SCOPE OF WORK

TO INSTALL A RESIDENTIAL ROOFTOP SOLAR PHOTOVOLTAIC (PV) SYSTEM AND BATTERY BACKUP. THE POWER GENERATED BY THE PV SYSTEM WILL BE INTERCONNECTED WITH THE UTILITY GRID THROUGH THE EXISTING ELECTRICAL SERVICE EQUIPMENT. THE PV SYSTEM DOES INCLUDE BATTERIES.

ELECTRICAL NOTES

1) ALL EQUIPMENT TO BE LISTED BY THE UL OR OTHER NRTL AND LABELED FOR ITS APPLICATION.
2) ALL CONDUCTORS SHALL BE COPPER, RATED FOR 600V AND 90°C WET ENVIRONMENT.
3) WIRING, CONDUIT, AND RACEWAYS MOUNTED ON ROOFTOPS SHALL BE ROUTED DIRECTLY TO, AND LOCATED AS CLOSE AS POSSIBLE TO THE NEAREST RIDGE, HIP, OR VALLEY.
4) WORKING CLEARANCES AROUND ALL NEW AND EXISTING ELECTRICAL EQUIPMENT SHALL COMPLY WITH NEC 110.26.
5) DRAWINGS INDICATE THE GENERAL ARRANGEMENT OF SYSTEMS. CONTRACTOR SHALL FURNISH ALL NECESSARY OUTLETS, SUPPORTS, FITTINGS AND ACCESSORIES TO FULFILL APPLICABLE CODES AND STANDARDS.
6) WHERE SIZES OF JUNCTION BOXES, RACEWAYS, AND CONDUITS ARE NOT SPECIFIED, THE CONTRACTOR SHALL SIZE THEM ACCORDINGLY.
7) ALL WIRE TERMINATIONS SHALL BE APPROPRIATELY LABELED AND READILY VISIBLE.
8) MODULE GROUNDING CLIPS TO BE INSTALLED BETWEEN MODULE FRAME AND MODULE SUPPORT RAIL, PER THE GROUNDING CLIP MANUFACTURER'S INSTRUCTION.
9) MODULE SUPPORT RAIL TO BE BONDED TO CONTINUOUS COPPER G.E.C. VIA WEEB LUG OR THE ILSCO GBL-4DBT LAY-IN LUG.
10) THE POLARITY OF THE GROUNDED CONDUCTORS IS (positive/negative) OR THE DC SIDE OF THE PV SYSTEM IS UNGROUNDED AND SHALL COMPLY WITH NEC 690.35

NCDOI REQUIREMENTS

OPTION 2

WEIGHT OF PV SYSTEM ON ROOF:

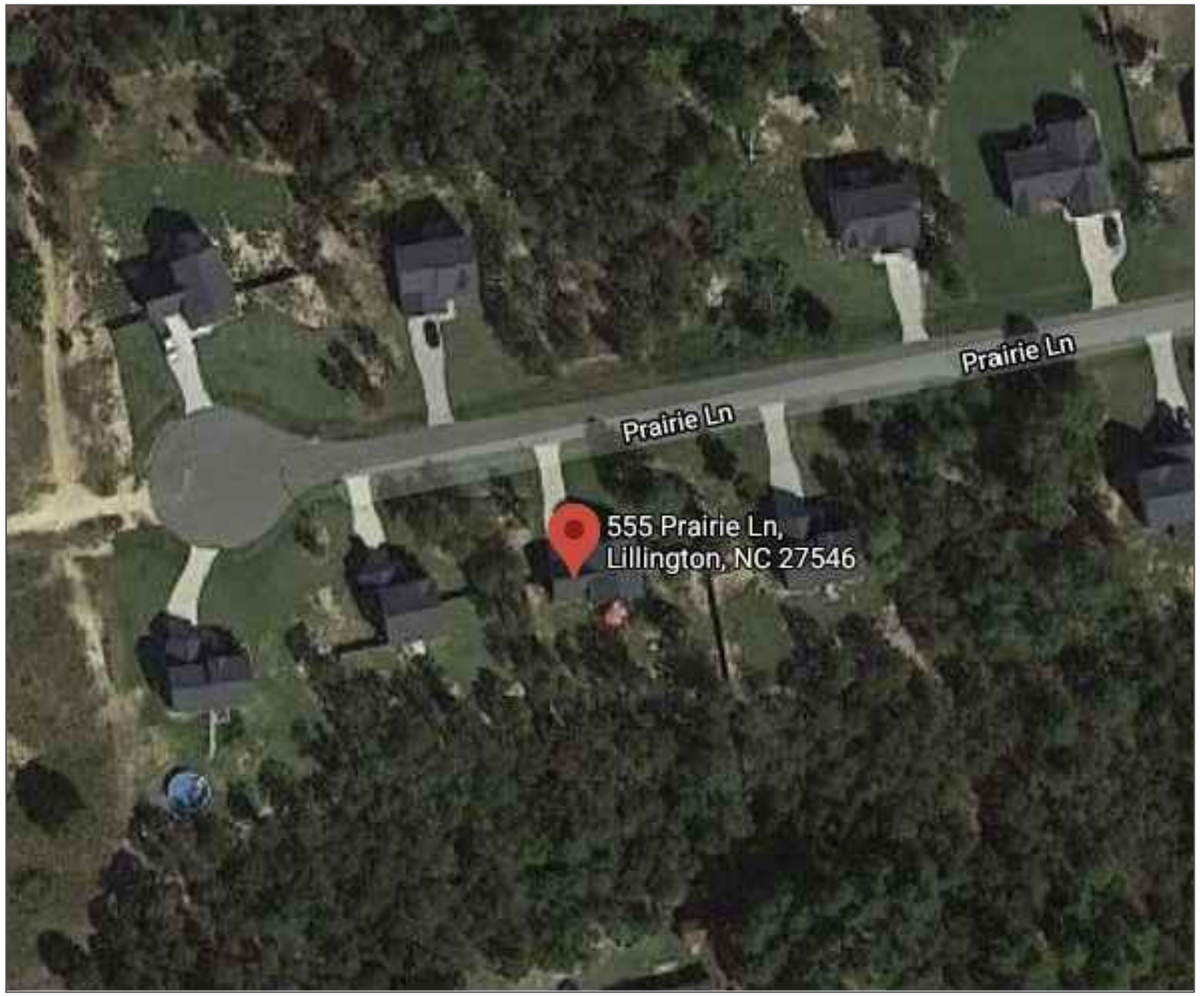
2.6483 PSF

EXISTING ROOF MATERIAL TYPE:

ASPHALT SHINGLE (SINGLE LAYER)

PROJECT LOCATION WIND ZONE:

115 MPH



VICINITY MAP

SHEET INDEX	
COVER	GENERAL INFORMATION
PV-1	SITE PLAN
PV-2	ROOF LAYOUT AND MOUNTING DETAIL
PV-3	ELECTRICAL SCHEMATIC
PV-4	AMPACITY CALCULATIONS AND WIRE SIZING
PV-5	LABELING SCHEDULE
CUTSHEETS	MANUFACTURER SPECIFICATION SHEETS

GOVERNING CODES
NFPA 70 NATIONAL ELECTRICAL CODE 2017
2018 INTERNATIONAL BUILDING CODE
2018 NORTH CAROLINA BUILDING CODE
2018 NORTH CAROLINA RESIDENTIAL CODE
UNDERWRITERS LABORATORIES (UL) STANDARDS
OSHA 29 CFR 1910.269
NORTH CAROLINA DEPARTMENT OF INSURANCE

DESIGN SPECIFICATIONS	
CONSTRUCTION TYPE	SINGLE-FAMILY
ZONING	RESIDENTIAL
GROUND SNOW LOAD	20 PSF
WIND EXPOSURE CATEGORY	CATEGORY B
WIND SPEED	115 MPH
UTILITY PROVIDER	DUKE PROGRESS
AHJ	TOWN OF LILLINGTON (HARNETT COUNTY)

SYSTEM SPECIFICATIONS	
SOLAR MODULES	(34) HANWHA Q.PEAK DUO BLK-G6+ 340
POWER OPTIMIZERS	(34) SOLAREDGE P340
INVERTER(S)	(1) SOLAREDGE SE10000H-US
SOLAR MOUNTS	SNAPNRACK COMP MOUNT
SOLAR RACKING SYSTEM	SNAPNRACK ULTRA RAIL 40
MONITORING	YES
POINT OF INTERCONNECT	60A/2P LOAD SIDE BREAKER IN TESLA GATEWAY

CONTRACTOR

Covenant Solar Tech
DBA SUN DOLLAR ENERGY
3200 WELLINGTON COURT SUITE 101
RALEIGH, NC 27615
(919) 508-6907
NC ELE LICENSE #: 30043U
NC GC LICENSE #: 84770

PROJECT & CLIENT INFORMATION

BERRY RESIDENCE
SOLAR PV + STORAGE SYSTEM
SYSTEM SIZE: 11.56 KW DC
SYSTEM SIZE: 10.0 KW AC

GUY BERRY
555 PRAIRIE LN
LILLINGTON, NC 27546
(443) 995-7100

ENGINEER OF RECORD

DRAWING BY

CST

REVISIONS

DESCRIPTION	DATE	#	BY
RELEASED FOR PERMITTING	3/9/2021	1	CST

SHEET SIZE

ANSI B
11" X 17"

DATE

3/9/2021

SHEET NAME

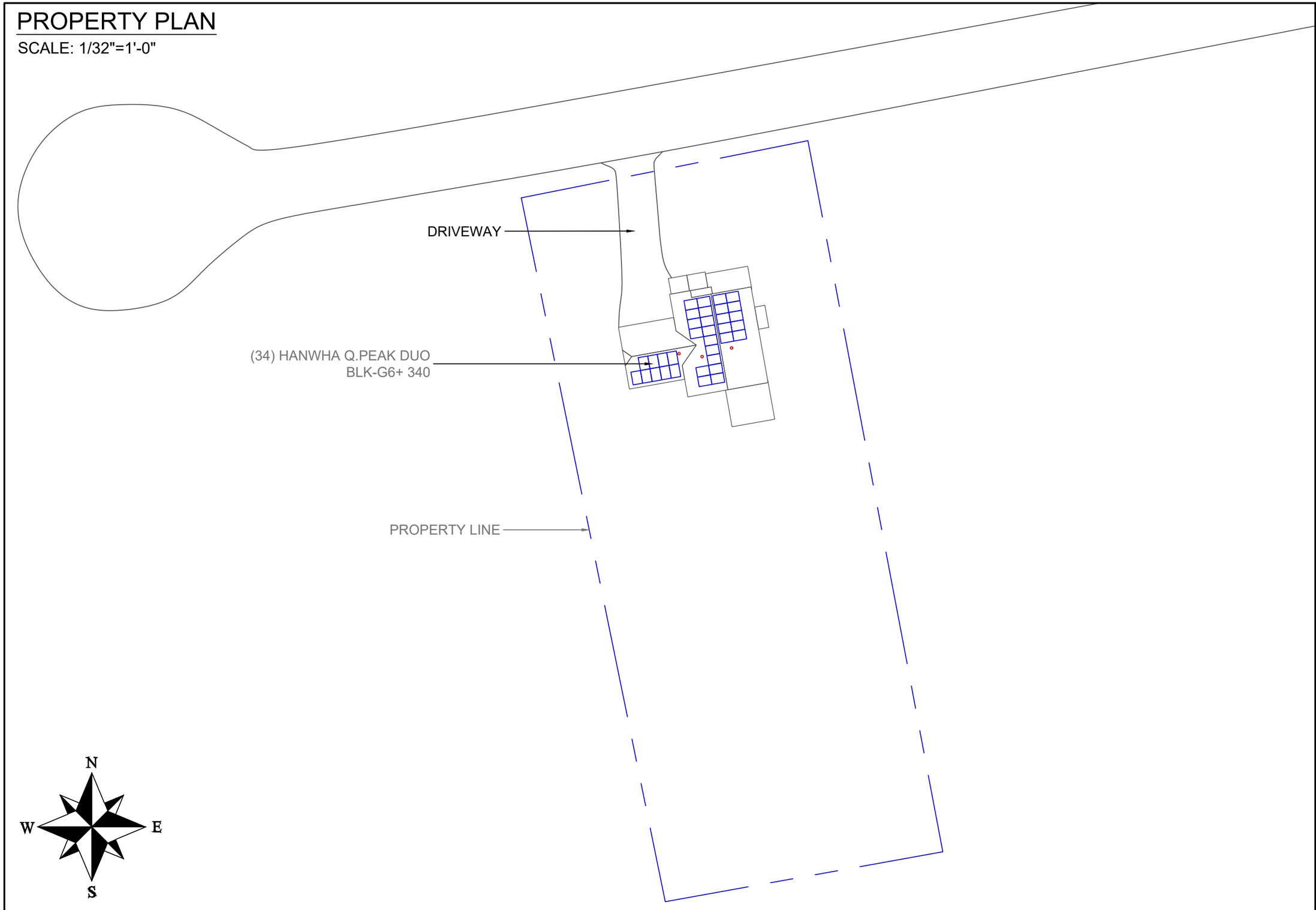
GENERAL INFORMATION

SHEET NUMBER

COVER

PROPERTY PLAN

SCALE: 1/32"=1'-0"



