Denver Landmark Preservation Design Review Application and Submittal Checklist

In order to preserve and protect the integrity of Denver’s historical, architectural, geographical and cultural heritage, the Denver Landmark Preservation Commission (LPC), the Lower Downtown Design Review Commission (LDDRC) and Landmark Preservation staff review all exterior work on an individual landmark or structures in a historic district if that work requires a building or zoning permit. This document lists the requirements for design review.

### Property Information

<table>
<thead>
<tr>
<th>Property Address:</th>
<th>1314 Gilpin St</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scope of Work:</td>
<td>Installing a roof mounted solar PV system. Single family home, roof mounted solar PV flush mount with 3.24 kW and 8 modules. A tesla powerwall battery will be added as well.</td>
</tr>
</tbody>
</table>

### Project Type (check all that apply)

- Accessory Dwelling Unit (ADUs)
- Additions
- Demolition
- Dormer Addition
- Egress Window and Well
- Electrical/Mechanical
- Garage
- General Alterations
- New Construction (infill)
- Pop-top/Rooftop Addition
- Porch Reconstruction or Replacement
- Roof Replacement
- Rooftop Deck
- Siding Replacement
- Signage or Comprehensive Sign Plans (CSP)
- Sitework and Fences
- Skylights
- Storefront Alterations
- Telecom
- Window and Door Replacement
- Venting or Building Penetrations
- Zone Lot Amendments (ZLAM)
- Other: Solar Panels

### Applicant Information

<table>
<thead>
<tr>
<th>Property Owner</th>
<th>Name: Paul Schechter/Naomi Reshotko</th>
<th>Pronouns:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address:</td>
<td>1314 N Gilpin St</td>
<td>City, State: Denver, CO 80218</td>
</tr>
<tr>
<td>Email:</td>
<td></td>
<td>Phone:</td>
</tr>
<tr>
<td>Applicant</td>
<td>Name: Roxanne Krieger - Rise Power</td>
<td>Pronouns:</td>
</tr>
<tr>
<td>Address:</td>
<td>681 N Plano Rd ste 121</td>
<td>City, State: Richardson, TX 75081</td>
</tr>
<tr>
<td>Email:</td>
<td><a href="mailto:permit@risepower.energy">permit@risepower.energy</a></td>
<td>Phone: 208-316-0748</td>
</tr>
</tbody>
</table>

### Signature Required

I acknowledge that I have the authority to submit information in this application on behalf of the project and that the information provided in the attached application is true and reliable.

Signature of Owner or Authorized Owner Representative: [Signature]

Full Name (Print): Roxanne Krieger

Date: 12/15/2023

NOTE: All applications become the property of the City and County of Denver. Applications are subject to the Colorado Open Records Act. Applications may be posted online or made available to any party that request a copy.

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This page must be completed
### Sitework and Fences

- **Detail Elevation Drawings**, that clearly note the height, for the following structure(s):
  - Fences
  - Fireplaces
  - Pergolas
  - Pools and hot tubs with built-in elements
  - Outdoor kitchens
  - Retaining walls
  - Site walls
  - Built-in seating areas

- **Section Drawings** of retaining and site walls, and in-ground pools or hot tubs that include dimensions and material notes.

- **Details of Construction** that include:
  - All construction materials clearly labeled in elevation including color, finish, and profiles
  - A material schedule or keynotes
  - Images of all proposed materials
  - Light fixture schedule with manufacture, style, and finish clearly noted
  - Material samples or photographs of new or innovative materials as requested by staff

### Solar Panels, Solar Tiles and Skylights

- **A Roof Plan** that includes:
  - Existing and proposed roof
  - Scaled and dimensioned with roof pitch and solar panel setbacks noted

- **Section Drawings** of solar panels and skylights that include dimensions and materials notes. Clearly show the roof and height of the solar panels or skylights, or thickness of the solar tiles.

- **Details of Construction** that include:
  - All construction materials clearly labeled in plan including color, finish, and profiles
  - Material samples or photographs of new or innovative materials as requested by staff

### Storefronts Alterations

- **Demolition Drawings**, if applicable, that include:
  - Site plan showing what will be demolished
  - Existing elevations – hatch and dimension area of porch to be demolished

- **Existing and Proposed Floor Plans** that include:
  - Labels of all tenant spaces. Use simple labels (e.g., Tenant 1, Tenant 2)
  - All existing and proposed floors, if applicable, indicating all proposed changes at each floor
  - Do not include furniture, reflected ceiling plans, interior finish plans, or other interior work (unless otherwise required for a building or zoning permit)

- **Enlarged/Detail Elevation Drawings** that include:
  - Existing and proposed storefront columns, cornices, kickplates, glazing and mullions, and transoms
  - Awnings or canopies, if applicable

- **Section Drawings** through:
  - Building entry(s)
  - Typical storefront glazing sections

- **Details of Construction** that include:
  - All construction materials clearly labeled in plan including color, finish, and profiles
  - A material schedule or keynotes
  - Images of all proposed materials
  - Glazing transparency calculations
  - Material samples or photographs of new or innovative materials as requested by staff

- **Storefront Lighting** information that clearly shows the:
  - Fixture lamp type, size and location, if applicable
  - Location of power source, conduits, and raceways
  - Lighting intensity, color temperature in degrees
PHOTOVOLTAIC SYSTEM SPECIFICATIONS:
- SYSTEM SIZE: 3.24 KW DC
- MODULE TYPE & AMOUNT: 2.32 KW AC
- MODULE DIMENSIONS: (08) HANWHA Q.PEAK DUO BLK ML-G10+405W (L/W/H) 74.00"/41.10"/1.26"
- INVERTER: (08) ENPHASE IQ8PLUS-72-US [240V]
- GATEWAY: (01) TESLA POWERWALL BACKUP GATEWAY 2
- BATTERY: (01) TESLA POWERWALL 2.0 BATTERY
- BATTERY CAPACITY: 13.5 KWH

INSTRUCTIONS:
1. USE SYMBOLS IN KEY TO MARK UP JCO SHEET.
2. SAFETY PLANS MUST BE MARKED BEFORE JOB STARTS AS PART OF THE PRE-PLAN.
3. DOCUMENT ALL ADDITIONAL HAZARDS ON THIS PAGE AND MAKE NOTES ON THE JCO SHEET.

SATELLITE VIEW

(RIP POWER RICHMOND, VA 23230) WWW.RIPPOWER.COM

IN CASE OF EMERGENCY:
- NEAREST HOSPITAL OR OCCUPATIONAL INDUSTRIAL CLINIC
- SAFETY COACH CONTACT INFORMATION
- ALL EMPLOYEES ON SITE SHALL BE MADE AWARE OF THE SAFETY PLAN AND SIGN INDICATING THAT THEY ARE AWARE OF THE HAZARDS ON-SITE AND THE PLAN FOR WORKING SAFELY

NOTE:
1. THIS DRAWING IS FOR ILLUSTRATIVE PURPOSES ONLY!
2. ALL TESTING SHALL BE PERFORMED BY QUALIFIED PERSONNEL, WITH PROPER PERSONAL PROTECTIVE EQUIPMENT
3. THE AC DISCONNECT SHOULD BE LOCATED TOGETHER IN A READILY ACCESSIBLE LOCATION WITHIN 10' OF THE MAIN SERVICE METER
4. 24/7 UNESCORTED KEYLESS ACCESS SHALL BE PROVIDED FOR THE UTILITY METER AND AC DISCONNECT

RAE POWER RICHMOND, VA 23230) WWW.RIPPOWER.COM
PHOTOVOLTAIC ROOF MOUNT SYSTEM

PHOTOVOLTAIC SYSTEM SPECIFICATIONS:

- **SYSTEM SIZE:** 3.24 kW DC, 2.32 kW AC
- **MODULE TYPE & A MOUNT:** (08) HANWHA Q.PEAK DUO BLK ML-G10+405W
- **MODULE DIMENSIONS:** 74.0" x 141.10" x 28.0"
- **INVERTER:** (05) ENPHASE IQ8PLUS-72-2-US [240V]
- **INTERCONNECTION METHOD:** LOAD BREAKER
- **GATEWAY:** (01) TESLA POWERWALL BACKUP GATEWAY 2
- **BATTERY:** (01) TESLA POWERWALL 2.0 BATTERY
- **BATTERY CAPACITY:** 13.5 kWh

GOVERNING CODES

ADOPTED CONSTRUCTION CODES

- 2021 INTERNATIONAL BUILDING CODE
- 2021 INTERNATIONAL RESIDENTIAL CODE
- 2021 INTERNATIONAL PLUMBING CODE
- 2021 INTERNATIONAL MECHANICAL CODE
- 2021 INTERNATIONAL FUEL GAS CODE
- 2021 INTERNATIONAL EXISTING BUILDING CODE
- 2021 INTERNATIONAL ENERGY CONSERVATION CODE
- 2021 INTERNATIONAL FIRE CODE
- 2023 NATIONAL ELECTRIC CODE

GENERAL NOTES:

- Installation of solar photovoltaic system shall be in accordance with NEC Article 690, and all other applicable NEC Codes where noted or existing.
- Proper access and working clearance around existing and proposed electrical equipment will comply with NEC Article 110.
- All conductors, including the grounding electrode conductor, shall be protected from physical damage in accordance with NEC Article 250.
- The PV modules are considered non-combustible; this system is utility interactive per UL 1741 and does not require the placement of ground ladders over openings such as windows or doors and located at strong points of building construction in locations where the access point does not conflict with overhead obstructions such as tree limbs, wires or signs.
- DC conductors shall be within protected raceways in accordance with NEC 860.31.
- All dc conductors shall be within protected raceways in accordance with NEC 860.31.
- All signage to be placed in accordance with local jurisdictional building code.
- PV modules to be rated UL 1701 Class C fire rating or better.
- All equipment to be certified by a nationally recognized testing laboratory.

