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December 22, 2021

UNTD Builders
2801 North Thanksgiving Way
Suite 210
Lehi, UT 84043

Re: Engineering Services
Morant Residence
24035 Noble Darcy Lane, Katy, TX
11.400 kW System

To Whom it May Concern,

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

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

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

Description of Residence:

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

A. Loading Criteria Used

- 146 MPH wind loading based on ASCE 7-16 Exposure Category "B" at a slope of 25 degrees
- 7 PSF = Dead Load roofing/framing Live Load = 20 PSF Snow Load = 0 PSF
- 3 PSF = Dead Load solar panels/mounting hardware

Total Dead Load = 10 PSF

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

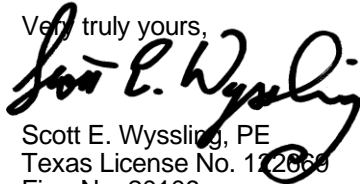
B. Solar Panel Anchorage

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

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

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

Very truly yours,



Scott E. Wyssling, PE
Texas License No. 172669
Firm No. 20109



signed 12/22/2021

CODES, NOTES, SAFETY

- 2015 INTERNATIONAL ENERGY CONSERVATION CODE
- 2015 INTERNATIONAL RESIDENTIAL CODE
- 2020 NFPA 70 - NATIONAL ELECTRICAL CODE
- 2015 INTERNATIONAL BUILDING CODE
- 2015 INTERNATIONAL EXISTING BUILDING CODE
- 2015 INTERNATIONAL FUEL GAS CODE
- 2015 INTERNATIONAL MECHANICAL CODE
- 2015 INTERNATIONAL PLUMBING CODE
- 2015 INTERNATIONAL FIRECODE
- LOCAL AND STATE AMENDMENTS TO ABOVE

- ALL PANELS, SWITCHES, ETC. SHALL HAVE SUFFICIENT GUTTER SPACE AND LUGS IN COMPLIANCE TO UL REQUIREMENTS TO ACCOMODATE CONDUCTORS SHOWN.
- THIS SYSTEM WILL NOT BE INTERCONNECTED UNTIL APPROVAL FROM THE LOCAL JURSDICTION AND THE UTILITY IS OBTAINED.
- ALL EXTERIOR ELECTRICAL DEVICES AND EQUIPMENT INCLUDING THOSE THAT ARE EXPOSED TO OUTSIDE ENVIRONMENT SHALL BE WEATHERPROOF AND SHALL BE LISTED BY "UL" FOR THE TYPE OF APPLICATION AND "UL" LABEL SHALL APPEAR ON ALL ELECTRICAL EQUIPMENT.
- WIRING METHOD SHALL BE EMT ABOVE GROUND MOUNTED IN CONCEALED SPACES (UNLESS APPROVED OTHERWISE) AND SCHEDULE - 40 PVC FOR BELOW GROUND INSTALLATION UNLESS NOTED OTHERWISE.
- AN OSHA APPROVED LADDER PROVIDING ACCESS TO ALL PORTIONS OF THE ARRAY SHALL BE SECURED IN PRIOR TO REQUESTING INSPECTION.
- IT IS THE CONTRACTOR'S RESPONSIBILITY TO INSTALL A SUPPLEMENTAL GROUNDING ELECTRODE CONDUCTOR IF NECESSARY.

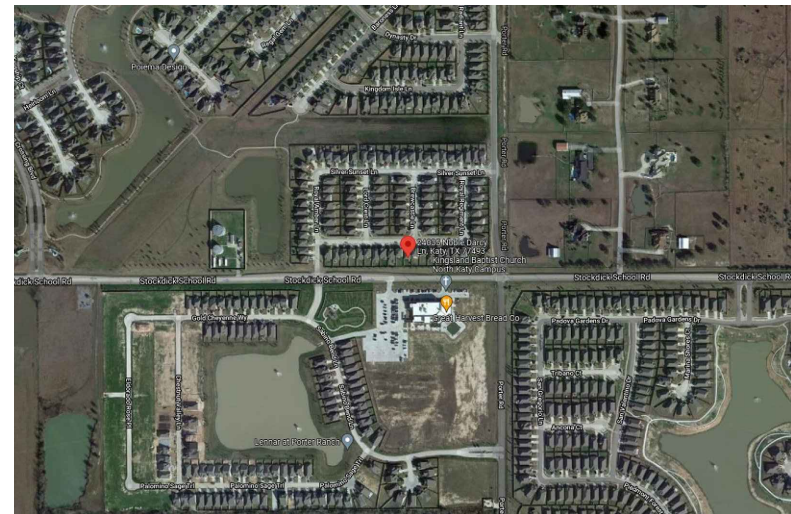
- INSTALLERS SHALL DRAW IN DESIGNATED SAFETY AREA AROUND HOME.
- INSTALLERS SHALL UPDATE NAME, ADDRESS, AND PHONE NUMBER OF NEAREST URGENT CARE FACILITY RELATIVE TO THE SITE BEFORE STARTING WORK.

