Powerwall 3 System Design Guide

This document is intended to provide resources and guidance on designing systems with Powerwall 3. This document highlights common issues but does not cover all NEC requirements. For complete installation guidelines, see the *Powerwall 3 with Gateway 3*, *Powerwall 3 with Backup Switch* and *Powerwall 3 with Backup Gateway 2* installation manuals.

DESIGN CONSIDERATIONS

Supported Configurations

- Up to (4) Powerwall 3 units can be installed with Backup Switch, Backup Gateway 2, or Gateway 3

  NOTE: Backup Switch is not certified for installation in Canada; only install Powerwall 3 with Backup Gateway 2 or Gateway 3 in Canada.

- Powerwall 3 with Backup Gateway 2 and AC-coupled solar (Tesla Solar Inverter or third party solar inverters)
- Powerwall 3 is not yet compatible with the following:
  - Neurio remote energy meters (all metering must be performed by Backup Switch, Backup Gateway 2, or Gateway 3; see *Metering Considerations on page 14* for more information)
  - Powerwall 3 with Backup Switch or Gateway 3 and AC-coupled solar (Tesla Solar Inverter or third party solar inverters)
  - Other batteries (Powerwall 2, Powerwall+, or third party batteries)
  - Stacked units (Powerwall 3 must be mounted in a side-by-side configuration)
  - Non-backup systems

Powerwall 3 Solar

- Powerwall 3 has an integrated inverter and 6 MPPTs, with a maximum solar input of 20 kW DC.
- At least one MCI is required per string for the Powerwall 3 system to function properly. Where MCIs are required to meet Rapid Shutdown (RSD) requirements, see the Powerwall 3 installation manual for required MCIs depending on PV module.

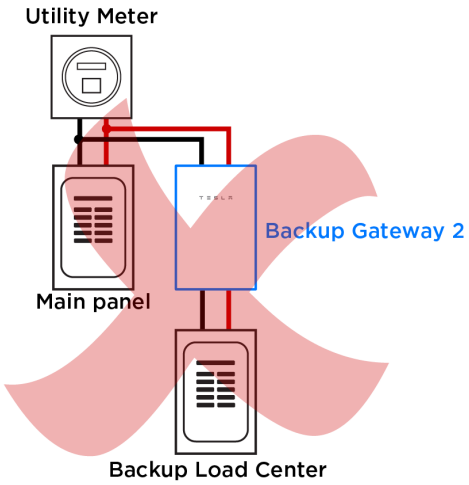
  WARNING: Where it is allowable to install only (1) MCI per string, **MCI-1 must be used**. See the Powerwall 3 installation manual for more information.

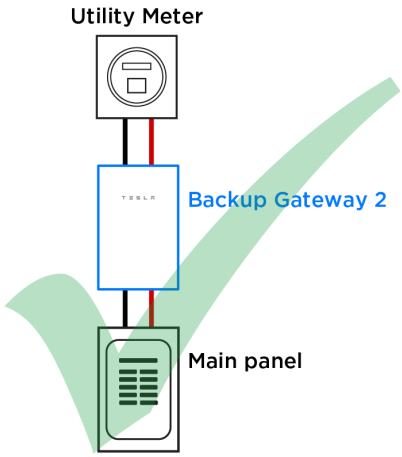
NOTE: See *AC-Coupled Solar System Sizing on page 11* for information about sizing AC-coupled solar (Tesla Solar Inverter or third party solar inverters) with Powerwall 3.

System Tie-in

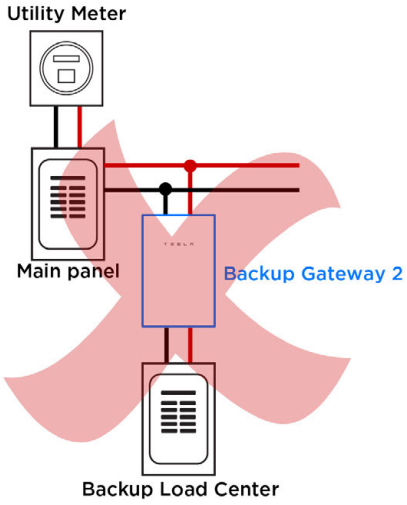
- Only Tesla devices are compatible with Powerwall; no third-party equipment in lieu of Backup Switch, Backup Gateway 2, or Gateway 3.
- Up to 200 A service with Form 2S meter socket when designing with Backup Switch.
- Backup systems must be 120/240 V single/split-phase service only.
- Backup Gateway / Gateway 3 should be installed with either a 200 A or smaller service or (in absence of a service rating) maximum 200 A of loads downstream of Backup Gateway 2 / Gateway 3 per NEC load calculations.
- No line-side or load-side taps for Backup Gateway 2 / Gateway 3 interconnection:

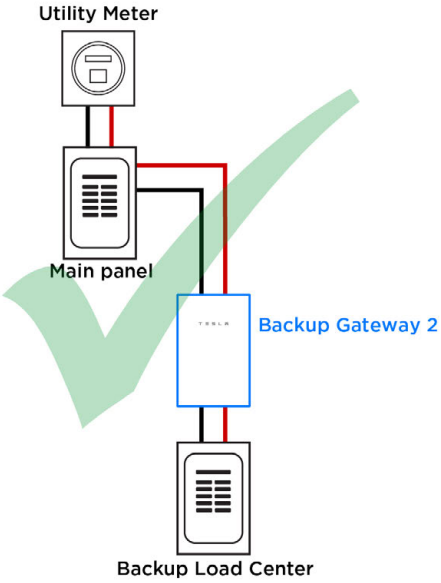
- Line Side Tap: Connecting the Backup Gateway 2 / Gateway 3 to the line side of the main panel or service disconnect by tapping existing wiring is never allowed, according to NEC 230.82. Inherently, there are always loads downstream of the Backup Gateway 2 / Gateway 3; it is not permissible to interconnect loads to the supply side of the service disconnect (left figure). It is permissible for the Backup Gateway 2 / Gateway 3 to intercept the service feeders (right figure) because the main breaker in the Backup Gateway 2 / Gateway 3 becomes the main service disconnect.