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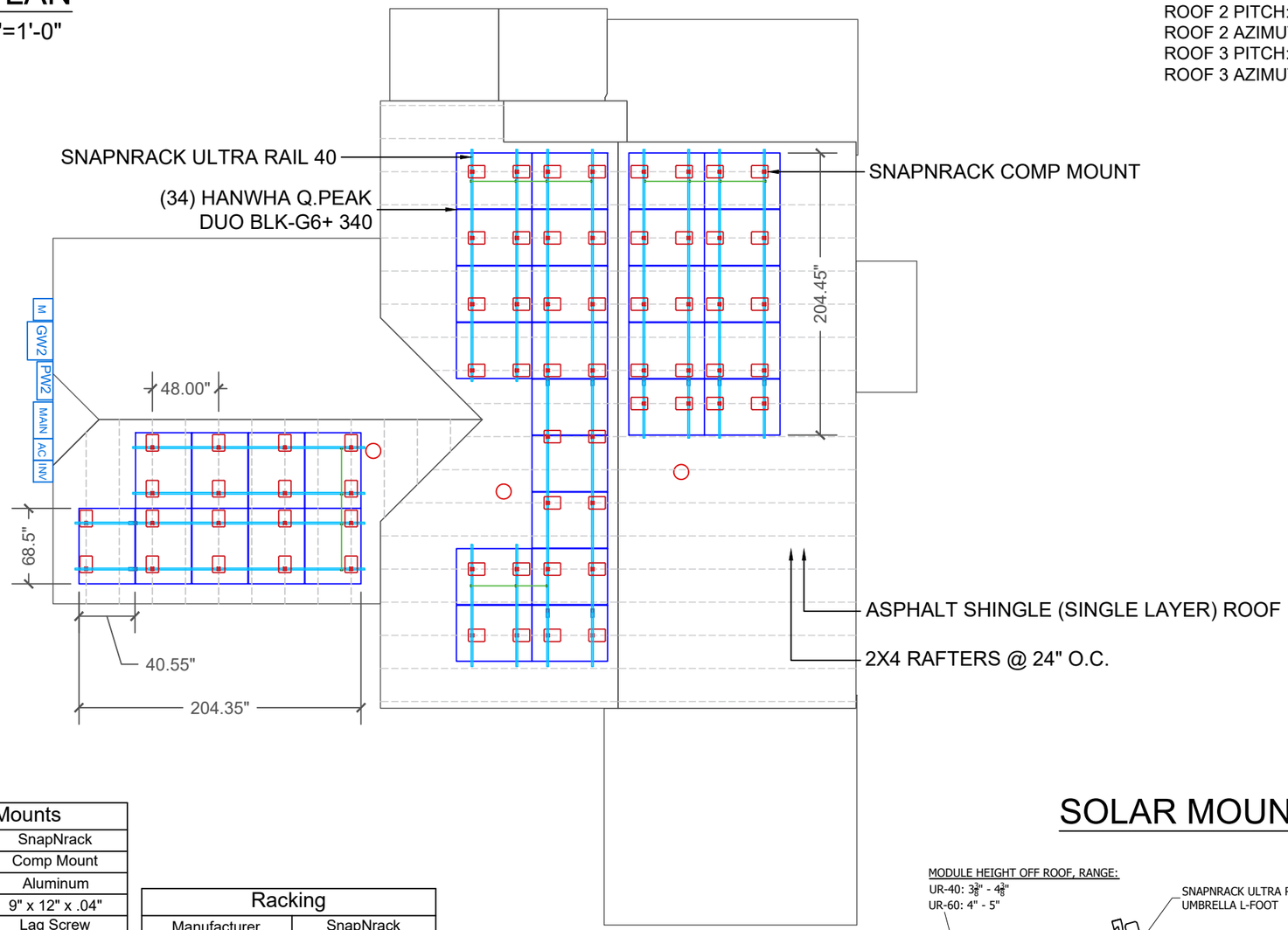
SITE PLAN

SHEET NUMBER

PV-1

ROOF PLAN

SCALE: 1/8"=1'-0"



ROOF 1 PITCH: 34°
ROOF 1 AZIMUTH: 170°
ROOF 2 PITCH: 34°
ROOF 2 AZIMUTH: 260°
ROOF 3 PITCH: 34°
ROOF 3 AZIMUTH: 80°

LOAD CALCULATIONS		
NUMBER OF MODULES	34	
MODULE WEIGHT	43.9	LBS
MODULE SQ FT	19.313	SQ FT
TOTAL MODULE WEIGHT	1492.6	LBS
TOTAL MODULE SQ FT	656.642	SQ FT
NUMBER OF PORTRAIT	34	
NUMBER OF LANDSCAPE	0	
NUMBER OF OPTIMIZERS	34	
WEIGHT PER OPTIMIZER	1.5	LBS
TOTAL OPTIMIZER WEIGHT	51	LBS
TOTAL LENGTH OF RAIL	227	LF
RAIL WEIGHT PER FOOT	0.56	LBS
TOTAL RAIL WEIGHT	127.12	LBS
NUMBER OF FLANGES	66	
WEIGHT PER FLANGE	0.7565	LBS
WEIGHT PER SYSTEM	49.929	LBS
NUMBER OF MID CLAMPS	54	
MID CLAMP WEIGHT	0.21	LBS
WEIGHT PER SYSTEM	11.34	LBS
NUMBER OF END CLAMPS	28	
END CLAMP WEIGHT	0.32	LBS
WEIGHT PER SYSTEM	6	LBS
NUMBER OF SPLICES	10	
WEIGHT PER SPLICE	0.1	LBS
WEIGHT PER SYSTEM	1	LBS
TOTAL ARRAY WEIGHT	1738.989	LBS
POINT LOAD	26.348318	LBS/FT
TOTAL ARRAY AREA	656.642	SQ FT
ARRAY DEAD LOAD	**2.6483**	**PSF**

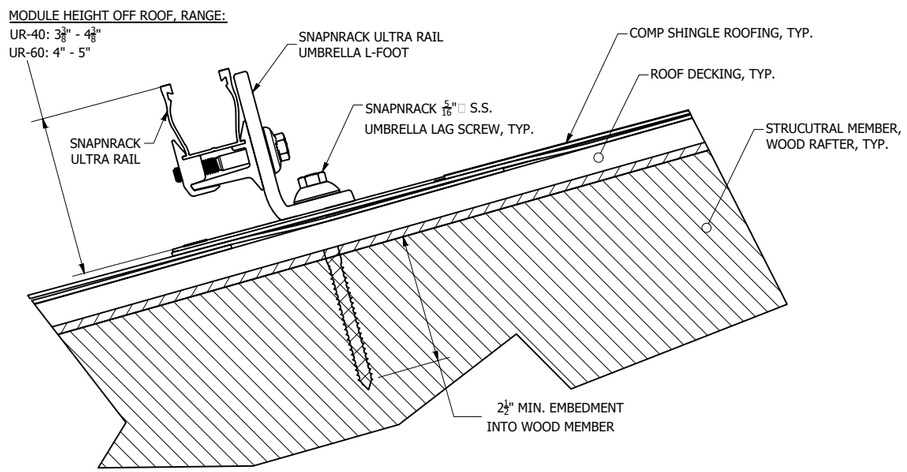
Flashings/Mounts	
Manufacturer	SnapNrack
Mount Type	Comp Mount
Flashing Material	Aluminum
Flashing Size	9" x 12" x .04"
Fastener Type	Lag Screw
Fastener Material	18-8 Stainless Steel
Fastener Size	5/16" x 4"
L-Foot Material	Aluminum
Sealing Washer	EPDM Bonded SS
Sealing Washer Size	5/16" ID x 3/4" OD
Weight	0.7565 Lbs.
Structural	IBC Compliant
UL Listing	UL 2703

Racking	
Manufacturer	SnapNrack
Model Number	Ultra Rail 40
Length	168"
Width	1.54"
Height	1.89"
Weight	0.56 Lbs./Ft
Material	Aluminum
Structural	IBC Compliant
UL Listing	UL 2703

LEGEND

- M UTILITY METER
- MSP MAIN SERVICE PANEL
- INV INVERTER
- AC AC DISCONNECT
- DC DC DISCONNECT
- JB JUNCTION BOX
- SUB SUBPANEL
- LC LOAD CENTER
- (M) PV METER
- EXTERIOR CONDUIT
- G GAS METER
- FLASHINGS
- RAILS
- GROUNDING
- RAIL SPLICE

SOLAR MOUNTING DETAIL



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ENGINEER OF RECORD

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SHEET SIZE

ANSI B
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DATE

3/9/2021

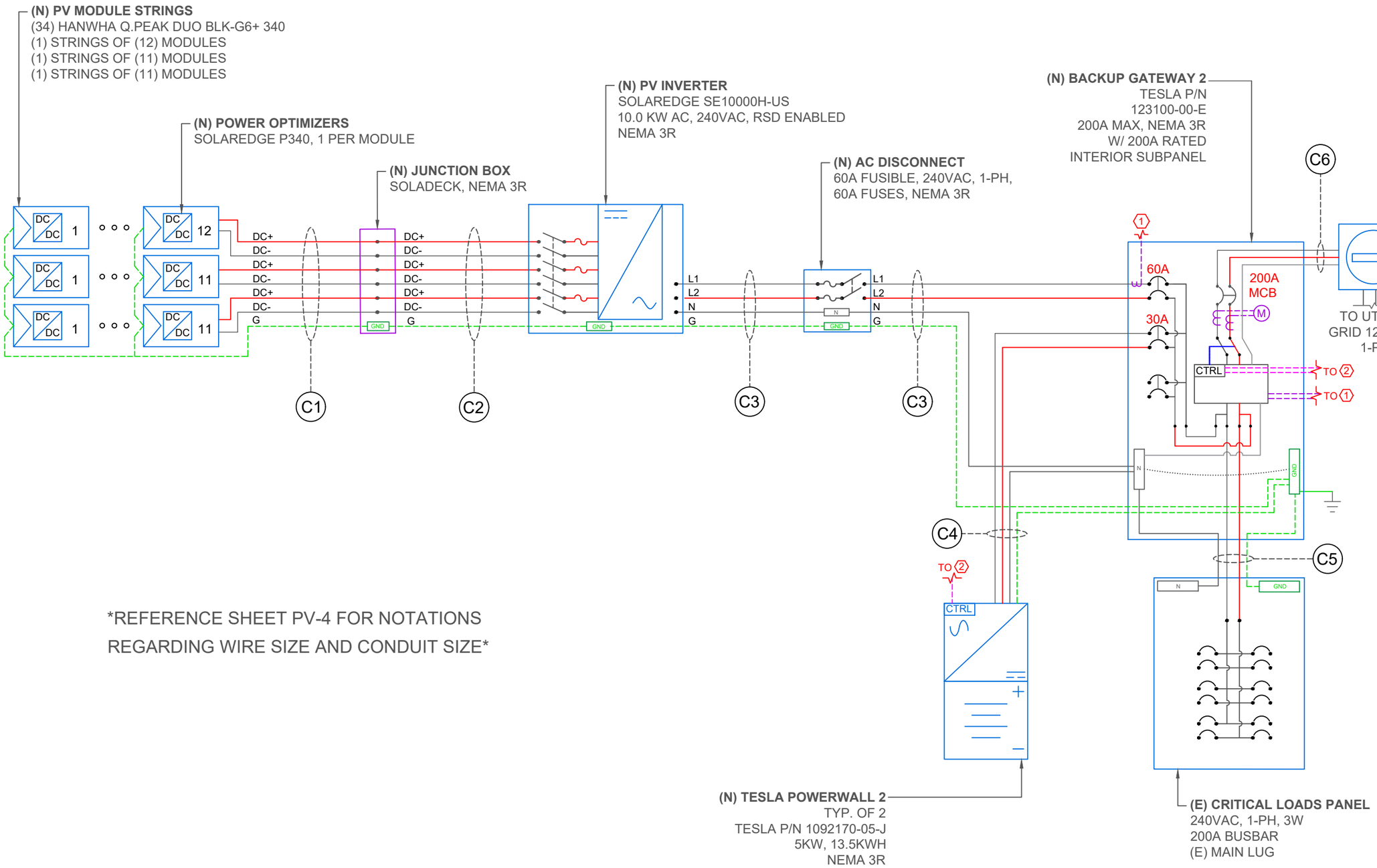
SHEET NAME

ROOF LAYOUT & DETAIL DRAWINGS

SHEET NUMBER

PV-2

ELECTRICAL LINE DIAGRAM



*REFERENCE SHEET PV-4 FOR NOTATIONS
REGARDING WIRE SIZE AND CONDUIT SIZE*

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SHEET NAME

ELECTRICAL SCHEMATIC

SHEET NUMBER

PV-3

Solar PV Module Data

Manufacturer	Hanwha
Model Number	Q-Peak DUO BLK-G6+
Max Power (Pmax)	340
Max Power Voltage (Vmp)	33.94
Max Power Current (Imp)	10.02
Open Circuit Voltage (Voc)	40.66
Short Circuit Current (Isc)	10.52
Max Series Fuse (OCPD)	20
Max System Voltage	1000
UL Listing	UL1703
Protection Rating	IP67

Power Optimizer Data

Manufacturer	SolarEdge
Model Number	P340
Rated DC Input Power	340
Max Input Voltage	48
Max Input Current	13.75
Max Short Circuit Current	11
Max Output Voltage	60
Max Output Current	15
UL Listing	UL1741
Protection Rating	IP68/NEMA6P

Junction Box Data

Manufacturer	Soladeck
Model Number	0799-5B
Voltage Rating	600
Amperage Rating	120
UL Listing	UL 50
Enclosure Rating	NEMA 3R

Powerwall 2 (AC) Data (New)

Manufacturer	Tesla
Model Type	Powerwall 2
Model Number	1092170-05-J
Voltage Rating	120/240 Volts
Total Energy	14 kWh
Usable Energy	13.5 kWh
Max Continuous Power	5 kW
Real Power (10s)	7 kW
Apparent Power	5.8 kW
Apparent Power (10s)	7.2 kW
Max Output Current	30 Amps
Phase	Single
UL Listing	UL1642, UL1741, UL1973, UL9540
Enclosure Rating	NEMA 3R