LOCATION OF NEAREST URGENT CARE FACILITY
 NAME:
 ADDRESS:
 PHONE NUMBER:

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EQPM	MOD/INV/RACKING SPECS

VICINITY MAP



SCOPE OF WORK

- SYSTEM SIZE: 11.4 DC, 10.0 AC
- MODULES: (30) Jinko Solar EAGLE 66TR G4 JKM380M-6RL3-B
- OPTIMIZERS: (30) SolarEdge P401 OPTIMIZERS
- INVERTERS: (1) SolarEdge 10000H-US (240)
- RACKING SYSTEM: Ecofasten ROCK IT 3.0



LEGEND

- MP MAIN SERVICE PANEL ME METER IF SEPERATE
- SP SUB PANEL
- I INVERTER
- ACD AC DISCONNECT
- JB JUNCTION BOX
- SD STORAGE DEVICE
- PM PRODUCTION METER
- BP BACK UP LOADS PANEL
- 3' FIRE & SAFETY PATHWAY
- PVC PIPE VENT - - - - - PROPERTY LINE
- METAL PIPE VENT SKY LIGHT
- ATTIC VENT SATELLITE DISH
- ELECTRICAL MAST CHIMNEY



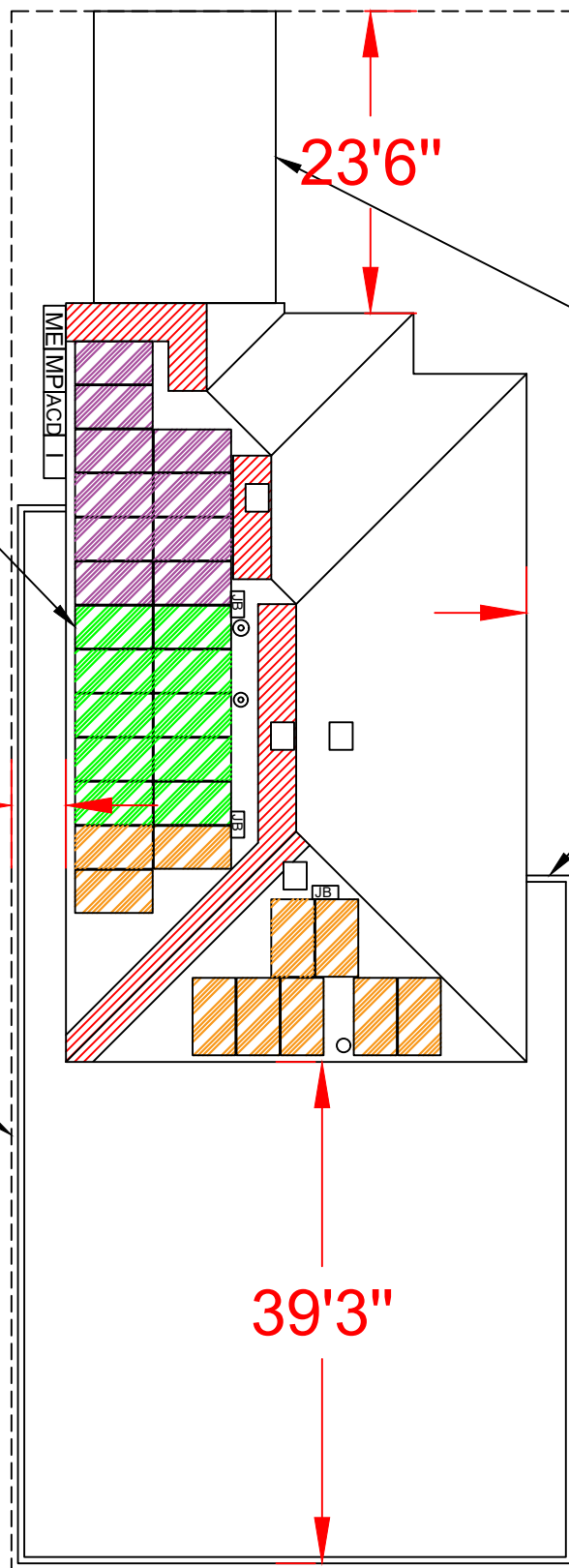
CONDUIT TO BE RUN
IN ATTIC IF POSSIBLE

STREET

N



(30) Jinko Solar EAGLE 66TR G4
JKM380M-6RL3-B MODULES
WITH (30) SOLAREEDGE P401
OPTIMIZERS



EXISTING
DRIVEWAY

FENCE

PROPERTY LINE



STRING 1



STRING 2



STRING 3

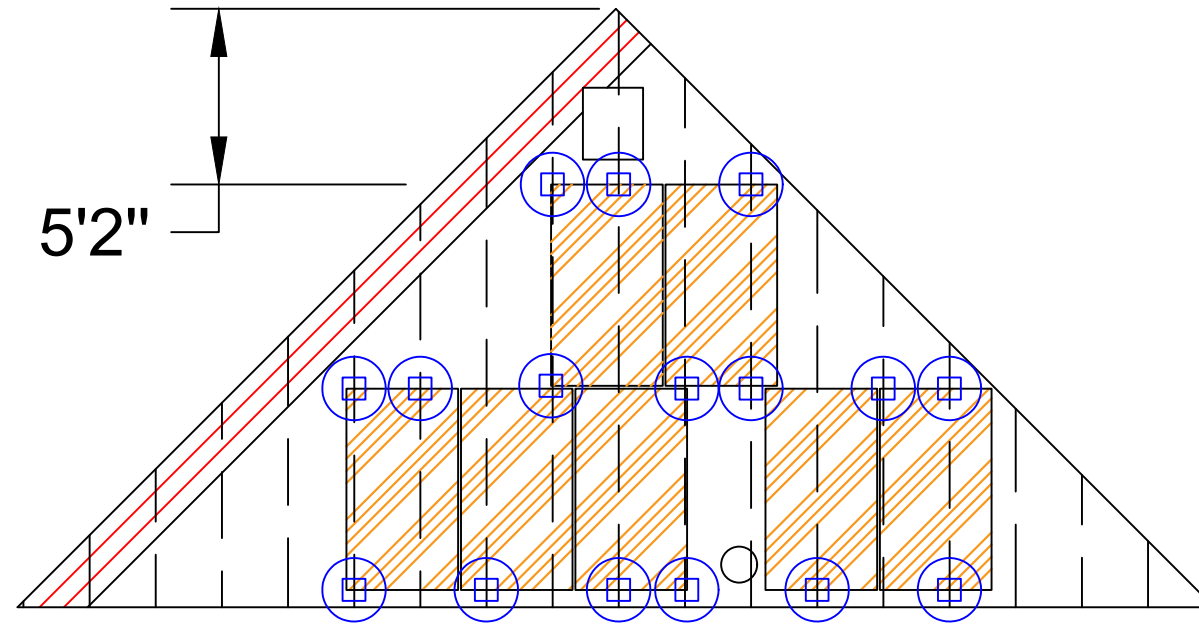


24035 NOBLE DARCY LN, KATY, TX 77493

SCALE 1/20" : 1'