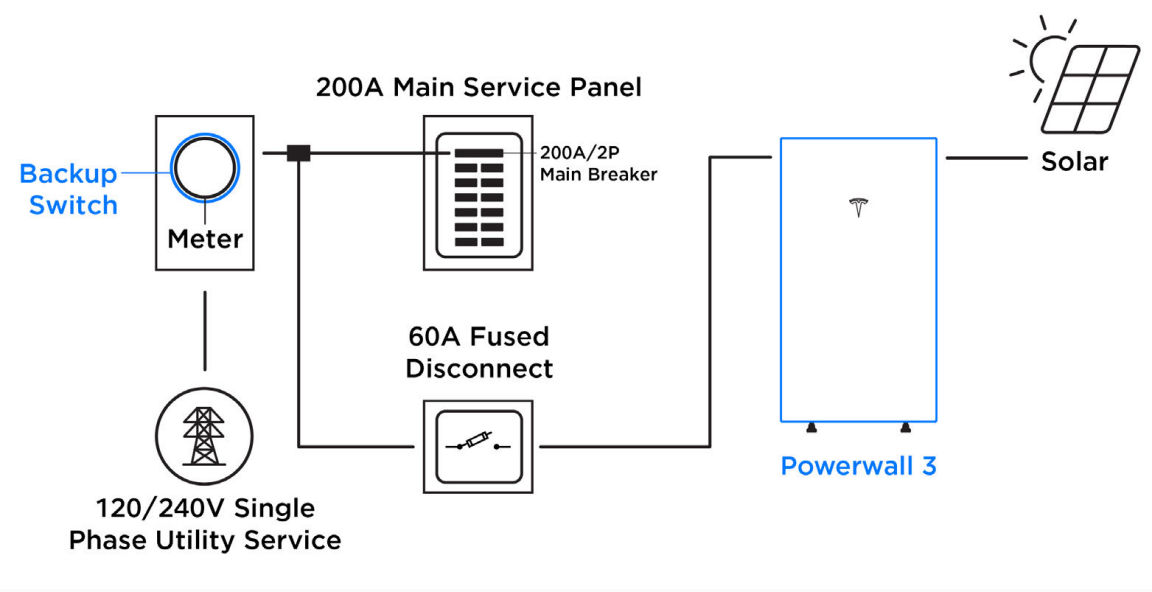


- Load Side Tap: Connecting the Backup Gateway 2 / Gateway 3 to the load side of the main panel or service disconnect by tapping via insulation-piercing connectors is non-standard practice and increases the possibility of issues and/or failed inspections. Connection to the Backup Gateway 2 / Gateway 3 must be a directly routed feed.





NOTE: When using the Backup Switch as the site relay, it is permissible to interconnect the generation panel via a tap because there are no loads downstream of the generation-only panel.



- Powerwall must not interact with (or must be completely isolated from) any other storage systems or generation sources not listed to UL 1741.
- An overcurrent protection device (OCPD) is always utilized for Powerwall 3 tie in (705.12).
  - The default required OCPD is 60 A; Powerwall 3 can be configured with a maximum current / power output, in which case one of the following breaker sizes is required

Table 1. Maximum Continuous Current Options

Maximum Continuous Current	Output (AC)	Breaker (Overcurrent Protection)
48 A	11.5 kW (default)	60 A
41.7 A	10 kW	60 A
31.7 A	7.6 kW	40 A
24 A	5.8 kW	35 A

CAUTION: If using a fuse as the Powerwall 3 overcurrent protection device, it must be a Class RK1 Fast Acting fuse. Use one of the following fuses or equivalent:

Fuse Type	Manufacturer	Part Number
60 A Fast-Acting Fuse, Class RK1, >= 250VAC, CLF	Littelfuse	KLNR60
	Eaton / Bussmann	KTN-R-60
	Mersen / Ferraz Shawmut	A2K60R
40 A Fast-Acting Fuse, Class RK1, >= 250VAC, CLF	Littelfuse	KLNR40
	Eaton / Bussmann	KTN-R-40
	Mersen / Ferraz Shawmut	A2K40R
35 A Fast-Acting Fuse, Class RK1, >= 250VAC, CLF	Littelfuse	KLNR35
	Eaton / Bussmann	KTN-R-35
	Mersen / Ferraz Shawmut	A2K35R

- Controlled sources such as Powerwall 3 can avoid the supply rules of NEC 705.12, including the 120% rule, when panel limits are used and backfeed is limited using software (also known as a Power Control System (705.13)), so no backfeed calculation is required. See *Power Control System (PCS) Features for Powerwall Systems* for more information.
- Recommend that total Powerwall supply is able to power the single largest automatic load in the backup circuit (see *Backup Loads Supported per Powerwall Quantity on page 6*).
- Any/all backup load centers abide by 705.12 or 705.13 and are adequately protected with an overcurrent protection device.
- A load center with generation and any others upstream must abide by 705.12 or 705.13.
- Site and solar monitoring must be installed to capture overall power flow to/from the site, as well as all solar production.
- Powerwall, Backup Gateway, and Backup Switch are rated for 10 kA of fault current. If potential fault current onsite is greater than 10 kA:
    - A J-class fuse upstream of the Backup Gateway 2 can be utilized to make the Backup Gateway 2 rated for 22 kA.
    - Backup Switch is rated for 22 kA when a minimum 22 kA main breaker is used in conjunction with the Backup Switch.
- Gateway 3 is rated for 25 kA of fault current when installed with an Eaton CSR or BWH main breaker, or 22 kA when installed with a Square D QO main breaker.
- Multiple Backup Gateways can be installed on a single site to accommodate sites with greater than 200A service equipment; see the *Multiple Backup Gateways on a Single Site* Application Note on Partner Portal.

Equipment Location

Powerwall is not installed in habitable locations.

SYSTEM SIZING

The following resources explain how to size the Powerwall 3 system to meet customer expectations, as well as how to determine which loads can be included in the backup circuit and what to do with loads that cannot be included.

Backup Loads Supported per Powerwall Quantity

- The largest load in the backup circuit is limited by the quantity of Powerwalls; each Powerwall 3 can support the largest load/breaker size of 60A.
- See the multi-Powerwall installation appendix in the *Powerwall 3 with Backup Switch*, *Powerwall 3 with Backup Gateway 2*, or *Powerwall 3 with Gateway 3* installation manual for requirements for installing multiple Powerwall units.

