



City of Flagstaff

211 W. Aspen Ave
Flagstaff, AZ 86001

www.flagstaff.az.gov

Planning & Development Services Division

(928) 213-2618

frontcounter@flagstaffaz.gov

HPC-C

Application to Heritage Preservation for a Certificate within an Overlay

Property Owner(s)	Title	Phone	Email
Greg Hadden		(512) 638-3215	rghaddenmail@gmail.com
Mailing Address		City, State, Zip	
803 W Aspen		FLAGSTAFF AZ 86001	
Applicant	Title	Phone	Email
Danielle Treible, Project Manager		(928) 288-2046	danielle@rooftopsolar.us
Mailing Address		City, State, Zip	
515 N. Beaver St.		Flagstaff AZ 86001	
Property Interest of Applicant(s) (Owner, contractual interest, or agent)			
Agent/Project Manager			
Site Address		City, State, Zip	
803 W Aspen		FLAGSTAFF AZ 86001	
Project Name			
Hadden Solar + Storage Project			
Parcel Number(s)		Zoning District(s)	
100-24-019		Residential	
Property Information:			
☐ Yes ☒ No	Listed individually on the National, Arizona, or Flagstaff Register of Historic Places? (Name: _____)		
☒ Yes ☐ No	Located in a National Register Historic District? (Name: <u>Flagstaff Townsite</u>)		
☐ Yes ☒ No	Is a structure on the property considered contributing to the District?		
☒ Yes ☐ No	Located in a Historic or Landmark Overlay? (Name: <u>Townsite Historic Overlay Zone</u>)		
☐ Yes ☒ No	Has the structure every been inventoried or evaluated for the National, Arizona, or Flagstaff Register of Historic Places?		
☐ Yes ☒ No	Is the structure over 50 years old at the time of application?		
☐ Yes ☒ No	Does this application include review of a sign in an overlay or the Central Sign District?		
Type of HPC Application Requested:			
☒ Certificate of No Effect (May be reviewed by the Heritage Preservation Officer or the Commission)			
☐ Certificate of Appropriateness (Must be reviewed by the Heritage Preservation Commission)			
☐ Certificate of Economic Hardship (Must be reviewed by the Heritage Preservation Commission)			
Property Owner Signature:	Date:	Applicant Signature:	Date:
	09/09/2026		9/9/26

Note: Applications which are incomplete or not accompanied by the required information in the Submittal Requirement Checklist will not be accepted.



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Submittal Requirement Checklist

- ☒ Complete Application including all signatures.
- ☐ Payment of review fee. If applying for multiple types of HPC reviews only one fee is collected at the time of the first application for the same work.
- ☒ An electronic copy of drawings needed to describe the proposal, which may include a Site Plan, Floor Plans, Exterior Elevations, Building Sections, Lighting Plan, and a Landscape Plan. All drawings shall be drawn to scale and dimensioned and shall clearly and accurately represent the natural and built conditions of the context area and the project, including both existing conditions and proposed work.
- ☒ An electronic copy of a Color Board depicting all exterior materials and finishes associated with the work.
- ☒ An electronic copy of photographs of the context, including the property, surrounding properties, and the neighborhood. Include historic photos of the property in the case of restoration projects, if available.
- ☐ A list of related permits and development applications that have been or will need to be submitted.
- ☐ Proof of ownership, or letter of authorization from the current property owner, if the applicant and owner are not the same.
- ☐ Any other information which the applicant feels would be helpful and/or pertinent to the request.
- ☐ Any other information requested by the Heritage Preservation Officer or Heritage Preservation Commission.
- ☐ For Certificates of Economic Hardship, contact the Heritage Preservation Officer for additional submittal requirements.

Review Process and Guidelines

The Heritage Preservation Commission meets to review applications on the third Wednesday of each month. If you are submitting an application for review of a Certificate of Appropriateness or Economic Hardship, Planning & Development Services must receive your application by the submittal deadline posted to the [Heritage Preservation application website](#).

For your item to be added to an agenda, the Heritage Preservation Officer (HPO) must deem the application complete within 5 working days. The HPO will contact applicants for additional information as necessary.

Please also note that per the Flagstaff Zoning Code, the HPO may refer any application, including Certificates of No Effect to the Commission for any reason. If the HPO refers the application, you will not need to resubmit, but additional materials may be requested.

Applications pertaining to Certificates for properties with the Townsite Overlay Zone must also be properly noticed 15 days prior to the public hearing in accordance with *Section J of the Townsite Historic Design Review Overlay District Design Standards and Guidelines*.

Approval of a Certificate does not indicate a final approval of site plans, building plans, permanent sign permits, and other applications that will be required prior to demolition, modification, or construction. Approval of all Certificates will be conditioned on their conformance with Zoning Code and Building Code standards. The Heritage Preservation Officer may elect to hold an application until a review by the InterDivision staff is completed and substantive comments have been provided to the applicant.

We encourage you to reach out early in designing your projects so that the HPO may assist you or your clients. HPO contact information: Lauren Clementino, Phone: (928) 213-2633; Email: lclementino@flagstaffaz.gov.



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Project Description:

Installation of a low profile roof mounted solar system, comprised of (12) Hyundai 440W modules and (1) Tesla Powerwall 3 battery, and a Tesla Backup Switch, to be installed on the new structure built on this property in 2024.

Explanation of how the project meets the applicable Overlay (Downtown, Townsite, or Landmark) design standards and guidelines and the *Secretary of the Interior's Standards for the Treatment of Historic Properties*:

Placement and Visibility (Minimizing Visual Impact) The solar panels will be installed parallel to the roof plane, matching existing pitch/slope + not altering the structural profile of the roofline

The panels are positioned to have no visibility from the primary public right-of-way (Aspen Ave)

The panels will be set back, placed on a rear roof slope, hidden behind architectural features.

Preservation of Materials: Solar is proposed to be installed on new structure built in 2024, not the original historic structure. The installation respects the historic character of the Townsite

Historic Dist. while enabling sustainable energy upgrades. Project meets Sec. Standards 9+10

protecting character-defining features, retaining structural + visual integrity of the historic site.



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Summary Statement of Significance

National Register of Historic Places documentation or a Cultural Resource Study can be submitted in lieu of completing this page to demonstrate significance (attach additional pages as necessary).

The criteria for determining the significance of a cultural resource is based on the potential of the cultural resource to contribute to our understanding of the past. A cultural resource is significant if:

- It is listed or eligible as a National Historic Landmark, or for the National Register of Historic Places, or the Arizona Register of Historic Places; or
- It is associated with events or persons in the architectural, engineering, archeological, scientific, technological, economic, agricultural, educational, social, political, military, or cultural annals of the City, the State of Arizona, or the United States of America; or
- It represents the work of, or for, an important individual; or
- It embodies distinctive characteristics of type, period, region, artistic values or methods of construction, including being the oldest of its type or the best example of its type; or
- It has yielded, or may be likely to yield, information needed for scientific research, such as important archaeological resources.

Original Construction Date: 2024

Describe Previous Major Alterations (Include dates):

Early modifications during its historic period: adding an enclosed garage space, transforming portions of the lot layout into rental spaces/apartments by 1961. June 2015 (Cultural Resource Review); July 2023 (Roofing Upgrades); August 2023 (Major Modern Remodel & ADU)

Describe the Significance of the Resource (In terms of a., b., c., d., or e., above):

803 W Aspen Avenue is a historically significant property that meets Criteria A and D of the City of Flagstaff's heritage framework.

In reference to D: According to the official National Register of Historic Places Inventory for Flagstaff, 803 W Aspen is explicitly documented as a key local example of stylistic modifications to the Period Revival mode. It embodies the early 20th-century trend of adjusting picturesque, historic domestic designs to fit regional and residential needs in Flagstaff.

Source(s) of Information Used:

National Register of Historic Places (NRHP) Inventory; City of Flagstaff Cultural Resource Records; Flagstaff Townsite Historic District Guidelines.

Describe the Level of Integrity of the Resource (Existing and proposed):

The proposed level of integrity will remain unimpaired and fully intact. The low-profile solar array is designed to be highly compatible with the historic structure. Because the panels will be

mounted parallel to the roof plane on a non-primary elevation, with minimal street visibility, they will not alter the property's historic design or roofline profile. No historic materials or workmanship will be damaged or removed during installation. Furthermore, the racking and mounting system is completely reversible. If the solar array is removed in the future, the essential form, fabric, and long-term historic integrity of the resource will be left entirely undamaged.









NOTE: UTILITY PERSONNEL REQUIRE COORDINATED ACCESS TO ALL DER SYSTEM COMPONENTS, SERVICE DISCONNECTS, METERING AND SERVICE EQUIPMENT FOR SCHEDULED MAINTENANCE AND SAFETY INSPECTIONS. CUSTOMERS ARE RESPONSIBLE FOR ENSURING THAT ACCESS IS AVAILABLE AND MAY BE CONTACTED BY THE UTILITY TO ARRANGE SITE VISITS WHEN EQUIPMENT IS LOCATED WITHIN FENCED OR SECURED AREAS. EMERGENCY ACCESS TO THIS EQUIPMENT MUST BE AVAILABLE AT ALL TIMES.

NOTE: UTILITY HAS 24HR UNRESTRICTED ACCESS TO ALL PV SYSTEM COMPONENTS LOCATED AT SERVICE ENTRANCE.

NOTE: REFERENCE SECTION 301.15 OF THE APS ESRM FOR ELECTRIC METER SEPARATION BETWEEN WATER/GAS.

NOTE: WORKSPACE IN FRONT OF AC ELECTRICAL SYSTEM COMPONENTS SHALL BE IN ACCORDANCE WITH APS AND NEC REQUIREMENTS. FOR APS REQUIREMENTS, REFERENCE SECTION 300 OF THE APS ESRM AND SECTION 8.2 OF THE APS INTERCONNECTION REQUIREMENTS.

NOTE: PV SOURCE AND OUTPUT CONDUCTORS TO BE ROUTED ALONG BUILDING STRUCTURAL MEMBERS. WHERE INTEGRATED INTO ROOFING MATERIALS, THE CIRCUIT LOCATIONS SHALL BE CLEARLY MARKED.

NOTE: THERE ARE NO DC PHOTOVOLTAIC SOURCE OR OUTPUT CIRCUITS INSIDE STRUCTURE.

REV.	DESCRIPTION	DATE
A	CONSTRUCTION DOCUMENTS	8/25/26

NOTE: VERIFY LOCATION OF ALL P.V. EQUIPMENT IN FIELD PRIOR TO INSTALLATION.

NOTE: THERE ARE NO FENCES, GATES, OR OBSTRUCTIONS ON PROPERTY.



PROJECT LOCATION

NOTE: PROVIDE SMOKE/HEAT DETECTION IN GARAGE NEAR BATTERY WHERE REQUIRED BY AHJ AND ADOPTED CODES. CONNECT TO EXISTING SMOKE DETECTOR SYSTEM WHERE APPLICABLE.

NOTE: PROJECT TO COMPLY WITH THE FOLLOWING CODES:
2017 NEC
2018 IRC
2018 IFC
W/ CITY OF FLAGSTAFF AMENDMENTS

SCALE: 1" = 20'-0"

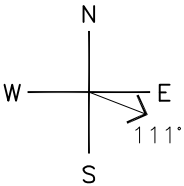
NOTE: MAINTAIN NEC AND UTILITY COMPANY REQUIRED CLEARANCES AROUND ELECTRICAL SERVICE GEAR AND EQUIPMENT.



EXPIRES 9-30-27

ELECTRICAL SITE PLAN

PANEL AZIMUTH



PHOTOVOLTAIC MODULE / INVERTER

PV MODULE:
(12) HYUNDAI HiN-T440NF(BK)

MID CIRCUIT INTERRUPTERS:
(5) TESLA SOLAR SHUTDOWN DEVICES

INVERTER/BATTERY (240V, 1Ø):
(1) TESLA POWERWALL 3 11.5KW

SEE ARRAY DRAWING, SHEET SK4, FOR FULL MODULE / INVERTER SPECS.

HYUNDAI PV MODULES

BI-DIRECTIONAL METER
DER SIDE DISCONNECT SWITCH

BI-DIRECTIONAL METER

UTILITY DISCONNECT SWITCH

RSD INITIATOR SWITCH

EXISTING ELECTRICAL
SERVICE ENTRANCE SECTION

W.P. JUNCTION
BOX, TYPICAL.

TESLA POWERWALL 3
(GARAGE INTERIOR)



APPROVALS	DATE
DRAWN	8/25/26
CHECKED	
ENGINEER	
REV.A	

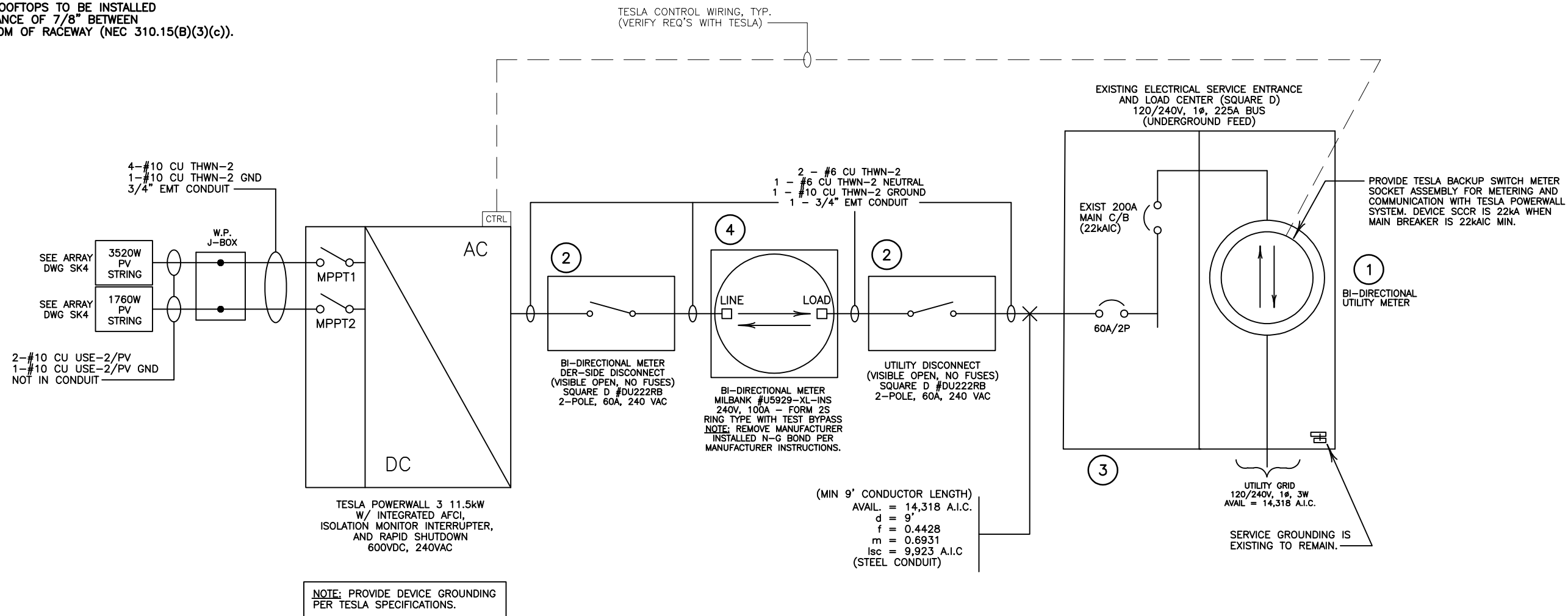
ELECTRICAL SITE PLAN
5.28kWdc / 11.5kWac PV SYSTEM ADDITION
WITH TESLA POWERWALL BATTERY BACKUP - 13.5kWh
HADDEN RESIDENCE
803 W ASPEN AVE
FLAGSTAFF, AZ 86001

SIZE B	DRAWING NO. 26141-SK1		
SCALE	N/A	REV.A	SK-01

REV.	DESCRIPTION	DATE
A	CONSTRUCTION DOCUMENTS	8/25/26

NOTE:
ALL EQUIPMENT LUGS TO
BE RATED MINIMUM 75°C.

NOTE:
RACEWAYS ON ROOFTOPS TO BE INSTALLED
A MINIMUM DISTANCE OF 7/8" BETWEEN
ROOF AND BOTTOM OF RACEWAY (NEC 310.15(B)(3)(c)).



