.com/cehe/bus/windandsolar/applicationguidelines/

There you will find helpful information. Send hard copies to me at: Bellaire Service Center, CenterPoint Energy, P.O. Box 1700, Houston, TX 77251-1700. The fax number is 713-945-9164.

Anything that you have that is electronic can be emailed to me at timothy.sullivan@centerpointenergy.com

The application and addendum need to be filled out and returned to me. Two documents are part of the Public Utility Commission of Texas (PUCT) Substantive Rules. One document is an example of a one-line. Please let me know if there are any questions on your part.

Your supplier or contractor can be a source of information in filling out the application. Attached for your information are files for prospective customers who are considering installation of DG devices that would be operated directly with the CNP distribution grid. The PUCT has established state-wide rules for any such installation 0 - 10,000 kW and connected at a voltage up to 60,000 Volts. This would define a project under the PUCT rule requirements. Interconnection to the distribution grid will require review and compliance per the PUCT rules.

Basically, all DG projects must have design review prior to installation by CNP for compliance. Normally, there will be a study fee (established in the "CNP_Distributed_Generation_Application.pdf"). We will notify you after the initial review if this is applicable. We will coordinate the technical review of the interconnection equipment. The review package and application should be sent to the address shown in the application. Information should include a one-line diagram showing the relationship of the DG unit tied into a breaker or breakers in the electrical panel and the CNP meter location. The AC disconnect switch should be between the inverter and electrical panel and must be a lockable, external handle, visible and readily accessible disconnect switch and typically installed within 10 feet of the CNP meter. If the AC disconnect switch is installed more than 10 feet from the CNP meter, a weather-resistant, easily-read placard must be installed within 10 feet of the CNP meter, clearly identifying the location of the AC disconnect switch. Manufacturer specifics for the machine (or inverter) and disconnect switch are necessary in the review. Depending on actual conditions at the site, possible CNP system modifications may be required to accommodate the interconnection which would be at customer expense. The determination of any possible modification costs or study fees would be detailed in the report of our review.

Finally, once an application has been accepted as being in compliance, you will be notified of our approval of the connection design for construction.

A field inspection will be required to demonstrate the installation is built as planned
PRIOR TO ACTUAL SYNCHRONIZATION WITH THE CNP GRID.

An interconnection agreement will be prepared and must be signed by the customer prior to energization.

I hope this initial information will be useful in your further development of the project. Feel free to have your prospective equipment supplier or installer contact us for clarification of technical questions in this review. An internet search for distributed renewable generation or solar panels, suppliers, and contractors in the Houston area should help you locate installers.

If you have further questions, please contact me at 713-945-4155.

The address to the PUCT substantive rules web site is included below for your convenience. <https://www.puc.texas.gov/industry/electric/business/dg/Dg.aspx>

Tim Sullivan
Distribution System Protection
CenterPoint Energy

CenterPoint Energy Houston Electric, LLC
 Applicable: Entire Service Area

CNP 8031

6.1.2.4 INTERCONNECTION AND PARALLEL OPERATION OF DISTRIBUTED GENERATION

6.1.2.4.1 DISTRIBUTED GENERATION SERVICE – RATE DGS

Company shall interconnect distributed generation pursuant to Public Utility Commission of Texas Substantive Rules 25.211 and 25.212.

A customer seeking interconnection and parallel operation of distributed generation with Company must complete and submit the Application for Interconnection and Parallel Operation of Distributed Generation with the Utility System.

PRE-INTERCONNECTION STUDY FEE SCHEDULE

Pre-certified distributed generation units that are up to 500 Kw that export not more than 15% of the total load on a single radial feeder and also contribute not more than 25% of the maximum potential short circuit current on a radial feeder are exempt from any pre-interconnection study fees. For all other DG applications, the study fees in the following table will apply.