AC Units and Large Motor Loads

- Inrush current (largest instantaneous current draw when a motor starts) is limited to 185 A LRA per Powerwall 3.
- For air conditioner units, use LRA on equipment label as inrush current.
- Other motor loads – Code Letter per 2017 NEC Table 430.7(B), measure inrush via clamp meter identified by manufacturer as capable of measuring < 0.25 second inrush current, or oscilloscope if no code letter or LRA value is listed.
- Design Options if motor LRA is greater than the number of Powerwall 3 units multiplied by 185A:
    - Increase number of Powerwalls
    - Relocate AC unit/motor load out of backup circuit
- Example:
    - Motor Load unit with 200 A LRA and utilizes a 60A/2P Breaker
    - Required Powerwall(s): (2) Powerwall 3 units required, so that 200A < 370A

> **NOTE:** Double-check that the AC breaker follows the Powerwall breaker sizing rules.

EV Charging

Type of Electric Vehicle Charging	Compatibility
Tesla vehicle charging (Wall Connector or Tesla Mobile Connector)	1 Powerwall
Third-Party Level 1 EV charging	1 Powerwall
Third-Party Level 2 EV charging	1-2 Powerwalls*

*(2) Powerwall 3 units are required for third-party Level 2 EV chargers above 11.5 kW.

Per the *Vehicle Charging During Outage feature*, the system will adjust the charging power during an outage to ensure Powerwall can continue to support the home without overloading Powerwall, and will only charge the vehicle when the percentage of charge is higher than the limit set by the customer.

Powerwall 3 DC System Sizing

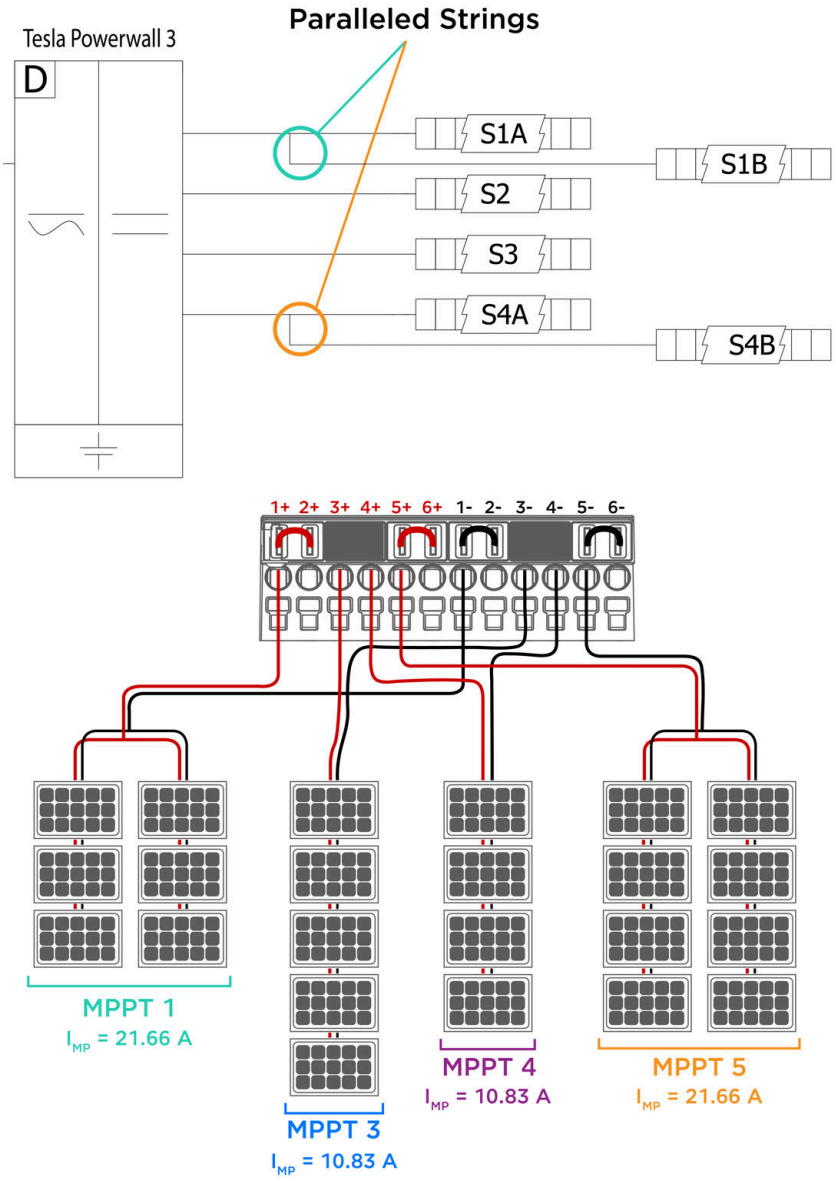
- Powerwall 3 can be configured as up to a 11.5 kW AC rated inverter that can support up to a maximum DC system size of 20 kW.
  - 20 kW DC is the absolute maximum solar system size that Powerwall 3 can support.
  - Powerwall 3 has a boosting feature that can send 5 kW continuously from solar to the battery at the same time that 11.5 kW of solar is inverted to AC power, leading to a potential total DC power of 16.5 kW. This helps alleviate clipping concerns and enables sizing the DC system larger, but only if the battery is being used in a way that it will have available charge power during the peak solar production hours of the day.
  - If Powerwall 3 is power / current limited, a larger DC solar system size may experience curtailment. Size the DC solar system appropriately based on the configured power / current output.
  - Where clipping may occur, the amount of clipping depends on the specific scenario.
- Each Powerwall 3 has (6) MPPTs available for Solar. When strings are combined on the roof, the following MPPTs can be jumped to double the total PV input current capacity to 26A:
  - MPPT 1 to MPPT 2
  - MPPT 5 to MPPT 6

NOTE: MPPT inputs 3 and 4 cannot be jumped and are closed from the factory.

NOTE: For Solar Roof and older PV modules with I_{MP} < 6.5A, the jumper is not required.