NOTE: ALL EQUIPMENT MUST BE UTILIZED
IN ACCORDANCE WITH THE MANUFACTURER'S
INTENDED USE AND DESIGN SPECIFICATIONS.

NOTE: ALL EQUIPMENT IS NEW
UNLESS NOTED OTHERWISE.

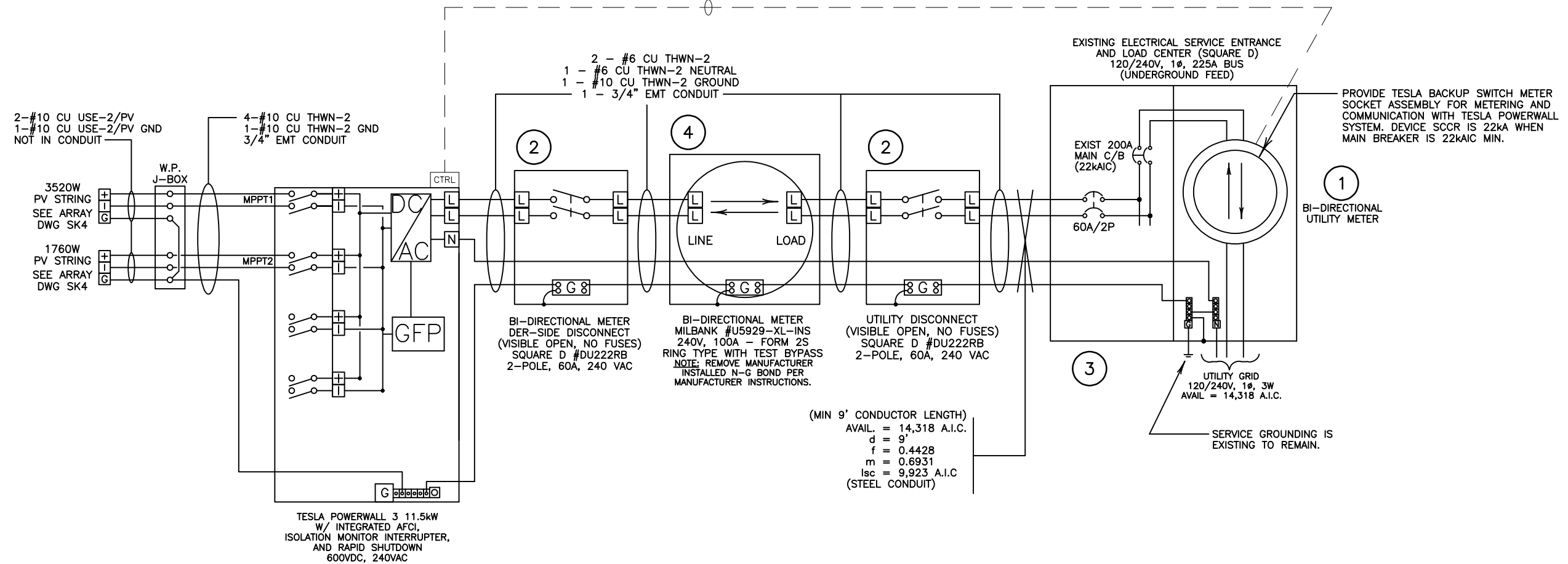
ELECTRICAL ONE-LINE DIAGRAM

PHOTOVOLTAIC MODULE / INVERTER		KEYED NOTES									
PV MODULE: (12) HYUNDAI HiN-T440NF(BK)		① BI-DIRECTIONAL UTILITY METER TO BE INSTALLED BY UTILITY COMPANY.			APPROVALS		DATE		ELECTRICAL ONE-LINE DIAGRAM 5.28kWdc / 11.5kWac PV SYSTEM ADDITION WITH TESLA POWERWALL BATTERY BACKUP – 13.5kWh		
MID CIRCUIT INTERRUPTERS: (5) TESLA SOLAR SHUTDOWN DEVICES		② SWITCH COVER TO BE LOCKED AT ALL TIMES. SWITCH TO BE VISIBLE OPEN AND ACCESSIBLE PER UTILITY REQUIREMENTS AND CONFORM TO NEC 705.22.			DRAWN		8/25/26		HADDEN RESIDENCE 803 W ASPEN AVE FLAGSTAFF, AZ 86001		
INVERTER/BATTERY (240V, 1Ø): (1) TESLA POWERWALL 3 11.5KW		③ GEC TO BE INSTALLED AS REQUIRED PER MANUFACTURER INSTRUCTIONS AND NEC 690.47.			CHECKED				SIZE		
SEE ARRAY DRAWING, SHEET SK4, FOR FULL MODULE / INVERTER SPECS.		④ METER ENCLOSURE AND SOCKET PROVIDED AND INSTALLED BY CONTRACTOR. METER, CTs, AND TEST SWITCHES PROVIDED BY UTILITY COMPANY WHEN REQUIRED. CONTRACTOR TO SUBMIT SHOP DRAWINGS OF METERING CABINET TO UTILITY COMPANY FOR APPROVAL.		ENGINEER				B		DRAWING NO. 26141-SK2	
				REV.A				SCALE		N/A	
								REV.A		SK-02	

NOTE:
ALL EQUIPMENT LUGS TO
BE RATED MINIMUM 75°C.

TESLA CONTROL WIRING, TYP.
(VERIFY REQ'S WITH TESLA) -

REV.	DESCRIPTION	DATE
A	CONSTRUCTION DOCUMENTS	8/25/26



NOTE: PROVIDE DEVICE GROUNDING PER TESLA SPECIFICATIONS.

NOTE: ALL EQUIPMENT MUST BE UTILIZED
IN ACCORDANCE WITH THE MANUFACTURER'S
INTENDED USE AND DESIGN SPECIFICATIONS.

NOTE: ALL EQUIPMENT IS NEW
UNLESS NOTED OTHERWISE.

PHOTOVOLTAIC MODULE SPECS
HYUNDAI #HiN-T440NF(BK) 440 WATTS Voc=38.8 VDC, Isc=14.39 AMPS Vmp=32.3 VDC, Imp=13.63 AMPS

PHOTOVOLTAIC MODULE / INVERTER

PV MODULE:
(12) HYUNDAI HiN-T440NF(BK)

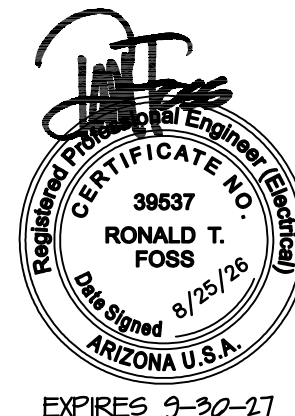
MID CIRCUIT INTERRUPTERS:
(5) TESLA SOLAR SHUTDOWN DEVICES

INVERTER/BATTERY (240V, 1Ø):
(1) TESLA POWERWALL 3 11.5KW

SEE ARRAY DRAWING, SHEET SK4, FOR
FULL MODULE / INVERTER SPECS.

KEYED NOTES

- ① BI-DIRECTIONAL UTILITY METER TO BE INSTALLED BY UTILITY COMPANY.
- ② SWITCH COVER TO BE LOCKED AT ALL TIMES. SWITCH TO BE VISIBLE OPEN AND ACCESSIBLE PER UTILITY REQUIREMENTS AND CONFORM TO NEC 705.22.
- ③ GEC TO BE INSTALLED AS REQUIRED PER MANUFACTURER INSTRUCTIONS AND NEC 690.47.
- ④ METER ENCLOSURE AND SOCKET PROVIDED AND INSTALLED BY CONTRACTOR. METER, CTs, AND TEST SWITCHES PROVIDED BY UTILITY COMPANY WHEN REQUIRED. CONTRACTOR TO SUBMIT SHOP DRAWINGS OF METERING CABINET TO UTILITY COMPANY FOR APPROVAL.



ELECTRICAL THREE-LINE DIAGRAM

 ROOFTOP SOLAR		 evoneer professional electrical engineering services			
APPROVALS		DATE		ELECTRICAL THREE – LINE DIAGRAM 5.28kWdc / 11.5kWac PV SYSTEM ADDITION WITH TESLA POWERWALL BATTERY BACKUP – 13.5kWh HADDEN RESIDENCE 803 W ASPEN AVE FLAGSTAFF, AZ 86001	
DRAWN		8/25/26			
CHECKED					
ENGINEER					
REV.A					
		SIZE B	DRAWING NO. 26141–SK3		
		SCALE N/A	REV.A SK–03		

NOTES:
PHOTOVOLTAIC PANELS AND MODULES SHALL BE LISTED AND LABELED IN ACCORDANCE WITH UL 1703.
INVERTERS SHALL BE LISTED AND LABELED IN ACCORDANCE WITH UL 1741.

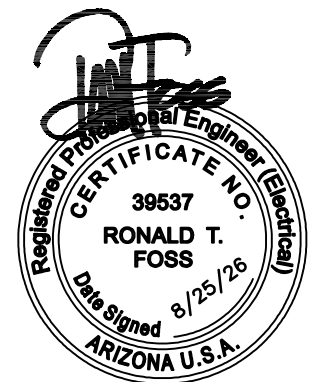
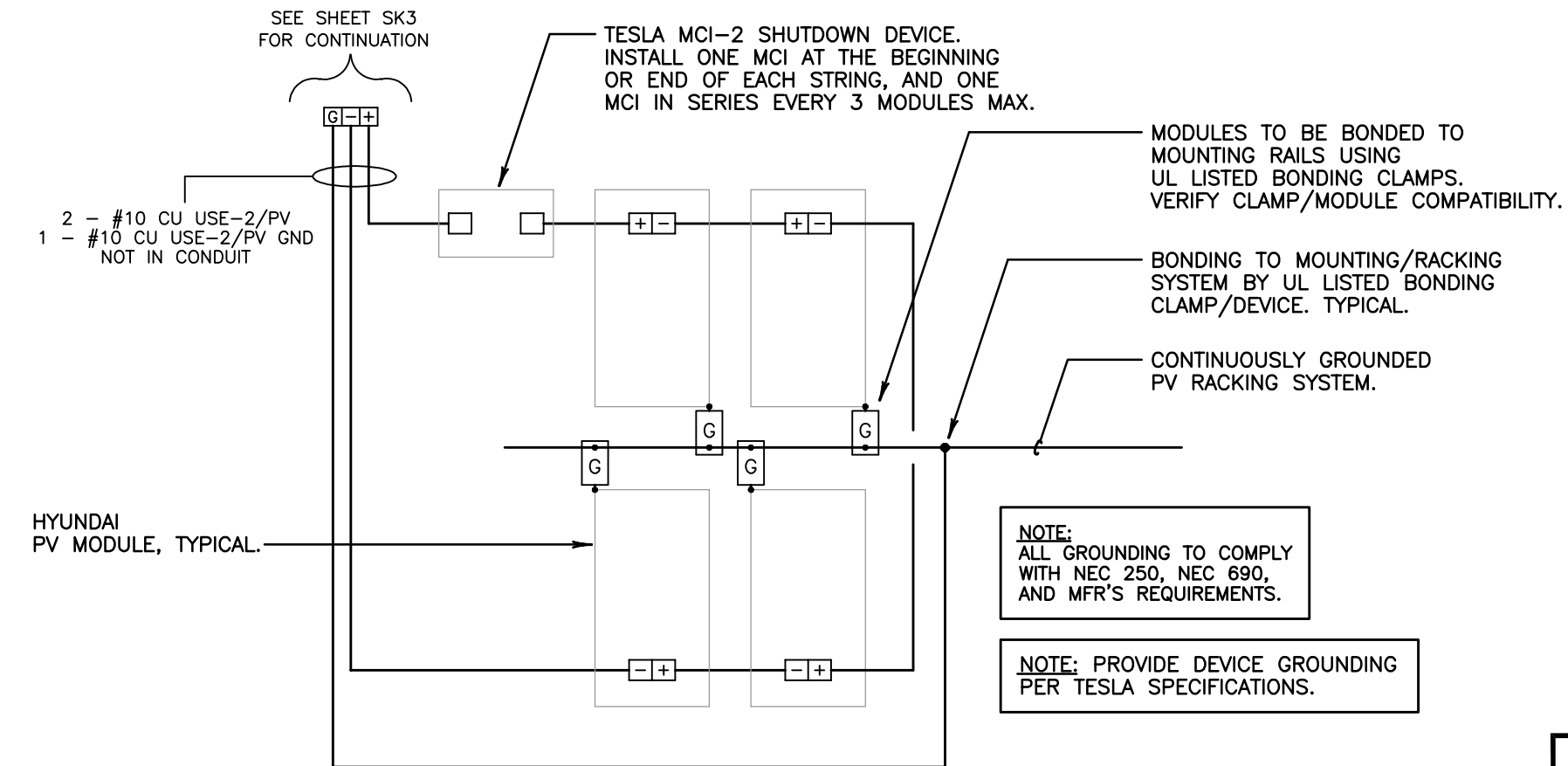
PHOTOVOLTAIC MODULE SPECS
HYUNDAI #HiN-T440NF(BK) 440 WATTS
Voc=38.8 VDC, Isc=14.39 AMPS Vmp=32.3 VDC, Imp=13.63 AMPS

3520 WATT PHOTOVOLTAIC ARRAY MPPT 1
HYUNDAI #HiN-T440NF(BK) 8 MODULES IN SERIES
Voc=310.4 VDC, Isc=14.39 AMPS Vmp=258.4 VDC, Imp=13.63 AMPS

1760 WATT PHOTOVOLTAIC ARRAY MPPT 2
HYUNDAI #HiN-T440NF(BK) 4 MODULES IN SERIES
Voc=155.2 VDC, Isc=14.39 AMPS Vmp=129.2 VDC, Imp=13.63 AMPS

REV.	DESCRIPTION	DATE
A	CONSTRUCTION DOCUMENTS	8/25/26

PV MODULE / MICROINVERTER SPECS			
PV MODULE: HYUNDAI HiN-T440NF(BK) INVERTER: TESLA POWERWALL 3 11.5KW			
<u>DC ELECTRICAL DATA</u>		<u>AC ELECTRICAL DATA</u>	
NOMINAL POWER OUTPUT	440W	MAX POWER OUTPUT	11500W
		NOMINAL VOLTAGE	240V
		NOMINAL OUTPUT CURRENT	48.0A



EXPIRES 9-30-27

ARRAY DRAWING

 ROOFTOP SOLAR		 evoneer professional electrical engineering services			
APPROVALS		DATE		ARRAY DRAWING 5.28kWdc / 11.5kWac PV SYSTEM ADDITION WITH TESLA POWERWALL BATTERY BACKUP – 13.5kWh HADDEN RESIDENCE 803 W ASPEN AVE FLAGSTAFF, AZ 86001	
DRAWN		8/25/26			
CHECKED					
ENGINEER					
REV.A					
		SIZE B	DRAWING NO. 26141–SK4		
		SCALE	N/A	REV.A	SK–04

REV.	DESCRIPTION	DATE
A	CONSTRUCTION DOCUMENTS	8/25/26

GENERAL NOTES

- A. EQUIPMENT SHALL BE INSTALLED AND LABELED IN ACCORDANCE WITH THE N.E.C. AND ALL APPLICABLE REQUIREMENTS OF THE SERVING ELECTRIC UTILITY COMPANY AND OF THE LOCAL AUTHORITY HAVING JURISDICTION.
- B. ALL PV EQUIPMENT, INCLUDING PV MODULES AND INVERTERS, TO BE LISTED OR FIELD LABELED FOR THE PV APPLICATION PER N.E.C. 690.4(B).
- C. GROUND WIRE MUST BE CONTINUOUS AND INSTALLED TO ALLOW FOR PANEL REMOVAL WITHOUT DISRUPTING CONTINUITY.
- D. FOLLOW MANUFACTURER’S SUGGESTED INSTALLATION PRACTICES AND WIRING SPECIFICATIONS.
- E. WIRES SHALL BE RATED AND LABELED "SUNLIGHT RESISTANT" WHERE EXPOSED TO AMBIENT CONDITIONS.
- F. DC DISCONNECT SHALL BE ACHEIVED VIA THE MC4 CONNECTOR AT EACH PANEL, AND LABELED FOR IDENTIFICATION.
- G. EQUIPMENT SHALL BE LABELED AS SPECIFIED IN THE NOTES ON THIS PAGE AND AS SPECIFIED IN THE N.E.C.
- H. LISTING AGENCY NAMES AND NUMBERS TO BE INDICATED ON POWER INVERTER AND SOLAR MODULES.
- I. WHERE DC PV SOURCE OR DC PV OUTPUT CIRCUITS ARE RUN INSIDE A BUILDING, METALLIC CONDUIT SHALL BE USED PER N.E.C. 690.31(G).