ROCK-IT MOUNTING FOOT

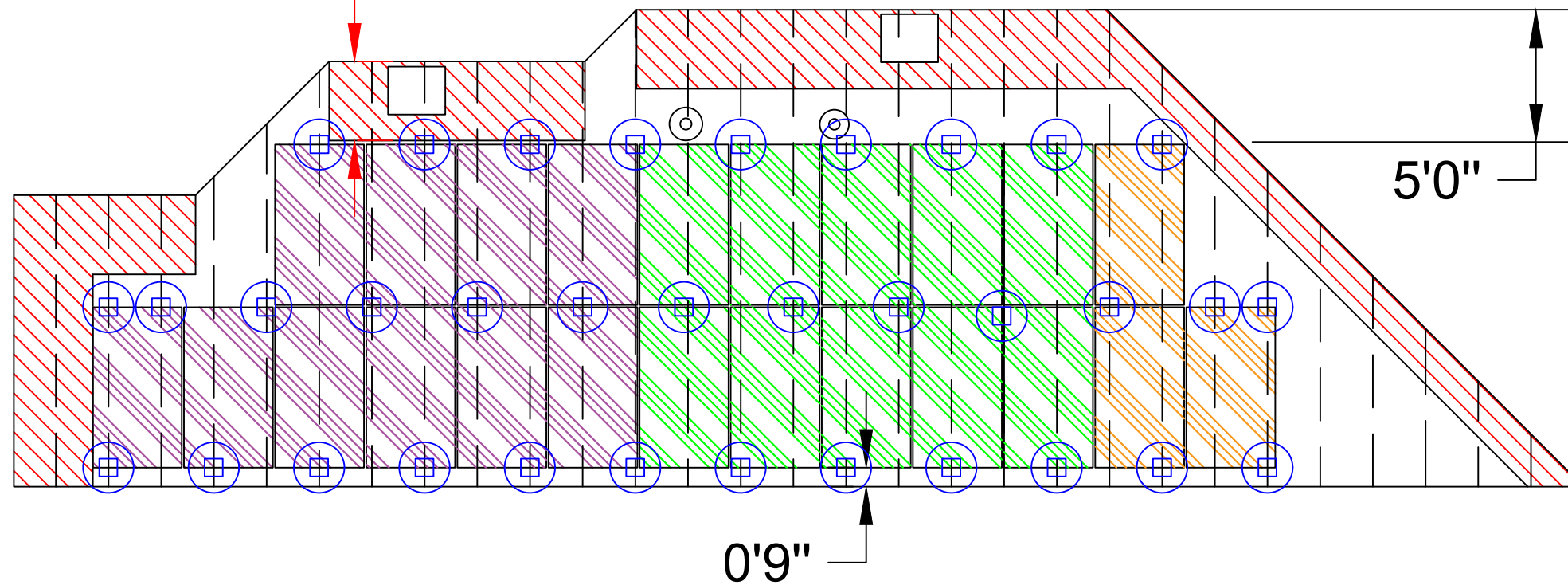
TOTAL MOUNTING FEET NEEDED: 50



ROOF AZIMUTH: 180°



3' FIRECODE PATHWAY

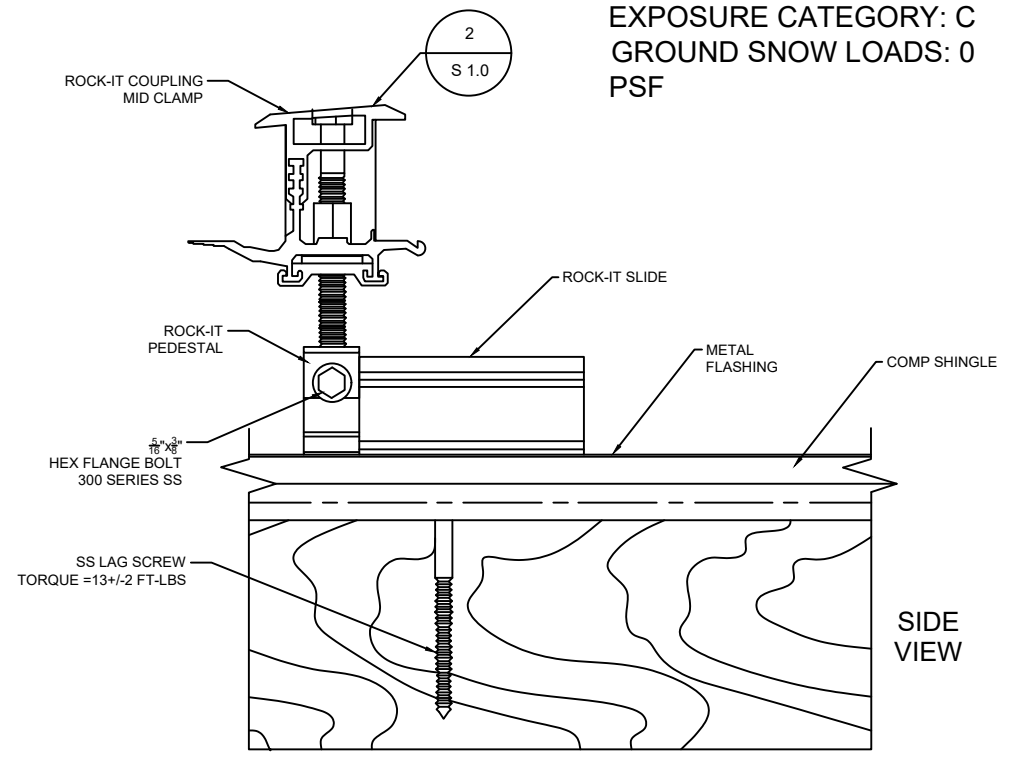


ROOF AZIMUTH: 270°