Inverter Data

Manufacturer	SolarEdge
Model Number	SE10000H-US
Max DC Input Voltage	480
Nominal DC Input Voltage	400
Max DC Input Current	27
Max DC Short Circuit Current	45
Max DC Input Power	15500
Max AC Output Power	10000
Nominal AC Output Voltage	240
Max AC Output Current	42
Strings Per Inverter	1 - 3
UL Listing	UL1741
Enclosure Rating	NEMA 4X

AC Disconnect Data

Manufacturer	Eaton
Model Number	DG222NRB
Voltage Rating	240
Amperage Rating	60
Phase	Single
Switch Syle	Fusible
Fuse Rating	60
UL Listing	UL 98
Enclosure Rating	NEMA 3R

Critical Loads Panel Data

Manufacturer	Eaton
Model Type	N/A
Model Number	MB1212L200BTS
Voltage Rating	120/240
Busbar Amp Rating	200
Main Breaker/Main Lug	Main Lug
Breaker Amp Rating	N/A
Phase	Single
UL Listing	UL 6294
Enclosure Rating	NEMA 3R

Backup Gateway 2 Data (New)

Manufacturer	Tesla
Model Type	Backup Gateway 2
Model Number	123100-00-E
Voltage Rating	120/240 Volts
Busbar Amperage Rating	200A
Main Breaker or Main Lug	Main Breaker
Breaker Rating	200A
Phase	Single
UL Listing	UL67, UL869A, UL916, UL1741
Enclosure Rating	NEMA 3R

Temperature Data

Average High Temp	93.2˚ F
Record Low Temp	10.4˚ F

WIRE SCHEDULE

TAG	CURRENT CARRYING CONDUCTORS				GROUNDING CONDUCTORS				CONDUIT/RACEWAY				NOTES
	QTY.	SIZE	MATERIAL	INSULATION TYP.	QTY.	SIZE	MATERIAL	INSULATION TYP.	QTY.	SIZE	MATERIAL	LOCATION	
C1	6	10 AWG	COPPER	PV WIRE	1	8 AWG	BARE COPPER	N/A	-	-	-	FREE AIR	
C2	6	10 AWG	COPPER	THHN/THWN-2	1	10 AWG	COPPER	THHN/THWN-2	1	3/4"	LFMC/EMT	EXTERIOR/INTERIOR	
C3	3	6 AWG	COPPER	THHN/THWN-2	1	10 AWG	COPPER	THHN/THWN-2	1	3/4"	LFNC/EMT	EXTERIOR	
C4	3	10 AWG	COPPER	THHN/THWN-2	1	10 AWG	COPPER	THHN/THWN-2	1	3/4"	LFNC/EMT	EXTERIOR	
C5	3	4/0 AWG	ALUMINUM	XHHW-2	1	2 AWG	ALUMINUM	XHHW-2	1	2"	PVC	EXTERIOR	
C6	3	4/0 AWG	ALUMINUM	XHHW-2	-	-	-	-	1	2"	PVC	EXTERIOR	

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ENGINEER OF RECORD

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SHEET SIZE

ANSI B
11" X 17"

DATE

3/9/2021

SHEET NAME

ELECTRICAL DATA
WIRE SCHEDULE

SHEET NUMBER

PV-4

Ampacity Calculations

Wiring Location: Module to Power Optimizer (Direct Current)
Wiring Location: Inverter to Service Entrance (Alternating Current)
All calculations show minimum sizing for ampacity
Actual wire sizing may be larger for voltage drop or other factors
All calculations are according to the 2017 National Electric Code

Modules: Hanwha Q-Peak DUO BLK-G6+ 340
Inverter: SolarEdge SE10000H-US

Initial Input Values

Isc (Short Circuit Current)	10.52					
Number of circuits	10.52	x	1	=	10.52	
Maximum Circuit Current (NEC 690.8 (A)(1+2)	10.52	x	156%	=	16.4112	
Minimum Overcurrent Device	20	A	Series Fuse Rating by Manufacturer			
	Size AWG #					
Chosen Conductor Type (THHN, RHW-2, or USE-2)	10					

Conductor Derating

NEC 690.31 © ref (NEC 310.16)						
Conductor 90°C Ampacity		40				
Conduit Fill Derating	1-3	40	x	1	=	40
Temperature Derating (°F)	141-149	40	x	0.65	=	26

Ampacity vs Overcurrent Device

Conductor Ampacity Check	26	16.4112	OK
Conductor to Overcurrent Check	26	20	OK

Input Data Into Yellow Fields
Green Field must say OK

Use this calculation for over current protection and wire sizing for stringers coming from Solar Panels.
Isc comes from manufacturer

Ampacity Calculations

Wiring Location: Inverter to Service Entrance (Alternating Current)
All calculations show minimum sizing for ampacity
Actual wire sizing may be larger for voltage drop or other factors
All calculations are according to the 2017 National Electric Code

Modules: Hanwha Q-Peak DUO BLK-G6+ 340
Inverter: SolarEdge SE10000H-US

Initial Input Values

Inverter Continuous AC Output Combined (Watts)	10000					
Minimum Operating Voltage	240					
		Watts		Volts		Amps
		10000	/	240	=	42
Inverter Continuous AC Amps		42				
Number of Inverters		42	x	1	=	42
Overcurrent Device Rating						
NEC 690.8 (B)(3)		42	x	125%	=	52.5
Minimum Overcurrent Device		60	Amps			
Circuit Breaker Size per NEC 240.6(A)		60	Amps			
		Size AWG #				
Chosen Conductor Type THHN,THWN,RHW-2 or USE-2		6				

Conductor Derating

NEC 690.31© ref (NEC 310.16)						
Conductor 90°C Ampacity		75				
Conduit Fill Derating	1-3	75	x	1	=	75
Temperature Derating (°F)	105-113	75	x	0.87	=	65.25

Ampacity vs Overcurrent Device

Conductor Ampacity Check	65.25	52.5	OK
Conductor to Overcurrent Check	65.25	60	OK

Input Data into Yellow Fields
Green Fields must say OK

Use this calculation for over current protection and wire sizing for inverter

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SHEET NAME
AMPACITY CALCULATIONS

SHEET NUMBER
PV-5

PV LABELS

SIGNAGE REQUIREMENTS

> WARNING SIGNS OR LABELS SHALL COMPLY WITH NEC 110.21(B)
> MIN. 3/8" LETTER HEIGHT
> ALL CAPITAL LETTERS
> ARIAL OR SIMILAR FONT
> REFLECTIVE, WEATHER RESISTANT MATERIAL, UL 969

PHOTOVOLTAIC SYSTEM
⚠ DC DISCONNECT ⚠

RATED MMP CURRENT	AMPS
RATED MPP VOLTAGE	VOLTS
MAX SYSTEM VOLTAGE	VDC
MAX CIRCUIT CURRENT	AMPS

NEC 690.53 — 1

APPLY TO:
INVERTER

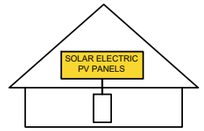
WARNING: PHOTOVOLTAIC POWER SOURCE

NEC 690.31(G)(3)(4) — 2

APPLY TO:
SOLAR DC RACEWAYS
DC JUNCTION BOXES

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



NEC 690.56(C)(1)(a) — 3

APPLY TO:
MAIN SERVICE DISCONNECT

⚠ WARNING

ELECTRIC SHOCK HAZARD

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

NEC 690.13(B) — 4

APPLY TO:
DISCONNECTS
SOLAR LOAD CENTERS
COMBINER BOXES

RAPID SHUTDOWN SWITCH FOR SOLAR PV SYSTEM

NEC 690.56(C)(3) — 5

APPLY TO:
INVERTERS

PHOTOVOLTAIC SYSTEM
⚠ AC DISCONNECT ⚠

OPERATING VOLTAGE	VAC
OPERATING CURRENT	AMPS

NEC 690.54 — 6

APPLY TO:
AC DISCONNECT

⚠ WARNING

THIS EQUIPMENT FED BY MULTIPLE SOURCES. TOTAL RATING OF ALL OVERCURRENT DEVICES, EXCLUDING MAIN SUPPLY OVERCURRENT DEVICE, SHALL NOT EXCEED AMPACITY OF BUSBAR

NEC 705.12 (B)(2)(3)(c) — 7

APPLY TO:
SERVICE PANEL(S)

⚠ WARNING

THE DISCONNECTION OF THE GROUNDED CONDUCTOR(S) MAY RESULT IN OVERVOLTAGE ON THE EQUIPMENT

NEC 690.31 (I) — 8

APPLY TO:
INVERTER(S)

SOLAR PV BREAKER

BREAKER IS BACKFED
DO NOT RELOCATE

NEC 705.12(B)(2)(3)(b) — 9

APPLY TO:
PV SYSTEM BREAKER

MAIN PV SYSTEM DISCONNECT

NEC 690.13 (B) — 10

APPLY TO:
MAIN AC DISCONNECT

BATTERY DISCONNECT

NEC 706.7 — 11

APPLY TO:
BATTERY DISCONNECT

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LABELING SCHEDULE

SHEET NUMBER

PV-6

powered by Q.ANTUM DUO

Q.PEAK DUO BLK-G6+

330-345

ENDURING HIGH PERFORMANCE

VDE 11/2016 Quality Tested – high reliability, low degradation, optimized durability, continous line monitoring – www.VDEinfo.com ID. 40032587

EUPD RESEARCH TOP BRAND PV MODULES EUROPE 2019

Q CELLS YIELD SECURITY – ANTI PID TECHNOLOGY (APT); HOT-SPOT PROTECT (HSP); TRACEABLE QUALITY (TRA.Q™); ANTI LID TECHNOLOGY (ALT)

Q.ANTUM TECHNOLOGY: LOW LEVELIZED COST OF ELECTRICITY

Higher yield per surface area, lower BOS costs, higher power classes, and an efficiency rate of up to 19.5 %.

INNOVATIVE ALL-WEATHER TECHNOLOGY

Optimal yields, whatever the weather with excellent low-light and temperature behavior.

ENDURING HIGH PERFORMANCE

Long-term yield security with Anti LID and Anti PID Technology[1], Hot-Spot Protect and Traceable Quality Tra.Q™.

EXTREME WEATHER RATING

High-tech aluminum alloy frame, certified for high snow (5400 Pa) and wind loads (4000 Pa).

A RELIABLE INVESTMENT

Inclusive 25-year product warranty and 25-year linear performance warranty[2].

STATE OF THE ART MODULE TECHNOLOGY

Q.ANTUM DUO combines cutting edge cell separation and innovative wiring with Q.ANTUM Technology.

[1] APT test conditions according to IEC/TS 62804-1:2015, method B (–1500 V, 168 h)
[2] See data sheet on rear for further information

THE IDEAL SOLUTION FOR:

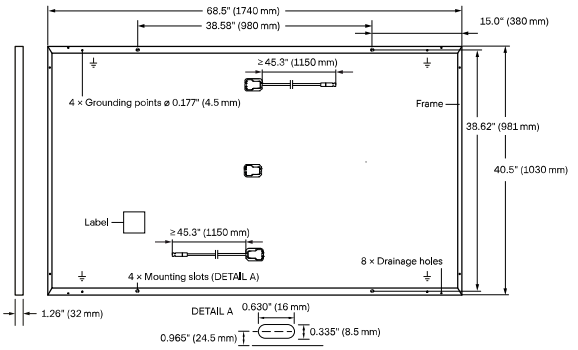
Rooftop arrays on residential buildings

Engineered in Germany

Q CELLS

MECHANICAL SPECIFICATION

Format	68.5 × 40.6 × 1.26 in (including frame) (1740 × 1030 × 32 mm)
Weight	43.9 lbs (19.9 kg)
Front Cover	0.13 in (3.2 mm) thermally pre-stressed glass with anti-reflection technology
Back Cover	Composite film
Frame	Black anodized aluminum
Cell	6 × 20 monocrystalline Q.ANTUM solar half cells
Junction Box	2.09-3.98 × 1.26-2.36 × 0.59-0.71 in (53-101 × 32-60 × 15-18 mm), Protection class IP67, with bypass diodes
Cable	4 mm² Solar cable; (+) ≥45.3 in (1150 mm), (–) ≥45.3 in (1150 mm)
Connector	Stäubli MC4, Hanwha Q CELLS HQC4, Amphenol UTX, Renhe 05-6, Tongling TL-Cable01S, JMTHY JM601; IP68 or Friends PV2e; IP67

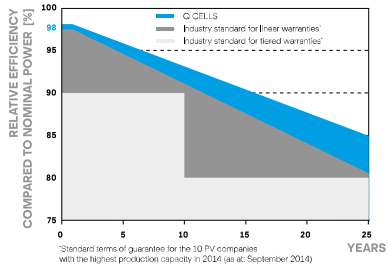


ELECTRICAL CHARACTERISTICS

POWER CLASS				330	335	340	345
MINIMUM PERFORMANCE AT STANDARD TEST CONDITIONS, STC[1] (POWER TOLERANCE +5 W / –0 W)							
Minimum	Power at MPP[1]	P_{MPP}	[W]	330	335	340	345
	Short Circuit Current[1]	I_{SC}	[A]	10.41	10.47	10.52	10.58
	Open Circuit Voltage[1]	V_{OC}	[V]	40.15	40.41	40.66	40.92
	Current at MPP	I_{MPP}	[A]	9.91	9.97	10.02	10.07
	Voltage at MPP	V_{MPP}	[V]	33.29	33.62	33.94	34.25
	Efficiency[1]	η	[%]	≥18.4	≥18.7	≥19.0	≥19.3
MINIMUM PERFORMANCE AT NORMAL OPERATING CONDITIONS, NMOT[2]							
Minimum	Power at MPP	P_{MPP}	[W]	247.0	250.7	254.5	258.2
	Short Circuit Current	I_{SC}	[A]	8.39	8.43	8.48	8.52
	Open Circuit Voltage	V_{OC}	[V]	37.86	38.10	38.34	38.59
	Current at MPP	I_{MPP}	[A]	7.80	7.84	7.89	7.93
	Voltage at MPP	V_{MPP}	[V]	31.66	31.97	32.27	32.57

[1]Measurement tolerances P_{MPP} ±3%; I_{SC}; V_{OC} ±5% at STC: 1000 W/m², 25±2 °C, AM 1.5 according to IEC 60904-3 • [2]800 W/m², NMOT, spectrum AM 1.5

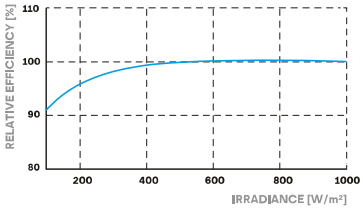
Q CELLS PERFORMANCE WARRANTY



At least 98 % of nominal power during first year. Thereafter max. 0.54 % degradation per year. At least 93.1 % of nominal power up to 10 years. At least 85 % of nominal power up to 25 years.