KEYED NOTES

- 1 BI-DIRECTIONAL UTILITY METER TO BE INSTALLED BY UTILITY COMPANY.
- 2 SWITCH COVER TO BE LOCKED AT ALL TIMES. SWITCH TO BE VISIBLE OPEN AND ACCESSIBLE PER UTILITY REQUIREMENTS AND CONFORM TO NEC 705.22.
- 3 GEC TO BE INSTALLED AS REQUIRED PER MANUFACTURER INSTRUCTIONS AND NEC 690.47.
- 4 METER ENCLOSURE AND SOCKET PROVIDED AND INSTALLED BY CONTRACTOR. METER, CTs, AND TEST SWITCHES PROVIDED BY UTILITY COMPANY WHEN REQUIRED. CONTRACTOR TO SUBMIT SHOP DRAWINGS OF METERING CABINET TO UTILITY COMPANY FOR APPROVAL.

CODE NOTES

PHOTOVOLTAIC SYSTEM SHALL BE INSTALLED ACCORDING TO THE 2017 N.E.C., 2018 I.F.C., 2018 I.R.C. IN PARTICULAR, REFERENCE THE FOLLOWING N.E.C. SECTIONS: 690(ALL), 705(ALL), 210.6, 230.70, 240, AND 250, INCLUDING REFERENCED SECTIONS AND TABLES. ALL EQUIPMENT PROVIDED SHALL BE LISTED BY AN INDEPENDANT TESTING AGENCY.

ENSURE THAT THIS PROJECT COMPLIES WITH THE FOLLOWING N.E.C. CODE SECTIONS:

N.E.C. 110.21(B) FIELD APPLIED HAZARD MARKINGS

N.E.C. 240.4(B) FOR OVERCURRENT DEVICES RATED 800 AMPERES OR LESS, THE NEXT HIGHER STANDARD OVERCURRENT DEVICE RATING (ABOVE THE AMPACITY OF THE CONDUCTORS BEING PROTECTED) SHALL BE PERMITTED TO BE USED, IF: 1) THE CONDUCTORS BEING PROTECTED ARE NOT PART OF A BRANCH CIRCUIT SUPPLYING MORE THAN ONE RECEPTACLE FOR CORD-AND-PLUG CONNECTED PORTABLE LOADS, AND 2) THE AMPACITY OF THE CONDUCTORS DOES NOT CORRESPOND WITH THE STANDARD AMPERE RATING OF A FUSE OR A CIRCUIT BREAKER WITHOUT OVERLOAD TRIP ADJUSTMENTS ABOVE ITS RATING, AND 3) THE NEXT HIGHER STANDARD RATING SELECTED DOES NOT EXCEED 800 AMPERES.

N.E.C. 240.6(A) THE STANDARD AMPERE RATINGS FOR FUSES AND INVERSE TIME CIRCUIT BREAKERS SHALL BE CONSIDERED: 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100, 110, 125, 150, 175, 200, 225, 250, 300, 350, 400, 450, 500, 600, 700, 800, 1000, 1200, 1600, 2000, 2500, 3000, 4000, 5000, AND 6000 AMPERES.

N.E.C. 250.64(C) GROUNDING ELECTRODE CONDUCTOR TO BE CONTINUOUS. GROUND CRIMPS TO BE IRREVERSIBLE.

N.E.C. 250.97 FOR CIRCUITS OVER 250 VOLTS TO GROUND, THE ELECTRICAL CONTINUITY OF METAL RACEWAYS AND CABLES WITH METAL SHEATHS THAT CONTAIN ANY CONDUCTOR OTHER THAN SERVICE CONDUCTORS SHALL BE ENSURED BY ONE OR MORE OF THE METHODS SPECIFIED FOR SERVICES IN N.E.C. 250.92(B), EXCEPT FOR (B)(1).

N.E.C. 690.4(C) THE INSTALLATION OF EQUIPMENT AND ALL ASSOCIATED WIRING AND INTERCONNECTIONS SHALL BE PERFORMED ONLY BY QUALIFIED PERSONS.

N.E.C. 690.8(A)(1) PHOTOVOLTAIC SOUCE CIRCUIT CURRENTS. THE MAXIMUM CURRENT SHALL BE THE SUM OF THE PARALLEL-CONNECTED MODULE RATED SHORT-CIRCUIT CURRENTS MULTIPLIED BY 125 PERCENT.

N.E.C. 690.8(A)(3) INVERTER OUTPUT CIRCUIT CURRENT. THE MAXIMUM CURRENT SHALL BE THE INVERTER CONTINUOUS OUTPUT CURRENT RATING.

N.E.C. 690.8(B) PV CIRCUIT CONDUCTORS SHALL BE SIZED AS REQUIRED BY N.E.C. 690.8(B)(1-2).

N.E.C. 690.11 ARC-FAULT PROTECTION (DIRECT CURRENT)

N.E.C. 690.12 RAPID SHUTDOWN OF PV SYSTEMS ON BUILDINGS

N.E.C. 690.13(B) PV SYSTEM DISCONNECT SHALL BE PERMANENTLY MARKED TO IDENTIFY IT AS A PHOTOVOLTAIC SYSTEM DISCONNECT, AND ALSO BE LABELED: "WARNING – ELECTRIC SHOCK HAZARD – TERMINALS ON THE LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION".

N.E.C. 690.15 DISCONNECTION OF PHOTOVOLTAIC EQUIPMENT

N.E.C. 690.33 CONNECTORS (A) CONFIGURATION, (B) GUARDING, (C) CONNECTORS SHALL BE OF THE LOCKING OR LATCHING TYPE, (E) LABELED "DO NOT DISCONNECT UNDER LOAD"

N.E.C. 690.41(B) GROUND-FAULT PROTECTION

N.E.C. 690.43 EQUIPMENT GROUNDING CONDUCTORS AND DEVICES TO COMPLY WITH N.E.C. 690.43(A) THROUGH (C).

N.E.C. 690.53 PERMANENT LABEL FOR DIRECT-CURRENT PHOTOVOLTAIC POWER SOURCE AT DISCONNECTING MEANS: MAXIMUM VOLTAGE MAXIMUM CIRCUIT CURRENT

N.E.C. 690.56(B) PLAQUES OR DIRECTORIES SHALL BE INSTALLED IN ACCORDANCE WITH N.E.C. 705.10.

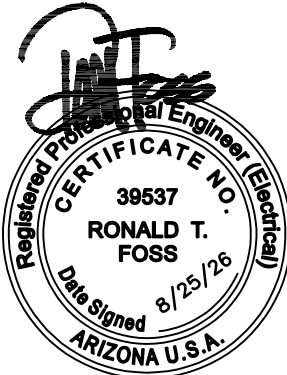
N.E.C. 705.10 A PERMANENT PLAQUE OR DIRECTORY DENOTING THE LOCATION OF ALL ELECTRICAL POWER SOURCE DISCONNECTING MEANS ON OR IN THE PREMISES SHALL BE INSTALLED AT EACH SERVICE EQUIPMENT LOCATION AND AT THE LOCATION(S) OF THE SYSTEM DISCONNECT(S) FOR ALL ELECTRIC POWER PRODUCTION SOURCES CAPABLE OF BEING INTERCONNECTED.

N.E.C. 705.12(B)(4) CIRCUIT BREAKERS, IF BACKFED, SHALL BE SUITABLE FOR SUCH OPERATION.

N.E.C. TABLE 250.66 THE SIZE OF THE GROUNDING ELECTRODE CONDUCTOR AT THE SERVICE, AT EACH BUILDING OR STRUCTURE WHERE SUPPLIED BY A FEEDER(S) OR BRANCH CIRCUIT(S), OR AT A SEPARATELY DERIVED SYSTEM OF A GROUNDED OR UNGROUNDED AC SYSTEM SHALL NOT BE LESS THAN GIVEN IN TABLE 250.66, EXCEPT AS PERMITTED IN 250.66(A) THROUGH (C).

N.E.C. TABLE 310.15(B)(16) ALLOWABLE AMPACITIES OF INSULATED CONDUCTORS RATED UP TO AND INCLUDING 2000 VOLTS, 60°C THROUGH 90°C, NOT MORE THAN THREE CURRENT-CARRYING CONDUCTORS IN RACEWAY, CABLE, OR EARTH, BASED ON AMBIENT TEMPERATURE OF 30°C. REFER TO N.E.C. 310.15(B)(2) FOR THE AMPACITY CORRECTION FACTORS WHERE THE AMBIENT TEMPERATURE IS OTHER THAN 30°C.

2020 N.E.C. 705.13 POWER CONTROL SYSTEMS. USE OF POWER CONTROL SYSTEM (PCS) TO CONTROL THE OUTPUT OF POWER PRODUCTION SOURCES.



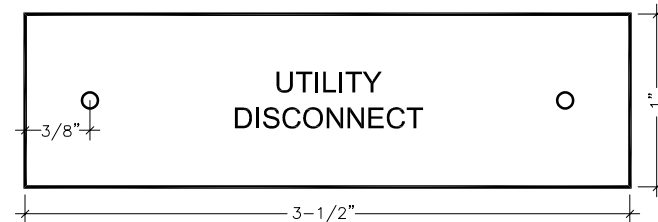
EXPIRES 9-30-27

NOTES

 ROOFTOP SOLAR		 evoneer professional electrical engineering services			
APPROVALS		DATE		NOTES 5.28kWdc / 11.5kWac PV SYSTEM ADDITION WITH TESLA POWERWALL BATTERY BACKUP – 13.5kWh HADDEN RESIDENCE 803 W ASPEN AVE FLAGSTAFF, AZ 86001	
DRAWN		8/25/26			
CHECKED					
ENGINEER					
REV.A					
		SIZE B	DRAWING NO. 26141–SK5		
		SCALE N/A	REV.A		SK–05

REV.	DESCRIPTION	DATE
A	CONSTRUCTION DOCUMENTS	8/25/26

UTILITY DISCONNECT

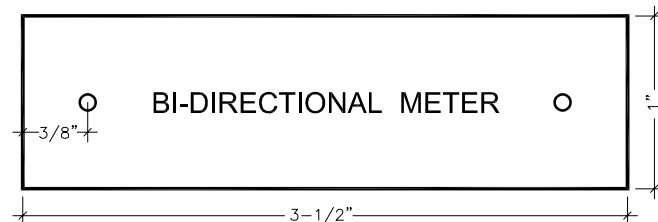


WARNING

ELECTRIC SHOCK HAZARD

TERMINALS ON THE LINE AND LOAD SIDES
MAY BE ENERGIZED IN THE OPEN POSITION

BI-DIRECTIONAL METER



WARNING

ELECTRIC SHOCK HAZARD

TERMINALS ON THE LINE AND LOAD SIDES
MAY BE ENERGIZED IN THE OPEN POSITION

TESLA SOLAR CT AND
TESLA BACKUP SWITCH

WARNING

THIS SENSOR IS PART OF A POWER
CONTROL SYSTEM. DO NOT REMOVE.
REPLACE ONLY WITH SAME TYPE
AND RATING.

MAIN SERVICE PANEL

PANELBOARD IS ENERGIZED FROM TWO SOURCES OF AC POWER

SOLAR - 48.0 AMPS AC AT 240V
UTILITY - GRID 200 AMPS AC AT 240V

PHOTOVOLTAIC POWER SOURCE BREAKERS ARE BACKFEEDING

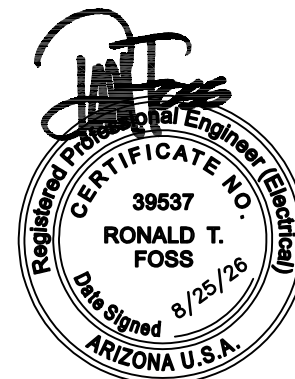
WARNING: POWER SOURCE OUTPUT CONNECTION - DO NOT RELOCATE THIS OVERCURRENT DEVICE

WARNING

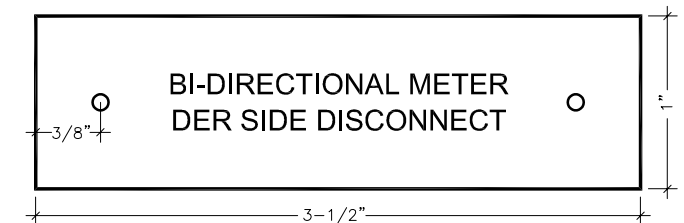
ELECTRIC SHOCK HAZARD

TERMINALS ON THE LINE AND LOAD SIDES
MAY BE ENERGIZED IN THE OPEN POSITION

6" WIDE X 4" HIGH, REFLECTIVE, EXTERIOR RATED



EXPIRES 9-30-27

BI-DIRECTIONAL METER
DER-SIDE DISCONNECT

WARNING

ELECTRIC SHOCK HAZARD

TERMINALS ON THE LINE AND LOAD SIDES
MAY BE ENERGIZED IN THE OPEN POSITION

EQUIPMENT LABELING



APPROVALS	DATE
DRAWN	8/25/2
CHECKED	
ENGINEER	
REV.A	



EQUIPMENT LABELING

5.28kWdc / 11.5kWac PV SYSTEM ADDITION
WITH TESLA POWERWALL BATTERY BACKUP – 13.5kWh
HADDEN RESIDENCE
803 W ASPEN AVE
FLAGSTAFF, AZ 86001

SIZE B	DRAWING NO. 26141-SK6		
SCALE	N/A	REV.A	SK-06

INVERTER / DC DISCONNECT

(ORANGE WITH BLACK LETTERS)

WARNING

ELECTRIC SHOCK HAZARD

TERMINALS ON BOTH THE LINE AND LOAD SIDES
MAY BE ENERGIZED IN THE OPEN POSITION

3-1/2"

1-1/2"

(BLACK WITH WHITE LETTERS)

PHOTOVOLTAIC ARRAY
DC DISCONNECT SWITCH

MAXIMUM VOLTAGE600.0 Vdc

MAXIMUM CIRCUIT CURRENT15.0 Adc

4-3/8"

1-1/2"

(BLACK WITH WHITE LETTERS)

PHOTOVOLTAIC ARRAY
DC DISCONNECT SWITCH

2-1/2"

1"

RAPID SHUTDOWN

(LOCATED NEXT TO TESLA RAPID SHUTDOWN INITIATOR SWITCH)
(REFLECTIVE, RED WITH 3/8" WHITE LETTERS)

RAPID SHUTDOWN SWITCH
FOR SOLAR PV SYSTEM

5-1/2"

1-3/4"

TESLA POWERWALL 3

6" WIDE X 4" HIGH, REFLECTIVE, EXTERIOR RATED

ESS

LITHIUM-ION BATTERIES

(LOCATED NO MORE THAN 3' FROM THE SERVICE DISCONNECTING
MEANS TO WHICH THE PV SYSTEMS ARE CONNECTED)
(YELLOW WITH 3/8" BLACK LETTERS)

SOLAR PV SYSTEM EQUIPPED
WITH RAPID SHUTDOWN

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

SOLAR ELECTRIC
PV PANELS

WHITE WITH 3/16" BLACK LETTERS

REV.	DESCRIPTION	DATE
A	CONSTRUCTION DOCUMENTS	8/25/26

DC CONDUITS, RACEWAYS, JUNCTION BOXES, ETC.

(REFLECTIVE RED WITH 3/8" WHITE LETTERS, PER N.E.C. 690.31)

WARNING: PHOTOVOLTAIC
POWER SOURCE

5-3/4"

1-1/8"

I.F.C. LABELING REQUIREMENTS

LABELING REQUIRED ON ALL INTERIOR AND EXTERIOR DC
CONDUIT, ENCLOSURES, RACEWAYS, CABLE ASSEMBLIES,
JUNCTION BOXES, COMBINER BOXES, AND DISCONNECTS.