Non-Exporting	0 to 10 kW	10+ to 500 kW	500+ to 2000kW	2000+ to 10,000 kW
1. Pre-certified, not on network	\$0	\$0	\$650	\$845
2. Non pre-certified, not on network	\$312	\$503	\$1,210	\$1,405
3. Pre-certified, on network	\$272	\$640	\$1,680	\$1,875
4. Not pre-certified, on network	\$525	\$1,150	\$2,240	\$2,435

Exporting	0 to 10 kW	10+ to 500 kW	500+ to 2000kW	2000+ to 10,000 kW
1. Pre-certified, not on network	\$75	\$220	\$870	\$1,065
2. Non pre-certified, not on network	\$312	\$769	\$1,430	\$1,625
3. Pre-certified, on network	\$272	\$860	\$1,900	\$2,095
4. Not pre-certified, on network	\$495	\$1,370	\$2,460	\$2,655

CenterPoint Energy Houston Electric, LLC
Applicable: Entire Service Area

CNP 8031

Prescribed Form for the Application for Interconnection and Parallel Operation of Distributed Generation

Customers seeking to interconnect distributed generation with the utility system will complete and file with the company the following Application for Parallel Operation:

APPLICATION FOR INTERCONNECTION AND PARALLEL OPERATION OF DISTRIBUTED GENERATION

Return Completed Application to: CenterPoint Energy Houston Electric, LLC
Attention: Tim Sullivan
Distribution System
Protection P.O. Box 1700
Houston, TX. 77251

Customer's Name: Santiago Inchaurregui

Address: 7634 Wynlea St. Houston, TX 77061

Contact Person: Santiago Inchaurregui

Email Address: [REDACTED]

Telephone Number: (409) 795-1989

Service Point Address: 7634 Wynlea St. Houston, TX 77061

Information Prepared and Submitted By: Emily Hoff

(Name and Address) Global Efficient Energy, 2320 Gravel Rd, Fort Worth, TX 76118

Signature Emily Hoff

The following information shall be supplied by the Customer or Customer's designated representative. All applicable items must be accurately completed in order that the Customer's generating facilities may be effectively evaluated by CenterPoint Energy Houston Electric, LLC for interconnection with the utility system.

CenterPoint Energy Houston Electric, LLC

Applicable: Entire Service Area

CNP 8031

For systems not using pre-certified inverters (e.g., inverters certified to UL-1741 or IEEE 1547.1), does CenterPoint Energy Houston Electric, LLC have the dynamic modeling values from the generator manufacturer? Yes No

If not, please explain: _____

(Note: For pre-certified equipment the answer is Yes. Otherwise, applicant must provide the dynamic modeling values if they are available)

Layout sketch showing lockable, "visible" disconnect device is attached: Yes

1008901018146675410100

6

CenterPoint Energy Houston Electric, LLC
Applicable: Entire Service Area

CNP 8031

Authorized Release of Information List

By signing this Application in the space provided below, Customer authorizes CenterPoint Energy Houston Electric, LLC to release Customer's proprietary information to the extent necessary to process this Application to the following persons:

	Name	Phone Number	Email Address
Project Manager			
Electrical Contractor	Global Efficient Energy	682-626-5591 Ext. 2443	Emily.hoff@globalnrg.co
Consultant			
Other			

CenterPoint Energy Houston Electric, LLC

[CUSTOMER NAME]

BY: _____

BY: Santiago Inchaurregui

PRINTED NAME:

PRINTED NAME:

Tim Sullivan

Santiago Inchaurregui

TITLE: Lead Engineer System Protection

TITLE: Homeowner

DATE: _____

DATE: _____

APPLICATION AND STUDY FEES ADDENDUM

Please provide the following information for the generating facility.

(For Solar (PV) Only)

Panel Wattage / Number of Panels: 260 Watts/5 Panels

ESI ID (from electric bill): 1008901018146675410100

Inverter Capacity: 1.25 kW

Inverter peak efficiency rating: 96.3 %

Generation capacity: 1300 DC kW Rating

Generation maximum output: 1.25 kW AC
(should equal **Kilowatt Rating** from pg. 5 of the application)

NOTE: The application review package shall include a one-line diagram showing the relationship of the generation unit tied into a breaker or breakers in the electrical panel and the CenterPoint Energy (CNP) meter location. The Safety Disconnect switch shall be between the inverter and electrical panel and must be lockable with an external handle, visible and readily accessible, and within 10 feet of the CenterPoint Energy Meter. If Disconnection switch is installed more than 10 feet from the CenterPoint Energy meter, a weather-resistant, easily-read placard shall be install on the CenterPoint Energy meter, clearly identifying the location of the safety switch.