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PHOTOVOLTAIC SYSTEM SPECIFICATIONS:

**SYSTEM SIZE:**
- 3.24 kW DC
- 3.22 kW AC

**MODULE TYPE & AMOUNT:**
- (06) HANWHA Q.PEAK DUO BLK ML-G10+405W (L/F/W): 74.00"/41.10"/1.26"
- (06) ENPHASE IQ8PLUS-72-2-US [240V]

**INVERTER:**
- (01) TESLA POWERWALL 2.0 BATTERY

**BATTERY CAPACITY:**
- 13.5 kWh

**NOTES:**
- Solar PV shall be used as a secondary interconnection.
- The designed interconnection meets National Electric Code (NEC) requirements.

CIRCUIT(S)

- NEW BATTERY DISCONNECT GROUPED WITH SERVICE EQUIPMENT (VISIBLE, LOCKABLE, LABELED)
- NEW TESLA BACKUP GATEWAY 2
- NEW PV ATTACHMENTS AT 4'-0" O.C.
- NO POSITION, DISTANCE AND CLEARANCE CONCERNS OF OVERHEAD ELECTRICAL SERVICE LINES AND/OR OTHER UTILITIES IN RELATION TO THE PV PANELS

CIRCUIT #1 - 08 MODULES

- NEW JUNCTION BOX
- NEW AC COMBINER PANEL
- NEW AC CONNECTOR GROUPED WITH SERVICE EQUIPMENT (VISIBLE, LOCKABLE, LABELED)
- NEW TESLA BACKUP GATEWAY 2
- NEW BATTERY DISCONNECT GROUPED WITH SERVICE EQUIPMENT (VISIBLE, LOCKABLE, LABELED)
- NEW 125A SUB PANEL FOR NON BACKUP LOADS
- NEW TESLA POWERWALL 2.0 BATTERY

THE BILL HAS 24/7 KEYLESS ACCESS TO METERS AND UTILITY AC DISCONNECTS

**MODULE: ARRAY WEIGHT (LOAD CALC'S)**

- Number of Modules: 08
- Module Weight: 484.00 LBS
- Mounting System Weight: 36.00 LBS
- Total System Weight: 444.00 LBS

**SYSTEM LEGEND**
- VISIBLE, LOCKABLE, LABELED DISCONNECT

1314 N. GILPIN ST
D ENVER, CO 80218

BARRIE RESHOTKO RESIDENCE
1314 N. GILPIN ST
DENVER, CO 80218

RISE POWER
855-747-3769
WWW.RISEPOWER.ENERGY

11' X 17'

SHUTDOWN - YES
ATTIC FAN - NO
ATTIC RUN - YES
ATTIC FAN - NO
SHUTDOWN - YES

NO POSITION, DISTANCE AND CLEARANCE CONCERNS OF OVERHEAD ELECTRIC SERVICE LINES AND/OR OTHER UTILITIES IN RELATION TO THE PV PANELS

SYSTEM SIZE:
- 3.24 kW DC
- 3.22 kW AC

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- (06) ENPHASE IQ8PLUS-72-2-US [240V]

INVERTER:
- (01) TESLA POWERWALL 2.0 BATTERY

BATTERY CAPACITY:
- 13.5 kWh

NOTES:
- Solar PV shall be used as a secondary interconnection.
- The designed interconnection meets National Electric Code (NEC) requirements.
GENERAL STRUCTURAL NOTES:

1. THE SOLAR PANELS ARE TO BE MOUNTED TO THE ROOF FRAMING USING THE IRONRIDGE RACKING SYSTEM WITH FLASH LOC ATTACHMENTS. THE MOUNTING FEET ARE TO BE SPACED AS SHOWN IN THE DETAILS, AND MUST BE STAGGERED TO ADJACENT FRAMING MEMBERS TO SPREAD OUT THE ADDITIONAL LOAD.

2. UNLESS NOTED OTHERWISE, MOUNTING ANCHORS SHALL BE 5/16" LAG SCREWS WITH A MINIMUM OF 2-1/2" PENETRATION INTO ROOF FRAMING.

3. THE PROPOSED PV SYSTEM ADDS 2.37 PSF TO THE ROOF FRAMING SYSTEM.

4. ROOF LIVE LOAD = 20 PSF TYPICAL, 0 PSF UNDER NEW PV SYSTEM.

5. GROUND SNOW LOAD = 35 PSF

6. WIND SPEED = 107 MPH

7. EXPOSURE CATEGORY = C

8. RISK CATEGORY = II

ATTACHMENT DETAIL (SIDE VIEW)

IRONRIDGE END / MID CLAMP

PV MODULES

IRONRIDGE XR10 RAIL

UNIRAC FLASH LOC ATTACHMENT

5/16"x3" SS LAG BOLT WITH MIN 2-1/2" THREAD EMBEDMENT, SEALED PENETRATION

ATTACHMENT DETAIL ENLARGED VIEW

VISIBLE, LOCKABLE, LABELED DISCONNECT LOCATED WITHIN 10' OF UTILITY METER
NEW (01) TESLA POWERWALL 2 BATTERY

NEW 125A SUB PANEL ON EXTERIOR WALL FOR NON-BACKUP LOADS

NEW AC DISCONNECT GROUPED WITH SERVICE EQUIPMENT (VISIBLE, LOCKABLE, LABELED)

EXISTING MAIN SERVICE PANEL ON EXTERIOR WALL FOR BACKUP LOADS

NEW TESLA BACKUP GATEWAY-2

EXISTING EXTERIOR XCEL ENERGY UTILITY METER #46 653 658

NEW AC COMBINER PANEL

NEW BATTERY DISCONNECT GROUPED WITH SERVICE EQUIPMENT (VISIBLE, LOCKABLE, LABELED)

EXISTING EXTERIOR XCEL ENERGY UTILITY METER #46 653 658

NEW AC COMBINER PANEL
NEW EXTERIOR: 240V/125A BUS BAR RATATION, SUB PANEL, SINGLE PHASE, WITH A 100A MAIN BREAKER - 1PHASE, 3-W, (FOR NON-BACKUP LOAD)

NEW JUNCTION BOX 600 V, NEMA 3R, UL LISTED
NEW JUNCTION BOX 600 V, NEMA 3R, UL LISTED

TERMINATOR CAP ON LAST CABLE (REFERENCE POINT OF APPLICABILITY)

(p) NEW HANWHA Q.PEAK DUO BLK ML-G10+405W MODULES WITH (N) NEW ENPHASE IQ8PLUS-72-2-US [240V]

3.24 kW DC
2.32 kW AC

M* RMC) *FMC MAY BE USED IN INDOOR APPLICATIONS WHERE PERMITTED BY NEC ART. 348

3. THE AC DISCONNECT SHOULD BE LOCATED TOGETHER IN A READILY ACCESSIBLE LOCATION WITHIN 10' OF THE MAIN SERVICE METER. LINE CONFIGURATION IS 2C, CONFIGURATION LISTED.

2.32 kW AC

1-PHASE, 3-W, (OUTSIDE WALL)

NEW POWERWALL 2.0 BUS BAR RATING, SUB PANEL, SINGLE PHASE, WITH A 100A MAIN BREAKER - 1PHASE, 3-W, (FOR NON-BACKUP LOAD)

NEW EXTERIOR: 240V/200A BUS BAR RATATION, SUB PANEL, SINGLE PHASE, WITH A 200A MAIN BREAKER - 1PHASE, 3-W, (FOR BACKUP LOADS)

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3. THE AC DISCONNECT SHOULD BE LOCATED TOGETHER IN A READILY ACCESSIBLE LOCATION WITHIN 10' OF THE MAIN SERVICE METER.

NEW POWERWALL 2.0 BUS BAR RATING, SUB PANEL, SINGLE PHASE, WITH A 200A MAIN BREAKER - 1PHASE, 3-W, (FOR NON-BACKUP LOAD)

NEW JUNCTION BOX 600 V, NEMA 3R, UL LISTED
NEW JUNCTION BOX 600 V, NEMA 3R, UL LISTED

TERMINATOR CAP ON LAST CABLE (REFERENCE POINT OF APPLICABILITY)

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3.24 kW DC
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3. THE AC DISCONNECT SHOULD BE LOCATED TOGETHER IN A READILY ACCESSIBLE LOCATION WITHIN 10' OF THE MAIN SERVICE METER. LINE CONFIGURATION IS 2C, CONFIGURATION LISTED.
INVERTER SPECIFICATIONS
MANUFACTURER: ENPHASE ENERGY IQ8PLUS-TZ-2-US
MAX. DC VOLT RATING: 60 VOLS
MAX. POWER AT 40 C: 290 WATTS
NOMINAL AC VOLTAGE: 240 VOLTS
MAX. AC CURRENT: 1.21 AMPS
MAX. OCPD RATING: 20 AMPS
MAX. PANELS/CIRCUIT: 13
SHORT CIRCUIT CURRENT: 15 AMPS

PV MODULE RATING @ STC
MANUFACTURER: HANWHA Q.PEAK DUO BLK ML-G10+405W
MAX. POWER-POINT CURRENT (IMP): 10.83 AMPS
MAX. POWER-POINT VOLTAGE (VMP): 37.39 VOLTS
OPEN-CIRCUIT VOLTAGE (VOC): 45.34 VOLTS
SHORT-CIRCUIT CURRENT (ISC): 11.17 AMPS
NOM. MAX. POWER AT STC (PMAX): 405 WATT
MAX. SYSTEM VOLTAGE: 1000V
VOC TEMPERATURE COEFFICIENT: -0.27%/°C