LABELING TO READ: "WARNING: PHOTOVOLTAIC POWER SOURCE".

LABEL TO BE REFLECTIVE, WEATHER RESISTANT, AND
SUITABLE FOR THE ENVIRONMENT IN WHICH IT'S INSTALLED.

LETTERING TO BE ALL CAPITALS, MINIMUM 3/8", WHITE ON RED.

LABEL ADJACENT TO MAIN SERVICE DISCONNECT TO BE VISIBLE
FROM THE DISCONNECT OPERATION LOCATION.

LABELS TO BE PLACED EVERY 10 FEET, WITHIN 1 FOOT OF
TURNS / BENDS, AND WITHIN 1 FOOT ABOVE / BELOW
PENETRATIONS.

EQUIPMENT LABELING

EXPIRES 9-30-27

ROOFTOP
SOLAR

APPROVALS

DATE

DRAWN

CHECKED

ENGINEER

REV.A

8/25/26

evoneer

professional electrical
engineering services

EQUIPMENT LABELING

5.28kWdc / 11.5kWac PV SYSTEM ADDITION
WITH TESLA POWERWALL BATTERY BACKUP – 13.5kWh
HADDEN RESIDENCE
803 W ASPEN AVE
FLAGSTAFF, AZ 86001

SIZE
B

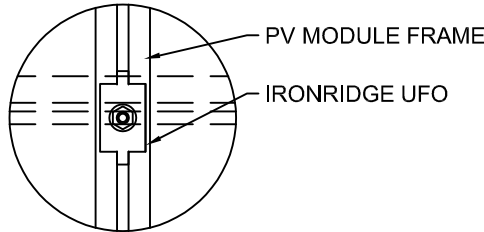
DRAWING NO.
26141-SK7

SCALE

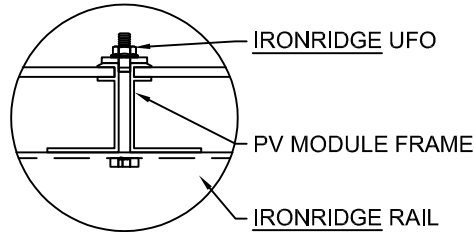
N/A

REV.A

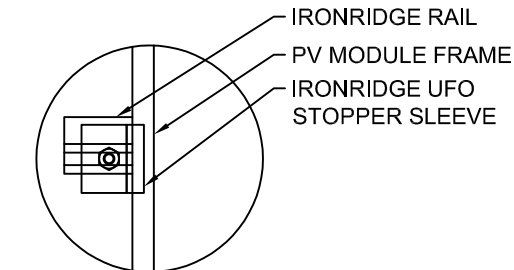
SK-07



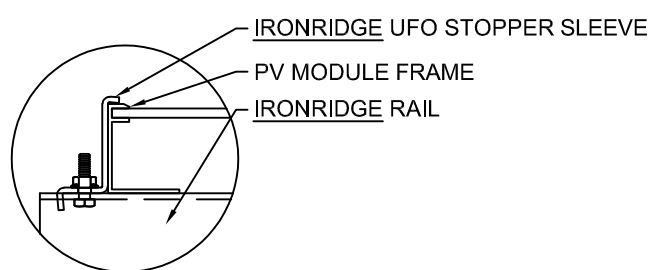
MID CLAMP PLAN VIEW



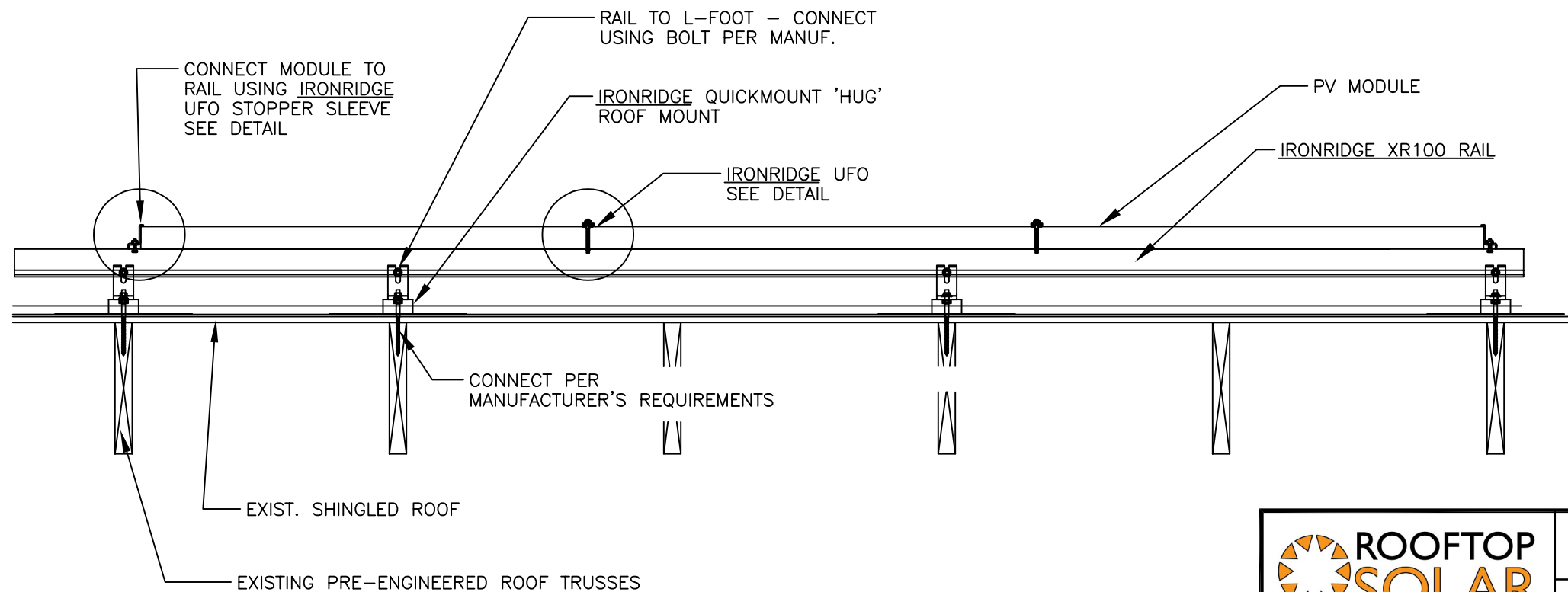
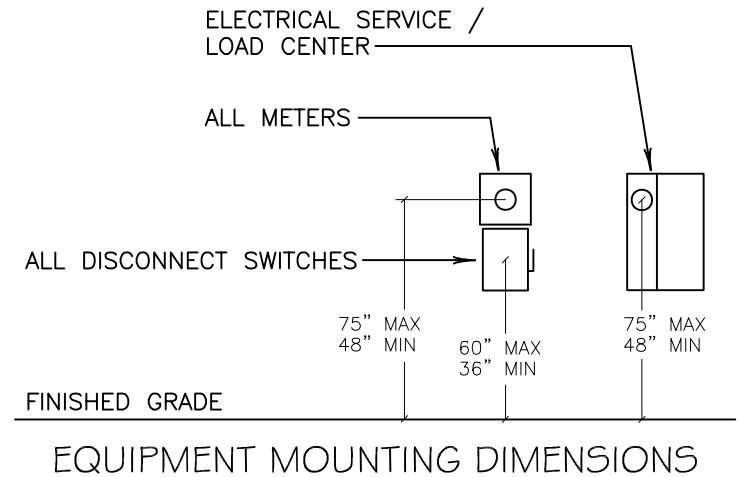
MID CLAMP SECTION VIEW



END CLAMP PLAN VIEW



END CLAMP SECTION VIEW

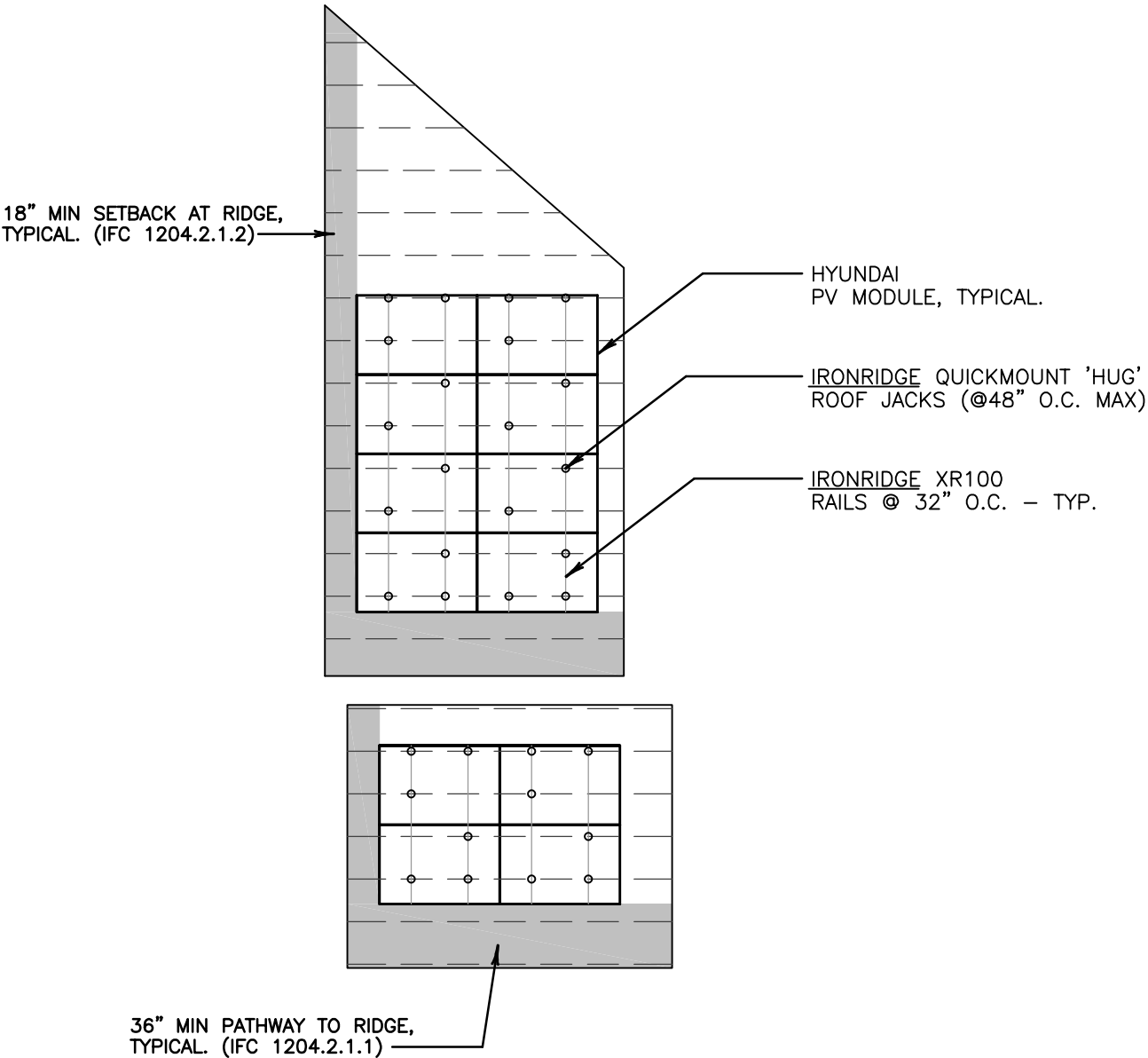


ROOF CONNECTION DETAIL

REV.	DESCRIPTION	DATE
A	CONSTRUCTION DOCUMENTS	8/25/26

		MOUNTING DETAILS	
		5.28kWdc / 11.5kWac PV SYSTEM ADDITION WITH TESLA POWERWALL BATTERY BACKUP - 13.5kWh HADDEN RESIDENCE 803 W ASPEN AVE FLAGSTAFF, AZ 86001	
APPROVALS	DATE	SIZE	DRAWING NO.
DRAWN	8/25/26	B	26141-SK8
CHECKED		SCALE	N/A
ENGINEER		REV.A	SK-08
REV.A			

REV.	DESCRIPTION	DATE
A	CONSTRUCTION DOCUMENTS	8/25/26



ROOF JACK AND RACKING SUMMARY:

(32) IRONRIDGE QUICKMOUNT 'HUG' ROOF JACKS

APPROX. 90 FT OF IRONRIDGE XR100 RAIL

NOTE: IRONRIDGE XR100 RAIL CANTILEVER NOT TO EXCEED 40% OF SPAN



ROOF LAYOUT

			
		ROOF LAYOUT	
		5.28kWdc / 11.5kWac PV SYSTEM ADDITION WITH TESLA POWERWALL BATTERY BACKUP – 13.5kWh HADDEN RESIDENCE 803 W ASPEN AVE FLAGSTAFF, AZ 86001	
		SIZE B	DRAWING NO. 26141–SK9
		SCALE N/A	REV.A SK–09

REV.	DESCRIPTION	DATE
A	CONSTRUCTION DOCUMENTS	8/25/26

<u>UPLIFT CALCULATION</u>	4	PANEL ARRAY	x	2	ARRAY(S)	=	8	PANEL(S)
SINGLE PANEL AREA:	21	SF						
PANEL GROUP AREA:	84	SF	x WINDLOAD	30	PSF	=	2520	LBS TOTAL LOAD
CONNECTOR TYPE	5/16"	LAG SCREW (EMBED MIN 3")						
# OF STANDOFF(S):	10							
PULL OUT STRENGTH:	205	LBS PER EMBEDDED INCH	10	x	3	x	205	= 6150 LBS
<u>POINT LOAD CALCULATION</u>	50	LBS	PANEL WEIGHT					
ARRAY WEIGHT:	200	LBS	/ 10 STANDOFFS	=	20	LBS	PER STANDOFF	
<u>TOTAL LOAD CALCULATION</u>								
	200	LBS	/	84	SQ FT	=	2.38	PSF

<u>UPLIFT CALCULATION</u>	2	PANEL ARRAY	x	2	ARRAY(S)	=	4	PANEL(S)
SINGLE PANEL AREA:	21	SF						
PANEL GROUP AREA:	42	SF	x WINDLOAD	30	PSF	=	1260	LBS TOTAL LOAD
CONNECTOR TYPE	5/16"	LAG SCREW (EMBED MIN 3")						
# OF STANDOFF(S):	6							
PULL OUT STRENGTH:	205	LBS PER EMBEDDED INCH	6	x	3	x	205	= 3690 LBS
<u>POINT LOAD CALCULATION</u>	50	LBS	PANEL WEIGHT					
ARRAY WEIGHT:	100	LBS	/ 6 STANDOFFS	=	16.6667	LBS	PER STANDOFF	
<u>TOTAL LOAD CALCULATION</u>								
	100	LBS	/	42	SQ FT	=	2.38	PSF

1.	32	TOTAL PV MOUNTS							
2.	RAIL SYSTEMS:	2	AT 14'-11" IN LENGTH	x	2	RUN(S)	59'-8"	TOTAL TRACK LENGTH	
		2	AT 7'-6" IN LENGTH	x	2	RUN(S)	30'-0"	89'-8"	
3.	12	HYUNDAI 440W MODULES	50.0	LBS EACH					
4.	WEIGHT AT EACH MOUNTING POINT:	20	LBS (10 MOUNTING POINTS	x	(2)	4	MODULE ROW(S)		
		16.67	LBS (6 MOUNTING POINTS	x	(2)	2	MODULE ROW(S)		
5.	WEIGHT PER SQ FT:	2.38	LBS AT	(2)	4	MODULE ROW(S)			
		2.38	LBS AT	(2)	2	MODULE ROW(S)			
6.	PITCHED SHINGLED ROOF								
7.	TOTAL ROOFTOP SQ FT:	2686							
8.	TOTAL EQUIPMENT COVERAGE SQ FT	252							

ROOF CALCS

 ROOFTOP SOLAR					
APPROVALS		DATE		ROOF CALCS 5.28kWdc / 11.5kWac PV SYSTEM ADDITION WITH TESLA POWERWALL BATTERY BACKUP – 13.5kWh HADDEN RESIDENCE 803 W ASPEN AVE FLAGSTAFF, AZ 86001	
DRAWN		8/25/26			
CHECKED					
ENGINEER					
REV.A				SIZE B	DRAWING NO. 26141–SK10
		SCALE	N/A	REV.A	SK–10