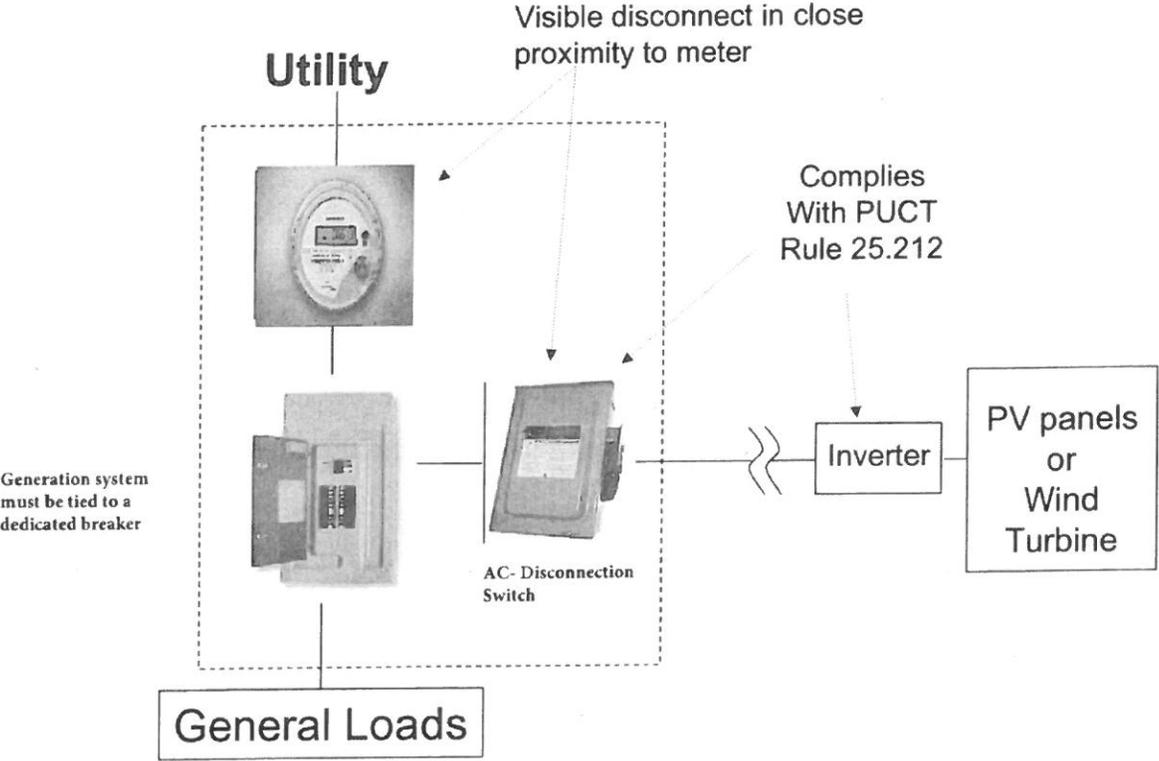
Manufacturer specifics for the inverter and the safety disconnect switch are necessary in the application review.

If there are any questions, please call or email Tim Sullivan at 713-945-4155


Juan Garza @ 713-945-4134

juan.garza@centerpointenergy.com

Example One-Line Diagram
For Small Distributed Generation Installations



CAUTION

SOLAR INVERTER
OUTPUT BREAKER
DO NOT RELOCATE

PHOTOVOLTAIC SYSTEM

 AC DISCONNECT 

OPERATING VOLTAGE VOLTS

OPERATING CURRENT AMPS

WARNING

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

WARNING

THIS PREMISE IS SUPPLIED
BY A SECOND SOURCE OF POWER
(UTILITY AND SOLAR)

APPROVED
ELECTRICAL PLAN

PLANS AND SPECIFICATIONS TO BE IN
ACCORDANCE WITH CURRENT NATIONAL
ELECT. CODE & CITY BUILDING CODE.

THIS PLAN SHALL BE KEPT
ON JOB FOR INSPECTORS. SEPARATE
PERMIT FOR ELECTRICAL REQUIRED.

NO. 384

PHOTOVOLTAIC
SYSTEM EQUIPPED
WITH RAPID
SHUTDOWN

APPROVED
ELECTRICAL PLAN

PLANS AND SPECIFICATIONS TO BE IN
ACCORDANCE WITH CURRENT NATIONAL
ELECT. CODE & CITY BUILDING CODE.
THIS PLAN SHALL BE KEPT
ON JOB FOR INSPECTORS. SEPARATE
PERMIT FOR ELECTRICAL REQUIRED.