All data within measurement tolerances. Full warranties in accordance with the warranty terms of the Q CELLS sales organization of your respective country.

PERFORMANCE AT LOW IRRADIANCE



Typical module performance under low irradiance conditions in comparison to STC conditions (25 °C, 1000 W/m²)

TEMPERATURE COEFFICIENTS							
Temperature Coefficient of I_{SC}	α	[%/K]	+0.04	Temperature Coefficient of V_{OC}	β	[%/K]	–0.27
Temperature Coefficient of P_{MPP}	γ	[%/K]	–0.36	Normal Module Operating Temperature	NMOT	[°F]	109±5.4 (43±3 °C)

PROPERTIES FOR SYSTEM DESIGN

Maximum System Voltage V_{SYS}	[V]	1000 (IEC) / 1000 (UL)	Safety Class	II
Maximum Series Fuse Rating	[A DC]	20	Fire Rating based on ANSI / UL 1703	C (IEC) / TYPE 2 (UL)
Max. Design Load, Push / Pull[3]	[lbs / ft²]	75 (3600 Pa) / 55 (2667 Pa)	Permitted Module Temperature on Continuous Duty	–40 °F up to +185 °F (–40 °C up to +85 °C)
Max. Test Load, Push / Pull[3]	[lbs / ft²]	113 (5400 Pa) / 84 (4000 Pa)		

[3] See Installation Manual

QUALIFICATIONS AND CERTIFICATES

UL 1703, VDE Quality Tested, CE-compliant, IEC 61215:2016, IEC 61730:2016, Application Class II, U.S. Patent No. 9,893,215 (solar cells)

PACKAGING INFORMATION

Number of Modules per Pallet	32
Number of Pallets per 53' Trailer	28
Number of Pallets per 40' HC-Container	24
Pallet Dimensions (L × W × H)	71.5 × 45.3 × 48.0 in (1815 × 1150 × 1220 mm)
Pallet Weight	1505 lbs (683 kg)

Note: Installation instructions must be followed. See the installation and operating manual or contact our technical service department for further information on approved installation and use of this product.

Hanwha Q CELLS America Inc.
400 Spectrum Center Drive, Suite 1400, Irvine, CA 92618, USA | **TEL** +1 949 748 59 96 | **EMAIL** inquiry@us.q-cells.com | **WEB** www.q-cells.us

INVERTERS

Single Phase Inverter with HD-Wave Technology

for North America

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

12-25 YEAR WARRANTY

Optimized installation with HD-Wave technology

- Specifically designed to work with power optimizers
- Record-breaking efficiency
- Quick and easy inverter commissioning directly from a smartphone using the SolarEdge SetApp
- Fixed voltage inverter for longer strings
- Integrated arc fault protection and rapid shutdown for NEC 2014 and 2017, per article 690.11 and 690.12
- UL1741 SA certified, for CPUC Rule 21 grid compliance
- Extremely small
- Built-in module-level monitoring
- Outdoor and indoor installation
- Optional: Revenue grade data, ANSI C12.20 Class 0.5 (0.5% accuracy)

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Single Phase Inverter with HD-Wave Technology for North America

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

Model Number	SE3000H-US	SE3800H-US	SE5000H-US	SE6000H-US	SE7600H-US	SE10000H-US	SE11400H-US	
APPLICABLE TO INVERTERS WITH PART NUMBER	SEXXXXH-XXXXXBXX4							
OUTPUT								
Rated AC Power Output	3000	3800 @ 240V 3300 @ 208V	5000	6000 @ 240V 5000 @ 208V	7600	10000	11400 @ 240V 10000 @ 208V	VA
Maximum AC Power Output	3000	3800 @ 240V 3300 @ 208V	5000	6000 @ 240V 5000 @ 208V	7600	10000	11400 @ 240V 10000 @ 208V	VA
AC Output Voltage Min.-Nom.-Max. (211 - 240 - 264)	✓	✓	✓	✓	✓	✓	✓	Vac
AC Output Voltage Min.-Nom.-Max. (183 - 208 - 229)	-	✓	-	✓	-	-	✓	Vac
AC Frequency (Nominal)	59.3 - 60 - 60.5[1]							Hz
Maximum Continuous Output Current @240V	12.5	16	21	25	32	42	47.5	A
Maximum Continuous Output Current @208V	-	16	-	24	-	-	48.5	A
Power Factor	1, adjustable -0.85 to 0.85							
GFDI Threshold	1							A
Utility Monitoring, Islanding Protection, Country Configurable Thresholds	Yes							
INPUT								
Maximum DC Power @240V	4650	5900	7750	9300	11800	15500	17650	W
Maximum DC Power @208V	-	5100	-	7750	-	-	15500	W
Transformer-less, Ungrounded	Yes							
Maximum Input Voltage	480							Vdc
Nominal DC Input Voltage	380				400			Vdc
Maximum Input Current @240V[2]	8.5	10.5	13.5	16.5	20	27	30.5	Adc
Maximum Input Current @208V[2]	-	9	-	13.5	-	-	27	Adc
Max. Input Short Circuit Current	45							Adc
Reverse-Polarity Protection	Yes							
Ground-Fault Isolation Detection	600kΩ Sensitivity							
Maximum Inverter Efficiency	99	99.2						%
CEC Weighted Efficiency	99						99 @ 240V 98.5 @ 208V	%
Nighttime Power Consumption	< 2.5							W

[1] For other regional settings please contact SolarEdge support
[2] A higher current source may be used; the inverter will limit its input current to the values stated

Single Phase Inverter with HD-Wave Technology for North America

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

Model Number	SE3000H-US	SE3800H-US	SE5000H-US	SE6000H-US	SE7600H-US	SE10000H-US	SE11400H-US	
ADDITIONAL FEATURES								
Supported Communication Interfaces	RS485, Ethernet, ZigBee (optional), Cellular (optional)							
Revenue Grade Data, ANSI C12.20	Optional[3]							
Inverter Commissioning	with the SetApp mobile application using built-in Wi-Fi Access Point for local connection							
Rapid Shutdown - NEC 2014 and 2017 690.12	Automatic Rapid Shutdown upon AC Grid Disconnect							
STANDARD COMPLIANCE								
Safety	UL1741, UL1741 SA, UL1699B, CSA C22.2, Canadian AFCI according to T.I.L. M-07							
Grid Connection Standards	IEEE1547, Rule 21, Rule 14 (HI)							
Emissions	FCC Part 15 Class B							
INSTALLATION SPECIFICATIONS								
AC Output Conduit Size / AWG Range	1'' Maximum / 14-6 AWG					1'' Maximum /14-4 AWG		
DC Input Conduit Size / # of Strings / AWG Range	1'' Maximum / 1-2 strings / 14-6 AWG					1'' Maximum / 1-3 strings / 14-6 AWG		
Dimensions with Safety Switch (HxWxD)	17.7 x 14.6 x 6.8 / 450 x 370 x 174					21.3 x 14.6 x 7.3 / 540 x 370 x 185		in / mm
Weight with Safety Switch	22 / 10		25.1 / 11.4		26.2 / 11.9	38.8 / 17.6		lb / kg
Noise	< 25				<50			dBA
Cooling	Natural Convection							
Operating Temperature Range	-40 to +140 / -40 to +60[4]							°F / °C
Protection Rating	NEMA 4X (Inverter with Safety Switch)							

[3] Revenue grade inverter P/N: SExxxxH-US000BNC4
[4] Full power up to at least 50°C / 122°F; for power de-rating information refer to: https://www.solaredge.com/sites/default/files/se-temperature-derating-note-na.pdf

RoHS

Power Optimizer

For North America

P320 / P340 / P370 / P400 / P405 / P505

POWER OPTIMIZER

PV power optimization at the module-level

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

solaredge

/ Power Optimizer
For North America
P320 / P340 / P370 / P400 / P405 / P505

Optimizer model (typical module compatibility)	P320 (for 60-cell modules)	P340 (for high-power 60-cell modules)	P370 (for higher-power 60 and 72-cell modules)	P400 (for 72 & 96-cell modules)	P405 (for thin film modules)	P505 (for higher current modules)	
INPUT							
Rated Input DC Power[1]	320	340	370	400	405	505	W
Absolute Maximum Input Voltage (Voc at lowest temperature)	48		60	80	125[2]	83[2]	Vdc
MPPT Operating Range	8 - 48		8 - 60	8 - 80	12.5 - 105	12.5 - 83	Vdc
Maximum Short Circuit Current (Isc)	11			10.1		14	Adc
Maximum DC Input Current	13.75			12.63		17.5	Adc
Maximum Efficiency	99.5						%
Weighted Efficiency	98.8					98.6	%
Overvoltage Category	II						
OUTPUT DURING OPERATION (POWER OPTIMIZER CONNECTED TO OPERATING SOLAREDGE INVERTER)							
Maximum Output Current	15						Adc
Maximum Output Voltage	60				85		Vdc
OUTPUT DURING STANDBY (POWER OPTIMIZER DISCONNECTED FROM SOLAREDGE INVERTER OR SOLAREDGE INVERTER OFF)							
Safety Output Voltage per Power Optimizer	1 ± 0.1						Vdc
STANDARD COMPLIANCE							
EMC	FCC Part15 Class B, IEC61000-6-2, IEC61000-6-3						
Safety	IEC62109-1 (class II safety), UL1741						
RoHS	Yes						
INSTALLATION SPECIFICATIONS							
Maximum Allowed System Voltage	1000						Vdc
Compatible inverters	All SolarEdge Single Phase and Three Phase inverters						
Dimensions (W x L x H)	129 x 153 x 27.5 / 5.1 x 6 x 1.1			129 x 153 x 33.5 / 5.1 x 6 x 1.3	129 x 159 x 49.5 / 5.1 x 6.3 x 1.9	129 x 162 x 59 / 5.1 x 6.4 x 2.3	mm / in
Weight (including cables)	630 / 1.4			750 / 1.7	845 / 1.9	1064 / 2.3	gr / lb
Input Connector	MC4[3]						
Output Wire Type / Connector	Double Insulated; MC4						
Output Wire Length	0.95 / 3.0		1.2 / 3.9				m / ft
Input Wire Length	0.16 / 0.52						m / ft
Operating Temperature Range	-40 - +85 / -40 - +185						˚C / ˚F
Protection Rating	IP68 / NEMA6P						
Relative Humidity	0 - 100						%

[1] Rated STC power of the module. Module of up to +5% power tolerance allowed
[2] NEC 2017 requires max input voltage be not more than 80V
[3] For other connector types please contact SolarEdge

PV System Design Using a SolarEdge Inverter[4][5]		Single Phase HD-Wave	Single phase	Three Phase 208V	Three Phase 480V	
Minimum String Length (Power Optimizers)	P320, P340, P370, P400	8		10	18	
	P405 / P505	6		8	14	
Maximum String Length (Power Optimizers)		25		25	50[6]	
Maximum Power per String		5700 (6000 with SE7600-US - SE11400-US)	5250	6000[7]	12750[8]	W
Parallel Strings of Different Lengths or Orientations		Yes				

[4] For detailed string sizing information refer to: http://www.solaredge.com/sites/default/files/string_sizing_na.pdf
[5] It is not allowed to mix P405/P505 with P320/P340/P370/P400 in one string
[6] A string with more than 30 optimizers does not meet NEC rapid shutdown requirements; safety voltage will be above the 30V requirement
[7] For SE14.4KUS/SE43.2KUS: It is allowed to install up to 6,500W per string when 3 strings are connected to the inverter (3 strings per unit for SE43.2KUS) and when the maximum power difference between the strings is up to 1,000W
[8] For SE30KUS/SE33.3KUS/SE66.6KUS/SE100KUS: It is allowed to install up to 15,000W per string when 3 strings are connected to the inverter (3 strings per unit for SE66.6KUS/SE100KUS) and when the maximum power difference between the strings is up to 2,000W

CE RoHS

pe.eaton.com

Eaton general duty cartridge fuse safety switch

DG222NRB

UPC:782113144221

Dimensions:

- **Height:** 14.37 IN
- **Length:** 7.35 IN
- **Width:** 8.4 IN

Weight:10 LB

Notes: Maximum hp ratings apply only when dual element fuses are used. 3-Phase hp rating shown is a grounded B phase rating, UL listed.

Warranties:

- Eaton Selling Policy 25-000, one (1) year from the date of installation of the Product or eighteen (18) months from the date of shipment of the Product, whichever occurs first.