SPECS

Hadden

803 W Aspen Ave, Flagstaff, AZ 86001

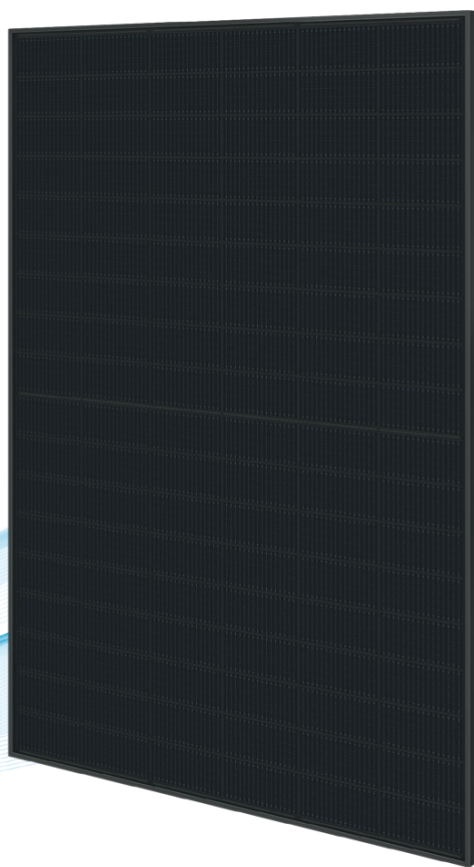
August 25, 2026

HD HYUNDAI SOLAR MODULE

NF(BK) Series

Premium N-Type TOPCon Module

HiN-T430NF(BK) | HiN-T435NF(BK) | HiN-T440NF(BK)



22.53%
High Efficiency



High-End
TOPCon
Technology



Higher
Bifaciality



Long-Term
Reliability



Compatible
with Carport
Applications



For Residential
(Full Black Design)

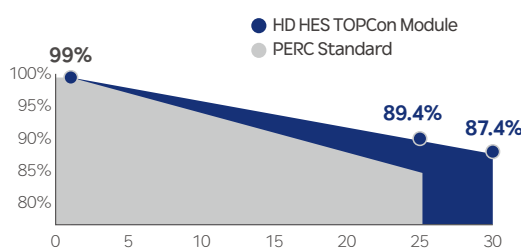
HD Hyundai's Warranty Provisions

25
YEARS

- 25-Year Product Warranty
- Materials and workmanship

30
YEARS

- 30-Year Performance Warranty
- First year degradation: 1%
- Linear warranty after initial year: with 0.4%p annual degradation, 87.4% is guaranteed up to 30years



*Refer to HD HES standard warranty for details.

Certification



- ISO 9001 : Quality management systems
- ISO 14001 : Environmental management systems
- ISO 45001 : Occupational health and safety management systems
- UL 61730: Photovoltaic (PV) module safety qualification (CSA)
- IEC 61701: Salt mist corrosion testing
- IEC 62716: Ammonia corrosion testing
- IEC 62804: Potential Induced Degradation (PID) testing
- IEC 60068-2-68: Sand and dust testing for environmental durability

Electrical Characteristics

HiN-TxxxNF(BK)		HiN-T430NF(BK)		HiN-T435NF(BK)		HiN-T440NF(BK)	
Item	Unit	BNPI		BNPI		BNPI	
Nominal output (Pmax)	W	430	476	435	482	440	488
Open circuit voltage (Voc)	V	38.4	38.4	38.6	38.6	38.8	38.8
Short circuit current (Isc)	A	14.25	15.79	14.32	15.87	14.39	15.94
Voltage at Pmax (Vmpp)	V	31.9	31.9	32.1	32.1	32.3	32.3
Current at Pmax (Impp)	A	13.48	14.94	13.56	15.02	13.63	15.10
Module efficiency	%	22.02		22.28		22.53	
Power Class Sorting	W	0 ~ +5					
Temperature coefficient of Pmax	%/K	-0.30					
Temperature coefficient of Voc	%/K	-0.25					
Temperature coefficient of Isc	%/K	0.046					
Bifaciality	%	80%±10%					

*STC : Irradiance 1,000 W/m², cell temperature 25°C, AM=1.5 / Test uncertainty for Pmax ±3%; Voc ±3%; Isc ±3%
 **The electrical properties of BNPI are measured under the irradiance corresponding to 1000 W/m² on the module front and 135 W/m² on the module rear.

Additional Power Gain from rear side					
Pmpp gain	Pmpp[W]	Vmpp[V]	Impp[A]	Voc[V]	Isc[A]
5%	458	32.30	14.18	38.80	14.97
15%	493	32.30	15.27	38.80	16.12
25%	528	32.40	16.36	38.90	17.27

*Electrical characteristics with different rear power gain (reference to 440W)

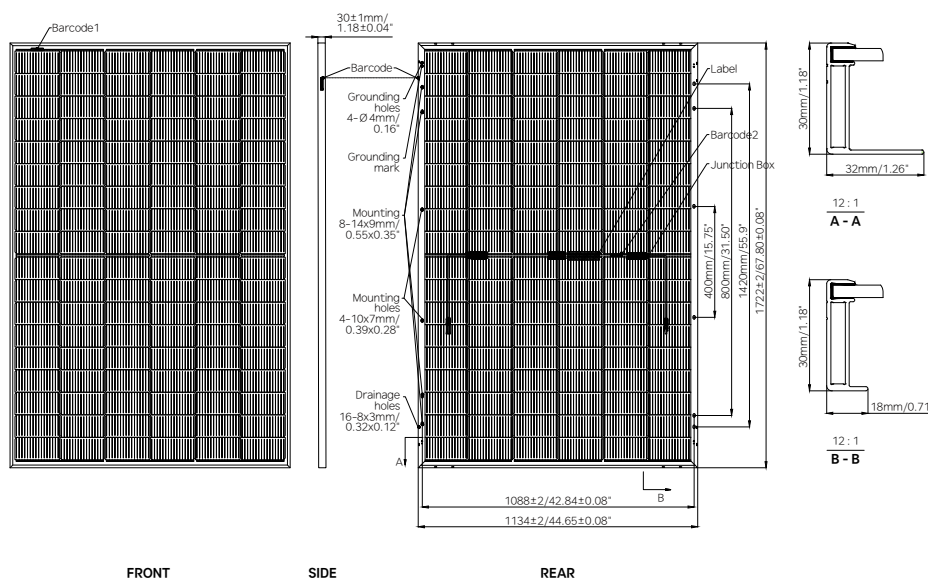
Mechanical Characteristics

Dimensions	1,722mm (L) x 1,134mm (W) x 30mm (H) (67.8in x 44.6in x 1.2in)
Weight	24.5 kg (50.01lbs)
Solar Cells	N-Type TOPCon, 108 (6x18) monocrystalline 16BB half-cut bifacial cells
Output Cables	Cable : (+)1,200mm(47.2in), (-)1,200mm(47.2in) / Customized length available Connector : Stäubli MC4 genuine Connector / Compatible, IP68
Junction Box	3-part, 3 bypass diodes, IP68 rated
Construction	Front : 2.0mm(0.08in) semi-tempered solar glass with high transmittance and anti-reflective coating Rear : 2.0mm(0.08in) semi-tempered solar glass
Frame	Anodized aluminum alloy

Shipping Configurations

Packing Direction	Vertical	Packing pallet weight (kg)	912
Container Size (HC)	40'	Modules Per Pallet (pcs)	36
Pallets Per Container	26	Modules Per Container (pcs)	936

Module Diagram (unit : mm)

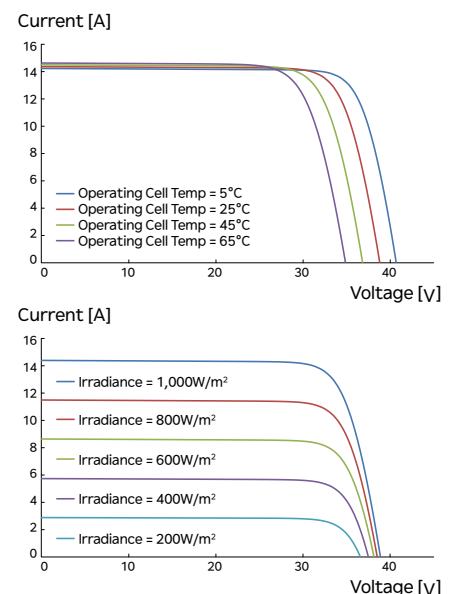


Installation Safety Guide

- Only qualified personnel should install or perform maintenance.
- Be aware of dangerous high DC voltage.
- Do not handle or install modules when they are wet.

Nominal Module Operation Temperature	44°C ± 2°C
Operating Temperature	-40°C~+85°C
Maximum System Voltage	DC 1,500 V
Maximum Reverse Current	30A
Maximum Test Load	Front 5,400Pa *See Installation Manual *Rear 5,400Pa
Fire Performance	Type 29

I-V Curves (HiN-T440NF(BK))



Powerwall 3

Power Everything

Powerwall 3 is a fully integrated solar and battery system, designed to accelerate the transition to sustainable energy. Customers can receive whole home backup, cost savings, and energy independence by producing and consuming their own energy while participating in grid services. Once installed, customers can manage their system using the Tesla App to customize system behavior to meet their energy goals.

Powerwall 3 achieves this by supporting up to 20 kW DC of solar and providing up to 11.5 kW AC of continuous power per unit. It has the ability to start heavy loads rated up to 185 LRA, meaning a single unit can support the power needs of most homes. Powerwall 3 Expansions make it easier and more affordable to scale up customers' systems to meet their current or future needs. Powerwall 3 is designed for fast and efficient installations, modular system expansion, and simple connection to any electrical service.



Powerwall 3 Technical Specifications

System Technical Specifications

Model Number	1707000-xx-y			
Nominal Grid Voltage (Input & Output)	120/240 VAC			
Grid Type	Split phase			
Frequency	60 Hz			
Nominal Battery Energy	13.5 kWh AC ¹			
Nominal Output Power (AC)	5.8 kW	7.6 kW	10 kW	11.5 kW
Maximum Apparent Power	5,800 VA	7,600 VA	10,000 VA	11,500 VA
Maximum Continuous Current	24 A	31.7 A	41.7 A	48 A
Overcurrent Protection Device ²	30 A	40 A	60 A	60 A
Configurable Maximum Continuous Discharge Power Off-Grid (PV Only, -20°C to 25°C)	15.4 kW ³			
Maximum Continuous Charge Current / Power (Powerwall 3 only)	20.8 A AC / 5 kW			
Maximum Continuous Charge Current / Power (Powerwall 3 with up to (3) Expansion units)	33.3 A AC / 8 kW			
Output Power Factor Rating	0 – 1 (Grid Code configurable)			
Maximum Output Fault Current (1 s)	160 A			
Maximum Short-Circuit Current Rating	10 kA			
Load Start Capability	185 LRA			
Solar to Battery to Home/Grid Efficiency	89% ^{1,4}			
Solar to Home/Grid Efficiency	97.5% ⁵			
Power Scalability	Up to 4 Powerwall 3 units supported			
Energy Scalability	Up to 3 Expansion units (for a maximum total of 7 units)			
Supported Islanding Devices	Gateway 3, Backup Switch, Backup Gateway 2			
Connectivity	Wi-Fi (2.4 and 5 GHz), Ethernet, Cellular (LTE/4G ⁶)			
Hardware Interface	Dry contact relay, Rapid Shutdown (RSD) certified switch and 2-pin connector, RS-485 for meters			
AC Metering	Revenue Grade (+/- 0.5%, ANSI C12.20)			
Protections	Integrated arc fault circuit interrupter (AFCI), Isolation Monitor Interrupter (IMI), PV Rapid Shutdown (RSD) using Tesla Mid-Circuit Interrupters			
Customer Interface	Tesla Mobile App			
Warranty	10 years			

¹Values provided for 25°C (77°F), at beginning of life. 3.3 kW charge/discharge power.

²See [Powerwall 3 Installation Manual](#) for fuse requirements if using fuse for overcurrent protection.

³15.4kW off-grid maximum continuous discharge power is only available if on-grid rating is 11.5 kW. If enabled, Powerwall 3 must be installed with an 80 A breaker and appropriately sized conductors.

⁴Typical solar shifting use case.

⁵Tested using CEC weighted efficiency methodology.

⁶The customer is expected to provide internet connectivity for Powerwall 3; cellular should not be used as the primary mode of connectivity. Cellular connectivity subject to network operator service coverage and signal strength.

Powerwall 3 Technical Specifications

Solar Technical Specifications

Maximum Solar STC Input	20 kW
Withstand Voltage	600 V DC
PV DC Input Voltage Range	60 — 550 V DC
PV DC MPPT Voltage Range	60 — 480 V DC
MPPTs	6
Maximum Current per MPPT (I_{MP})	15 A ^{7,8}
Maximum Short Circuit Current per MPPT (I_{SC})	19 A ⁸

⁷ Only applicable to Powerwall 3 units with 15 A I_{MP} on the product label. Otherwise, Powerwall 3 has an I_{MP} of 13 A.

⁸ When PV strings are combined on the roof and the DC input current exceeds the MPPT rating, a jumper can be used to combine two MPPTs into a single input to intake DC current up to 30 A I_{MP} / 38 A I_{SC} (or 26 A I_{MP} / 30 A I_{SC} if Powerwall 3 is labeled with 13 A I_{MP} / 15 A I_{SC}).

Environmental Specifications

Operating Temperature	–20°C to 50°C (–4°F to 122°F) ⁹
Operating Humidity (RH)	Up to 100%, condensing
Storage Temperature	–20°C to 30°C (–4°F to 86°F), up to 95% RH, non-condensing, State of Energy (SOE): 25% initial
Maximum Elevation	3000 m (9843 ft)
Environment	Indoor and outdoor rated
Enclosure Rating	NEMA 3R
Ingress Rating	IP67 (Battery & Power Electronics) IP55 (Wiring Compartment)
Pollution Rating	PD3
Operating Noise @ 1 m	< 50 db(A) typical < 62 db(A) maximum

⁹ Performance may be de-rated at operating temperatures above 40°C (104°F).

Compliance Information

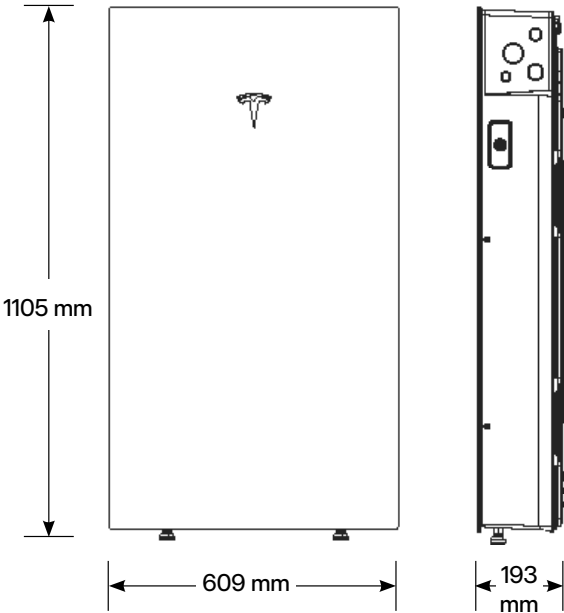
Certifications	UL 1741, UL 9540, UL 9540A, UL 3741, UL 1741 PCS, UL 1741 SA, UL 1741 SB, UL 1741 Multimode, UL 1973, UL 1699B, UL 1998, CSA C22.2 No. 0.8, CSA C22.2 No. 107.1, CSA C22.2 No. 330, CSA 22.3 No. 9, IEEE 1547, IEEE 1547A, IEEE 1547.1, CA Rule No.21
Grid Connection	United States and Canada
Emissions	FCC Part 15 Class B, ICES 003
Environmental	RoHS Directive 2011/65/EU
Seismic	AC156, IEEE 693-2005 (high)
Fire Testing	Meets the unit level performance criteria of UL 9540A

Powerwall 3 Technical Specifications

Mechanical Specifications

Dimensions	1105 x 609 x 193 mm (43.5 x 24 x 7.6 in) ¹⁰
Total Weight of Installed Unit	132 kg (291.2 lb)
Weight of Powerwall 3	124 kg (272.5 lb)
Weight of Glass Front Cover	6.5 kg (14.5 lb)
Weight of Wall Bracket	1.9 kg (4.2 lb)
Mounting Options	Floor or wall mount

¹⁰ These dimensions include the glass front cover being installed on Powerwall 3.