NO. 384

This Plaque is in compliance with Rapid Shutdown Article
690.56(C) N.E.C

Sunmodule Pro-Series SW 260 POLY (33mm frame)



TUV Power controlled:
Lowest measuring tolerance in industry



Every component is tested to meet
3 times IEC requirements



Designed to withstand heavy
accumulations of snow and ice



Sunmodule Plus:
Positive performance tolerance



25-year linear performance warranty
and 10-year product warranty



Glass with anti-reflective coating



World-class quality

Fully-automated production lines and seamless monitoring of the process and material ensure the quality that the company sets as its benchmark for its sites worldwide.

SolarWorld Plus-Sorting

Plus-Sorting guarantees highest system efficiency. SolarWorld only delivers modules that have greater than or equal to the nameplate rated power.

25-year linear performance guarantee and extension of product warranty to 10 years

SolarWorld guarantees a maximum performance degradation of 0.7% p.a. in the course of 25 years, a significant added value compared to the two-phase warranties common in the industry, along with our industry-first 10-year product warranty.*

*in accordance with the applicable SolarWorld Limited Warranty at purchase.
www.solarworld.com/warranty

- Qualified, IEC 61215
- Safety tested, IEC 61330
- Blowing sand resistance, IEC 60068 2-F8
- Ammonia resistance, IEC 62716
- Salt mist corrosion, IEC 61201
- Periodic inspection



- Periodic inspection
- Power controlled



APPROVED ELECTRICAL PLAN
PLANS AND SPECIFICATIONS TO BE IN ACCORDANCE WITH CURRENT NATIONAL ELECT. CODE & CITY BUILDING CODE. THIS PLAN SHALL BE KEPT ON JOB FOR INSPECTORS. SEPARATE PERMIT FOR ELECTRICAL REQUIRED.

NO. 384



Sunmodule[®] Pro-Series SW 260 POLY (33mm frame)



PERFORMANCE UNDER STANDARD TEST CONDITIONS (STC)*

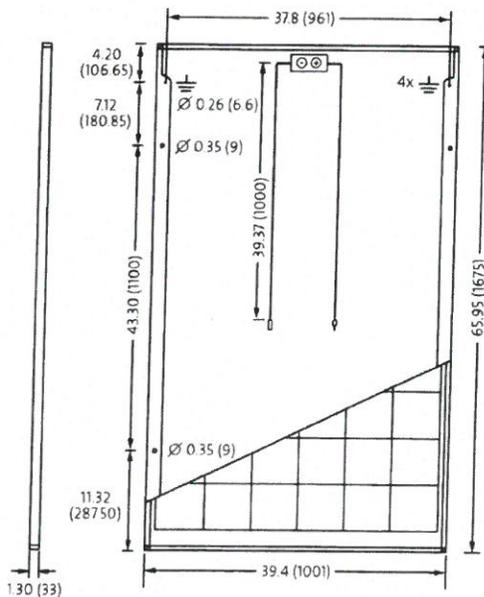
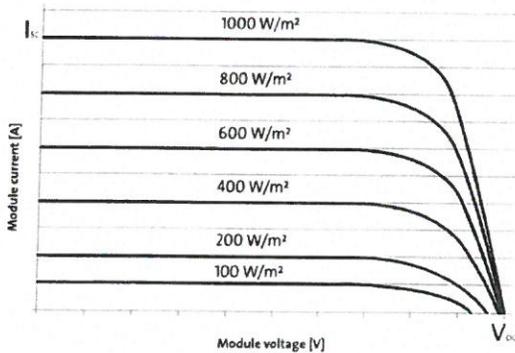
Maximum power	P_{max}	260 Wp
Open circuit voltage	V_{oc}	38.4 V
Maximum power point voltage	V_{mpp}	31.4 V
Short circuit current	I_{sc}	8.94 A
Maximum power point current	I_{mpp}	8.37 A
Module efficiency	η_m	15.51 %

*STC: 1000 W/m², 25°C, AM 1.5

1) Measuring tolerance (P_{max}) traceable to TUV Rheinland: +/- 2% (TUV Power Controlled).