Specifications:

- **Type:** General duty, cartridge fused
- **Amperage Rating:** 60A
- **Enclosure:** NEMA 3R
- **Enclosure Material:** Painted galvanized steel
- **Fuse Class Provision:** Class H fuses
- **Fuse Configuration:** Fusible with neutral
- **Number Of Poles:** Two-pole
- **Number Of Wires:** Three-wire
- **Product Category:** General duty safety switch
- **Voltage Rating:** 240V

Supporting documents:

- Eatons Volume 2-Commercial Distribution
- Eaton Specification Sheet - DG222NRB

Certifications:

- UL Listed

Product compliance: No Data

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

AC Voltage (Nominal)	120/240 V
Feed-In Type	Split Phase
Grid Frequency	60 Hz
Total Energy	14 kWh
Usable Energy	13.5 kWh
Real Power, max continuous	5 kW (charge and discharge)
Real Power, peak (10 s, off-grid/backup)	7 kW (charge and discharge)
Apparent Power, max continuous	5.8 kVA (charge and discharge)
Apparent Power, peak (10 s, off-grid/backup)	7.2 kVA (charge and discharge)
Maximum Supply Fault Current	10 kA
Maximum Output Fault Current	32 A
Overcurrent Protection Device	30 A
Imbalance for Split-Phase Loads	100%
Power Factor Output Range	+/– 1.0 adjustable
Power Factor Range (full-rated power)	+/– 0.85
Internal Battery DC Voltage	50 V
Round Trip Efficiency[1,3]	90%
Warranty	10 years

[1]Values provided for 25°C (77°F), 3.3 kW charge/discharge power.
[2]In Backup mode, grid charge power is limited to 3.3 kW.
[3]AC to battery to AC, at beginning of life.

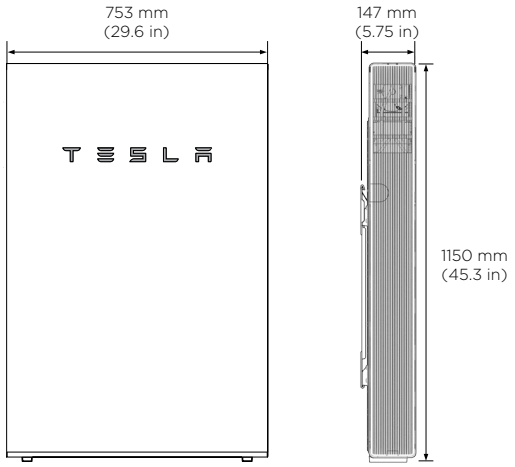
COMPLIANCE INFORMATION

Certifications	UL 1642, UL 1741, UL 1973, UL 9540, IEEE 1547, UN 38.3
Grid Connection	Worldwide Compatibility
Emissions	FCC Part 15 Class B, ICES 003
Environmental	RoHS Directive 2011/65/EU
Seismic	AC156, IEEE 693-2005 (high)

MECHANICAL SPECIFICATIONS

Dimensions[1]	1150 mm x 755 mm x 147 mm (45.3 in x 29.6 in x 5.75 in)
Weight[1]	114 kg (251.3 lbs)
Mounting options	Floor or wall mount

[1]Dimensions and weight differ slightly if manufactured before March 2019. Contact Tesla for additional information.

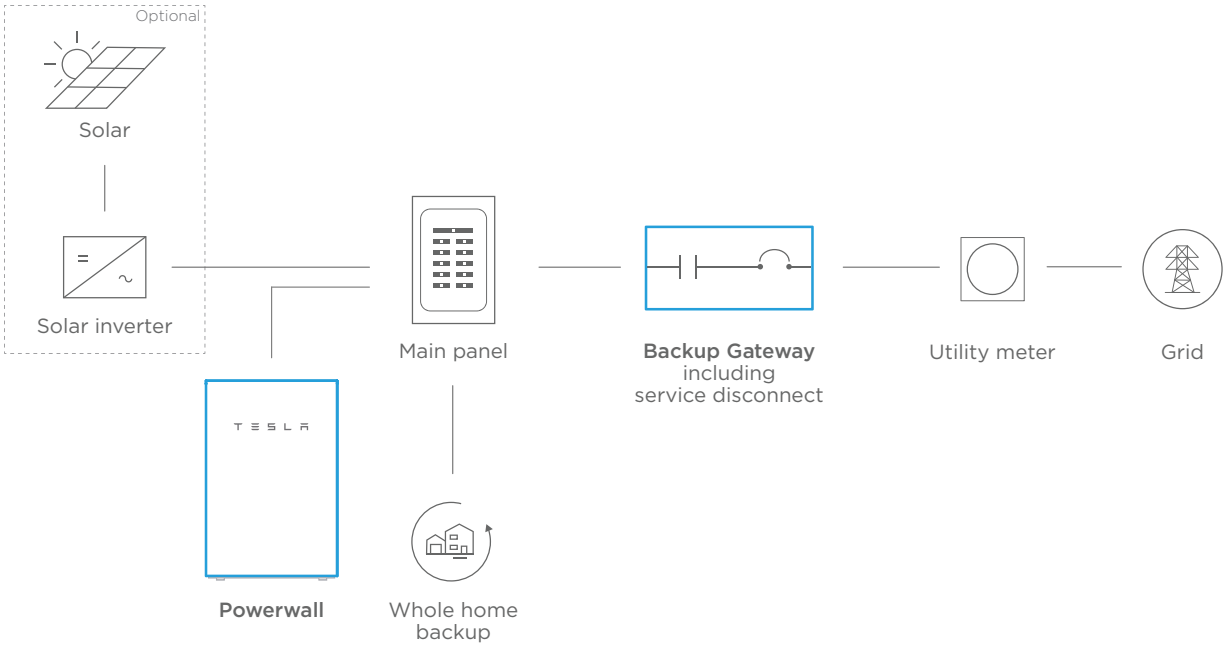


ENVIRONMENTAL SPECIFICATIONS

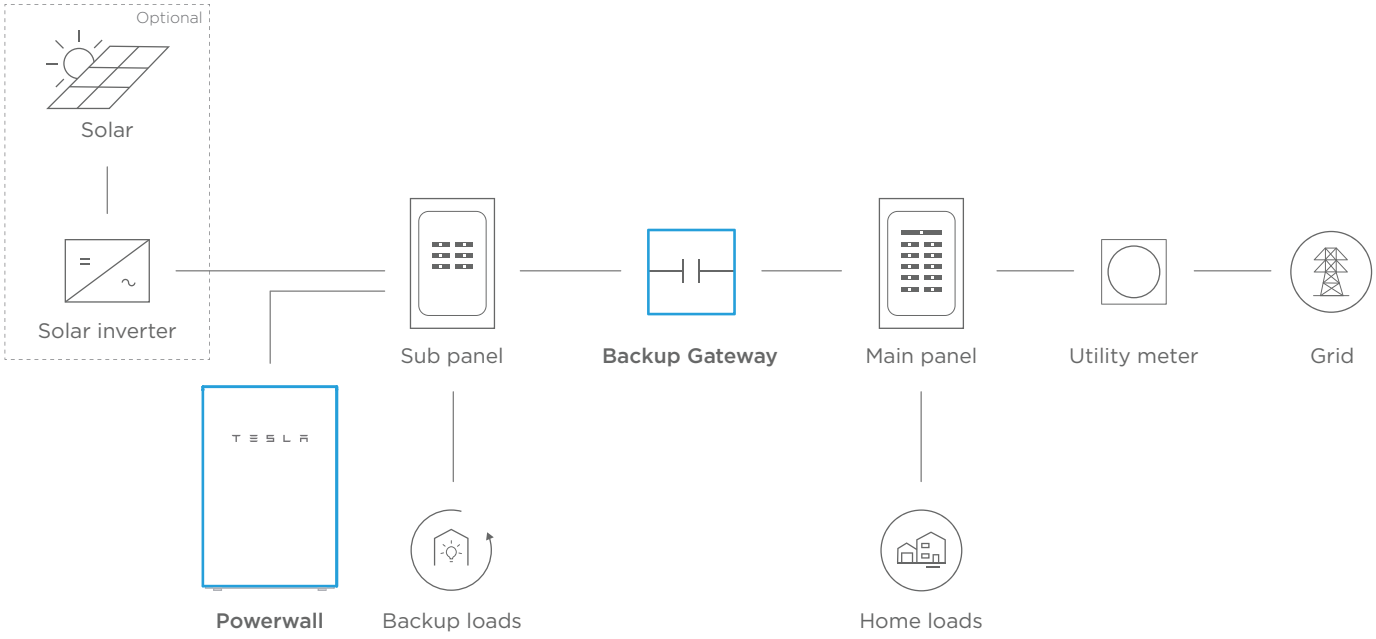
Operating Temperature	–20°C to 50°C (–4°F to 122°F)
Recommended Temperature	0°C to 30°C (32°F to 86°F)
Operating Humidity (RH)	Up to 100%, condensing
Storage Conditions	–20°C to 30°C (–4°F to 86°F) Up to 95% RH, non-condensing State of Energy (SoE): 25% initial
Maximum Elevation	3000 m (9843 ft)
Environment	Indoor and outdoor rated
Enclosure Type	NEMA 3R
Ingress Rating	IP67 (Battery & Power Electronics) IP56 (Wiring Compartment)
Wet Location Rating	Yes
Noise Level @ 1m	< 40 dBA at 30°C (86°F)

TYPICAL SYSTEM LAYOUTS

WHOLE HOME BACKUP



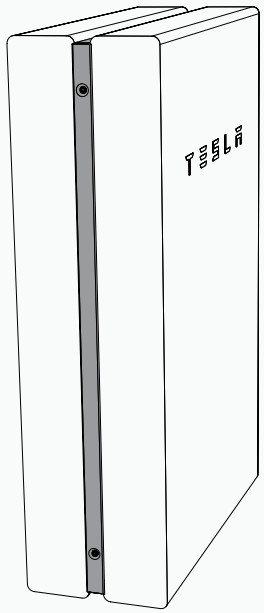
PARTIAL HOME BACKUP



POWERWALL
Multi-Powerwall Stack Kit

The Stack Kit for Tesla Powerwall joins two floor-mounted Powerwall units in front-to-back multi-Powerwall installations. Side clips and a top cover secure the units and prevent debris from falling between them. An optional bridge assembly conceals wire runs between the Powerwalls, preserving the clean lines of the installation.

Up to 3 floor-mounted Powerwalls can be joined using two Stack Kits. For systems with more than 3 Powerwalls, separate groups of 3 units should be assembled.



ENVIRONMENTAL SPECIFICATIONS

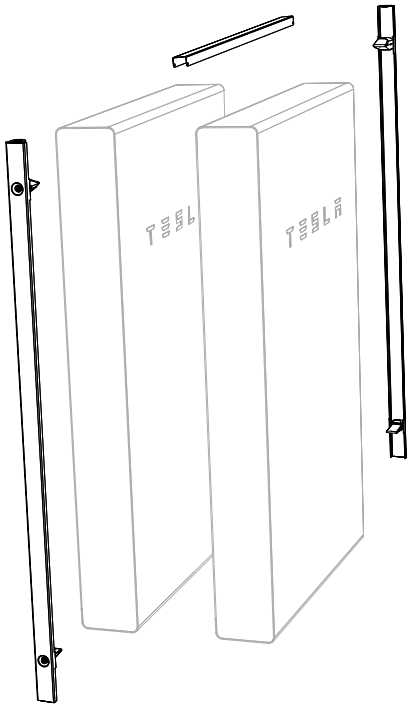
Operating Temperature	–20°C to 50°C (–4°F to 122°F)
Operating Humidity (RH)	Up to 100%, condensing
Environment	Indoor and outdoor rated
Ingress Rating	IP67

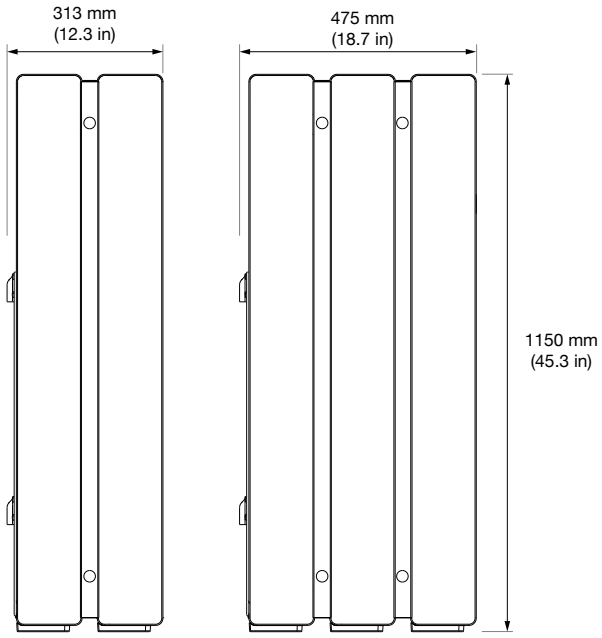
COMPLIANCE INFORMATION

Certifications	UL 1741, IEC 62109-1, CSA C22.2.107.1
Environmental	RoHS Directive 2011/65/EU, REACH Regulation
Seismic	AC156, IEEE 693-2005 (high)

MECHANICAL SPECIFICATIONS

Stack Kit Shipping Dimensions	1134 mm x 175 mm x 48 mm (44.6 in x 6.9 in x 1.9 in)
Stack Kit Shipping Weight	2.2 kg (4.8 lbs)
Materials	Powder-coated steel, stainless steel, galvanized steel, high-impact plastic
2-Powerwall Stack Dimensions	1150 mm x 755 mm x 313 mm (45.3 in x 29.7 in x 12.3 in)
Weight (including 2 Powerwalls)	253 kg (556 lbs)
3-Powerwall Stack Dimensions	1150 mm x 755 mm x 475 mm (45.3 in x 29.7 in x 18.7 in)
Weight (including 3 Powerwalls)	379.5 kg (837 lbs)





POWERWALL
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 controls connection 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 use and manage backup energy reserves from any mobile device with the Tesla app.