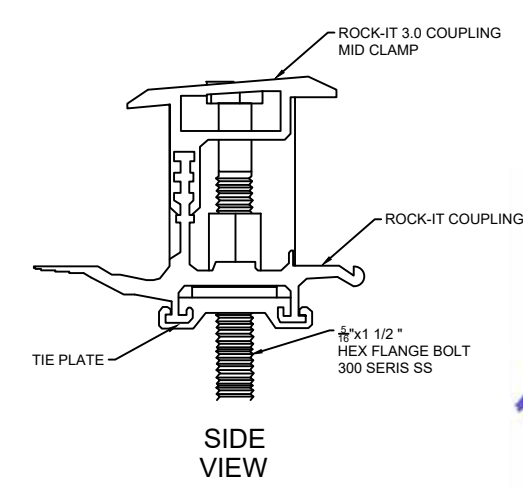
ROOF TILT: 25°
ROOF TYPE: COMP SHINGLE
1 LAYER

TOTAL SYSTEM WEIGHT ON ROOF 1422 LBS

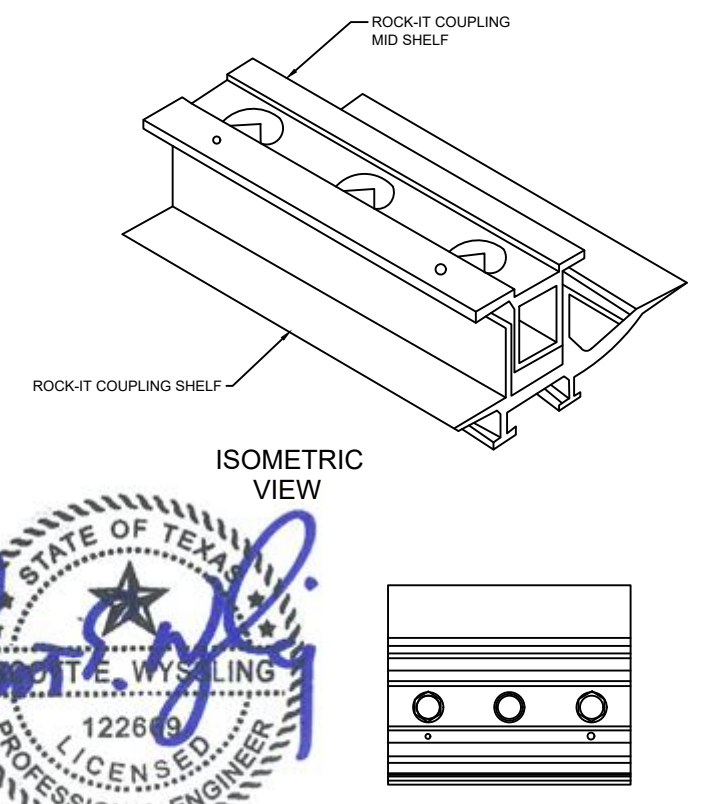
WIND SPEED: 146
 EXPOSURE CATEGORY: C
 GROUND SNOW LOADS: 0 PSF