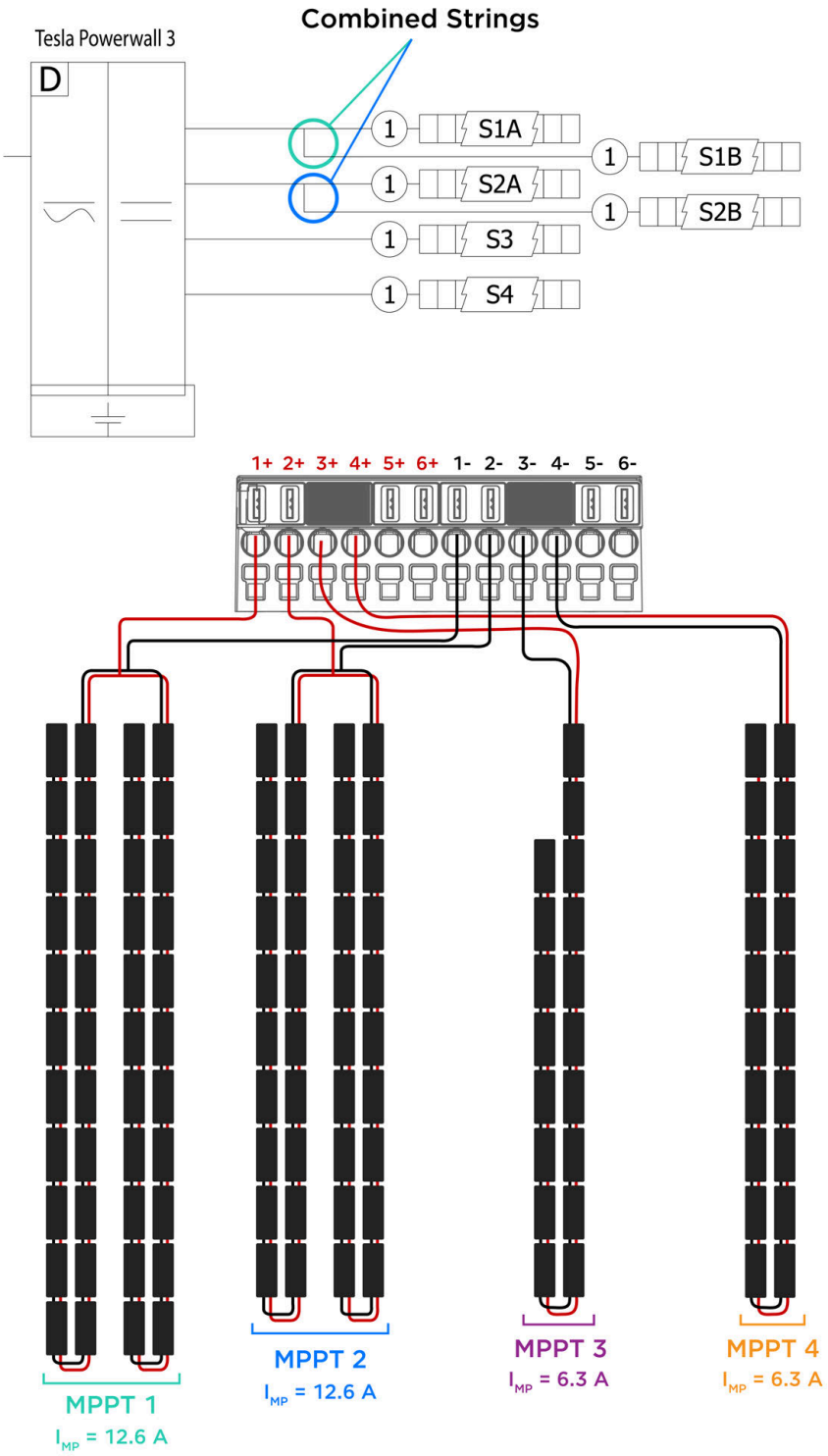
NOTE: If there are more than three PV strings, strings can be combined upstream of Powerwall 3 so long as the voltage and current ratings of the system do not exceed the capabilities of Powerwall 3.

Figure 1. Powerwall 3 with Solar Panels Stringing Example:



NOTE: In the example above, the strings connected to MPPTs 1 and 5 are combined on the roof, so jumpers are required.

Figure 2. Powerwall 3 with Solar Roof Stringing Example:



- When calculating the minimum and maximum number of modules per string, use the *Tesla Solar Stringing Tool* on Partner Portal. For instructions on how to use the tool, see the *User Guide*. Or, you can use the following variables and equation:
  - A = VOC at standard test conditions (STC) for the modules
  - B = Voltage temperature coefficient
  - C = Number of modules in string
  - A * B * C = **X**

- 60 ≤ **X** ≤ 550V

- Total DC circuit distance, from + MPPT terminal to - MPPT terminal (including module wire leads, jumper wires and all wiring within the array boundary for any individual string), shall not exceed 160 m for single strings or paralleled strings
  - Total DC circuit distance refers to the entire round trip wire distance, from inverter to the roof, then back to the inverter
  - Ensure paralleled strings are the same distance, or as close to the same distance as possible (if the paralleled strings are different distances, it is likely the MCIs will not function properly; this likelihood increases the greater the difference in paralleled string distances)

- Powerwall 3 is a string inverter. Individual strings should not be extended over mounting planes with different pitches and/or azimuths to provide peak performance of the system. Series strings must have modules on the same pitch & azimuth, and strings of equal distance can be combined in parallel.
  - Note that a situation where all 20 kW kW are simultaneously producing at peak may result in solar clipping. Tesla recommends, but does not require, diversifying azimuths when the array is significantly oversized. The (6) MPPTs are particularly suited for sites where the strings may not be on the same azimuth and are therefore not producing at peak simultaneously.