Powerwall 3 Expansion Technical Specifications

Battery Technical Specifications

Model Number	1807000-xx-y
Nominal Battery Energy	13.5 kWh
Voltage Range	52 – 92 V DC ¹¹

¹¹ Powerwall 3 Expansion units are connected in parallel and are not field serviceable.

Environmental Specifications

Operating Temperature	–20°C to 50°C (–4°F to 122°F) ¹²
Operating Humidity (RH)	Up to 100%, condensing
Storage Temperature	–20°C to 30°C (–4°F to 86°F), up to 95% RH, non-condensing, State of Energy (SOE): 25% initial
Maximum Elevation	3000 m (9843 ft)
Environment	Indoor and outdoor rated
Enclosure Rating	NEMA 3R
Ingress Rating	IP67
Pollution Rating	PD3

¹² Performance may be de-rated at operating temperatures above 40°C (104°F).

Compliance Information

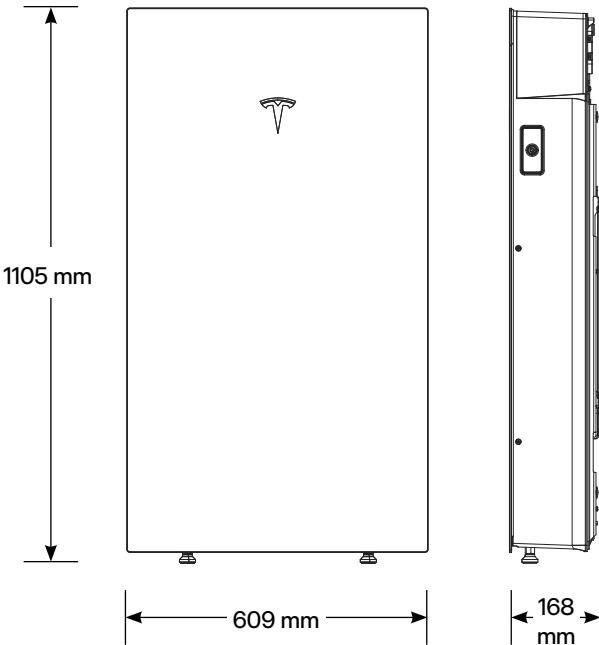
Certifications	UL 1973, UL 9540 Meets the unit level performance criteria of UL 9540A
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Mechanical Specifications

Dimensions	1105 x 609 x 168 mm (43.5 x 24 x 6.6 in) ¹³
Total Weight of Wall-Mounted Expansion Unit	118.5 kg (261.2 lb)
Weight of Expansion Unit	110 kg (242.5 lb)
Weight of Glass Front Cover	6.5 kg (14.5 lb)
Weight of Wall Bracket	1.9 kg (4.2 lb)
Weight of Expansion Accessories	0.7 kg (1.5 lb)
Mounting Options	Floor or wall mount
Stacking Capability (Floor Mount Only)	Up to (3) Expansion units behind a Powerwall 3
Compatibility with Other Systems	Only compatible with Powerwall 3
Connection to Powerwall 3 or Expansions	Powerwall 3 Expansion harness ¹⁴

¹³ These dimensions include the glass front cover being installed on Powerwall 3 Expansion.

¹⁴ The Powerwall 3 Expansion harness is a listed component of the UL 9540 certification.



Solar Shutdown Device Technical Specifications

The Solar Shutdown Device is a Mid-Circuit Interrupter (MCI) and is integral to the rapid shutdown (RSD) function required for rooftop PV systems in accordance with Article 690 of the NEC. When paired with Powerwall 3, solar array shutdown is initiated by an External System Shutdown Switch or the On/Off Enable switch located on Powerwall 3. Systems not subject to rapid shutdown requirements must still install one or more MCIs for functional purposes; see the Powerwall 3 installation manual for details.

Electrical Specifications	Model	MCI-1	MCI-2	MCI-2 High Current
	Nominal Input DC Current Rating (I _{MP})	13 A	13 A	15 A
	Maximum Input Short Circuit Current (I _{SC})	19 A	17 A	19 A
	Maximum System Voltage	600 V DC	1000 V DC ¹⁵	1000 V DC ¹⁵
	Maximum Disconnect Voltage ¹⁶	600 V DC	165 V DC	165 V DC
¹⁵ Maximum System Voltage is limited by Powerwall to 600 V DC.				
¹⁶ Maximum Disconnect Voltage is the maximum voltage allowed across each MCI in the open position (Rapid Shutdown Initiated). An individual MCI-2 has a voltage rating of 165V but in combination (connected in the same string) their voltage ratings are additive.				
RSD Module Performance	Maximum Number of Devices per String	5		
	Control	Power Line Excitation		
	Passive State	Normally Open		
	Maximum Power Consumption	7 W		
	Warranty	25 years		
Environmental Specifications	Operating Temperature	-40°C to 50°C (-40°F to 122°F)	-45°C to 70°C (-49°F to 158°F)	
	Storage Temperature	-30°C to 70°C (-22°F to 158°F)	-30°C to 70°C (-22°F to 158°F)	
	Enclosure Rating	NEMA 4X / IP65		
Mechanical Specifications	Electrical Connections	MC4 Connector		
	Housing	Plastic		
	Dimensions	125 x 150 x 22 mm (5 x 6 x 1 in)	173 x 45 x 22 mm (6.8 x 1.8 x 1 in)	
	Weight	350 g (0.77 lb)	120 g (0.26 lb)	
	Mounting Options	ZEP Home Run Clip M4 Screw (#10) M8 Bolt (5/16") Nail / Wood screw	Wire Clip	
Compliance Information	Certifications	UL 1741 PVRSE, UL 3741, PVRSA (Photovoltaic Rapid Shutdown Array)		
	RSD Initiation Method	External System Shutdown Switch or Powerwall 3 Enable Switch		

UL 3741 PV Hazard Control (and PVRSA) Compatibility

See [UL 3741 Application Addendum](#)

Gateway 3

Tesla Gateway 3 controls connection to the grid in a Powerwall system, automatically detecting outages and providing seamless transition to backup power. It provides energy monitoring that is used by Powerwall for solar self-consumption, time-based control, and backup operation.

Performance Specifications

Model Number	1841000-x1-y	AC Meter	+/- 0.5%
Nominal Grid Voltage	120/240 V AC	Communication	CAN
Grid Configuration	Split phase	User Interface	Tesla App
Grid Frequency	60 Hz	Backup Transition	Automatic disconnect for seamless backup
Continuous Current Rating	200 A	Overcurrent Protection Device	100–200 A Service entrance rated Eaton CSR, BWH, or BW, or Square D QOM breakers
Maximum Supply Short Circuit Current	22 kA with Square D or Eaton main breaker 25 kA with Eaton main breaker ¹⁷	Internal Panelboard	200 A 8-space/16 circuit breakers Eaton BR, Siemens QP, or Square D HOM breakers rated to 10–125A
IEC Protective Class	Class I	Warranty	10 years
Overvoltage Category	Category IV		

¹⁷ Only Eaton CSR or BWH main breakers are 25 kA rated.

Environmental Specifications

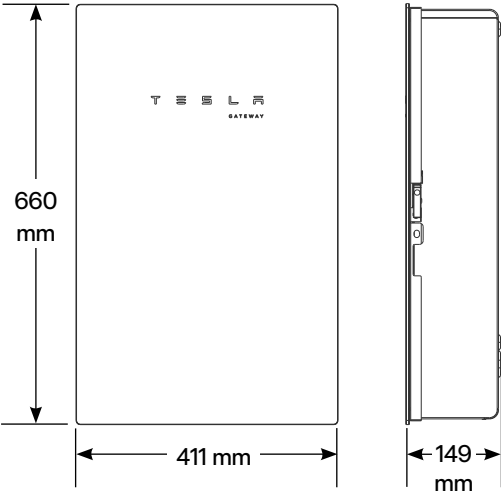
Operating Temperature	–20°C to 50°C (–4°F to 122°F)
Operating Humidity (RH)	Up to 100%, condensing
Maximum Elevation	3000 m (9843 ft)
Environment	Indoor and outdoor rated
Enclosure Type	NEMA 3R

Compliance Information

Certifications	UL 67, UL 869A, UL 916, UL 1741 PCS, CSA 22.2 107.1, CSA 22.2 29
Emissions	FCC Part 15, Class B, ICES 003

Mechanical Specifications

Dimensions	660 x 411 x 149 mm (26 x 16 x 6 in)
Weight	16.3 kg (36 lb)
Mounting options	Wall mount



Backup Switch

The Tesla Backup Switch controls connection to the grid in a Powerwall system, and can be easily installed behind the utility meter or in a standalone meter panel downstream of the utility meter.

The Backup Switch automatically detects grid outages, providing a seamless transition to backup power. It communicates directly with Powerwall, allowing home energy usage monitoring from any mobile device with the Tesla app.

Performance Specifications

Model Number	1624171-xx-y
Continuous Load Rating	200 A, 120/240 V split phase
Maximum Supply Short Circuit Current	22 kA with breaker ¹⁸
Communication	CAN
AC Meter	+/- 0.5%
Expected Service Life	21 years
Warranty	10 years

¹⁸ Breaker maximum supply short circuit current rating must be equal to or greater than the available fault current.

Environmental Specifications

Operating Temperature	−40°C to 50°C (−40°F to 122°F)
Storage Temperature	−40°C to 85°C (−40°F to 185°F)
Enclosure Rating	NEMA 3R
Pollution Rating	PD3

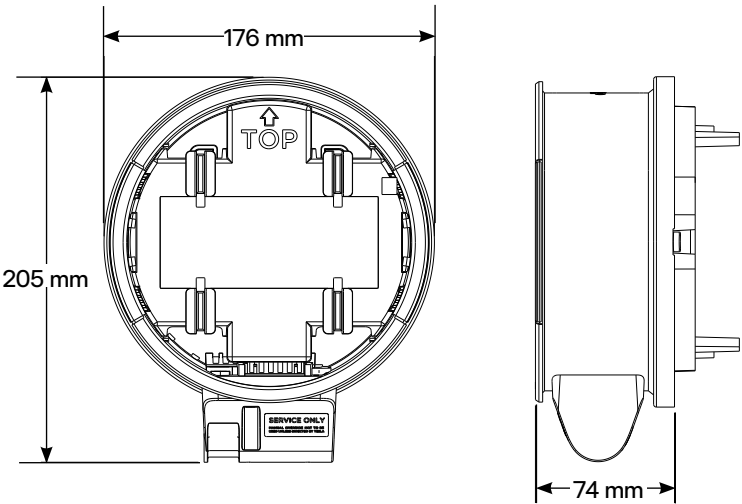
Compliance Information

Safety Standards	USA: UL 414, UL 414 SB, UL 2735, UL 916, CA Prop 65
Emissions	FCC Part 15, Class B, ICES 003

Mechanical Specifications

Dimensions	176 x 205 x 74 mm (6.9 x 8.1 x 2.9 in)
Weight	2.8 lb
Meter and Socket Compatibility	ANSI Type 2S, ringless or ring type
External Service Interface	Contactor manual override ¹⁹ Reset button
Conduit Compatibility	1/2-inch NPT

¹⁹ Manually overrides the contactor position during a service event.



Backup Gateway 2

Backup Gateway 2 controls connection to the grid when paired with Powerwall 3, automatically detecting outages and providing seamless transition to backup power. Backup Gateway 2 also provides energy metering for solar self-consumption, time-based control, and backup operation.

In this system configuration, Powerwall 3 acts as the Site Controller, with the Backup Gateway 2 Site Controller disabled.

Performance Specifications

Model Number	1232100-xx-y	Internal Primary AC Meter	+/- 0.2%
AC Voltage (Nominal)	120/240 V	Internal Auxiliary AC Meter	+/- 2%
Feed-in Type	Split phase	Backup Transition	Automatic disconnect for seamless backup
Grid Frequency	60 Hz	Modularity	Supports up to 10 AC-coupled Powerwalls
Current Rating	200 A	Optional Internal Panelboard	200 A 6-space / 12 circuit breakers Siemens QP or Square D HOM breakers rated 10 - 80A or Eaton BR breakers rated 10 - 125A
Maximum Supply Short Circuit Current	10 kA ²⁰	Warranty	10 years
Overcurrent Protection Device	100 - 200 A, Service entrance rated		
Overvoltage Category	Category IV		

²⁰ When protected by Class J fuses, Backup Gateway 2 is suitable for use in circuits capable of delivering not more than 22kA symmetrical amperes.

Environmental Specifications

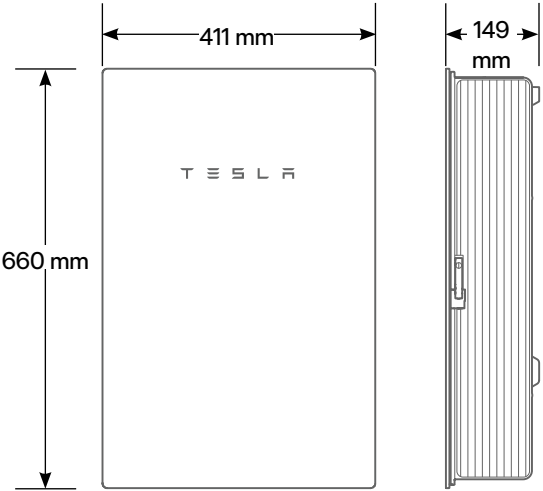
Operating Temperature	-20°C to 50°C (-4°F to 122°F)
Operating Humidity (RH)	Up to 100%, condensing
Maximum Elevation	3000 m (9843 ft)
Environment	Indoor and outdoor rated
Enclosure Type	NEMA 3R

Compliance Information

Certifications	UL 67, UL 869A, UL 916, UL 1741 PCS, CSA 22.2 0.19, CSA 22.2 205
Emissions	FCC Part 15, Class B, ICES 003

Mechanical Specifications

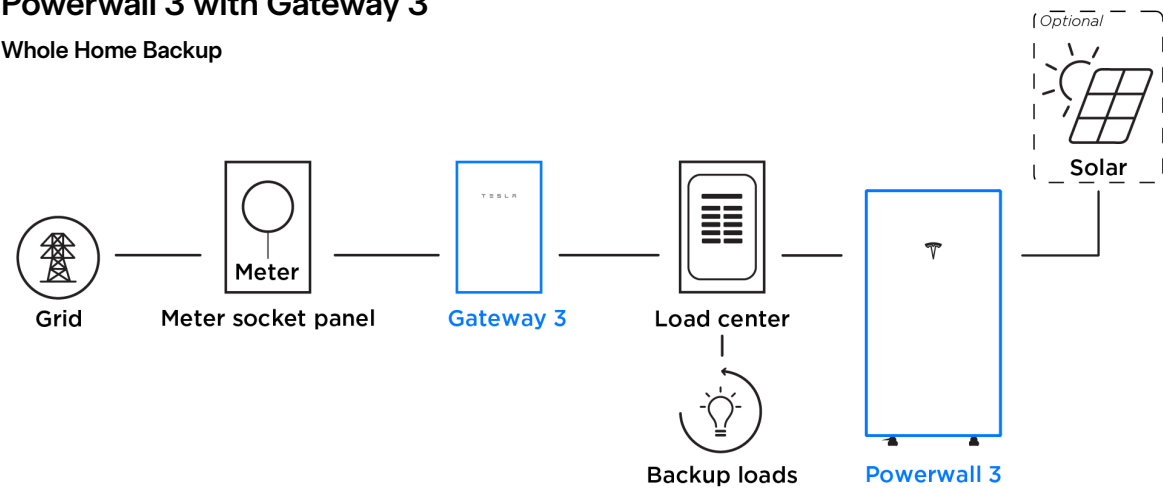
Dimensions	660 x 411 x 149 mm (26 x 16 x 6 in)
Weight	20.4 kg (45 lb)
Mounting options	Wall mount