PV SYSTEM
SYSTEM SIZE: 3.24 kW DC
2.32 kW AC
MODULE: (08) HANWHA Q.PEAK DUO BLK ML-M10+405W
INVERTER: (08) ENPHASE IQ8PLUS-TZ-2-US [240V]
GATEWAY: (01) TESLA POWERWALL BACKUP GATEWAY 2
BATTERY: (01) TESLA POWERWALL 2.0 BATTERY
BATTERY CAPACITY: 13.5 kWh
PV MODULE PTC RATING: 376.3W
ROOF SLOPE: 35°
ROOF AZIM: 180°, 270°
MODULES PER STRING: 08

BATTERY SPECIFICATIONS
BATTERY MANUFACTURER: TESLA POWERWALL 2.0 BATTERY
NOMINAL VOLTAGE RANGE: 120/240 V
MAX. CONTINUOUS POWER: 5 kW
USABLE ENERGY: 13.5 kWh
MAX. OUTPUT CURRENT: 32 A
NOMINAL DC VOLTAGE: 50 V

BACKUP GATEWAY SPECIFICATIONS
MANUFACTURER: TESLA POWERWALL BACKUP GATEWAY 2
SYSTEM VOLTAGE: 120/240 VAC, 60HZ
CURRENT RATING: 200 A
MAX.OCPD FOR STORAGE BRANCH: 80 A
MAX. OCPD FOR PV BRANCH: 80 A

WIRING CALCULATIONS
WIRE FROM: -
TAG #: -
CONDUCT: -
QTY: -
GAUGE: -
WIRE RATING: -
TEMP RATING: -
WIRE AMP: -
DE RATE: -
CONDUCT FILL: -
WIRE OCP: -
INVERTER QTY: -
OCP: -
NEC: -
STRING AMPS: -
GRIND SIZE: -
GRIND WIRE TYPE: -

ARRAY TO JUNCTION BOX #1
TRUNK CABLE 2 #12 THWN-2 90° 30A x 0.91 x N/A = 27.30A 08 x 1.21A x 1.25 = 12.10A #6 SBC

JUNCTION BOX #1 TO JUNCTION BOX #2
ROMEX 2 #10 ROMEX 75° 35A x 0.88 x 1.00A = 30.80A 08 x 1.21A x 1.25 = 12.10A #8 THWN

JUNCTION BOX #2 TO COMBINER PANEL
3/4" EMT 2 #10 THHN 75° 35A x 0.88 x 1.00A = 30.80A 08 x 1.21A x 1.25 = 12.10A #8 THWN

COMBINER PANEL TO BACKUP GATEWAY
3/4" EMT 3 #8 THHN 75° 50A x 0.88 x 1.00 = 44.00A 08 x 1.21A x 1.25 = 12.10A #8 THWN

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BATTERY: (01) TESLA POWERWALL 2.0 BATTERY
BATTERY CAPACITY: 13.5 kWh
PV MODULE PTC RATING: 376.3W
ROOF SLOPE: 35°
ROOF AZIM: 180°, 270°
MODULES PER STRING: 08

ATTIC RUN - YES
SHUTDOWN - YES

NOTE:

Rooftop conductor ampacities designed in compliance with art. 690.8, Tables 310.15(B)(2)(a), 310.15(B)(3)(a), 310.15(B)(3)(c), 310.15(B)(16), Chapter 9 Table 4, 5, & 9.
Location specific temperature obtained from ASHRAE 2017 data tables

REVISIONS
Signature with Seal
Project Name & Address

INITIAL DESIGN
PremiumCAD

Sheet Name
DRAWN BY
Sheet Size
Sheet Number
ANSI B 11" X 17"
2. WIRING SYSTEMS INSTALLED IN DIRECT SUNLIGHT MUST BE RATED FOR EXPECTED OPERATING TEMPERATURE AS SPECIFIED BY NEC 680.31(A),(C) AND NEC TABLES 310.15(B)(2)(A) AND 310.15(B)(3)(C).
3. JUNCTION AND PULL BOXES PERMITTED INSTALLED UNDER PV MODULES ACCORDING TO NEC 690.34.
4. ADDITIONAL AC CONDUCTORS SHAL BE PROVIDED WHERE THE INVERTER IS NOT WITHIN SIGHT OF THE AC SERVICING DISCONNECT. ALL EQUIPMENT SHALL BE INSTALLED ACCESSIBLE TO QUALIFIED PERSONNEL ACCORDING TO NEC APPLICABLE CODES.
5. ALL COMPONENTS ARE LISTED FOR THEIR PURPOSE AND RATED FOR OUTDOOR USAGE WHEN APPROPRIATE.

REQUIREMENTS AND ARE NOT MEANT TO LIMIT UP-SIZING.

WIRING & CONDUIT NOTES:

1. ALL CONDUIT AND WIRE WILL BE LISTED AND APPROVED FOR THEIR PURPOSE. CONDUCT AND WIRE SPECIFICATIONS ARE BASED ON MINIMUM CODE REQUIREMENTS AND ARE NOT MEANT TO LIMIT UP-SIZING.
2. CONDUCTORS SIZED ACCORDING TO NEC 690.8, 690.9, AND NEC TABLES 310.15(B)(2)(A) AND 310.15(B)(3)(C).
3. VOLTAGE DROP LIMITED TO 1.5%.
4. DC WIRING LIMITED TO MODULE FOOTPRINT. MICROINVERTER WIRING SYSTEMS SHALL BE LOCATED AND SECURED UNDER THE ARRAY W/SUITABLE WIRING CLIPS.
5. AC CONDUCTORS COLORED OR MARKED AS FOLLOWS: PHASE A OR L1- BLACK, PHASE B OR L2- BLUE, PHASE C OR L3- YELLOW, ORANGE**, OR OTHER CONVENTION NEUTRAL- WHITE OR GREY IN WIRE DELTA CONNECTED SYSTEMS THE PHASE WITH HIGHER VOLTAGE TO BE MARKED ORANGE [NEC 110.15].

GROUNDING NOTES:

1. GROUNDING SYSTEM COMPONENTS SHALL BE LISTED FOR THEIR PURPOSE, AND GROUNDING DEVICES EXPOSED TO THE ELEMENTS SHALL BE RATED FOR SUCH USE.
2. PV EQUIPMENT SHALL BE GROUNDED ACCORDING TO NEC 690.43 AND MINIMUM NEC TABLE 250.122.
3. METAL PARTS OF MODULE FRAMES, MODULE RACKING, AND ENCLOSURES CONSIDERED GROUNDED IN ACCORDANCE WITH NEC 250.134 AND 250.136(A)
4. GROUNDING EQUIPMENTS SHALL BE SIZED ACCORDING TO NEC 690.45 AND MICROINVERTER MANUFACTURERS’ INSTRUCTIONS.
5. EACH MODULE WILL BE GROUNDED USING WEEB GROUNDING CLIPS AS SHOWN IN MANUFACTURER’S DOCUMENTATION AND APPROVED BY THE AHJ. IF WEEBS ARE NOT USED, MODULE GROUNDING LUGS MUST BE INSTALLED AT THE SPECIFIED GROUNDING LUG HOLES PER THE MANUFACTURERS’ INSTALLATION REQUIREMENTS.
6. THE GROUNDING CONNECTION TO A MODULE SHALL BE ARRANGED SUCH THAT THE REMOVAL OF A MODULE DOES NOT INTERRUPT A GROUNDING CONDUCTOR TO ANOTHER MODULE.
7. GROUNDING AND BONDING CONDUCTORS, IF INSULATED, SHALL BE COLORED GREEN OR MARKED GREEN IF #4 AWG OR LARGER [NEC 250.119]
8. THE GROUNDING ELECTRODE SYSTEM COMPLIES WITH NEC 690.47 AND NEC 250.50 THROUGH 250.106. IF EXISTING SYSTEM IS INACCESSIBLE, OR INADEQUATE, A GROUNDING ELECTRODE SYSTEM PROPOSED ACCORDING TO NEC 250, NEC 690.47 AND AHU.
9. GROUND-FAULT DETECTION SHALL COMPLY WITH NEC 690.41(B)(1) AND (2) TO REDUCE FIRE HAZARDS.

DISCONNECTION AND OVER-CURRENT PROTECTION NOTES:

1. DISCONNECTING SWITCHES SHALL BE WIRING SUCH THAT WHEN THE SWITCH IS OPENED THE CONDUCTORS REMAINING ENERGIZED ARE CONNECTED TO THE TERMINALS MARKED “LINE SIDE” (TYPICALLY THE UPPER TERMINALS).
2. DISCONNECTS TO BE ACCESSIBLE TO QUALIFIED UTILITY PERSONNEL, BE LOCKABLE, AND BE A VISIBLY-IDENTIFIED DISCONNECT.
3. PV SYSTEM CIRCUITS INSTALLED ON OR IN BUILDINGS SHALL INCLUDE A RAPID SHUTDOWN FUNCTION TO REDUCE SHOCK HAZARD FOR EMERGENCY RESPONDERS IN ACCORDANCE WITH 690.12(A) THROUGH (D).
4. ALL OCPD RATINGS AND TYPES SPECIFIED ACCORDING TO NEC 690.8, 690.9, AND NEC 250.119.
5. MICROINVERTER BRANCHES CONNECTED TO A SINGLE BREAKER OR GROUPED FUSES IN ACCORDANCE WITH NEC 110.3(B).
6. IF REQUIRED BY AHU, SYSTEM WILL INCLUDE ARC-Fault CIRCUIT PROTECTION ACCORDING TO NEC 690.11 AND UL 1699B.