1 ROCK-IT MOUNT DETAIL
 S 1.0 NOT TO SCALE

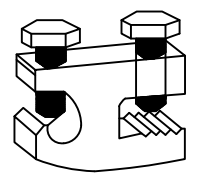


2 ROCK-IT COUPLING ASSEMBLY
 S 1.0 NOT TO SCALE



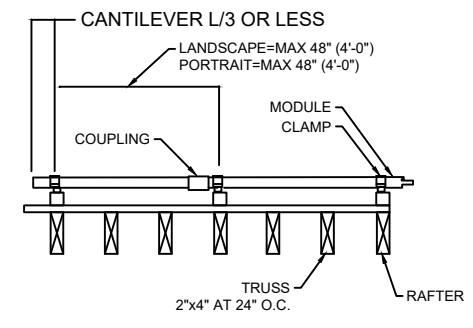
signed 12/22/2021

TOP VIEW

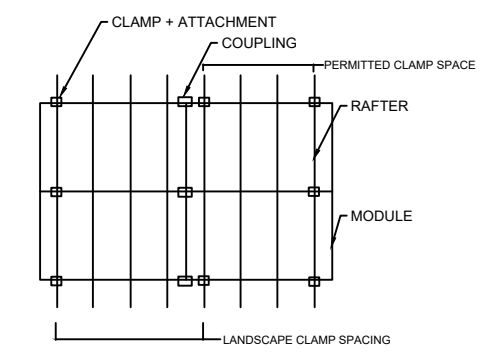


U.L LISTING FOR ECOFASTEN: 2703
 WEIGHT: 2.3 LB.

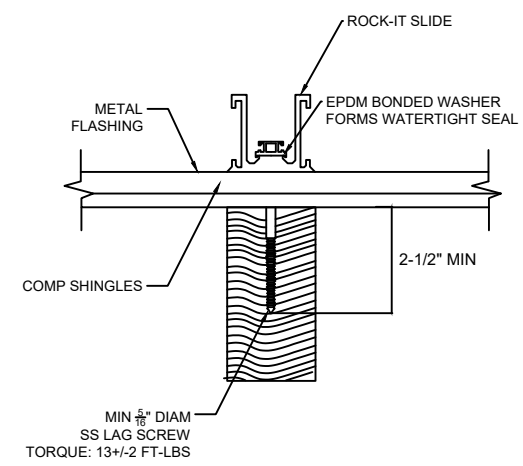
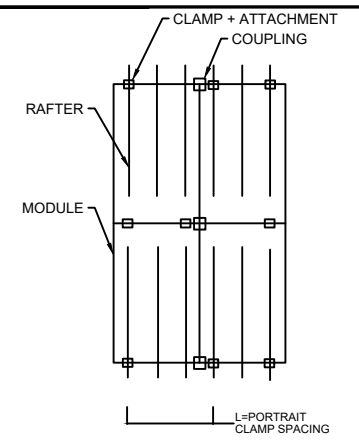
8 ILSCO SGB-4
 GROUNDING LUGS
 S 1.0 NOT TO SCALE



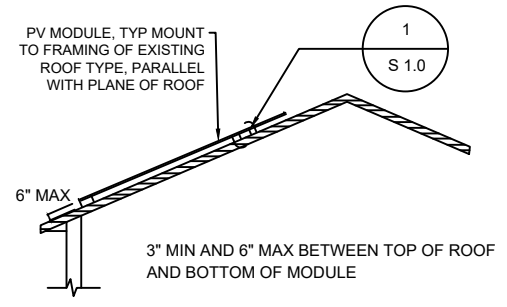
4 PV SYSTEM MOUNT DETAIL
 S 1.0 NOT TO SCALE