Powerwall 3 Example System Configurations

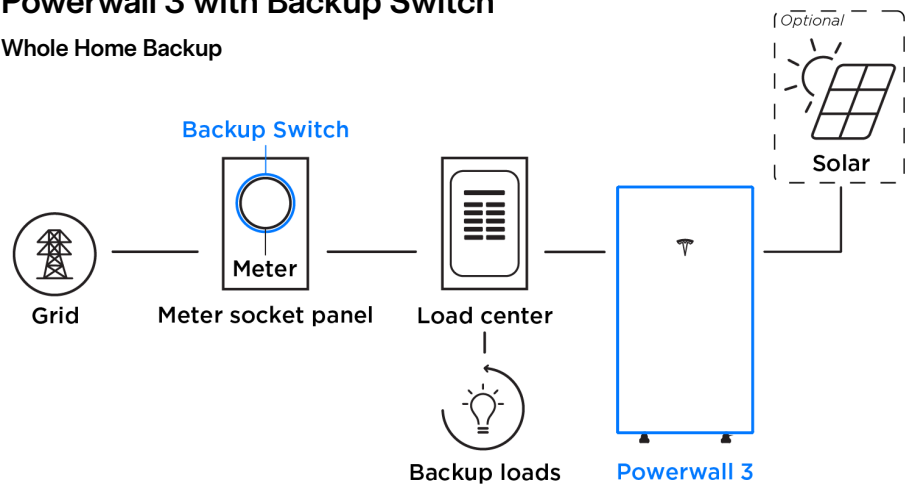
Powerwall 3 with Gateway 3

Whole Home Backup



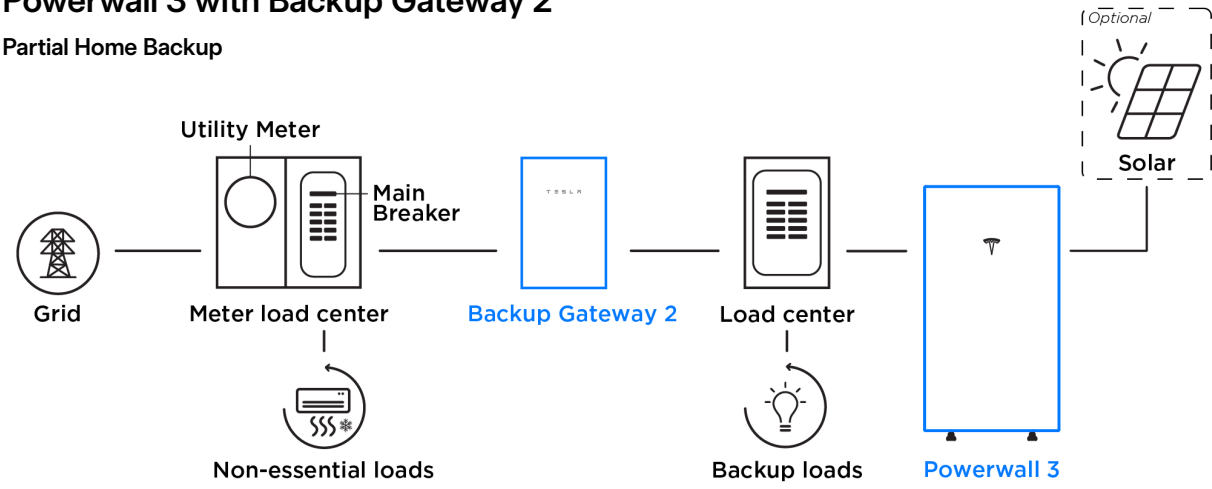
Powerwall 3 with Backup Switch

Whole Home Backup



Powerwall 3 with Backup Gateway 2

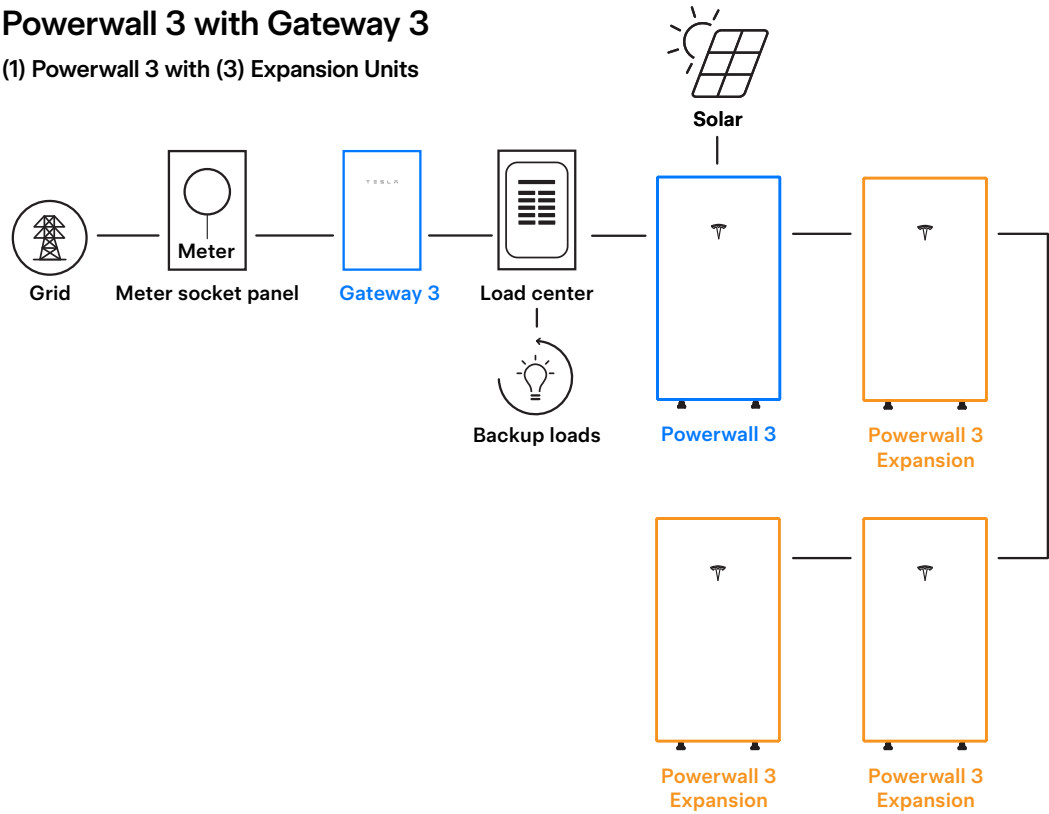
Partial Home Backup



Powerwall 3 Example System Configurations

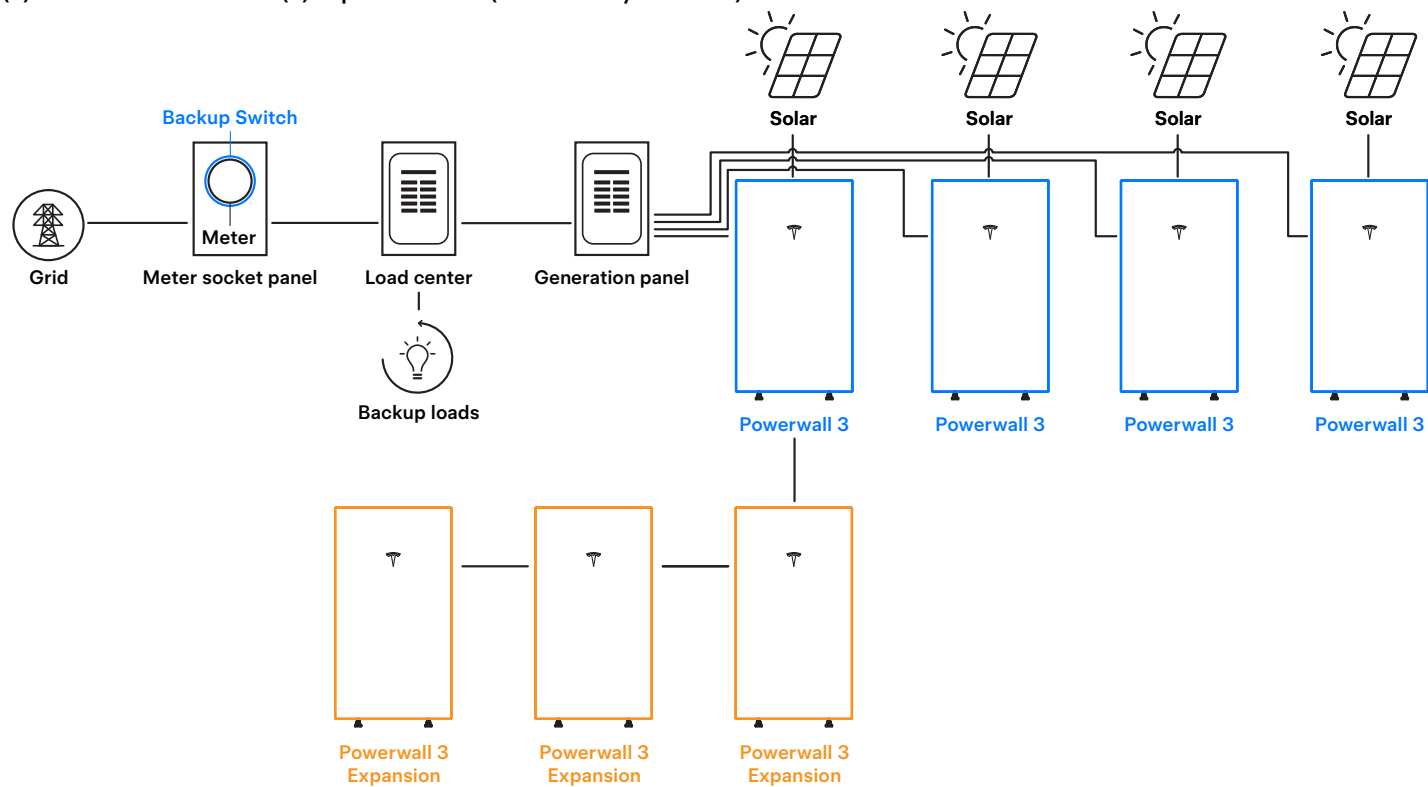
Powerwall 3 with Gateway 3

(1) Powerwall 3 with (3) Expansion Units



Powerwall 3 with Backup Switch

(4) Powerwall 3 Units with (3) Expansion Units (Maximum System Size)





by Schneider Electric

List Price \$353.00 USD

Availability **Stock Item: This item is normally stocked in our distribution facility.**

Technical Characteristics

Number of Poles	2-Pole
Terminal Type	Lugs
Type of Duty	General Duty
Maximum Voltage Rating	240VAC
Wire Size	#10 to #2 AWG(Al) - #14 to #2 AWG(Cu)
Action	Single Throw
Ampere Rating	60A
Approvals	UL Listed File Number E2875
Enclosure Rating	NEMA 3R
Enclosure Type	Rainproof and Sleet/Ice proof (Indoor/Outdoor)
Factory Installed Neutral	No
Disconnect Type	Non-Fusible
Mounting Type	Surface

Shipping and Ordering

Category	00106 - Safety Switch, General Duty, 30 - 200 Amp, NEMA3R
Discount Schedule	DE1A
GTIN	00785901491491
Package Quantity	1
Weight	4.7 lbs.
Availability Code	Stock Item: This item is normally stocked in our distribution facility.
Returnability	Y
Country of Origin	MX

As standards, specifications, and designs change from time to time, please ask for confirmation of the information given in this document.



The Respect Your Roof Deserves

When integrating with a home, solar attachments must be dependable for the lifetime of the rooftop. Due to recent innovations, many asphalt shingles have bonded courses. A mount that protects without the need to pry shingles can really speed things up.

Halo UltraGrip™ (HUG®) is here to respect the roof. Its Halo is a cast-aluminum barrier that encases the UltraGrip, our industrial-grade, foam-and-mastic seal. This allows HUG to accelerate the installation process and provide the utmost in waterproofing protection. Give your roof a HUG®.



Multi-Tiered Waterproofing

HUG® utilizes a multi-tiered stack of components to provide revolutionary waterproofing protection. The Halo cast-aluminum, raised-perimeter foundation surrounds the UltraGrip™ base—a foam-backed mastic seal combination that prevents water intrusion by adhering and sealing with the shingle surface.

Halo UltraGrip™ is part of the QuickMount® product line.

UltraGrip™ Seal Technology

HUG UltraGrip™ utilizes a state-of-the-art seal design that uses a unique, foam-and-mastic combination. The foam-backed adhesive provides an entirely new flashing system that conforms and adheres to every nook and cranny of composition shingles, filling gaps and shingle step-downs (up to 1/8" in height).



Rafter Mount



Deck Mount



Rafter & Deck Mounting Options

Mount HUG® to the roof rafters, the roof deck, or both with our custom-engineered RD (rafter-or-deck) Structural Screw. The RD Structural Screw anchors HUG® to the roof with an EPDM sealing washer, completing the stack of waterproofing barriers. See backside for more installation information.



Rated & Certified to Respect the Roof™

UL 2703, UL 2703A,
441 (27), TAS 100(A)-95



Adaptive, Rafter-Friendly Installation



Hit the rafter? Good to go!

When you find a rafter, you can move on. Only 2 RD Structural Screws are needed.



Miss the rafter? Try it again.

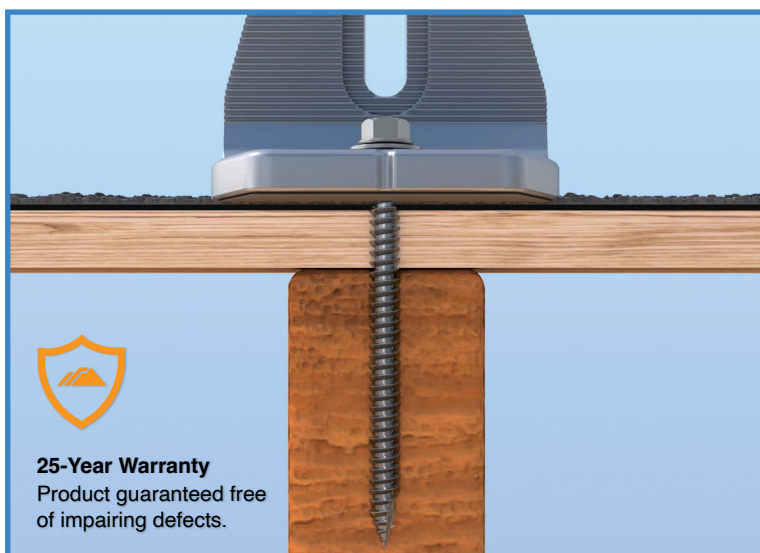
Place another screw to the left or right. If rafter is found, install 3rd and final screw.



Still no luck? Install the rest.

If more than 3 screws miss the rafter, secure six screws to deck mount it.

Trusted Strength & Less Hassle



25-Year Warranty

Product guaranteed free of impairing defects.

Structural capacities of HUG® were reviewed in many load directions, with racking rail running cross-slope or up-slope in relation to roof pitch.

For further details, see the HUG® certification letters for attaching to rafters and decking.

IronRidge designed the HUG®, in combination with the RD Structural Screw to streamline installs, which means the following:

- No prying shingles
- No roof nail interference
- No pilot holes necessary
- No sealant (in most cases)
- No butyl shims needed

Attachment Loading



The rafter-mounted HUG® has been tested and rated to support 1004 (lbs) of uplift and 368 (lbs) of lateral load.

Structural Design



Parts are designed and certified for compliance with the International Building Code & ASCE/SEI-7.

Water Seal Ratings



HUG® passed both the UL 441 Section 27 "Rain Test" and TAS 100(A)-95 "Wind Driven Rain Test" by Intertek.