INTERCONNECTION NOTES:

1. LOAD-SIDE INTERCONNECTION SHALL BE IN ACCORDANCE WITH NEC 705.12 (B)
2. THE SUM OF THE UTILITY OCPD AND INVERTER CONTINUOUS OUTPUT MAY NOT EXCEED 120% OF BUSBAR RATING [NEC 705.12(D)(2)(C)]
4. MICROINVERTER BRANCHES CONNECTED TO A SINGLE BREAKER OR GROUPED FUSES IN ACCORDANCE WITH NEC 110.3(B).
5. IF REQUIRED BY AHU, SYSTEM WILL INCLUDE ARC-Fault CIRCUIT PROTECTION ACCORDING TO NEC 690.11 AND UL 1699B.
6. SUPPLY SIDE TAP INTERCONNECTION ACCORDING TO NEC 705.12 (A) WITH SERVICE ENTRANCE CONDUCTORS IN ACCORDANCE WITH NEC 290.42 2.7 BACKFEED BREAKER FOR ELECTRIC POWER SOURCES OUTPUT IS EXEMPT FROM ADDITIONAL FASTENING [NEC 705.12 (B)(5)].
4.11 METER SOCKETS

4.11.1 SELF-CONTAINED METER SOCKETS PURCHASING, INSTALLING, CONNECTING, AND MAINTAINING SELF-CONTAINED METER SOCKETS SHALL BE THE RESPONSIBILITY OF THE CUSTOMER. ALL METER SOCKETS SHALL BE NATIONALY RECOGNIZED TESTING LABORATORY (NRTL) LISTED AND LABELED; USED IN ACCORDANCE WITH THEIR LABELING, INSTALLED PER THE 2014 NATIONAL ELECTICAL CODE®, OR AS MAY BE AMENDED, AND MEET ANY CODE REQUIREMENTS THAT MAY BE ENFORCED BY THE LOCAL PUBLIC AUTHORITY. ALL SINGLE AND MULTIPLE POSITION METER SOCKETS INSTALLED ON THE COMPANY’S SYSTEM SHALL MEET THE COMPANY’S STANDARDS FOR THESE DEVICES AS LISTED ON THE FOLLOWING PAGES. COMPANY ELECTRIC METER PERSONNEL ARE INSTRUCTED NOT TO INSTALL A METER AT A LOCATION WHERE THE METER SOCKET DOES NOT COMPLY WITH ALL CRITERIA LISTED BELOW. METER SOCKETS WILL BE CONSIDERED UN-APPROVED UNLESS THEY ADHERE TO THIS CRITERIA.

1. INDIVIDUAL METER SOCKETS SHALL BE CONSTRUCTED FROM STEEL. SOCKETS CONSTRUCTED FROM ALUMINUM OR NON-METALLIC MATERIALS ARE NOT ALLOWED.

2. INDIVIDUAL METER SOCKETS, EXCLUDING SIDE-WIRED TYPE WHICH ARE Bussed ON THE LINE-SIDE OF THE METER, USED IN ALL INSTALLATIONS SHALL HAVE THE FOLLOWING MINIMUM DIMENSIONS: A. 200 AMP – 19” HEIGHT X 13” WIDTH B. 320 AMP – 26 ½” X 13” WIDTH.

3. TEMPORARY COVER PLATES FOR METER SOCKETS SHALL BE CONSTRUCTED FROM A NON-METALLIC MATERIAL.

4. SINGLE-PHASE AND THREE-PHASE METER SOCKETS SHALL BE RATED FOR EITHER 200 OR 320 CONTINUOUS DUTY AND SHALL BE EQUIPPED WITH AN APPROVED LEVER-ACTUATED, LOCKING-JAW, Bypass constructed such that the bypass lever cannot be in the bypass position with the socket cover installed. The bypass handle shall be located on the right side of the meter block when facing the meter block. The only approved bypasses are the TALON (FORMERLY LANDIS & GYR), SQUARE D. MILBANK HD (HEAVY DUTY), EASTON MSL (WITH "XCH" SUFFIX), AND COOPER B-Line. NOTE: EFFECTIVE APRIL 15, 2015 BLUE HANDLED EASTON MSL (METER SOCKET LEVER Bypass) SINGLE-PHASE AND THREE-PHASE METER SOCKETS USING A "XCH" SUFFIX ARE APPROVED FOR USE. NOTE: EFFECTIVE OCTOBER 1, 2014 ALL TEMPORARY SINGLE-PHASE COMMERCIAL SERVICES (E.G. CONSTRUCTION TEMPORARY), SHALL HAVE A LOCKING-JAW, LEVER Bypass.

5. SOCKETS SHALL BE EQUIPPED WITH AN INSULATING, TRACK-RESISTANT POLYCARBONATE SAFETY SHIELD.

6. SINGLE-PHASE AND THREE-PHASE, THREE-WIRE SOCKETS SHALL HAVE A FIFTH TERMINAL CONNECTED TO THE NEUTRAL WITHIN THE SOCKET WITH MINIMUM #16 AWG WIRE. THE FIFTH TERMINAL SHALL BE INSTALLED IN THE 9/4 EFFECTIVE DATE AUGUST 15, 2017 O’CLOCK, RATHER THAN THE 6 O’CLOCK, POSITION IF THE METER BLOCK DESIGN ALLOWS. THE COMPANY WILL NOT FURNISH OR INSTALL THE FIFTH TERMINAL.

7. THREE-PHASE, FOUR-WIRE SOCKETS SHALL HAVE THE SEVENTH TERMINAL CONNECTED TO THE NEUTRAL WITHIN THE SOCKET WITH MINIMUM #16 AWG WIRE.

8. SOCKETS SHALL HAVE RINGLESS STYLE COVERS. NO SCREWS, STUDS, OR WING NUTS ARE ALLOWED TO Secure THE METER COVERS.

9. SEALING MEANS SHALL PROVIDE FOR A PLASTIC PADLOCK SEAL WITH A 0.04” DIAMETER SHACKLE AND A KEY TYPE PADLOCK WITH A 9/32” SHACKLE.

10. 320 AMP METER SOCKETS SHALL HAVE AN ANTI-INVERSION CLIP INSTALLED IN THE TOP RIGHT TERMINAL.

4.11.2 SELF-CONTAINED MULTIPLE METERING PANELS:

1. MULTIPLE METERING PANELS SHALL BE CONSTRUCTED FROM STEEL OR ALUMINUM. PANELS CONSTRUCTED FROM NON-METALLIC MATERIALS ARE NOT ALLOWED.

2. MULTIPLE METERING PANELS WHICH ARE Bussed ON THE LINE-SIDE OF THE METER SHALL HAVE THE FOLLOWING MINIMUM DIMENSION IN THE METERING SECTION: A. 200 AMP – 10” HEIGHT X 9 ½” WIDTH (HEIGHT MEASURED FROM TOP TO BOTTOM OF A SINGLE METER COMPARTMENT). B. 320 AMP – 13” HEIGHT X 11” WIDTH.

3. EACH METER SOCKET SHALL HAVE AN INDIVIDUAL RINGLESS COVER WITH SEALING PROVISIONS. NO SCREWS, STUDS, OR WING NUTS ARE ALLOWED TO Secure METER COVERS.

4. THE PANEL SHALL HAVE PERMANENT BARRIERS TO ISOLATE THE CUSTOMER’S DISCONNECT SWITCH AND WIRING FROM THE METERING AREAS.

5. EACH LINE-SIDE COMPARTMENT SHALL HAVE PROVISIONS FOR A COMPANY SEAL, WHETHER OR NOT THE COMPARTMENT IS DESIGNED TO HOUSE A METER.

6. NO MULTIPLE METERING PANELS SHALL HAVE A DOOR THAT COMPLETELY ENCLOSES THE UTILITY METERING.

4.11.3 SELF-CONTAINED COMBINATION METERING DEVICES:

1. COMBINATION METERING DEVICES, SUCH AS METER/MAN AND METER/PANEL, SHALL BE CONSTRUCTED FROM STEEL OR ALUMINUM. DEVICES CONSTRUCTED FROM NON-METALLIC MATERIALS ARE NOT ALLOWED.

2. COMBINATION METERING DEVICES, EXCLUDING SIDE-WIRED TYPE WHICH ARE Bussed ON THE LINE SIDE OF THE METER, USED IN ALL INSTALLATIONS SHALL HAVE THE FOLLOWING MINIMUM DIMENSION IN THE METERING SECTION. A. 200 AMP – 9 ½” HEIGHT X 13” WIDTH (HEIGHT MEASURED FROM TOP OF ENCLOSURE TO CENTER OF METER BLOCK). B. 320 AMP – 13 ¼” HEIGHT X 13” WIDTH (HEIGHT MEASURED FROM TOP OF ENCLOSURE TO CENTER OF METER BLOCK).


4. COMBINATION METERING DEVICES SHALL HAVE SEPARATE COVERS ON THE CUSTOMER’S DISCONNECT SWITCH AND WIRING AREA AND ON THE METERING AREA.

4.11.4 SELF-CONTAINED METERING PEDESTALS:

1. METERING PEDESTALS SHALL BE CONSTRUCTED FROM STEEL OR ALUMINUM. PEDESTALS CONSTRUCTED FROM NONMETALLIC MATERIALS ARE NOT ALLOWED.

2. METERING PEDESTALS THAT ARE FACTORY WIRED TYPE OR Bussed ON THE LINE SIDE OF THE METER, USED IN ALL INSTALLATIONS SHALL HAVE THE FOLLOWING MINIMUM DIMENSIONS IN THE METERING SECTION: A. 200 AMP – 9 ½” WIDTH B. 320 AMP – 11” WIDTH.