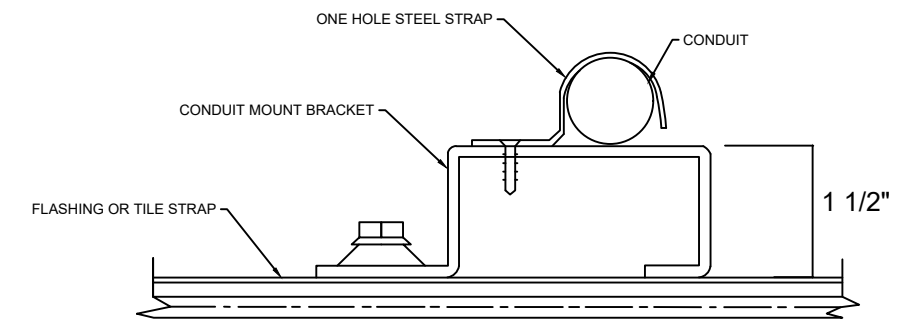
5 MODULES IN PORTRAIT/LANDSCAPE
 S 1.0 NOT TO SCALE



3 SECTION VIEW
 S 1.0 NOT TO SCALE



6 PV ARRAY TYP. ELEVATION
 S 1.0 NOT TO SCALE



7 CONDUIT MOUNTING DETAIL
 S 1.0 NOT TO SCALE

SYSTEM SUMMARY

(11.4 kW DC/ 10.0 kW AC)

3 STRINGS OF (10,10,10) CONNECTED IN SERIES

- (30) Jinko Solar EAGLE 66TR G4 JKM380M-6RL3-B
- (30) SolarEdge P570 OPTIMIZERS
- (1) SolarEdge SE10000H-US (240) INVERTER

NOTE:
 • ALL GROUNDING TO COMPLY WITH NEC 690.47
 • ROOF TOP CONDUIT SHALL BE LOCATED MIN. 1/8" ABOVE ROOF SURFACE
 • ALL TERMINALS SHALL BE MIN. 75 DEG. C RATED.

NOTE:
 GROUNDING ELECTRODE CONDUCTOR/SYSTEM BONDING JUMPER NOT REQUIRED FOR SOLAREGE POWER OPTIMIZER. PROPERLY INSTALLED SYSTEM MEETS THE REQUIREMENTS OF NEC 690.35 FOR UNGROUNDED PV POWER SYSTEMS. PROVIDE EQUIPMENT GROUNDING PER MANUFACTURER'S REQUIREMENTS IN COMPLIANCE WITH NEC

NOTE:
 EGC IS EXPOSED BEFORE JUNCTION BOX THEN PROTECTED BY CONDUIT

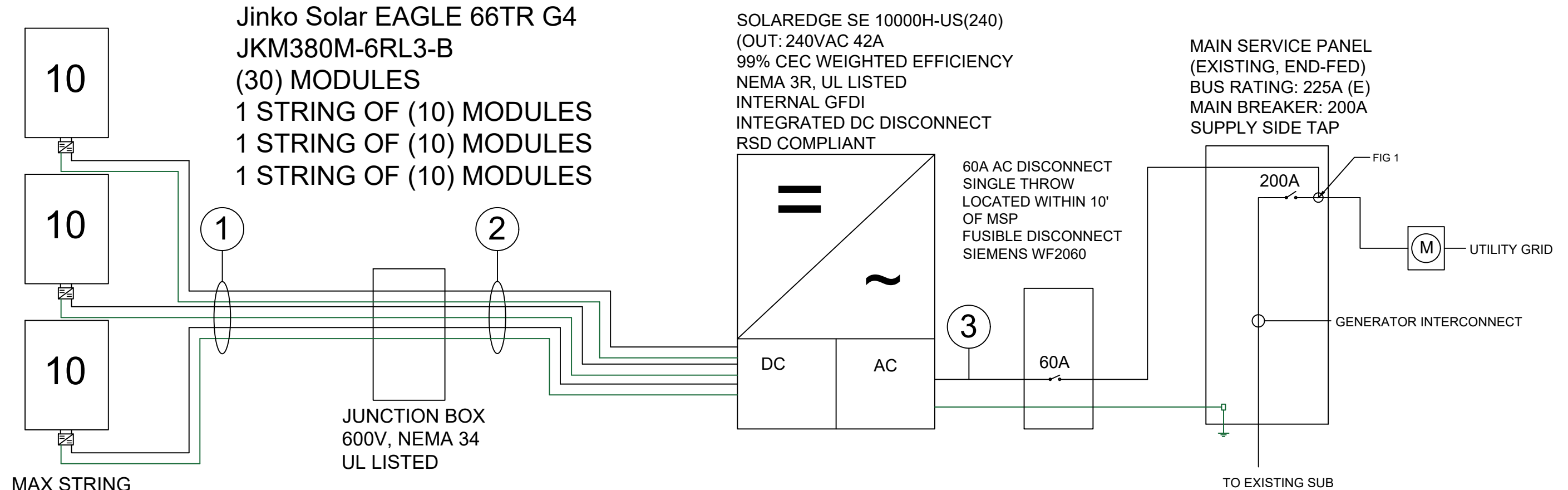
NOTE:
 EXISTING GROUNDING SYSTEM MUST BE VERIFIED OR UPGRADED TO MEET CODE

CONDUIT SCHEDULE

NUMBER	CONDUIT	LIVE WIRE	NEUTRAL	GROUND
1	.75" EMT	(2) 12 AWG PV	-	6 AWG BARE Cu
2	.75" EMT	(2) 12 AWG THWN-2	-	12 AWG THWN-2
3	.75" EMT	(2) 6 AWG THWN-2	6 AWG THWN-2	10 AWG THWN-2