- If installing multiple Powerwall 3 units, it is recommended but not required to distribute the DC PV system across all Powerwall 3 units so that each Powerwall 3 receives the benefits of DC coupling solar

Available Third-Party Solar Design Tools

Powerwall 3 has been added to the following solar design tool databases:

- Aurora
- Sunobi

AC-Coupled Solar System Sizing

DC-coupled solar (connected directly to Powerwall 3) is strongly preferred over AC-coupled solar for the following reasons:

- Less equipment required for DC-coupled solar, resulting in reduced system cost
- Increased efficiency for DC-coupled solar
- Low energy management during a grid outage

In some scenarios, it is difficult or not feasible to avoid systems with AC-coupled solar. Most commonly, this occurs when Powerwall 3 is installed on a system with existing AC-coupled solar. As shown below, solar can be installed alongside Powerwall 3 solar, or with Powerwall 3 as storage only.

Figure 3. Powerwall 3 with AC and DC Coupled Solar

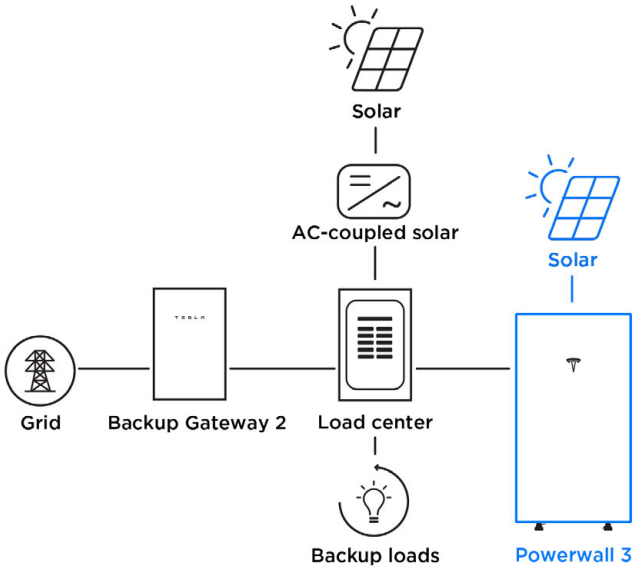
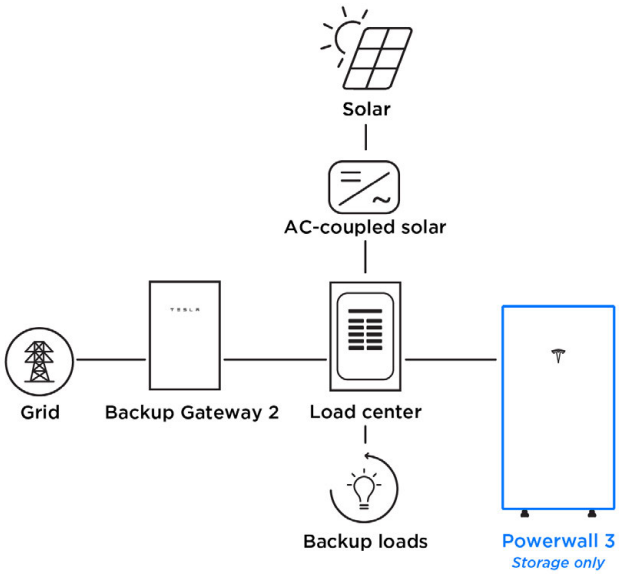


Figure 4. Powerwall 3 with AC Coupled Solar (Storage Only)



For systems with AC-coupled solar only, a maximum of 7.68 kW AC per Powerwall is allowed in the backup circuit (the smaller of AC inverter rating or DC system size[1]).

[1]The 7.68 kW PV to Powerwall ratio was put in place to protect the Powerwall system from excessive PV power during a grid outage. 7.68 is used because it is a common solar inverter size, allowing more PV systems to be fully backed up without needing to be split apart, and inverters don't always produce their maximum power. This ratio does not prevent all issues; Powerwall's maximum charge rate is 5 kW under ideal conditions (notably operating temperature). If there is more than 5 kW of excess PV per Powerwall, the system will frequency shift to try to reduce PV power, and may have to shut PV production down completely.

NOTE: The AC-coupled PV to Powerwall ratio and the maximum DC solar system sizing are independent of each other. See *Powerwall 3 DC System Sizing on page 7* for information about sizing the Powerwall 3 DC system.

NOTE: When using Tesla Solar Inverters, the number of inverters is not impacted by the PV to Powerwall ratio (the maximum number of Tesla Solar Inverters in the backup circuit is 200A, or 5 Solar Inverters).

CAUTION: Exceeding the PV to Powerwall ratio may result in high fault current during a grid outage, which creates a serious risk of damage to Powerwall and/or the customer's home loads. If a Powerwall is damaged by high fault current due to excess PV during an outage, it will be out of warranty.

Options to avoid exceeding the ratio:

1. Increase number of Powerwalls on site
2. Utilize Tesla Brand Solar Device for all PV on site to avoid PV to Powerwall ratio
3. Split PV Inverter Point of Interconnection, In / Out of backup (confirm with local AHJ that this practice is accepted)
4. Downsize PV to meet ratio
5. Shed part of the PV system using grid dependent relays/contactors

Powerwall Qty	Maximum continuous output of solar array (kW)	Examples	Explanation
1	7.68	10 kW DC solar on 7.68 kW AC inverter	Allows solar over 7.68 kW DC because the output will be capped to 7.68 kW AC by the (overdriven) inverter. The Powerwall will not see more than 7.68 kW solar.
		7.68 kW DC solar on 10 kW AC inverter	While the inverter is capable of 10 kW AC, the 7.68 kW DC solar array will not produce more than 7.68 kW AC solar.
2	15.36	20 kW DC solar on (2) 7.68 kW AC inverters	Allows solar over 15.36 kW DC because the total output will be capped to 15.36 kW AC by the (overdriven) inverters.
		15.36 kW DC solar split between (1) 6 kW AC inverter and (1) 10 kW AC inverter	The 16 kW AC combined output of the inverters can exceed 15.36 kW because the 15.36 kW DC solar array will not produce more than 15.36 kW AC solar. Note that the solar does not need to be evenly split in the ratio; instead, consider the total output.

NOTE: The 7.68 kW PV to Powerwall ratio can be applied to any Powerwall unit in the system, including Powerwall+ or Powerwall 3. For example, a 7.68 kW third party solar inverter can be backed up with a single Powerwall+ or Powerwall 3, as the ratio rule does not apply to the solar inverter portion of the Powerwall+ or Powerwall 3.