UL 2703 & 2703A



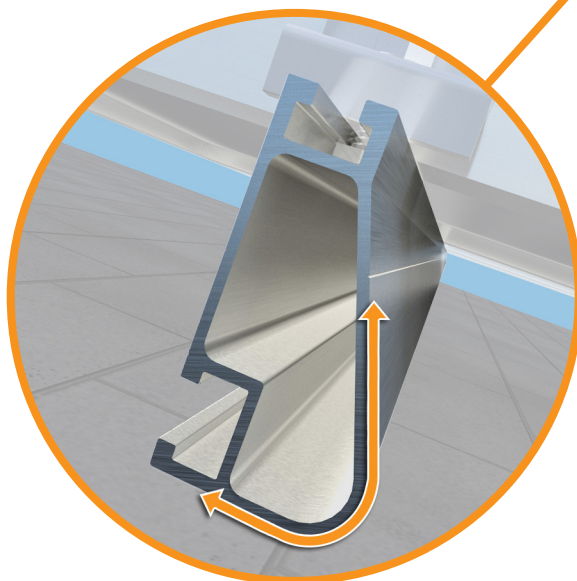
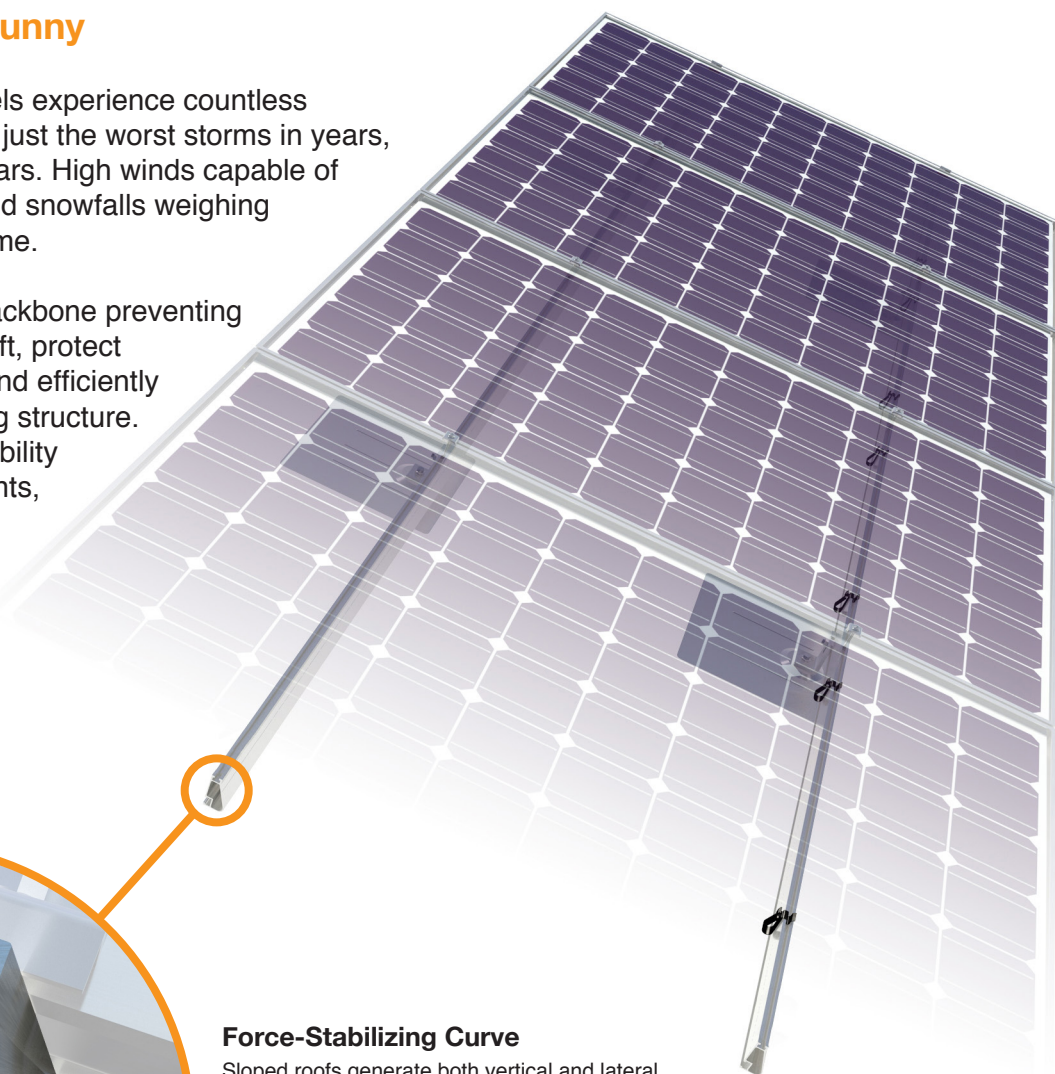
Systems conform to UL 2703 and HUG® also conforms to UL 2703A. See Flush Mount Manual for more info.



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 increase 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



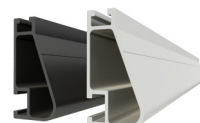
XR Rails are compatible with FlashFoot and other pitched roof attachments.



IronRidge offers a range of tilt leg options for flat roof mounting applications.

Corrosion-Resistant Materials

All XR Rails are made of marine-grade 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, perfectly matched to regions without snow. It achieves 6 foot spans, while also staying light and economical.

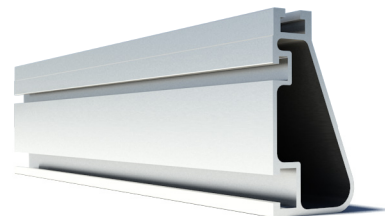
- 6' spanning capability
- Moderate load capability
- Clear anodized finish
- Internal splices available



XR100

XR100 is the ultimate residential mounting rail. It supports a range of wind and snow conditions, while also maximizing spans.

- 8' 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 12 feet or more for commercial applications.

- 12' spanning capability
- Extreme load capability
- Clear anodized finish
- Internal splices available

Rail Selection

The following table was prepared in compliance with applicable engineering codes and standards. Values are based on the following criteria: ASCE 7-10, Roof Zone 1, Exposure B, Roof Slope of 7 to 27 degrees and Mean Building Height of 30 ft. Visit IronRidge.com for detailed span tables and certifications.

Load		Rail Span					
Snow (PSF)	Wind (MPH)	4'	5' 4"	6'	8'	10'	12'
None	100	XR10		XR100		XR1000	
	120						
	140						
	160						
10-20	100						
	120						
	140						
	160						
30	100						
	160						
40	100						
	160						
50-70	160						
80-90	160						

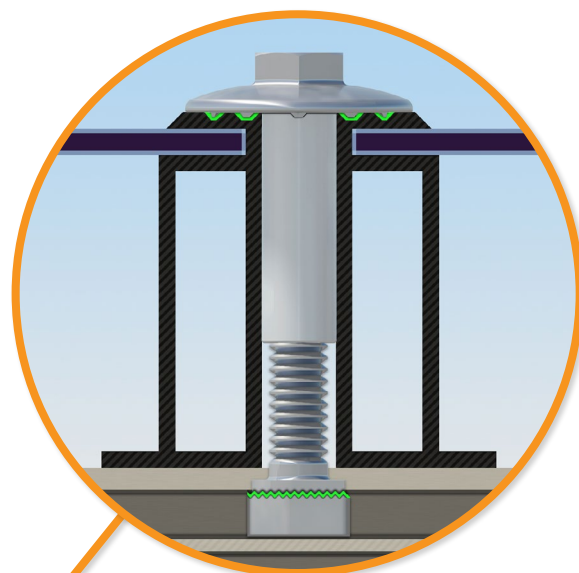


UFO Family of Components

Simplified Grounding for Every Application

The UFO family of components eliminates the need for separate grounding hardware by bonding solar modules directly to IronRidge XR Rails. All system types that feature the UFO family—Flush Mount, Tilt Mount and Ground Mount—are fully listed to the UL 2703 standard.

UFO hardware forms secure electrical bonds with both the module and the rail, resulting in many parallel grounding paths throughout the system. This leads to safer and more reliable installations.



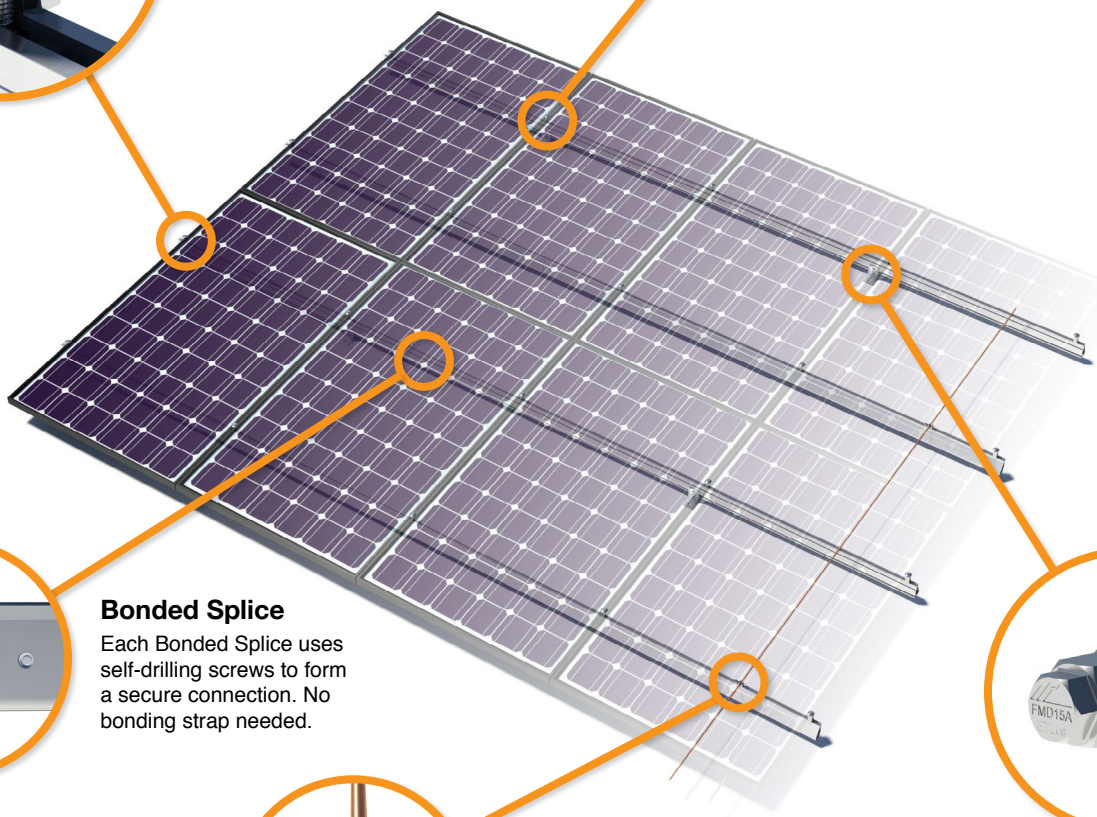
Universal Fastening Object (UFO)

The UFO securely bonds solar modules to XR Rails. It comes assembled and lubricated, and can fit a wide range of module heights.



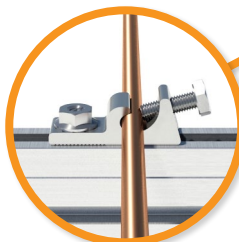
Stopper Sleeve

The Stopper Sleeve snaps onto the UFO, converting it into a bonded end clamp.



Bonded Splice

Each Bonded Splice uses self-drilling screws to form a secure connection. No bonding strap needed.



Grounding Lug

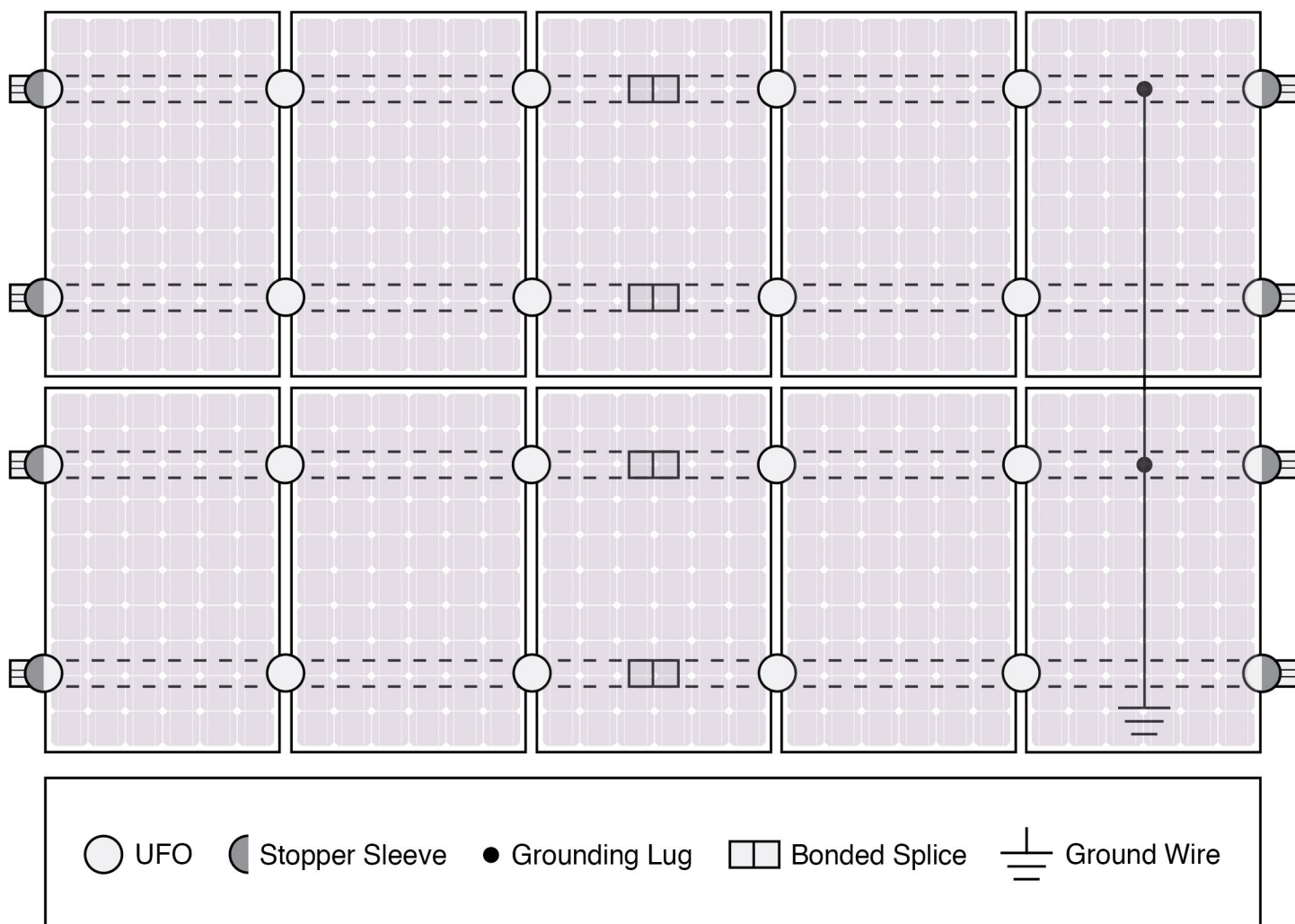
A single Grounding Lug connects an entire row of PV modules to the grounding conductor.



Bonded Attachments

The bonding bolt attaches and bonds the L-foot to the rail. It is installed with the same socket as the rest of the system.

System Diagram



⚡ Approved Enphase microinverters can provide equipment grounding of IronRidge systems, eliminating the need for grounding lugs and field installed equipment ground conductors (EGC). A minimum of two microinverters mounted to the same rail and connected to the same Engage cable is required. Refer to installation manuals for additional details.

UL Certification

The IronRidge Flush Mount, Tilt Mount, and Ground Mount Systems have been listed to UL 2703 by Intertek Group plc.

UL 2703 is the standard for evaluating solar mounting systems. It ensures these devices will maintain strong electrical and mechanical connections over an extended period of time in extreme outdoor environments.

 [Go to IronRidge.com/UFO](https://www.ironridge.com/UFO)

Cross-System Compatibility			
Feature	Flush Mount	Tilt Mount	Ground Mount
XR Rails	✓	✓	XR1000 Only
UFO/Stopper	✓	✓	✓
Bonded Splice	✓	✓	N/A
Grounding Lugs	1 per Row	1 per Row	1 per Array
Microinverters & Power Optimizers	Enphase - M250-72, M250-60, M215-60, C250-72 Darfon - MIG240, MIG300, G320, G640 SolarEdge - P300, P320, P400, P405, P600, P700, P730		
Fire Rating	Class A	Class A	N/A
Modules	Tested or Evaluated with over 400 Framed Modules Refer to installation manuals for a detailed list.		