3. PEDESTALS SHALL BE FURNISHED, INSTALLED, AND MAINTAINED BY THE CUSTOMER.

4. PEDESTALS SHALL MEET COMPANY AND APPLICABLE CODE REQUIREMENTS.

5. PEDESTALS SHALL BE ADEQUATELY SUPPORTED TO MAINTAIN THE VERTICAL ALIGNMENT OF THE METER IN A LEVEL AND PLUMB POSITION THROUGHOUT THE LIFE OF THE INSTALLATION.

6. METERING PEDESTALS WITH FACTORY INSTALLED DISCONNECTING MEANS, SHALL HAVE PERMANENT BARRIERS TO ISOLATE THE CUSTOMER’S DISCONNECT SWITCH AND WIRING FROM THE METERING AREA.

7. METERING PEDESTALS SHALL HAVE SEPARATE COVERS ON THE CUSTOMER’S DISCONNECT SWITCH, WIRING AREA AND ON THE METERING AREA.

8. THE UTILITY METERING COMPARTMENT DOOR SHALL BE HINGED EITHER ON THE LEFT OR RIGHT SIDE OF METERING PEDESTAL. TOP HINGED DOORS REQUIRE PRIOR APPROVAL FROM THE LOCAL ELECTRIC METER DEPARTMENT. A LOCKING MECHANISM SHALL BE PROVIDED TO MAINTAIN THE DOOR IN AN OPEN POSITION.

9. CUSTOMER OWNED EQUIPMENT OTHER THAN SERVICE CONDUCTORS, SHALL NOT BE INSTALLED IN THE SPACE DEDICATED TO THE UTILITY METERING COMPARTMENT.

10. SOCKETS SHALL HAVE RINGLESS STYLE COVERS. NO SCREWS, STUDS OR WING NUTS ARE ALLOWED TO Secure THE METER SOCKETS.

11. PEDESTALS THAT HAVE THE METER SOCKET LOCATED INSIDE A METERING COMPARTMENT ENCLOSURE SHALL HAVE AN 8” X 8” LEXAN VIEWING WINDOW INSTALLED.

12. PEDESTALS SHALL MEET ADDITIONAL REQUIREMENTS SHOWN IN THE ILLUSTRATIONS SECTION, DRAWINGS SC-60 AND SC-70.

4.11.5 INSTRUMENT TRANSFORMER METER SOCKETS THE COMPANY WILL FURNISH THE INSTRUMENT TRANSFORMER METER SOCKETS. THE COMPANY SHALL BE CONTACTED FIRST TO DETERMINE THE RATE, LOAD, AND SERVICE VOLTAGE. THE CUSTOMER SHOULD CONTACT THE COMPANY’S LOCAL ELECTRIC METER DEPARTMENT TO OBTAIN METERING EQUIPMENT AND TO COORDINATE METER INSTALLATION. EFFECTIVE DATE AUGUST 15, 2017
**WARNING**

ELECTRICAL SHOCK HAZARD

Terminals on the line and load sides may be energized in the open position.

Label location: combiner panel, AC disconnect, point of interconnection per code: NEC 705.20(L), NEC 690.13(B)

**WARNING**

Turn off photovoltaic AC disconnect prior to working inside panel.

Label location: combiner panel(s), main service disconnect per code: NEC 110.27(C), OSHA 1910.146(7)

**WARNING**

Dual power source second source is photovoltaic system.

Label location: main service disconnect, production/net meter per code: NEC 690.59, 705.30(C)

**WARNING**

This equipment fed by multiple sources: total rating of all overcurrent devices excluding main power supply shall not exceed ampacity of busbar.

Label location: point of interconnection, combiner panel per code: NEC 705.12(B)(5)

**WARNING**

PV system disconnect.

Label location: AC disconnect per code: NEC 690.13(B)

**WARNING**

Power source output connection. Do not relocate this overcurrent device.

Label location: point of interconnection per code: NEC 705.12(B)(2)

**CAUTION**

Photovoltaic system circuit is backfed.

Label location: main service disconnect per code: NEC 705.20(D), NEC 690.59

**DO NOT DISCONNECT UNDER LOAD**

Label location: main service disconnect per code: NEC 690.15(B) & NEC 690.31(D)(2)

**SOLAR PV DC CIRCUIT**

Label location: DC conduit, DC junction box per code: NEC 690.31(D)(2)

**PHOTOVOLTAIC POWER SOURCE**

Label location: DC conduit, DC junction box per code: NEC 690.31(D)(2)

**EMERGENCY CONTACT**

Texas Solar
210-245-6800

For immediate assistance call 911

Label location: point of interconnection per code: NEC 705.10

**CAUTION:**

Power to this building is also supplied from the following sources with disconnect(s) located as shown. Dangerous voltage may be present at all times.

Visible, lockable, labeled disconnect located within 10' of utility meter.

Main service panel.

Backup gateway AC Disconnect.

AC combiner panel.

Xcel energy utility meter.

Battery disconnect.

Sub panel.

Tesla battery.

Battery disconnect.

Sub panel.

Tesla battery.

CAUTION:

Solar PV disconnect.

PV AC disconnect.

Rapid shutdown for solar PV system.

Turn rapid shutdown switch to the "OFF" position to shut down PV system and reduce shock hazard in the array.

Label location: main service disconnect per code: NEC 690.13(B)

**PHOTOVOLTAIC SYSTEM CONNECTED**

Label location: at the main billing meter

**PHOTOVOLTAIC SYSTEM DISCONNECT**

Label location: at the PV disconnect

**CAUTION:**

Visible, lockable, labeled disconnect located within 10' of utility meter.

Main service panel.

Backup gateway AC Disconnect.

AC combiner panel.

Xcel energy utility meter.

Battery disconnect.

Sub panel.

Tesla battery.

Battery disconnect.

Sub panel.

Tesla battery.
IQ8 and IQ8+ Microinverters

Our newest IQ8 Microinverters are the industry’s first microgrid-forming, software-defined microinverters with split-phase power conversion capability to convert DC power to AC power efficiently. The brain of the semiconductor-based microinverter is our proprietary application-specific integrated circuit (ASIC) which enables the microinverter to operate in grid-tied or off-grid modes. This chip is built in advanced 55nm technology with high-speed digital logic and has super-fast response times to changing loads and grid events, alleviating constraints on battery sizing for home energy systems.

Easy to install
- Lightweight and compact with plug-n-play connectors
- Powerlink Communication (PLC) between components
- Faster installation with simple two-wire cable

High productivity and reliability
- Produce power even when the grid is down*
- More than one million cumulative hours of testing
- Class II double-insulated enclosure
- Optimized for the latest high-powered PV modules

Microgrid-forming
- Complies with the latest advanced grid support**
- Remote automatic updates for the latest grid requirements
- Configurable to support a wide range of grid profiles
- Meets CA Rule 21 (UL 1741-S)A requirements

* Only when installed with IQ System Controller 2, meets UL 1741. **IQ8 and IQ8+ supports split-phase, 240V installed only.

IQ8 and IQ8+ Microinverters

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Part of the Enphase Energy System, IQ8 Series Microinverters integrate with the Enphase IQ Battery, Enphase IQ Gateway, and the Enphase Aplis monitoring and analysis software.

IQ8 Series Microinverters require reliability standards with more than one million cumulative hours of power-on testing, enabling an industry-leading limited warranty of up to 25 years.

IQ8 Series Microinverters are UL Listed as PV Rapid Shunt Down Equipment and conform with various regulations, when installed according to manufacturer’s instructions.

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IQ8-B-EN-US-2022-03-17

EN50530 Type-4 indoor
Solar Is Not Always Sunny

Over their lifetime, solar panels experience countless extreme weather events. Not just the worst storms in years, but the worst storms in 40 years. High winds capable of ripping panels from a roof, and snowfalls weighing enough to buckle a panel frame.

XR Rails® are the structural backbone preventing these results. They resist uplift, protect against buckling and safely and efficiently transfer loads into the building structure. Their superior spanning capability requires fewer roof attachments, reducing the number of roof penetrations and the amount of installation time.

Force-Stabilizing Curve
Sloped roofs generate both vertical and lateral forces on mounting rails which can cause them to bend and twist. The curved shape of XR Rails® is specially designed to derive our strength in both directions while resisting the twisting. This unique feature ensures greater security during extreme weather and a longer system lifetime.

Compatible with Flat & Pitched Roofs
XR Rails® are compatible with FlashFoot® and other pitched roof attachments.

Corrosion-Resistant Materials
All XR Rails® are made of 6000-series aluminum alloy, then protected with an anodized finish. Anodizing prevents surface and structural corrosion, while also providing a more attractive appearance.

XR Rail® Family
The XR Rail® Family offers the strength of a curved rail in three targeted sizes. Each size supports specific design loads, while minimizing material costs. Depending on your location, there is an XR Rail® to match.

**XR10**
XR10 is a sleek, low-profile mounting rail, designed for regions with light or no snow. It achieves spans up to 6 feet, while remaining light and economical.
- 6’ spanning capability
- Moderate wind capability
- Clear & black anodized finish
- Internal splices available

**XR100**
XR100 is a residential and commercial mounting rail. It supports a range of wind and snow conditions, while also maximizing spans up to 10 feet.
- 10’ spanning capability
- Heavy load capability
- Clear & black anodized finish
- Internal splices available

**XR1000**
XR1000 is a heavyweight among solar mounting rails. It’s built to handle extreme climates and spans up to 12 feet for commercial applications.
- 12’ spanning capability
- Extreme load capability
- Clear anodized finish
- Internal splices available

Rail Selection
The table below was prepared in compliance with applicable engineering codes and standards.* Values are based on the following criteria: ASCE 7-16, Gable Roof Flush Mount, Roof Zones 1 & 2e, Exposure B, Roof Slope of 8 to 20 degrees and Mean Building Height of 30 ft. Visit IronRidge.com for detailed certification letters.