Undersized Powerwall 3 Systems

If a customer acknowledges that they are willing to back up a large load that violates Tesla's guidance on what can be included in backup, design can proceed as long as the customer provides acknowledgment that they accept an undersized system.

NOTE: Undersized systems cannot be designed if the AHJ does not allow oversized loads in the backup circuit.

METERING CONSIDERATIONS

NOTE: Powerwall 3 is not compatible with any remote energy meters, including Neurio remote energy meters.

Site Metering

Backup Gateway 2, Gateway 3, and Backup Switch have internal meters (Internal Primary Meter X in Backup Gateway 2 and Meter Z for Backup Switch / Gateway 3) for monitoring Site. Please ensure that the Powerwall 3 system can meter the entire site using the meters available, including Meter Y for Non-Backup loads that are upstream of Backup Gateway 2. This means that currently:

- Powerwall 3 can only be used on services up to 200A (unless installing multiple Gateways).
- Powerwall 3 systems cannot meter more than 100A of non-backup loads.

Reminder: Backup Switch and Gateway 3 installs are always whole home backup; Meter Z inside Backup Switch / Gateway 3 is always configured as Site and cannot be changed. When Backup Switch / Gateway 3 is installed, no other meters can be configured as Site.

Solar Metering

- **Powerwall 3 Solar**: Powerwall 3 performs its own solar metering. No additional Solar metering needs to be installed or configured for Powerwall 3.
    - Powerwall 3 can also be used without any solar on the site.
- **AC-coupled Solar (Tesla Solar Inverter or third party)**: All AC-coupled solar must be monitored; at the time of this document's publication, the only option for metering Solar is using Tesla CTs connected to Backup Gateway 2.
    - AC-coupled solar cannot be installed on sites with Powerwall 3 and Backup Switch or Gateway 3 because there is no way to meter Solar.

CAUTION: If AC-coupled solar is not metered correctly, Powerwall will not frequency shift to control solar during a grid outage, resulting in a serious risk of damage to the customer's home loads and/or Powerwall.

EQUIPMENT LOCATION

When deciding where each component in the Powerwall 3 system will be mounted, consider product clearances, environmental requirements, code restrictions, and overall install efficiency. Best practice is to co-locate equipment to minimize conduit run and minimize aesthetic impact to the home. Attempt to respond to permit rejections regarding location with resources found on Partner Portal (such as *Residential Code for ESS and When to Escalate*). If unsuccessful, ensure the BOS location abides by the local code.

The following sections outline specific product requirements on equipment location (set by Tesla to ensure the product performs as intended) and code requirements on equipment location (determined by the codes enforced in your jurisdiction).

Product Mounting Requirements

Product mounting requirements can be found in the appropriate installation manual:

- *Powerwall 3 with Backup Gateway 2 Installation Manual*
- *Powerwall 3 with Backup Switch Installation Manual*
- *Powerwall 3 with Gateway 3 Installation Manual*

Each manual includes the following useful information:

Maximum distance between components	**Plan Distance Between Components** in *Step 1: Plan the Installation Site*
Minimum mounting clearances	**Powerwall 3 Space Requirements** in *Step 1: Plan the Installation Site*
Mounting bracket anchoring requirements	**Mounting Bracket Anchoring Details** in *Appendix A: Powerwall 3 Mounting Details*

NOTE: Powerwall 3 cannot be mounted in a stacked configuration. Units must be mounted side-by-side to ensure the wiring compartment remains accessible (see *Appendix A: Code Requirements on page 24* for commonly enforced codes).

Restricted Powerwall 3 Installation Locations

Powerwall 3 may NOT be mounted in any of the following locations:

- Habitable spaces (defined as any location used for sleeping, lounging, cooking, eating, etc.)
- Interior hallways

NOTE: See *Residential Code for ESS and When to Escalate* on Partner Portal for more information on how various codes apply to installing Powerwall systems, including Powerwall 3 installation location.

Recommended Powerwall 3 Locations (In Order of Most to Least Preferable)

1. Exterior wall within 10' of meter (providing job is not in a Cold Weather Area)
2. Interior space within 10' of the meter that is NOT habitable (must meet local code requirements)
3. Exterior wall greater than 10′ from meter
4. Interior space greater than 10' of the meter that is NOT habitable

Common Mounting Restrictions (Varies by Code)

The following restrictions are examples that commonly result in permitting and inspection issues if they are not followed.

- Setbacks from windows and doors entering living space
- Drywall requirements for interior installations
- Interconnected heat detectors for interior installations
- Vehicle deterrents when the Powerwall is considered in the path of the vehicle

In addition to the Powerwall 3 mounting clearances, all BOS locations must abide by NEC 110.26 clearance requirements.

NOTE: See *Residential Code for ESS and When to Escalate* for more information on how various codes apply to installing Powerwall systems, including the points listed above, as well as information on when to escalate rejections to Tesla.

ELECTRICAL DESIGN CONSIDERATIONS

Tesla products are intelligently designed to meet a variety of code requirements, with some features designed to meet specific code requirements without the need for additional auxiliary equipment. The following sections outline some of those features and how to use them strategically to meet requirements. Some jurisdictions may require additional equipment based on local requirements.

Backup Switch / Backup Gateway 2 / Gateway 3 Tie-in

The following sections outline where the Backup Switch / Backup Gateway 2 / Gateway 3 can be installed, and provide details about interconnecting the equipment to the existing home electrical system.