THERMAL CHARACTERISTICS

NOCT	46 °C
TC I_{sc}	0.051 %/°C
TC V_{oc}	-0.31 %/°C
TC P_{mpp}	-0.41 %/°C
Operating temperature	-40°C to 85°C



PERFORMANCE AT 800 W/m², NOCT, AM 1.5

Maximum power	P_{max}	192.4 Wp
Open circuit voltage	V_{oc}	34.8 V
Maximum power point voltage	V_{mpp}	28.5 V
Short circuit current	I_{sc}	7.35 A
Maximum power point current	I_{mpp}	6.76 A

Minor reduction in efficiency under partial load conditions at 25°C: at 200 W/m², 100% (+/-2%) of the STC efficiency (1000 W/m²) is achieved.

COMPONENT MATERIALS

Cells per module	60
Cell type	Poly crystalline
Cell dimensions	6.14 in x 6.14 in (156mm x 156 mm)
Front	Tempered glass (EN 12150)
Frame	Clear anodized aluminum
Weight	39.7 lbs (18.0 kg)

SYSTEM INTEGRATION PARAMETERS

Maximum system voltage SC II / NEC	1000 V	
Maximum reverse current	25 A	
Number of bypass diodes	3	
Design Loads*	Two rail system	113 psf downward 64 psf upward
Design Loads*	Three rail system	178 psf downward 64 psf upward
Design Loads*	Edge mounting	178 psf downward 41 psf upward

*Please refer to the Sunmodule installation instructions for the details associated with these load cases.

ADDITIONAL DATA

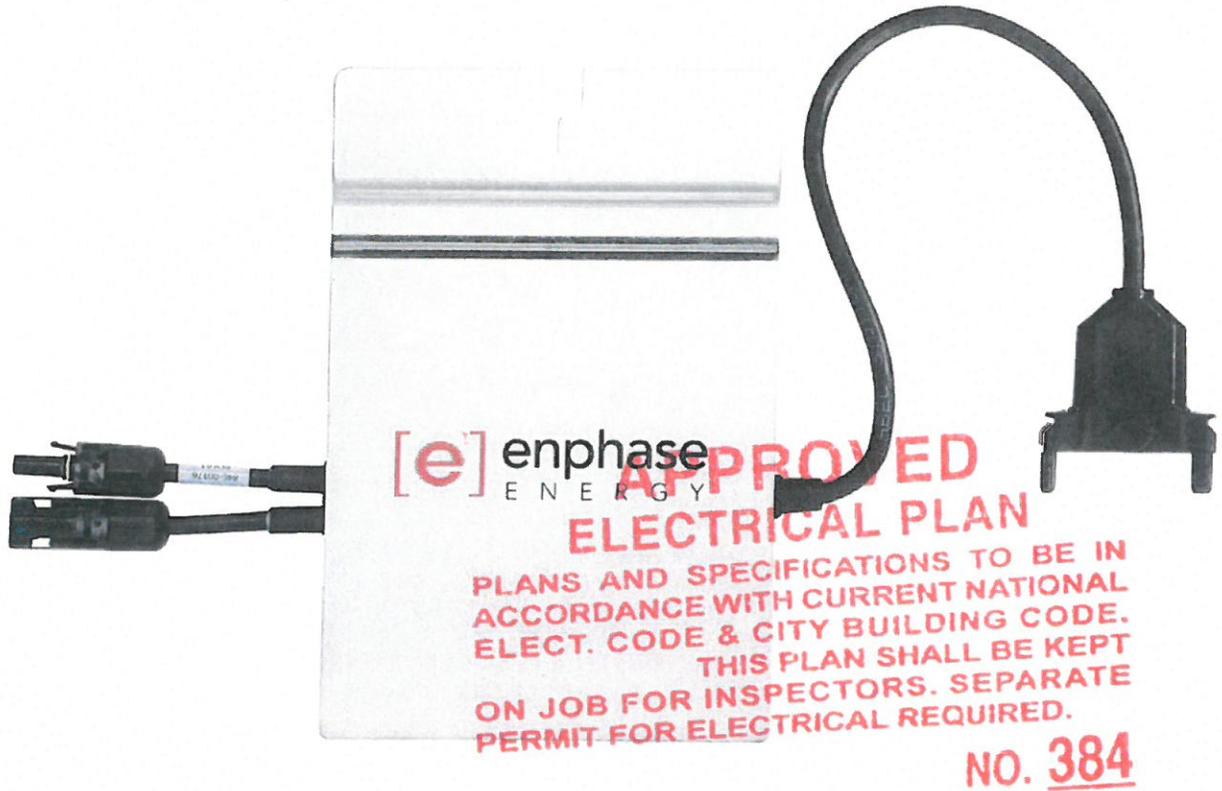
Power sorting ¹	-0 Wp / +5 Wp
J-Box	IP65
Module leads	PV wire per UL4703 with H4 connectors
Module type (UL 1703)	1
Glass	Low iron tempered with ARC