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<th>Load (PSF)</th>
<th>Rail Span</th>
<th>4’</th>
<th>5’-4’</th>
<th>6’</th>
<th>8’</th>
<th>10’</th>
<th>12’</th>
</tr>
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<tbody>
<tr>
<td>None</td>
<td>XR10</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>XR100</td>
<td>X</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>XR1000</td>
<td>X</td>
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<td>20</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>XR1000</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Table is meant to be a simplified span chart for conveying general rail capabilities. Use approved certification letters for actual design guidance.
FLASH LOC is the ultimate attachment for composition shingle and rolled comp roofs. The all-in-one mount installs fast — no kneeling on hot roofs to install flashing, no prying or cutting shingles, no pulling nails. Simply drive the lag bolt and inject sealant into the base. FLASH LOC’s patented TRIPLE SEAL technology preserves the roof and protects the penetration with a permanent pressure seal. Kitted with lag bolts, sealant, and hardware for maximum convenience. Don’t just divert water, LOC it out!

**PROTECT THE ROOF**
Install a high-strength waterproof attachment without lifting, prying or damaging shingles.

**LOC WATER**
With an auto slant, 360° auto-adapting gasket, and pressure-riveted sealant channel, the Triple-1-seal delivers a 100% waterproof connection.

**HIGHT-SPEED INSTALL**
Simply drive lag bolt and inject sealant into the port to create a permanent pressure seal.

**FLASH LOC Installation Guide**

**PRE-INSTALL**
Snap chalk lines for attachment rows. On shingle roofs, snap lines 1-3/4" below up slope edge of shingle course. Locate rafters and mark attachment locations.

At each location, drill a 7/32" pilot hole. Clean roof surface of dirt, debris, snow, and ice, then fill pilot hole with sealant.

**NOTE:** Space mounts per racking system installation specifications. When down pressure is >34 psi, span may not exceed 2 ft.

**STEP 1: SECURE**
Place FLASH LOC over pilot hole with lag on down-slope side. Align indicator marks on sides of mount with shingle line. Pass included lag bolt and sealing washer through FLASH LOC into pilot hole. Drive lag bolt until mount is held firmly in place.

**NOTE:** The EPDM in the sealing washer will expand beyond the edge of the metal washer when proper torque is applied.

**STEP 2: SEAL**
Insert tip of UNIRAC provided sealant into port. Inject until sealant exits both vents. Continue array installation, attaching rails to mounts with provided T-bolts.

**NOTE:** When FLASH LOC is installed over gap between shingle or tabs or vertical joints, fill gap/joint with sealant between mount and up slope edge of shingle course.

Use only provided sealant.

**FASTER INSTALLATION. 25-YEAR WARRANTY.**

For questions or customer service visit unirac.com or call (505) 248-2702
Grounding Lug

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>DESCRIPTION</th>
<th>WIRE SIZE RANGE (AWG)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>LUG, GROUNDING, LAY-IN - LOW PROFILE</td>
<td>4-10</td>
</tr>
<tr>
<td>2</td>
<td>BOLT, 1/4-28 X .750&quot; HEX CS SST</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>NUT, FLANGE HEX 1/4-20 SST</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>BOLT, T CSTM 1/4-20 X 1.188&quot; LOCK SS</td>
<td></td>
</tr>
</tbody>
</table>

**Part Number**

<table>
<thead>
<tr>
<th>Description</th>
<th>Wire Size Range (AWG)</th>
</tr>
</thead>
<tbody>
<tr>
<td>XR-LUG-05-A1</td>
<td>4-10</td>
</tr>
</tbody>
</table>

1) Lug, Grounding

- **Property**
  - Material: Tin Plated Copper
  - Finish: Clear Matte

2) Bolt, 1/4-28 x .750 Hex

- **Property**
  - Material: 300 Series Stainless Steel
  - Finish: Clear

3) Nut, Flange Hex 1/4-20

- **Property**
  - Material: 300 Series Stainless Steel
  - Finish: Clear

4) Bolt, T CSTM 1/4-20 x .750

- **Property**
  - Material: 300 Series Stainless Steel
  - Finish: Clear
Eaton DG221URB

Catalog Number: DG221URB

Eaton General duty non-fusible safety switch, single-throw, 30 A, 240 V, NEMA 3R, Rainproof, Painted galvanized steel, Two-pole, Two-wire

General specifications

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Catalog Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eaton general duty non-fusible safety switch</td>
<td>DG221URB</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Product Length/Depth</th>
<th>Product Height</th>
<th>Product Weight</th>
</tr>
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<tbody>
<tr>
<td>6.88 in</td>
<td>10.81 in</td>
<td>6 lb</td>
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<table>
<thead>
<tr>
<th>Warranty</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Eaton Selling Policy 25-000, one (1) year NEC 230.62 (C) Compliant Barrier from the date of installation of the Product or eighteen (18) months from the date of shipment of the Product, whichever occurs first.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Compliances</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>UL Listed</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Catalog Notes</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>WARNING! Switch is not approved for service entrance unless a neutral kit is installed.</td>
<td></td>
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</tbody>
</table>
POWER WALL
Backup Gateway 2

The Backup Gateway 2 for Tesla Powerwall provides energy management and monitoring for solar self-consumption, time-based control, and backup. The Backup Gateway 2 connects to the grid, automatically detecting outages and providing a seamless transition to backup power. When equipped with a main circuit breaker, the Backup Gateway 2 can be installed at the service entrance. When the optional internal panelboard is installed, the Backup Gateway 2 can also function as a load center. The Backup Gateway 2 communicates directly with Powerwall, allowing you to monitor energy usage and manage backup energy reserves from any mobile device with the Tesla app.

PERFORMANCE SPECIFICATIONS
AC Voltage (Nominal) 120/240V
Feed In Type Split Phase
Grid Frequency 60 Hz
Current Rating 200 A
Maximum Input Short Circuit Current 10 kA
Overcurrent Protection Device 100-200A, Service Entrance Rated
Overvoltage Category Category III
AC Meter Revenue accurate (+/- 0.2%)
Primary Connectivity Ethernet, Wi-Fi
Secondary Connectivity Cellular (3G, LTE, 4G)
User Interface Tesla app
Operating Modes Support for solar self-consumption, time-based control, and backup
Backup Transition Automatic disconnect for seamless backup
Modularity Supports up to 10 AC-coupled Powerwalls
Optional Internal Panelboard 2004 A-Panel / 12 circuit Eaton BR Circuit Breaker
Warranty 10 years

MECHANICAL SPECIFICATIONS
Dimensions 660 mm x 411 mm x 149 mm
Weight 26.4 kg (58 lbs)
Mounting options Wall mount, Semi-rush mount

ENVIRONMENTAL SPECIFICATIONS
Operating Temperature -20°C to 50°C (-4°F to 122°F)
Operating Humidity (RH) Up to 100%, condensing
Maximum Elevation 3000 m (9843 ft)
Environment Indoor and outdoor rated

COMPLIANCE INFORMATION
Certifications UL 67, UL 489, UL 915, UL 1741 PEC CSA 22.2 No. 19, CSA 22.2 No. 205
Emissions FCC Part 15, ICES 003

www.intertek.com
POWERWALL

Tesla Powerwall is a fully-integrated AC battery system for residential or light commercial use. Its rechargeable lithium-ion battery pack provides energy storage for solar self-consumption, time-based control, and backup.

Powerwall’s electrical interface provides a simple connection to any home or building. Its revolutionary compact design achieves market-leading energy density and is easy to install, enabling owners to quickly realize the benefits of reliable, clean power.

PERFORMANCE SPECIFICATIONS

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC Voltage (Nominal)</td>
<td>240/208 V</td>
</tr>
<tr>
<td>Fixing Type</td>
<td>Split Phase</td>
</tr>
<tr>
<td>Grid Frequency</td>
<td>60 Hz</td>
</tr>
<tr>
<td>Total Energy</td>
<td>14 kWh</td>
</tr>
<tr>
<td>Usable Energy</td>
<td>13.5 kWh</td>
</tr>
<tr>
<td>Real Power, max continuous</td>
<td>5 kW (charge and discharge)</td>
</tr>
<tr>
<td>Real Power, peak (50%, off-grid/backup)</td>
<td>7 kW (charge and discharge)</td>
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<tr>
<td>Apparent Power, max continuous</td>
<td>5.8 kW (charge and discharge)</td>
</tr>
<tr>
<td>Apparent Power, peak (50%, off-grid/backup)</td>
<td>7.2 kW (charge and discharge)</td>
</tr>
<tr>
<td>Maximum Supply Fault Current</td>
<td>10 kA</td>
</tr>
<tr>
<td>Maximum Output Current</td>
<td>32 A</td>
</tr>
<tr>
<td>Overcurrent Protection Device</td>
<td>50 A</td>
</tr>
<tr>
<td>Inrush for Split-Phase Loads</td>
<td>100%</td>
</tr>
<tr>
<td>Power Factor Output Range</td>
<td>+/- 1.0 adjustable</td>
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<tr>
<td>Power Factor Range (full-rated power)</td>
<td>+/- 0.85</td>
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<tr>
<td>Internal Battery DC Voltage</td>
<td>50 V</td>
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<tr>
<td>Round Trip Efficiency*</td>
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<td>Warranty</td>
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MECHANICAL SPECIFICATIONS

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ENVIRONMENTAL SPECIFICATIONS