Backup Switch Tie-in

Backup Switch can be installed where the following are true:

- Meter is single-phase Form 2S and physically accepts Backup Switch
- Meter CL rating is CL100 or CL200
- Main breaker rating is 200A or less
- AHJ and Utility accepts Backup Switch

Backup Gateway 2 Tie-in

- Input Lugs Rating: 200A
- Output Lugs Rating: 200A per lug
- Main Breaker Rating: 100A-200A, Service Entrance Rated
- Breaker Brand:
    - Main Breaker Space: Eaton BW (10 kAIC) OR CSR (25 kAIC)
    - Branch Breaker in Busbar: Eaton BR
- Internal Busbar Rating: 200A, 125A Max Branch Breaker
- Internal Busbar Size: 6 Spaces, 12 Circuits
- Non-Backup Lug Rating: 100A
- Rated Frequency: 60 Hz
- Service Compatibility: 120/240V, 1 Ø
- Optional Internal Panelboard:
    - Can be utilized as Backup Panel, Generation Panel, or Non-Backup Panel inside Backup Gateway
    - Eaton 200A rated 6 space / 12 circuit breaker busbar that supports max 125A Eaton BR breakers, or Siemens QP or Square D HOM breakers up to 80A. Supports Quad / Thin breakers
    - Can be installed with Main Breaker
    - When utilized as Non-Backup Panel, limited to 100A (due to Non-Backup Lugs) and required OCPD

Gateway 3 Tie-in

- Input Lugs Rating: 200A

- Output Lugs Rating: 200A per lug
- Main Breaker Rating: 100A-200A, Service Entrance Rated
- Main Breaker Brand:
  - Eaton BW (10 kAIC), or BWH / CSR (25 kAIC)
  - Square D QOM (22 kAIC)
- Branch Breaker Brands - Up to 125 A Rating:
  - Eaton BR
  - Siemens QP
  - Schneider / Square D Homeline
- Internal Busbar Rating: 200A, 125A Max Branch Breaker
- Internal Busbar Size: 8 Spaces, 16 Circuits
- Rated Frequency: 60 Hz
- Service Compatibility: 120/240V, 1 Ø

Disconnecting Means

When designing a system that must have a "Disconnecting Means" as defined by Article 100 of the National Electrical Code, there are two available methods for disconnecting Powerwall 3 from connected circuits: the Enable switch with locking cover on the side of Powerwall 3, and a certified Emergency Stop button field-wired to Powerwall 3 via a low voltage (12V DC) power circuit. Both methods, when initiated, de-energize AC and DC conductors associated with the PV and energy storage systems and can be locked in the off position with a standard padlock or similar Lock-Out/Tag-Out device. See the *Disconnecting Means for Tesla Powerwall 2, Powerwall+, and Powerwall 3 AHJ letter* on Partner Portal for more information on how each of these methods qualifies as a "Disconnecting Means".

For more information on installing an Emergency Stop button with Powerwall 3, see the appropriate installation manual:

- *Powerwall 3 with Backup Gateway 2 Installation Manual*
- *Powerwall 3 with Backup Switch Installation Manual*
- *Powerwall 3 with Gateway 3 Installation Manual*

NOTE: The Powerwall 3 AC breaker serves as a secondary disconnecting means.

Meeting Rapid Shutdown (RSD) Requirements

Powerwall 3 performs Rapid Shutdown (RSD) in compliance with NEC 2017, 2020, and 2023 690.12(B)(2) and 690.12(B)(1) and UL1741 standards to reduce shock hazard for emergency responders. To meet these RSD requirements, Tesla Mid-Circuit Interrupters (MCIs) must be installed within PV strings and arrays. For technical details and installation requirements for the Tesla MCI, see the Powerwall 3 installation manual.

To calculate how many MCIs are required for PV array based on the inside-the-array boundary voltage limit, see the *UL 3741 Application Addendum*. Tesla does not assist with these calculations; it is the sole responsibility of the Certified Installer to maintain code compliance.

NEC 705 Interconnection Code Compliance

705.12 Code Compliance

Powerwall 3 has a UL1741 inverter, so NEC 705.12 must be considered in the design of Powerwall systems.

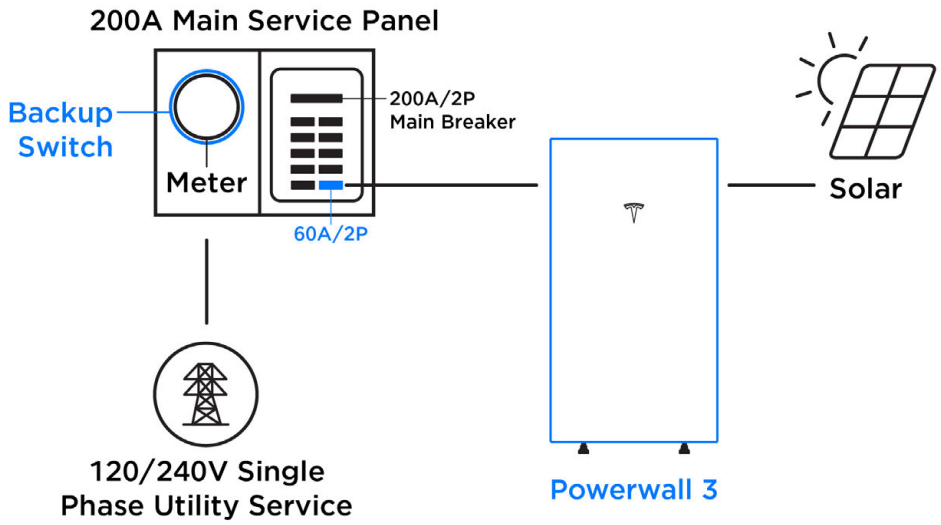
Max continuous AC output current = 48A

NEC 2020 705.13 Power Control System (PCS) (Also Called Energy Management System, or EMS)

Powerwall 3 and the Backup Gateway 2 / Gateway 3 / Backup Switch have achieved UL 1741 PCS certification, which allows Powerwall to limit its charge/discharge rate to programmed limits. This feature can be used to comply with NEC 705.13 without the need to upgrade main panels or perform load relocations, saving both time and cost on installations. PCS can be utilized when the AHJ is on NEC 2020, or when the AHJ allows PCS as a means for complying with 705.12. See the *Power Control System (PCS) Features for Powerwall Systems application note* for more information.