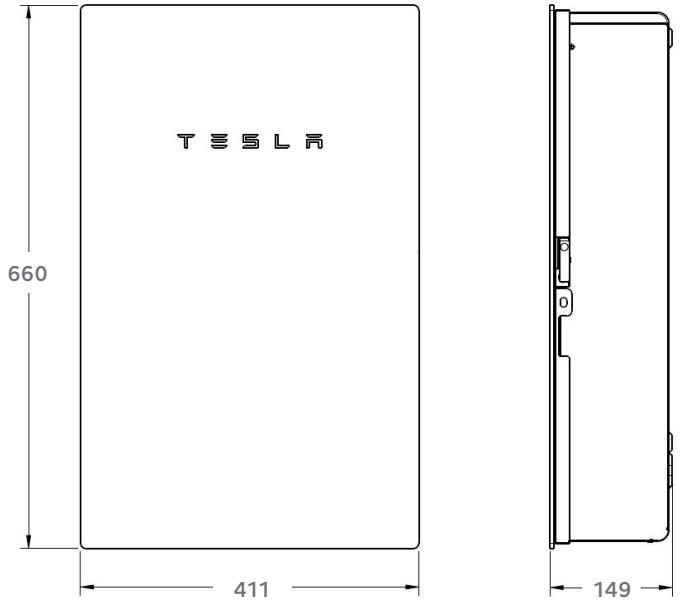
PERFORMANCE SPECIFICATIONS

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[1]
Overcurrent Protection Device	100-200A; Service Entrance Rated[1]
Overvoltage Category	Category IV
AC Meter	Revenue accurate (+/– 0.2 %)
Primary Connectivity	Ethernet, Wi-Fi
Secondary Connectivity	Cellular (3G, LTE/4G)[2]
User Interface	Tesla App
Operating Modes	Support for solar self-consumption, time-based control, backup, and off-grid
Backup Transition	Automatic disconnect for seamless backup
Modularity	Supports up to 10 AC-coupled Powerwalls
Optional Internal Panelboard	200A 6-space / 12 circuit Eaton BR Circuit Breakers
Warranty	10 years

[1] When protected by Class J fuses, Backup Gateway 2 is suitable for use in circuits capable of delivering not more than 22kA symmetrical amperes.
[2] The customer is expected to provide internet connectivity for Backup Gateway 2; cellular should not be used as the primary mode of connectivity. Cellular connectivity subject to network operator service coverage and signal strength.

MECHANICAL SPECIFICATIONS

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



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, ICES 003

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

Powerwall 2 AC & Backup Gateway: Permitting & Inspection Support for Tesla Home Energy Storage System

Summary Description

Powerwall 2 AC (*Powerwall*) and the Backup Gateway (*Gateway*) comprise a state-of-the-art battery system for residential and light commercial applications. Together, they enable energy stored from the grid (or renewable sources, like solar), to be used at night or to provide backup power in a grid outage.

Powerwall arrives at the job site as a factory assembly that includes:

- Lithium-ion battery cells
- Isolated DC/DC converter (to step up the battery's voltage)
- Integrated AC inverter (to convert low voltage DC from the battery to AC for the home or business)
- Liquid thermal management system (to maximize battery performance)

The battery cells inside Powerwall are the components closest to a conventional battery. No one is ever exposed to these cells because they are electrically and physically isolated from contact at all times.

All Powerwall installations require the Gateway, which serves several functions:

- Monitors the grid for outage
- Instantly isolates Powerwall from the grid (during grid outage, or when providing backup power)
- Communicates with the Powerwall (via communication cables)
- Monitors & manages how energy is used (including self-consumption, load-shifting & backup)
- Functions as both *service entrance* and *disconnect* (when installed with a breaker)

When a grid outage is detected, the Gateway instantly isolates Powerwall from the grid using a microprocessor-controlled power contactor.

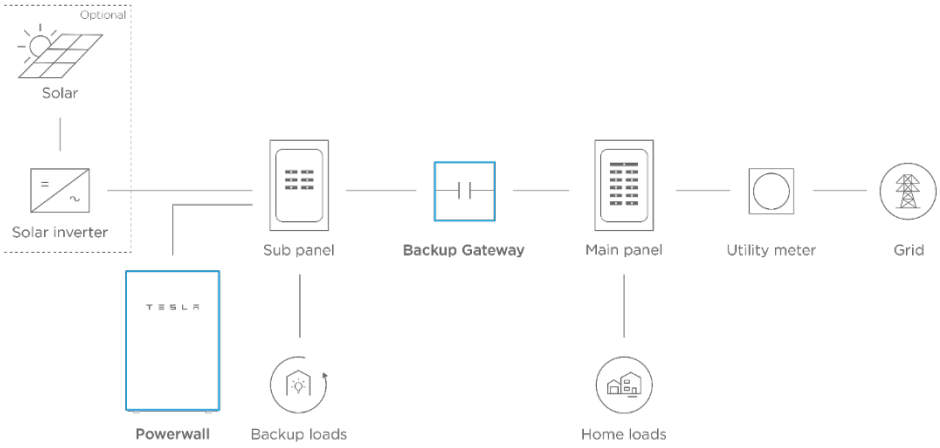
Powerwall Installation Example for Whole-Home Backup (Gateway as Service Entrance and Disconnect)

Key NEC References

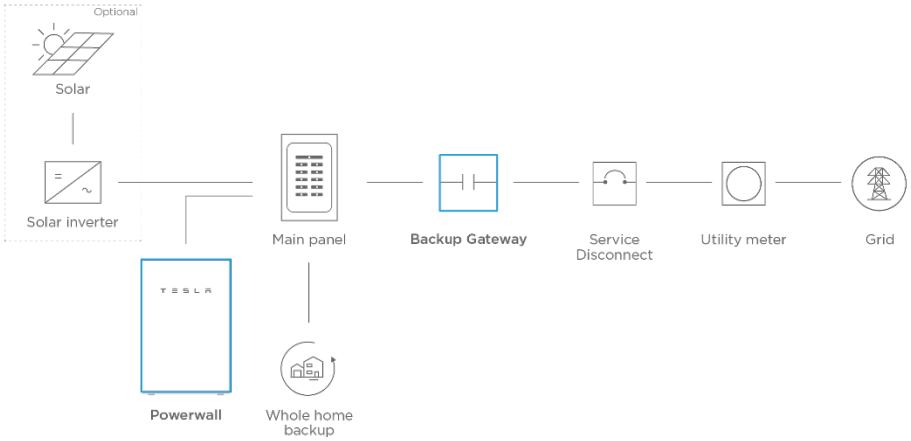
Applicable NEC references may vary with the adopted edition of the NEC and site-specific configurations. Generally, Chapters 1 through 4 as modified by the following NEC sections will apply to Powerwall and the Gateway:

Article or Section	Description	NEC Edition
705	Interconnected Electric Power Production Sources	2014, 2017
690.10	Stand Alone Systems	2014
690.71	Storage Batteries	2014
710	Stand Alone Systems	2017
706	Energy Storage Systems	2017

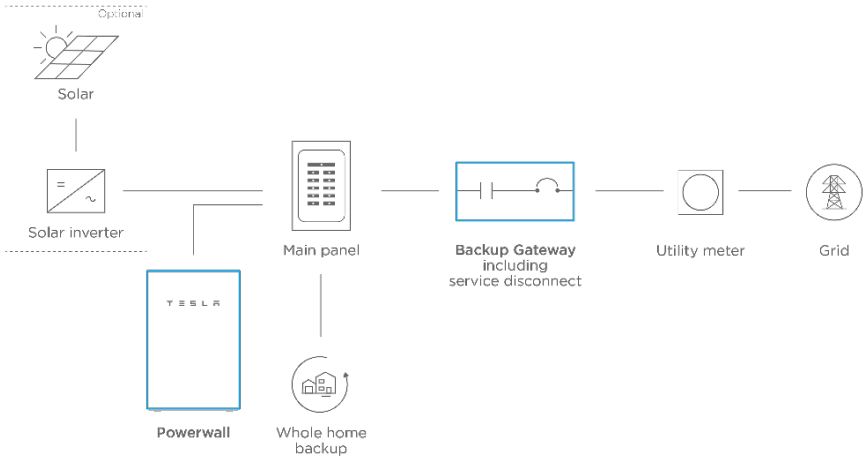
Most Common Configurations



Partial Home Backup (with or without solar)



Whole Home Backup (with or without solar)



Whole Home Backup (using Gateway as Service Entrance & Disconnect, with or without solar)

Key Specifications & Certifications

(Full datasheets provided separately)

Powerwall Electrical

Energy	13.5 kWh
AC Voltage (Nominal) and Maximum Continuous Current	120/240 V: 24 A
Frequency (Nominal)	60 Hz
Power, max continuous	5 kW (charge and discharge)
Power, peak (10 seconds)	7 kW (charge and discharge)
Overvoltage Category	Category III
Max Supply Fault Current	10 kA
Max Output Fault Current	32 A

Powerwall Environmental & Certifications

Operating Temperature	-20°C to 50°C (-4°F to 122°F)
Enclosure Type	NEMA 3R
Ingress Rating	IP67 (battery and power electronics) IP56 (wiring)
Wet Location Rating	Yes
Seismic Rating	AC156, IEEE 693-2005 (high)
Safety Certifications (partial list)	UL 1642, UL 1741SA, UL 1973, UL 9540
NRTL	Intertek/ETL

Powerwall Mechanical

Height	45.3 in
Width	29.7 in
Depth	6.1 in
Weight	276 lbs

Gateway Electrical

Disconnect Current	200 A
Overcurrent Protection Breaker	100-200 A (Service Entrance configuration)
Overvoltage Category	Category IV
Fault Current Withstand Rating	10 kAIC (Configurable to 22 kAIC)
AC Meter	Revenue grade
Service Rating	Suitable for Use as Service Equipment

Gateway Environmental & Certifications

Operating Temperature	-20°C to 50°C (-4°F to 122°F)
Enclosure Type	NEMA 3R
Ingress Rating	IP44
Safety Certifications (partial list)	UL 1642, UL 1741, IEC 61000-6-3, IEC 62109-1
NRTL	Intertek/ETL

Gateway Mechanical

Height	29.1 in
Width	14.9 in
Depth	5.1 in
Weight	36 lbs

Frequently Asked Questions

Are Powerwall and the Gateway listed equipment?

Yes. Powerwall and the Gateway are listed to the applicable product standards by Intertek/ETL, an OSHA-approved Nationally Recognized Testing Laboratory (NRTL). See the table above for a partial list of certifications. If physical certificates are required, please email powerwall@tesla.com.

What safety features does Powerwall include to avoid thermal runaway?

To resist single cell thermal runaway, Powerwall complies with requirements in UL 1973 and IEC 62619. For example, UL 1973 includes an internal fire test that ensures a runaway in one cell can't propagate to neighboring cells. Onboard sensors and the battery management system (BMS) provide multiple layers of protection to detect and stop precursors to thermal runaway.

How much does the AC Powerwall weigh, and will it comply with seismic requirements when wall-mounted?

Powerwall weighs 276 lbs. and complies with seismic requirements when wall-mounted according to manufacturer's instructions. It has been evaluated to ICC Acceptance Criteria AC156 for seismic requirements. Installation methods also comply with IEEE Standard 693-2005 for seismic design.

Is guidance available for emergency personnel working around a Powerwall that has been physically damaged?

Yes. An Emergency Response Guide is available on request. Emergency and maintenance personnel can work safely around Powerwall after opening the system's AC disconnect and/or breaker on the grid side. Water is the recommended suppressant in case of a fire involving a lithium-ion battery and will not exacerbate a fire involving lithium-ion cells.

Does Powerwall require additional venting to prevent the accumulation of flammable or explosive gases?

No. Unlike conventional lead-acid batteries, which produce hydrogen gas, the individual cells in the Powerwall are hermetically sealed and do not require additional ventilation. NEC [480.9(A)], NFPA 1 Chapter 52, and the 2018 IFC, all make clear venting is not required for lithium-ion batteries.

How much electrolyte is in Powerwall?

Tesla lithium-ion battery packs do not contain free liquid electrolyte and do not pose a liquid release hazard. If an enclosure is punctured, there are no electrolytes to "spill" onto the floor. Secondary containment measures are not needed.

NOTE: IFC Section 608 does not require spill control or neutralization for lithium-ion battery systems. Secondary containment is not applicable or required for this technology.

Is Powerwall's battery pack low voltage?

Yes. The internal battery pack operates at less than 50 VDC nominal. Unlike legacy battery systems, Powerwall is a fully enclosed, factory-listed assembly with no accessible battery terminals or live parts. Powerwall's output is AC and matches that of the serving utility. Powerwall's onboard inverter functions exactly like a solar PV inverter.

Are the working clearances outlined in the NEC 110.26 applicable to Powerwall?

No. Because Powerwall will never require examination, adjustment, servicing, or maintenance while energized, working clearances in Article 110.26 do not apply.

Does Powerwall require a separate disconnect?

No. Powerwall's onboard switch disconnects all ungrounded conductors and complies with Article 690.71 (2014) and 706.7 (2017).

NOTE: These articles require a second disconnecting means at the connected equipment when:

- Separated by a wall or partition, or
- Input and output terminals are more than 5ft away.

This second disconnect will typically be the 2P/30A breaker installed at the point of connection.

Can Powerwall be installed outdoors?