APPROVED ELECTRICAL PLAN

PLANS AND SPECIFICATIONS TO BE IN ACCORDANCE WITH CURRENT ELEC. CODE & CITY BUILDING CODE. THIS PLAN SHALL BE KEPT ON JOB FOR INSPECTORS. SEPARATE PERMIT FOR ELECTRICAL REQUIRED.

NO. 384

All units provided are imperial. SI units provided in parentheses. SolarWorld AG reserves the right to make specification changes without notice.



The Enphase Energy Microinverter System improves energy harvest, increases reliability, and dramatically simplifies design, installation and management of solar power systems.

The Enphase System includes the microinverter, the Envoy Communications Gateway™, and Enlighten®, Enphase's monitoring and analysis software.

PRODUCTIVE

- Maximum energy production
- Resilient to dust, debris and shading
- Performance monitoring per module

RELIABLE

- System availability greater than 99.8%
- No single point of system failure

SMART

- Quick and simple design, installation and management
- 24/7 monitoring and analysis

SAFE

- Low voltage DC
- Reduced fire risk



M215 — MICROINVERTER TECHNICAL DATA

Input Data (DC)		M215-60-2LL-S22/S23/S24 at 215-60-2LL-S22-17A/S23-NA (Ontario)	
Recommended input power (STC)	190 - 270W	<p style="text-align: center;">APPROVED ELECTRICAL PLAN PLANS AND SPECIFICATIONS TO BE IN ACCORDANCE WITH CURRENT NATIONAL ELECT. CODE & CITY BUILDING CODE. THIS PLAN SHALL BE KEPT ON JOB FOR INSPECTORS. SEPARATE PERMIT FOR ELECTRICAL REQUIRED.</p> <p style="text-align: right;">NO. 384</p>	
Maximum input DC voltage	45V		
Peak power tracking voltage	22V - 36V		
Operating range	16V - 36V		
Min./Max. start voltage	22V/45V		
Max. DC short circuit current	15A		
Max. input current	10.5A		
Output Data (AC)		@208 Vac	@240 Vac
Maximum output power	215W	215W	
Nominal output current	1.0A (arms at nominal duration)	0.9A (arms at nominal duration)	
Nominal voltage/range	208V/183-229V	240V/211-264V	
Extended voltage/range	208V/179-232V	240V/206-269V	
Nominal frequency/range	60.0/59.3-60.5 Hz	60.0/59.3-60.5 Hz	
Extended frequency range	60.0/59.2-60.6 Hz	60.0/59.2-60.6 Hz	
Power Factor	>0.95	>0.95	
Maximum units per 20A branch circuit	25 (three phase)	17 (single phase)	
Maximum output fault current	1.05 Arms, over 3 cycles; 25.2 Apeak, 1.74ms duration		
Efficiency			
CEC weighted efficiency	96.0%		
Peak inverter efficiency	96.3%		
Static MPPT efficiency (weighted, reference EN50530)	99.6%		
Dynamic MPPT efficiency (fast irradiation changes, reference EN50530)	99.3%		
Night time power consumption	46mW		
Mechanical Data			
Ambient temperature range	-40°C to + 65°C		
Operating temperature range (internal)	-40°C to + 85°C		
Dimensions (WxHxD)	17.3 cm x 16.4 cm x 2.5 cm (6.8" x 6.45" x 1.0")*		
Weight	1.6 kg (3.5 lbs)		
Cooling	Natural convection - No fans		
Enclosure environmental rating	Outdoor - NEMA 6		
* without mounting bracket			
Features			
Compatibility	Pairs with most 60-cell PV modules		
Communication	Power line		
Warranty	25-year limited warranty		
Monitoring	Free lifetime monitoring via Enlighten software		
Compliance	UL1741/IEEE1547, FCC Part 15 Class B CAN/CSA-C22.2 NO. 0-M91, 0.4-04, and 107.1-01		

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