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<td>Operating Temperature</td>
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<tr>
<td>Recommended Temperature</td>
<td>0°C to 30°C (32°F to 86°F)</td>
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<tr>
<td>Operating Humidity (%)</td>
<td>Up to 90%, non-condensing</td>
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<tr>
<td>Storage Conditions</td>
<td>-20°C to 32°C (-4°F to 89°F)</td>
</tr>
<tr>
<td>Maximum Elevation</td>
<td>3000 m (9842 ft)</td>
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<tr>
<td>Environment</td>
<td>Indoor and outdoor rated</td>
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<tr>
<td>Enclosure Type</td>
<td>NEMA 3R</td>
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<tr>
<td>Ingress Rating</td>
<td>IP54 (battery &amp; Power Electronics)</td>
</tr>
<tr>
<td>Wet Location Rating</td>
<td>Yes</td>
</tr>
<tr>
<td>Noise Level @ 1 m</td>
<td>&lt; 40 dBA at 30°C (86°F)</td>
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</tbody>
</table>

COMPLIANCE INFORMATION

- UL 62413, UL 7331, UL 733, UL 950, IEC 61471, JIS 53, 3
- Grid Connection: Worldwide Compatibility
- Emissions: FCC Part 15 Class B, ICES-003
- Environmental: RCM Directive; 2014/30/EU
- Seismic: AC951, IEEE 893-2005 (High)
March 30, 2017

Tesla Powerwall Hardware Compliance Letter

To whom it may concern:

The installation manual for the Tesla Powerwall was reviewed for mounting considerations. Based on the weight of the unit and the attachment layout of the mounting bracket, it was determined that the following fasteners should be used:

Wood Studs:
(4) – 5/8” wood screws with 3 1/2” minimum embedment

Metal Studs:
(5) – 5/16” sheet metal screws at each corner w/ 1 1/2” minimum penetration (25 ga stud minimum)
(1) – 3/16” sheet metal screws at each corner w/ 1 1/2” minimum penetration (18 ga stud and broken)

Concrete/CMU:
Schedule “A” for clear height less than 2’-8”

<table>
<thead>
<tr>
<th>FASTENER SCHEDULE “A”</th>
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</thead>
<tbody>
<tr>
<td>MANUFACTURER</td>
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<tr>
<td>SIMPSON</td>
</tr>
<tr>
<td>Hilti</td>
</tr>
<tr>
<td>Powers</td>
</tr>
</tbody>
</table>

Schedule “B” for clear height greater than 2’-8” and/or if the governing jurisdiction requires fastener:

- SINGELD \( \text{ESR-2773} \) (CONCRETE) \& \( \text{ESR-1028} \) (CMU)
- Hilti \( \text{ESR-3020} \) (CONCRETE) \& \( \text{ESR-3027} \) (CMU)
- Powers \( \text{ESR-2539} \) (CONCRETE) \& \( \text{ESR-1670} \) (CMU)

The following details are provided for guidance with various mounting configurations.

Sincerely,

[Signature]
Bryan McDonald, PE
Sr. Structural Design Engineer

TESLA MOTORS, INC. 408-681-3200 888-381-3200

GENERAL NOTES

1. Attaching details have been developed to cover most installations in the US. Conditions not covered here, consult with a local engineer for your Tesla contact.
2. All fasteners shall be galvanized or stainless steel for exterior applications.
3. The maximum equipment weight is 225 lbs.
4. The values of \( G \), \( k \), and \( f \) are 1.0, 2.9, and 1.0 respectively, as provided in ASCE 7-10.
5. The peak ground acceleration (\( G \)) used in the calculations is 0.37g.
7. Snow loads are based on Table 2.1-1 and Figure 1.1-1 for ASCE 7-10.
8. Wind spectra are based on Figure 28.5-1A for ASCE 7-10.
9. Waterproofing for all exterior applications shall be provided by the installer/maker.
10. Walls shall verify wall/building is structurally adequate to support Powerwall unit. Where owner wishes to add supplementation, wall must comply with existing construction at area of construction as specified in ASCE 7-10. Additional wall support to match existing construction.
11. See page 5 for application instructions.
Topic: Conductor Export Limit for Tesla Backup Gateway

To whom it may concern,

New Power Control System (PCS) features are available for the Tesla Powerwall 2 (the Powerwall 2) and Powerwall 3 (the Powerwall 3) to function in compliance with the 120% rule from the 2014 NEC and 2017 NEC. One feature, named a "Conductor Export Limit," will control power from an PCS in a facility to limit the total current on a conductor. In doing so, the Conductor Export Limit is equivalent to the power sources(s) output circuit current outlined in the requirements of 705.12(B)(12)(C)(e) of the 2017 NEC or 2018 NEC. This feature is outlined in the Appendix of the Installation Manual, with additional details outlined below.

Handshaking & Relaying

The Conductor Export Limit uses a pair of current transformers (CTs), with 1 CT per phase, to measure current at the control conductor location. Output from these CTs are measured by a dedicated meter with ±0.5% accuracy, and data is fed to the Backup Gateway.

The Powerwall 3 does not require additional CTs as it has a hardwired low voltage cable to the Backup Gateway. Using this connection, the Powerwall and Backup Gateway coordinates output current management and output current limit in real time. If the Powerwall loses the connection with the Backup Gateway, it will cease to supply power.

Applicable Certifications

The Tesla Backup Gateway (1 & 2) is Listed to UL 1741, including the supplement for Power Control Systems (PCS). A PCS is defined in UL 1741 as "Systems or devices which electrically limit or control the steady state AC currents, or DC currents, to a programmable limit or levels."

The Tesla Backup Gateway is also Listed to UL 616, Energy Management Equipment. This UL Standard covers equipment that energizes or de-energizes electrical loads to achieve the desired use of electrical power.

Labels and Markings

Below is an image of the field applied label on the Backup Gateway as required by the UL 1741 Supplement for PCS:

Additionally, as required by the UL Standard, the following label appears on the specified CTs used for the PCS:

Code Compliance

Where used, the Conductor Export Limit can limit the peak ampereage output to a home's main panel from the Backup Gateway. Below is one specific scenario for illustrative purposes:

[Diagram of Conductor Export Limit setup]
In this scenario, the expected amperage limit can be set equal to the continuous amperage allowed by the 100% rule on the main breaker. Therefore the limit is equivalent to the power source output circuit current in the requirements of Table 2-16 (8) of 2017 NEC or 2018 CEC.

In the above example, because the main panel is a 200A breaker with 200A service disconnect, the limit is set equal to 32 amps, equivalent to a 40A breaker.

200A main panel breaker = 200A, 32A main breaker = 32A PCC limit = 120%

Note that due to the Conductor Export Limit location on the supply side of the Powerwall Gateway, inter-connected power sources on the Backup Loads Panelboard still need to abide by 705.12 (6). In the above example, the subpanel is compliant with the 100% rule.

200A subpanel breaker = 120A, 125A subpanel breaker = 125A PCC limit = 40A

Programming of this setting is recorded to qualify Tesla qualified installers, and locked behind password. This connected access complies with the spirit of 704.1 (6)

Restricted Access Adjustable-Trip Circuit Breakers: A circuit breaker that has restricted access to the adjusting means shall be permitted to have an emergency setting that is equal to the rated current setting (long-time pickup setting). Restricted access shall be defined as located behind one of the following:

(i) Removable and accessible covers over the adjusting means
(ii) Rotated equipment enclosures
(iii) Locked doors accessible only to qualified personnel

Note the PCC is not a substitute for branch circuit overcurrent protection, but does meet the definition for supplementary overcurrent protection per the Article 100 Definition:

Overcurrent Protective Device, Busway Enclosure. A device intended to provide limited overcurrent protection for specific applications and utilization equipment such as luminaries and appliances, this limited protection is in addition to protection provided in the required branch circuit by the branch circuit overcurrent protective device (CVT-16).

A circuit breaker will always be utilized to control the Powerwall Gateway in the main panel as shown in the above diagram. This circuit breaker will typically be larger than the PCC limit of 120%. Therefore, any uncontrolled power sources or uncontrolled loads (4. everything except the Powerwall) will be subject to uncontrolled power flow. As such, conductors will be sized according to the circuit breaker acting as the branch circuit overcurrent protection. Additionally, whatever PV inverters must abide by 706.12 (6) at the main panel breaker ensuring that the Powerwall is fully controlled to 0A output.

Confirmer:
While the 2020 NEC has formally introduced a Power Control System, it allows for objectives that exceed the 100% rule. The Conductor Export Limit implemented with the Powerwall system is designed to function in compliance with the 100% rule from the 2017 NEC and 2014 NEC. This Conductor Export Limit feature is beneficial for safely connecting a larger amount of energy storage on a site, without overloading a breaker.

Signed:
[Signature]

Excerpt from the 2017 NEC or 2019 CEC (emphasis added):

706.12 Panel or Disconnection.
(6) Bus or Distribution Panel Rating. One hundred-twenty-five percent of the power source output circuit current shall be used in ampacity calculations for the following:
A Submodule. One of the methods that shall be used to determine the ratings of bushings in panelboards.
(6) When two sources, one a primary power source and the other a secondary power source, are located at opposite ends of a busway that contains both, the sum of 175% of the power source output circuit current and the rating of the overcurrent device protecting the busbar shall not exceed 125 percent of the ampacity of the busbar...
Monday, November 13, 2023
Castillo Order #: C-57028

Contractor
Rise Power
Richardson, TX 75081,

RE: Roof mounted PV system
Paul Benjamin Schechter Residence
1314 N Gilpin St., Denver, Colorado, 80218

To Whom It May Concern,

Structural Engineering Certification

Upon reviewing the as-built conditions provided by the contractor, I, Ermocrates Castillo PE# 60263 an engineer licensed pursuant to 2016 Colorado Revised Statutes Title 12, Article 25, Part 1 § 12-25-114, certify that the installation of the modules is in compliance with International Building Code 2021, Chapter 3 and that the building structure will safely accommodate wind, lateral and uplift forces, and equipment dead loads. The member forces in the area of the solar panels are not increased by more than 5%; thus, the stresses of the structural elements are not increased by more than 5%. Therefore, the requirements of Section 805.2 of the 2021 IEBC are met and the structure is permitted to remain unaltered. The solar array will be flush-mounted and parallel to the roof surface. Thus, it is concluded that any additional wind loading on the structure related to the addition of the proposed solar array is negligible. The attached calculations verify the capacity of the connections of the solar array to the existing roof against wind (uplift), the governing load case. Because the increase in lateral forces is less than 10%, this addition meets the requirements of the exception in Section 805.2 of the 2021 IEBC. Thus the existing lateral force resisting system is permitted to remain unaltered.