Yes. Powerwall is a NEMA Type 3R enclosure and can be installed outdoors.

What prevents Powerwall from back-feeding the utility grid during a power outage?

During a power outage, the Gateway automatically isolates the home from the grid per IEEE 1547. Powerwall and Gateway are both listed to UL 1741 because they are subject to the same anti-islanding rules as a typical grid-interactive PV system. Gateway reconnects to the grid once it is stable for at least 5 minutes.

What is the maximum number of circuits that can be backed up for a single Powerwall?

The number of circuits that a single Powerwall can back up isn't specified. The duration of backup power is a function of *Power * Time*, stated in Watt-hours. The maximum continuous output at any given time is limited to 5000W, with a peak output capacity of 7000W for 10 seconds. The number of loads and circuits the customer wants backed up will determine the overall system size, including total number of Powerwalls required.

Is Powerwall required to be capable of backing up all the home's loads simultaneously?

No. When Powerwall is operating as a *stand-alone system,* as permitted in 705.40, available current must be *"equal to or greater than the load posed by the largest single utilization equipment connected to the system"* (not including general lighting loads). Guidance on system sizing may be found in NEC Articles 690.10 [2014] and 710.15(A) [2017].

When in backup mode, what happens if the load exceeds Powerwall's rated output current?

Powerwall automatically shuts down. Powerwall's inverter is an inherently power- and current-limited device. If Powerwall is operating at full rated output current and more load is applied, it simply cannot produce more current. The inverter will sense the corresponding voltage change and immediately shut off. There is no risk for over-discharging above the rated nameplate of Powerwall.

Inspection Guide

In addition to a simpler installation process, Powerwall and Gateway systems are easier to review for safety and code compliance. Primary code references are from the 2014 NEC. Additional references [in brackets] are from the 2017 NEC.

General Requirements

- Listing verification - Equipment bears the mark of a Nationally Recognized Testing Laboratory. 90.7, [706.5]
- Manufacturer's installation instructions followed. 110.3(B)
- The completed installation appears to be neat and of good workmanship. 110.12
- Working clearances are in accordance with 110.26 for any components that are "likely to require examination, adjustment, servicing, or maintenance while energized."
    - Note that Powerwall has no accessible DC battery interconnections within the unit, and does not require maintenance while energized.
    - The ventilation clearance requirements found in 480.9 do not apply to this technology. Tesla Powerwall complies with [706.10(A)] using a pre-engineered ventilation solution.

Wiring Methods

- All conduit and fittings properly installed per the respective article in Chapter 3 of the NEC.
- Conduit is adequately secured and supported. 3xx.30
- Raceways containing insulated circuit conductors 4 AWG and larger are protected from abrasion by an identified fitting providing a smoothly rounded insulating surface. 300.4(G)
- Residential Energy Storage equipment grounding conductor is identified as either bare, green, or green with continuous yellow stripe(s). 250.119
- Grounded conductor identified properly. 200.6(A), (B)

Overcurrent Protection and Wire Sizing

Conductors and OCPDs are adequately sized per Articles 240 and 310 unless modified by 690.9(A), 690.10(B), or [706.20] and [706.21].

Disconnecting Means

- Disconnecting means are provided to disconnect the energy storage device from all ungrounded conductors of all sources. 690.15 and/or [706.7]. This requirement is met by the integrated disconnect switch.
- Where the energy storage device output terminals are more than 1.5 m (5 ft) from the connected equipment, or where output circuits pass through a wall or partition, a disconnecting means and overcurrent protection shall be provided at the energy storage device end of the circuit. 690.71(H), [706.7(E)]. The Powerwall complies with both the letter and the intent of the NEC:
    - As previously mentioned, the Powerwall is an inherently current-limiting device that will not contribute fault currents to the AC output circuit. It is important to note that the 2017 NEC has removed this overcurrent requirement altogether and clarified that the intent was to protect the DC conductors of a conventional battery.
    - The integrated disconnect satisfies the requirement for the energy storage device end of the circuit.
    - If the integrated disconnect is not within sight of the connected equipment, the 2P/30A breaker installed at the point of connection is the additional disconnect required by 690.71(H)(4).

Labeling

- A sign that indicates the type and location of on-site optional power sources is placed at building utility service-entrance location. 705.10, [706.11]
- Equipment fed by multiple sources are marked to indicate all sources of supply. 705.12(D)(3).
- Where the integrated disconnect and the 2P/30A breaker are not within sight, a plaque or directory shall be installed at each disconnect indicating the location of the other disconnecting means. 690.71(H)(5) or [706.7(E)(5)].

Additional resources

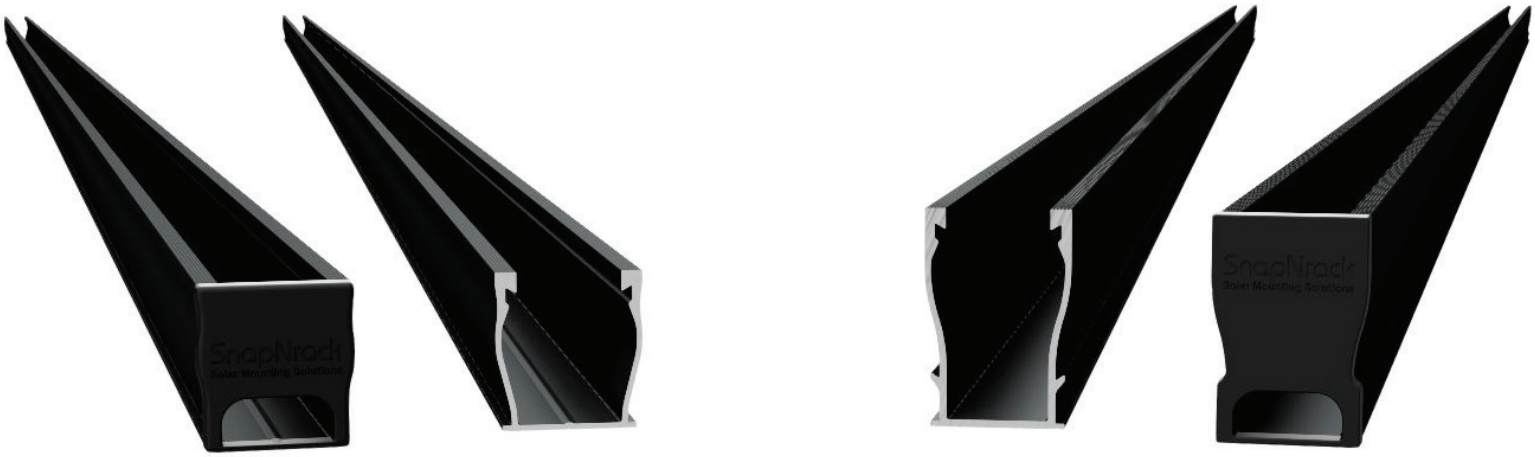
For compliance questions, a complete list of FAQs, or to request a Powerwall presentation for your building department, fire department or trade group (such as ICC and IAEI chapters) email CodeCompliance@tesla.com.

SEAC, the Sustainable Energy Action Committee, is a not-for-profit partnership of AHJs, testing laboratories and industry. SEAC has created free guidelines for building officials to plan check, correct and inspect storage battery systems for one- and two-family dwellings, available for download here.

SnapNrack™
Solar Mounting Solutions

UR-40
UR-60

Ultra Rail



The Ultimate Value in Rooftop Solar

- Industry leading Wire Management Solutions
- Mounts available for all roof types
- Single Tool Installation
- All SnapNrack Module Clamps & Accessories are compatible with both rail profiles

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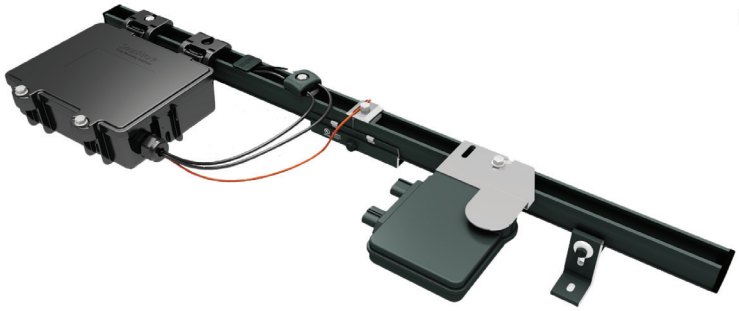
SnapNrack Ultra Rail System

A sleek, straightforward rail solution for mounting solar modules on all roof types. Ultra Rail features two rail profiles; UR-40 is a lightweight rail profile that is suitable for most geographic regions and maintains all the great features of SnapNrack rail, while UR-60 is a heavier duty rail profile that provides a larger rail channel and increased span capabilities. Both are compatible with all existing mounts, module clamps, and accessories for ease of install.

The Entire System is a Snap to Install

- New Ultra Rail Mounts include snap-in brackets for attaching rail
- Compatible with all the SnapNrack Mid Clamps and End Clamps customers love
- Universal End Clamps and snap-in End Caps provide a clean look to the array edge



Unparalleled Wire Management

- Open rail channel provides room for running wires resulting in a long-lasting quality install
- Industry best wire management offering includes Junction Boxes, Universal Wire Clamps, MLPE Attachment Kits, and Conduit Clamps
- System is fully bonded and listed to UL 2703 Standard

Heavy Duty UR-60 Rail

- UR-60 rail profile provides increased span capabilities for high wind speeds and snow loads
- Taller, stronger rail profile includes profile-specific rail splice and end cap
- All existing mounts, module clamps, and accessories are retained for the same great install experience

Quality. Innovative. Superior.

SnapNrack Solar Mounting Solutions are engineered to optimize material use and labor resources and improve overall installation quality and safety.

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OVERVIEW OF THE SNAPNRACK ULTRA RAIL SYSTEM INSTALLED ON A TYPICAL ROOF

REFER TO SPECIFIC "ATTACHMENT DETAIL" FOR DETAILS ON ATTACHING AND WATERPROOFING THE VARIOUS SNAPNRACK ROOF ATTACHMENT PRODUCTS

REFER TO SPECIFIC "COMPONENT DETAIL" FOR DETAILS ON VARIOUS SNAPNRACK ACCESSARY AND COMPONENT PRODUCTS

BOTH THE SNAPNRACK, UNIVERSAL END CLAMP AND SNAPNRACK, ULTRA RAIL END CLAMP CAN BE USED ON END MODULES

MODULES MAY BE CLAMPED ON SHORT OR LONG SIDE PER MODULE MANUFACTURER REQUIREMENTS

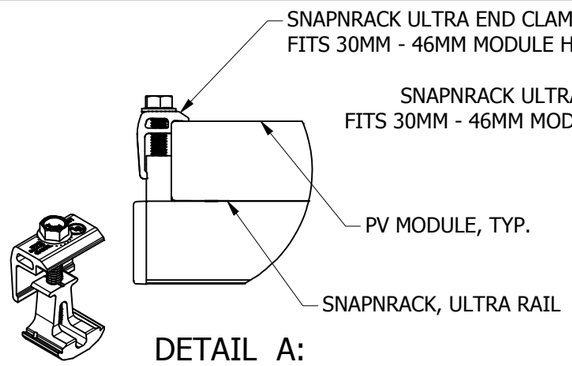
RAILS MAY BE MOUNTED UP/DOWN OR ACROSS THE SLOPE OF THE ROOF

REFER TO SNAPNRACK INSTALLATION MANUAL FOR 5/16"Ø HARDWARE TORQUE SPECIFICATIONS

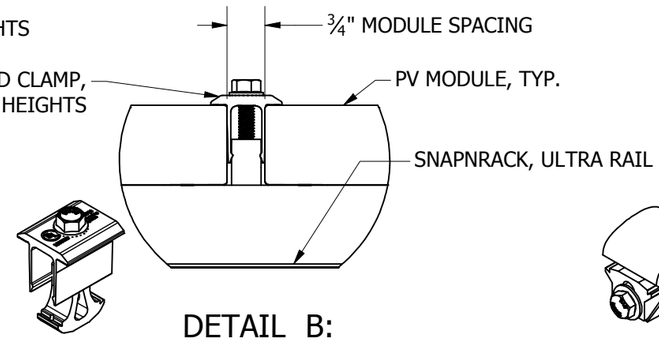
BIN: ALL

REVISION:

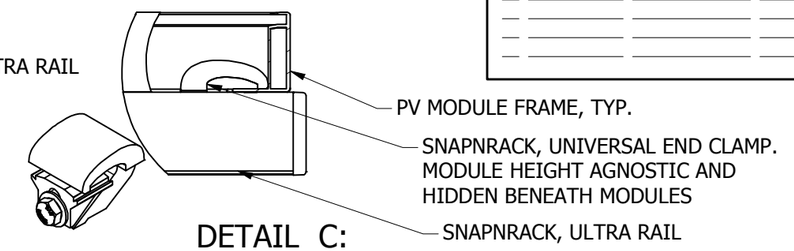
1	5/7/2019	NEW DETAIL	MJA
2	1/3/2020	ULTRA CLAMPS	MJA