WIRE DETAILS

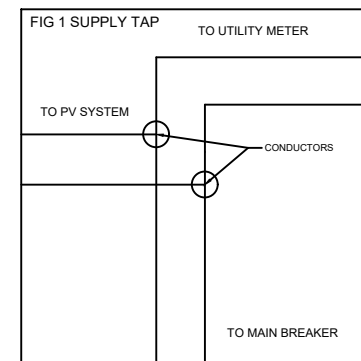
WIRE NUMBER	STRING or # MODULES MAX	VOLTAGE	MAX CONTINUOUS OUTPUT CURRENT *1.25	MAX OCPD	CONDUCTOR SETS	CONDUCTORS/ CONDUIT	EXPECTED MAX TEMP	TEMP DERATE	CONDUIT FILL DERATE	CONDUCTOR AND NEUTRAL (IF APPLICABLE) SIZE	EGC SIZE	CONDUCTOR METAL	INSULATION	V DROP	MIN EMT SIZE	MIN PVC SIZE
1	3X (10) Jinko Solar EAGLE 66TR G4 JKM380M-6RL3-B	406V	18.75(A)	20(A)	3	3 (RWG)	37	0.91	1	12 AWG	6 AWG BARE	Cu	PV	0.42%	.75 in	.75 in
2	3X (10) Jinko Solar EAGLE 66TR G4 JKM380M-6RL3-B	406V	18.75(A)	20(A)	3	3 (RWG)	37	0.91	.8	12 AWG	12 AWG	Cu	THWN-2	0.42%	.75 in	.75 in
3	41	240V	52.5(A)	60(A)	1	3 (RWG)	37	0.91	1	6 AWG	8 AWG	Cu	THWN-2	0.42%	.75 in	.75 in



MAX STRING LENGTH: 15

ELECTRICAL NOTES

- ALL EQUIPMENT TO BE LISTED BY UL OR OTHER NRTL AND LABELED FOR ITS APPLICATION.
- ALL CONDUCTORS SHALL BE COPPER, RATED FOR 600 V AND 90 DEGREE C WET ENVIRONMENT.
- WIRING, CONDUIT, AND RACEWAYS MOUNTED ON ROOFTOPS SHALL BE ROUTED DIRECTLY TO, AND LOCATED AS CLOSE AS POSSIBLE TO THE NEAREST RIDGE, HIP, OR VALLEY.
- WORKING CLEARANCES AROUND ALL NEW AND EXISTING ELECTRICAL EQUIPMENT SHALL COMPLY WITH NEC 110.26
- DRAWINGS INDICATE THE GENERAL ARRANGEMENT OF SYSTEMS. CONTRACTOR SHALL FURNISH ALL NECESSARY OUTLETS, SUPPORTS, FITTINGS, AND ACCESSORIES TO FULFILL APPLICABLE CODES AND STANDARDS.
- WHERE SIZES OF JUNCTION BOXES, RACEWAYS, AND CONDUITS ARE NOT SPECIFIED, THE CONTRACTOR SHALL SIZE THEM ACCORDINGLY.
- ALL WIRE TERMINATIONS SHALL BE APPROPRIATELY LABELED AND READILY VISIBLE.
- MODULE GROUNDING CLIPS TO BE INSTALLED BETWEEN MODULE FRAME AND MODULE SUPPORT RAIL, PER THE GROUNDING CLIP MANUFACTURER'S INSTRUCTION.
- MODULE SUPPORT RAIL TO BE BONDED TO CONTINUOUS COPPER G.E.C. VIA WEEB LUG OR ILSCO GBL-4DBT LAY-IN LUG.
- PV EQUIPMENT SHALL BE DESIGNED AND INSTALLED IN ACCORDANCE WITH NEC 690.
- EXACT LOCATION OF AUXILIARY GROUNDING TO BE DETERMINED AT TIME OF INSTALL.
- EXISTING WIRES MUST BE REPLACED IF SMALLER THAN LISTED MINIMUM SIZES PER NEC 310.15(B)(16).



UTILITY METER
 UTILITY: GEXA ENERGY
 SINGLE PHASE SERVICE
 120/240 V

POTENTIAL MODULE OUTPUT

$I_{sc}(25^{\circ}C) = 11.12A$, $T_{isc} = 0.048\%/^{\circ}C$
 $I_{sc}(T) = I_{sc}(25^{\circ}C) \times [1 + T_{isc} \times (T - 25^{\circ}C)]$
 $I_{sc}(4^{\circ}C) = 11.27A$, $I_{sc}(37^{\circ}C) = 11.21A$

$V_{oc}(25^{\circ}C) = 44.22V$, $T_{voc} = -0.280\%/^{\circ}C$
 $V_{oc}(T) = V_{oc}(25^{\circ}C) \times [1 + T_{voc} \times (T - 25^{\circ}C)]$
 $V_{oc}(4^{\circ}C) = 40.6V$