After adequate review, the existing roof framing has been determined to be adequate to support the imposed loads without any additional structural upgrades.

A. Site Visit & Documentation

A site visit was performed by the contractor to identify the size and spacing of the existing roof’s framing structure. The roof is evaluated for a module count of 8 modules.

B. Existing Structure

- Roof Style: Hip
- Roof Type: Asphalt Shingle
- Roof Height: 25 ft
- Rafter Type: Douglas Fir-Larch
- Rafter Size: 2x6
- Rafter Spacing: 16 in O.C.
- Roof Slope: 8/12 (33.7 deg)

C. Governing Codes

- 2021 International Building Code
- 2021 International Plumbing Code
- 2023 National Electrical Code
- 2021 International Mechanical Code
- 2021 International Residential Code
- 2021 International Energy Conservation Code
- 2021 International Fire Code
- ASCE 7-16
**D. Design Criteria**

- Wind speed (ult): 115 mph
- Wind speed (asd): 89 mph
- Risk category: II
- Exposure: C
- Ground snow load: 35 psf
- Total Seismic Load: 55.93 lbs

**E. Attachment Spans**

The solar panels shall be mounted in accordance with the most recent installation manual. Considering the wind speed, risk category, exposure, roof slopes, snow load, seismic load, size and spacing of framing members, and condition of the roof, the span tables provided by the manufacturer is not applicable and so the contractor what install the mounting system no greater than the below attachment spans:

<table>
<thead>
<tr>
<th>Zone 1</th>
<th>Non Exposed Modules</th>
<th>Cantilever</th>
<th>Exposed Modules</th>
<th>Cantilever</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone 1'</td>
<td>Attachments at 64 in O.C. with 2 rails</td>
<td>16 in</td>
<td>Attachments at 64 in O.C. with 2 rails</td>
<td>16 in</td>
</tr>
<tr>
<td>Zone 2e</td>
<td>Zone not applicable in Hip roofs</td>
<td>-</td>
<td>Zone not applicable in Hip roofs</td>
<td>-</td>
</tr>
<tr>
<td>Zone 2n</td>
<td>Attachments at 64 in O.C. with 2 rails</td>
<td>16 in</td>
<td>Attachments at 48 in O.C. with 2 rails</td>
<td>16 in</td>
</tr>
<tr>
<td>Zone 2r</td>
<td>Zone not applicable in Hip roofs</td>
<td>-</td>
<td>Zone not applicable in Hip roofs</td>
<td>-</td>
</tr>
<tr>
<td>Zone 3e</td>
<td>Attachments at 64 in O.C. with 2 rails</td>
<td>16 in</td>
<td>Attachments at 32 in O.C. with 2 rails</td>
<td>10.67 in</td>
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<tr>
<td>Zone 3r</td>
<td>Zone not applicable in Hip roofs</td>
<td>-</td>
<td>Zone not applicable in Hip roofs</td>
<td>-</td>
</tr>
</tbody>
</table>

**F. Limitations**

Castillo Engineering Services, LLC takes no responsibly for the installation of the system. The contractor has supplied the as-built conditions and shall cease construction and notify Castillo should any discrepancies between the provided as-built conditions and the condition described in this letter be found. The design and engineering of the racking, mounting, waterproofing, fire pathways and setbacks, electrical system and system labels are the responsibility of others. The contractor must adhere to the spans provided within this letter and all connections to the existing roof must adhere to industry standard and per manufacturer’s most recent installation instructions.

**PE Certification:**

Ermocrates Castillo, P.E  
Colorado License # 60263
**Site Information**

<table>
<thead>
<tr>
<th>Building Code Cycle</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Roof Height (ft)</td>
<td>25</td>
</tr>
<tr>
<td>Roof Length (ft)</td>
<td>80</td>
</tr>
<tr>
<td>Roof Width (ft)</td>
<td>50</td>
</tr>
<tr>
<td>Parapet Height (ft)</td>
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</tr>
<tr>
<td>Module Area (sq. ft.)</td>
<td>18</td>
</tr>
<tr>
<td>Component Amplification (a_p)</td>
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</tr>
<tr>
<td>Component Operating Weight</td>
<td>43.87</td>
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<tr>
<td>Total Modules in the Array</td>
<td>8</td>
</tr>
<tr>
<td>Ground Snow Load (psf)</td>
<td>35</td>
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<tr>
<td>Dead Load (psf)</td>
<td>3</td>
</tr>
<tr>
<td>SLOPED Roof Snow Load (psf)</td>
<td>13.68605147</td>
</tr>
<tr>
<td>Effective Wind Area (ft²)</td>
<td>18</td>
</tr>
<tr>
<td>Ground Elevation (ft)</td>
<td>5326</td>
</tr>
<tr>
<td>HVHZ</td>
<td>NO</td>
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**Site Information**

<table>
<thead>
<tr>
<th>Risk Category</th>
<th>II</th>
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</thead>
<tbody>
<tr>
<td>Exposure Category</td>
<td>C</td>
</tr>
<tr>
<td>Roof Slope</td>
<td>8° /12</td>
</tr>
<tr>
<td>Roof Slope (*)</td>
<td>33.69</td>
</tr>
<tr>
<td>Roof Type</td>
<td>Hip</td>
</tr>
<tr>
<td>Ultimate Wind Speed</td>
<td>115.00 mph</td>
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<tr>
<td>Nominal Wind Speed</td>
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<tr>
<td>Exposure Factor (Ce)</td>
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<tr>
<td>Temperature Factor (Ci)</td>
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<tr>
<td>Component Response Factor</td>
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<tr>
<td>Spectral Acceleration (S_ds)</td>
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<td>Importance Factor (Is)</td>
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<tr>
<td>Slope Factor (Cs)</td>
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<tr>
<td>K_p</td>
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<tr>
<td>K_z</td>
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<tr>
<td>Ke</td>
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<tr>
<td>K_s</td>
<td>0.95</td>
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<tr>
<td>Height B/W Module and Roof</td>
<td>0.50</td>
</tr>
</tbody>
</table>

**Design Calculations**

\[
\text{Velocity Pressure (q)} = 0.0256 \times \text{KEK}_z \times \text{K}_T \times \text{K}_D \times V^2 \\
\text{Velocity Pressure (ASD)} = 13.5 \text{ psf}
\]

**Width of Pressure Coefficient**

- 50' * 10% = 5'
- 25' * 40% = 10'

**Zone 1 Width**

- Zone Width A: 4 FT
- Zone 2 Width: N/A (FOR (*) < 7°)
- Zone 3 Width: N/A (FOR (*) < 7°)

**Subject: Connection Calculations**

**Attachment Strength, NDS 2018 Allowable Design Strength**

- 2"X4" Support Member
- 5/16" Lag Screw
  - No of Screws: 1
  - Length of Screw: 3.75 in
  - Tip Length: 0.3125 in
  - Side Member Thickness: 1.5 in
  - Adjustment: 1
  - Main Member Thickness: 4 in

| NDS Reference Withdrawal Per Screw | 535.36 lbs/in | Per 12.2 |
| NDS Reference Withdrawal Per Screw | 535.38 lbs/in | Per 12.2A |
| Allowable Design Load              | 517.00 lbs/in |

**Attachment Model**: Unirac Flashloc

**Attachment Strength**: 517 lbs

**FoS**: 1.5
Subject: Loading Calculations

<table>
<thead>
<tr>
<th>MAX DESIGN LOADS ALLOWABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIMIT MAX SPAN TO</td>
</tr>
<tr>
<td>RAFTER/SEAM SPACING</td>
</tr>
<tr>
<td>NO. OF RAILS</td>
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<table>
<thead>
<tr>
<th>Roof Zone</th>
<th>Down</th>
<th>Exposed N. Exposed</th>
<th>Spans (Exposed)</th>
<th>Spans (Non-Exposed)</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>274.7</td>
<td>292.0 240.3 lbs</td>
<td>64 in</td>
<td>64 in</td>
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<tr>
<td>1'</td>
<td>0.0</td>
<td>X</td>
<td>X in</td>
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<tr>
<td>2e</td>
<td>274.7</td>
<td>383.2 340.7 lbs</td>
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<td>64 in</td>
</tr>
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<td>2n</td>
<td>0.0</td>
<td>X</td>
<td>X in</td>
<td>X in</td>
</tr>
<tr>
<td>2r</td>
<td>274.7</td>
<td>401.5 356.9 lbs</td>
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<td>64 in</td>
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<tr>
<td>3e</td>
<td>274.7</td>
<td>339.6 452.8 lbs</td>
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<td>64 in</td>
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<tr>
<td>3r</td>
<td>0.0</td>
<td>X</td>
<td>X in</td>
<td>X in</td>
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</tbody>
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