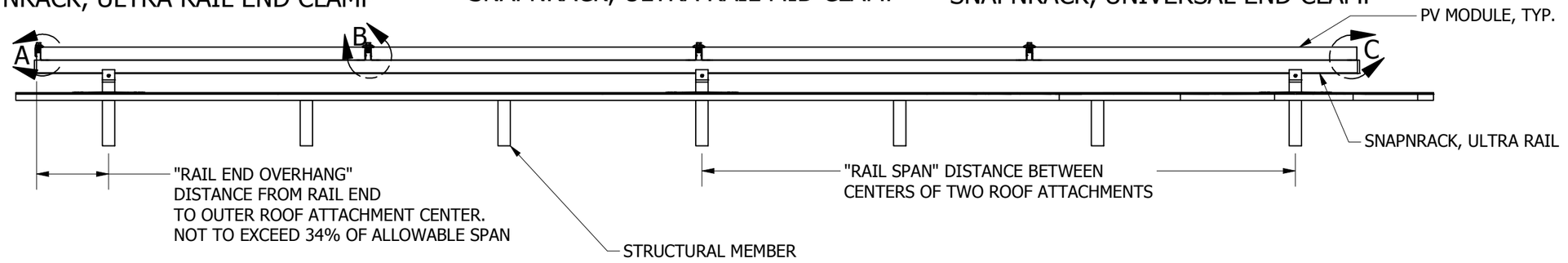
DETAIL A:
SNAPNRACK, ULTRA RAIL END CLAMP

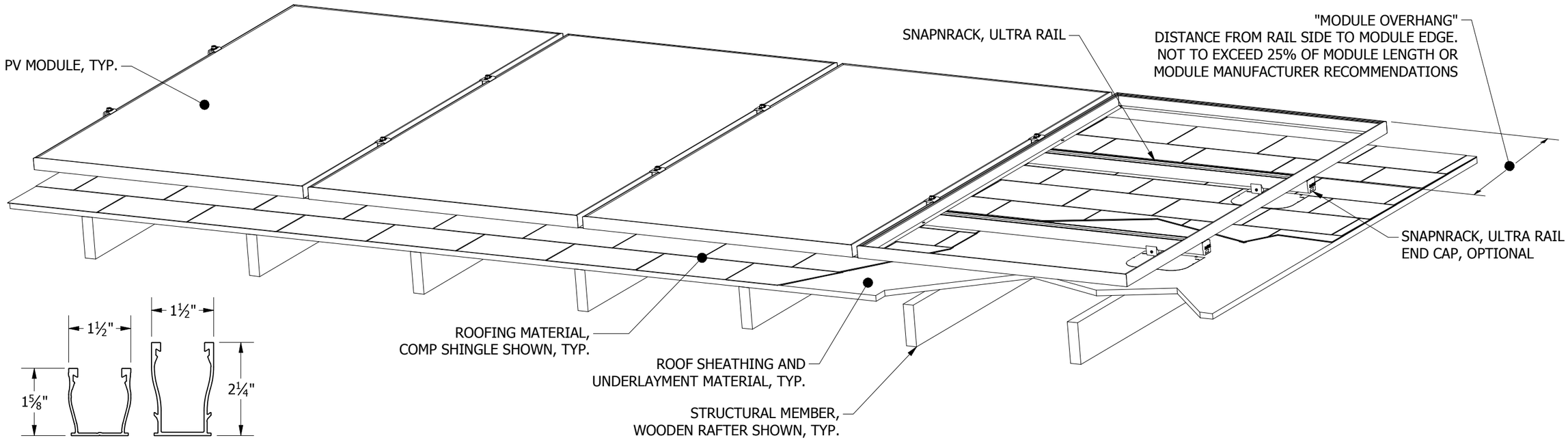


DETAIL B:
SNAPNRACK, ULTRA RAIL MID CLAMP



DETAIL C:
SNAPNRACK, UNIVERSAL END CLAMP





UR-40 RAIL | UR-60 RAIL
FOR USE WITH SNAPNRACK ULTRA SERIES RAILS

SnapNrack™ Solar Mounting Solutions

Sunrun South LLC
595 MARKET STREET, 29TH FLOOR • SAN FRANCISCO, CA 94105 USA
PHONE (415) 580-6900 • FAX (415) 580-6902

DESIGNER: M.AFFENTRANGER DRAFTER: M.AFFENTRANGER APPROVED BY: B.PETERSON	SCALE: DNS DATE: 1/3/2020	DRAWING NUMBER: SNR-DC-00329	DESCRIPTION: ULTRA RAIL, SYSTEM OVERVIEW, TYPICAL	REV 2

SNAPNRACK ULTRA RAIL UMBRELLA L FOOT WITH UMBRELLA FLASHING FOR COMPOSTION ROOF MOUNTING

REFER TO SNAPNRACK ENGINEERING CHARTS FOR APPLICABLE RAIL SPANS. "BIN" NUMBER ON CHART SHOULD MATCH "BIN" NUMBER ON THIS DRAWING

5/16"Ø S.S. UMBRELLA LAG SCREW MUST EMBED A MIN. OF 2½" INTO STRUCTURAL MEMBER

REFER TO SNAPNRACK INSTALLATION MANUAL FOR 5/16"Ø HARDWARE TORQUE SPECIFICATIONS

RAIL CAN BE MOUNTED ON EITHER SIDE OF THE L-FOOT

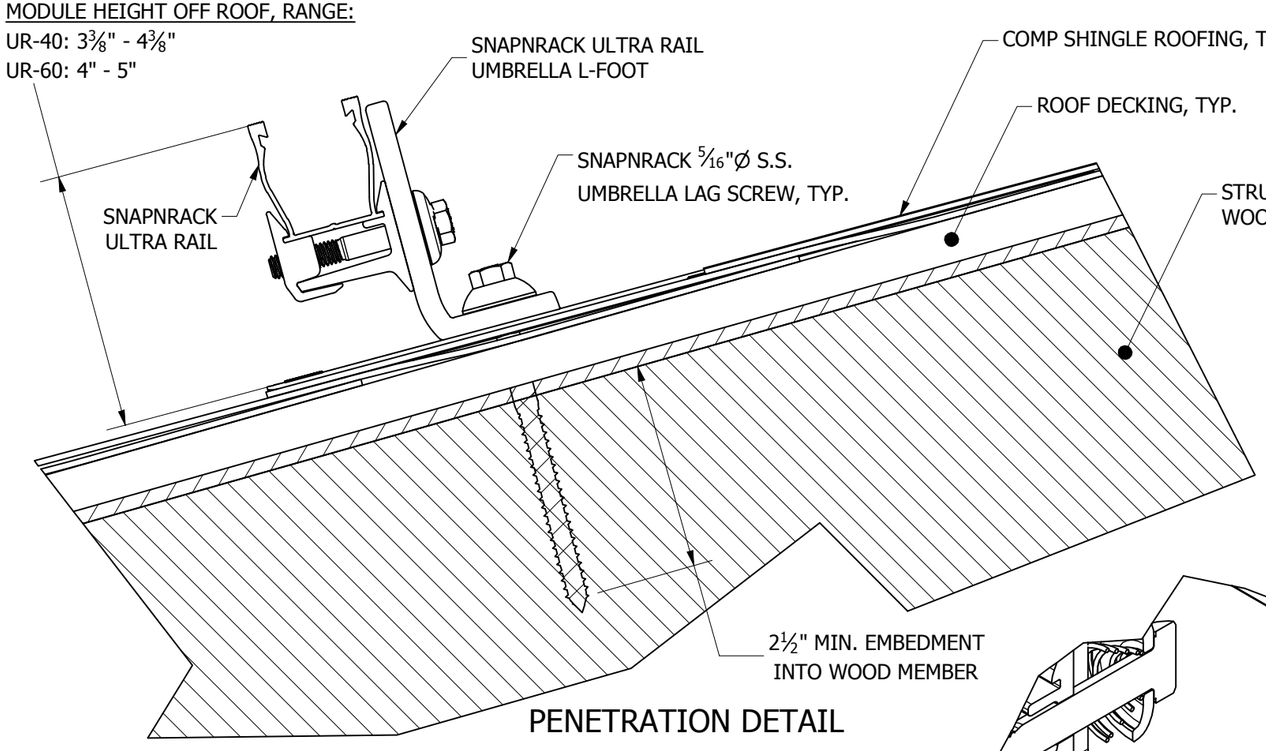
FOR LEVELING DETAILS, REFER TO SNAPNRACK DETAIL DRAWING "SNR-DC-00332 ULTRA RAIL, COMPONENT DETAIL, LEVELING EXTENSION KIT"

MODULE HEIGHT OFF ROOF, RANGE:
UR-40: 3⅜" - 4⅜"
UR-60: 4" - 5"

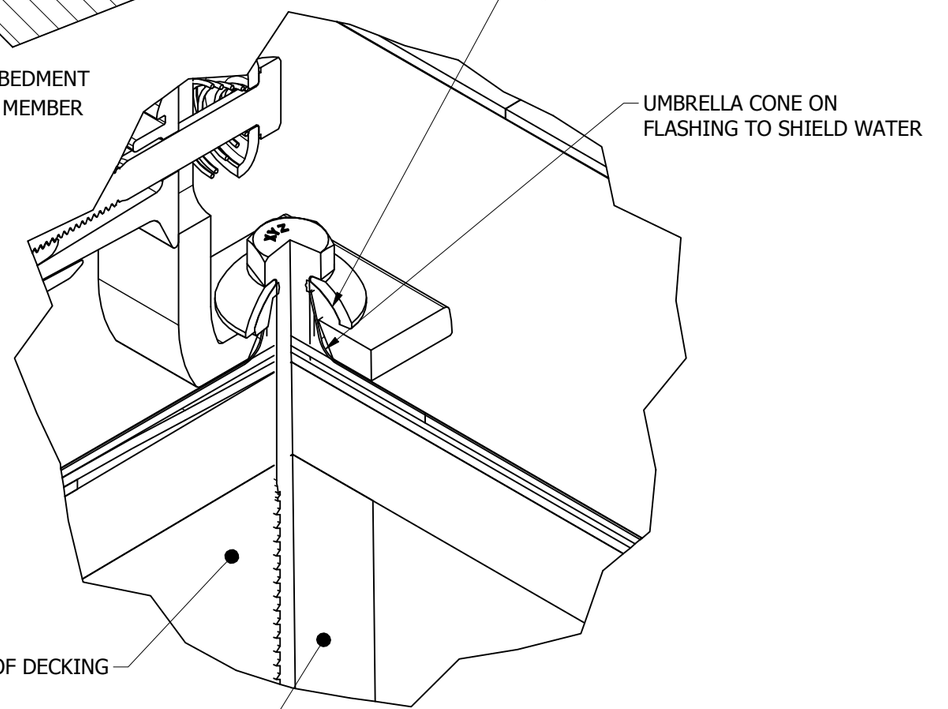
BIN: 8

REVISION:

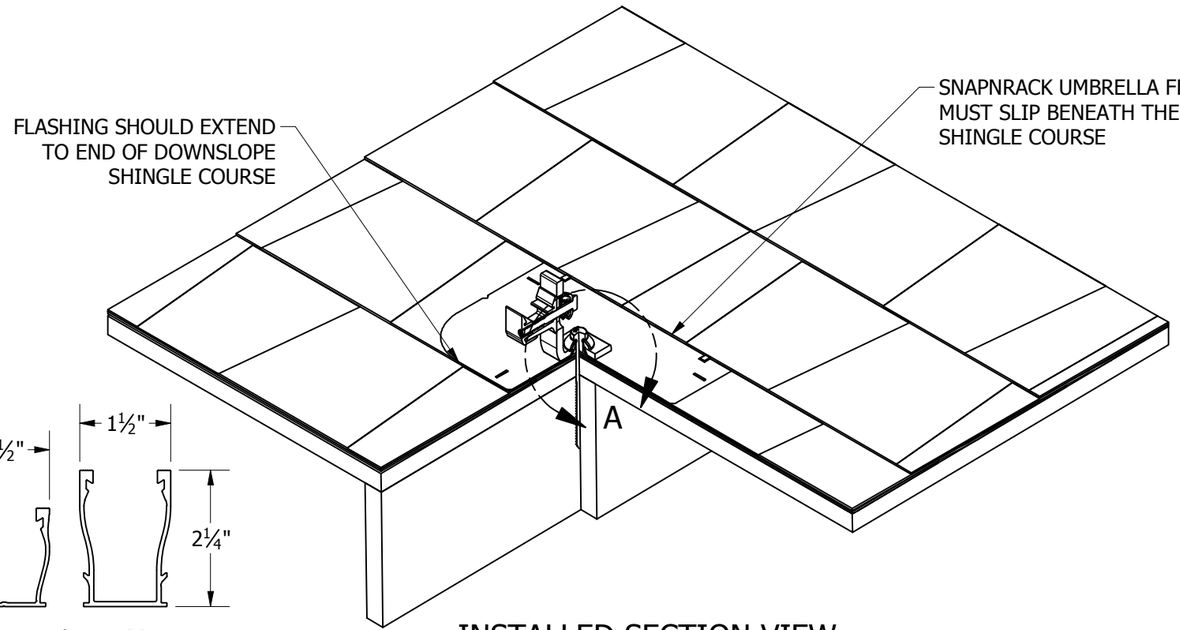
1	5/7/2019	NEW DETAIL	MJA
1	6/18/2019	DRO-00138	MJA



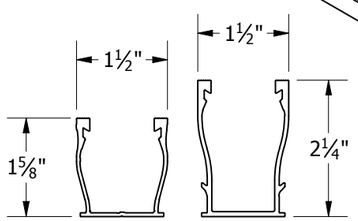
PENETRATION DETAIL



DETAIL A



INSTALLED SECTION VIEW



UR-40 RAIL | UR-60 RAIL
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Sunrun South LLC
595 MARKET STREET, 29TH FLOOR • SAN FRANCISCO, CA 94105 USA
PHONE (415) 580-6900 • FAX (415) 580-6902

DESIGNER: M.AFFENTRANGER	SCALE: DNS	DRAWING NUMBER: SNR-DC-00339	DESCRIPTION: ULTRA RAIL, ATTACHMENT DETAIL, UMBRELLA L FOOT TO RAFTER	REV: 1
DRAFTER: M.AFFENTRANGER				
APPROVED BY: B.PETERSON	DATE: 6/18/2019			