PARALLEL GENERATION ON SITE

LABEL LOCATION: MAIN PANEL
CODE REF: UTILITY REQUIREMENT

WARNING
INVERTER OUTPUT CONNECTION
DO NOT RELOCATE THIS
OVERCURRENT DEVICE

LABEL LOCATION: BACKFEED BREAKER
CODE REF: 2020, 2017 NEC 705.12(2)(3)(b)

PHOTOVOLTAIC AC DISCONNECT
RATED OPERATING CURRENT: 42 AMPS
NOMINAL OPERATING AC VOLTAGE: 240 AMPS

LABEL LOCATION: POINT OF INTERCONNECTION, AC DISCONNECT
CODE REF: 2020, 2017, 2014, AND 2011 NEC 690.54

WARNING
ELECTRICAL SHOCK HAZARD
TERMINALS ON BOTH LINE AND
LOAD SIDES MAY BE ENERGIZED IN
THE OPEN POSITION
DC VOLTAGE IS ALWAYS PRESENT
WHEN SOLAR MODULES ARE
EXPOSED TO SUNLIGHT

LABEL LOCATION: DC DISCONNECT, COMBINER BOX
CODE REF: 2017, 2020 NEC 690.13(B)

MAXIMUM VOLTAGE: **480** VDC
MAXIMUM CIRCUIT CURRENT: **15** ADC

MAX RATED OUTPUT
CURRENT OF THE CHARGE
CONTROLLER OR DC-TO-DC
CONVERTER (IF INSTALLED) **15** ADC

LABEL LOCATION: DC DISCONNECT INVERTER
CODE REF: UTILITY REQUIREMENT

WARNING
ELECTRICAL SHOCK HAZARD
TERMINALS ON BOTH LINE AND
LOAD SIDES MAY BE ENERGIZED
IN THE OPEN POSITION

LABEL LOCATION: DC DISCONNECT, COMBINER BOX
CODE REF: 2020, 2017 NEC 690.13(B)

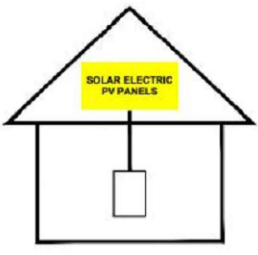
WARNING
PHOTOVOLTAIC SYSTEM
COMBINER PANEL

DO NOT ADD LOADS

LABEL LOCATION: AC COMBINER PANEL
CODE REF: 2020, 2017 NEC 690.12(B)

**SOLAR PV SYSTEM EQUIPPED
WITH RAPID SHUTDOWN**

TURN RAPID SHUTDOWN
SWITCH TO THE "OFF"
POSITION TO SHUTDOWN
PV SYSTEM AND REDUCE
SHOCK HAZARD IN THE
ARRAY.



LABEL LOCATION: MAIN SERVICE
CODE REF: 2020, 2017 NEC 690.12, 690.56(C)(1)(A)

**MANUAL
DISCONNECT
FOR PARALLEL
GENERATION**

LABEL LOCATION: AC DISCONNECT
CODE REF: UTILITY REQUIREMENTS

WARNING PHOTOVOLTAIC POWER SOURCE

LABEL LOCATION: DC CONDUIT JUNCTION BOX (EVERY 10 FEET)
CODE REF: NEC 2020 690.31(D)(2), NEC 2017 690.31(G)(3), 690.31(G)(4), NEC 2014
690.31(G)(3), 690(G)(4), NEC 2011 690.31 (E)(3), 690.31(E)(4), IFC 2012 605.11.1.4

CAUTION
DUAL POWER SOURCE SECOND
SOURCE IS PHOTOVOLTAIC

LABEL LOCATION: SERVICE METER MAIN PANEL
CODE REF: UTILITY REQUIREMENT

WARNING
INVERTER OUTPUT
CONNECTION

DO NOT RELOCATE THIS
OVERCURRENT DEVICE

LABEL LOCATION: IF APPLICABLE SERVICE PANEL
CODE REF: 2020, 2017 NEC 705.12(D)(7)

WARNING
ELECTRICAL SHOCK HAZARD
IF GROUND FAULT IS INDICATED
ALL NORMALLY GROUNDED
CONDUCTORS MAY BE
UNGROUND AND ENERGIZED

LABEL LOCATION: AC DISCONNECT COMBINER BOX SERVICE PANEL
CODE REF: 2020, 2017 NEC 690.5(C)

**RAPID SHUTDOWN
SWITCH FOR SOLAR
PV SYSTEM**

LABEL LOCATION: MAIN PANEL
CODE REF: 2020 NEC 690.56(c)(2), NEC 2017 690.56(C)(3), NEC 2014 690.12

**PHOTOVOLTAIC SYSTEM
UTILITY DISCONNECT SWITCH**

LABEL LOCATION: AC DISCONNECT
CODE REF: UTILITY REQUIREMENT

MAIN PANEL



MAIN PANEL STICKER