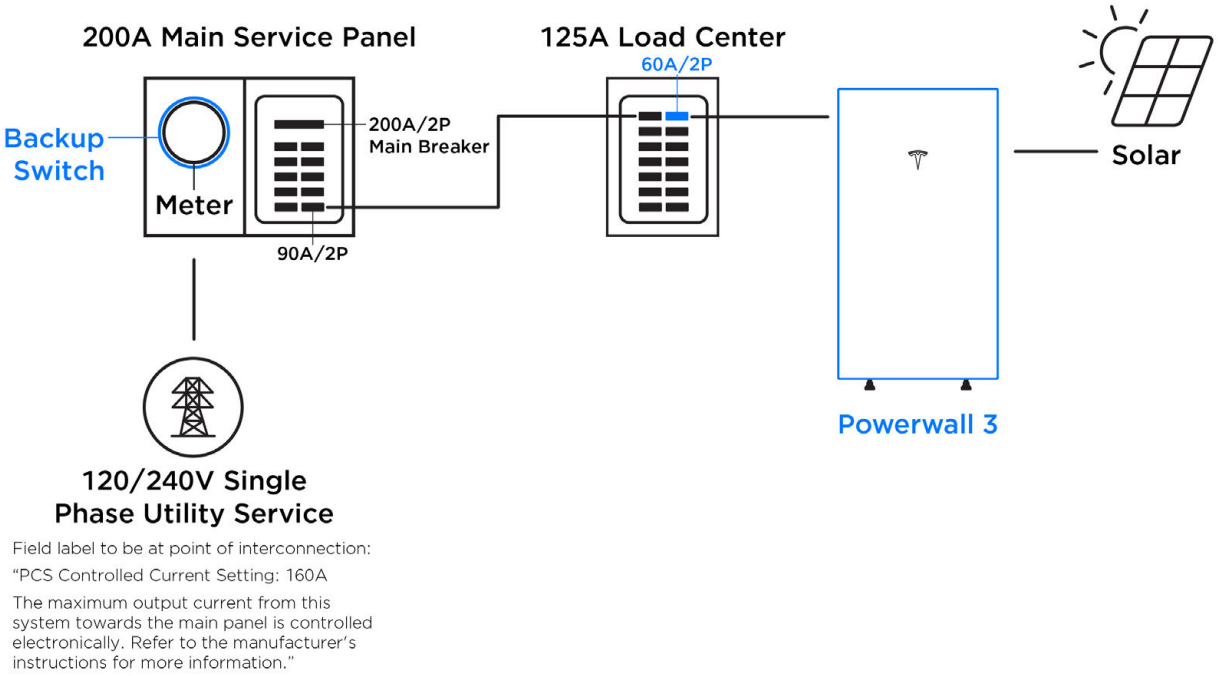
NOTE: Any uncontrolled power sources must still comply with NEC 705.12.

Electrical Configuration Examples with Compliance Notes

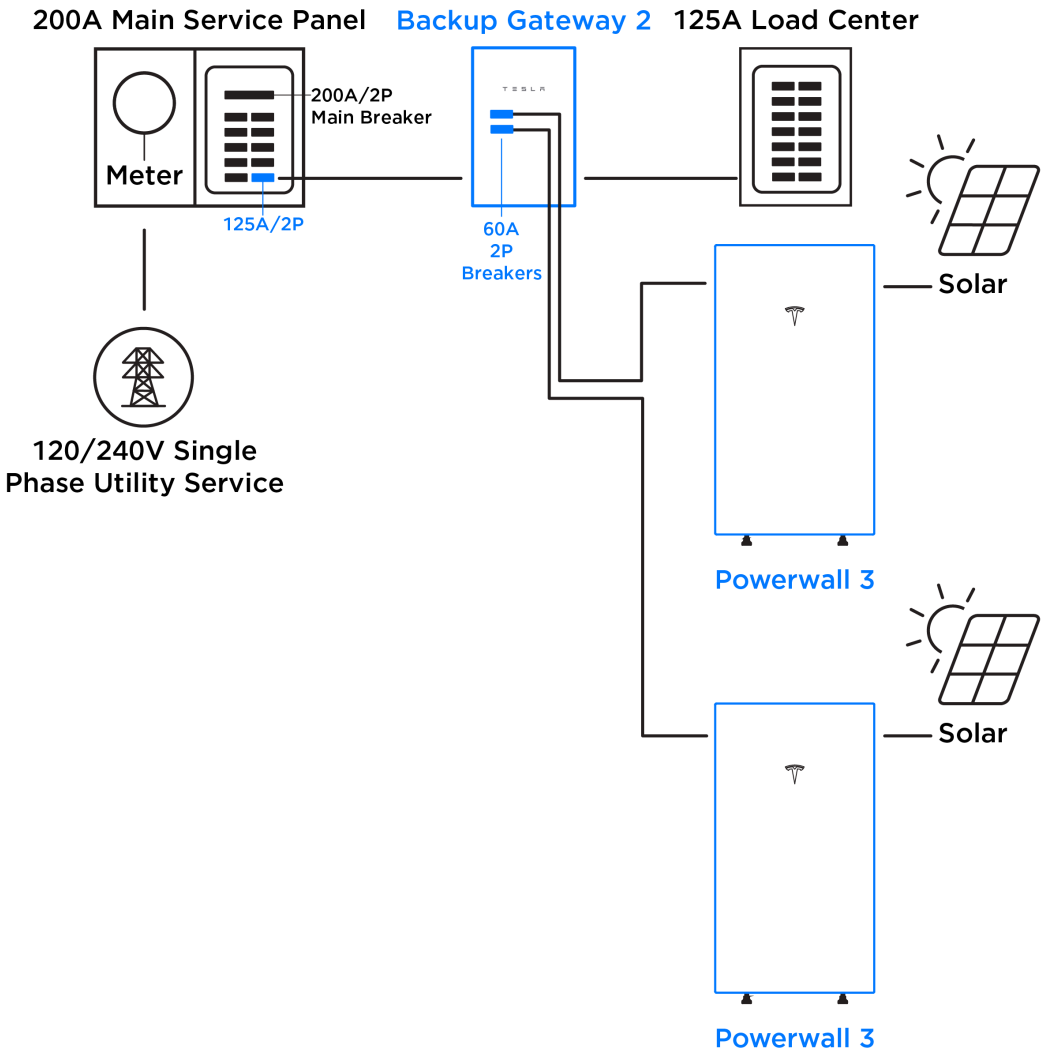


• Powerwall 3 interconnected on the load side of the service • A 60A overcurrent protection device in the main panel • The Backup Switch acting as the islanding relay at the meter	NEC 2020 / 2023 705.13

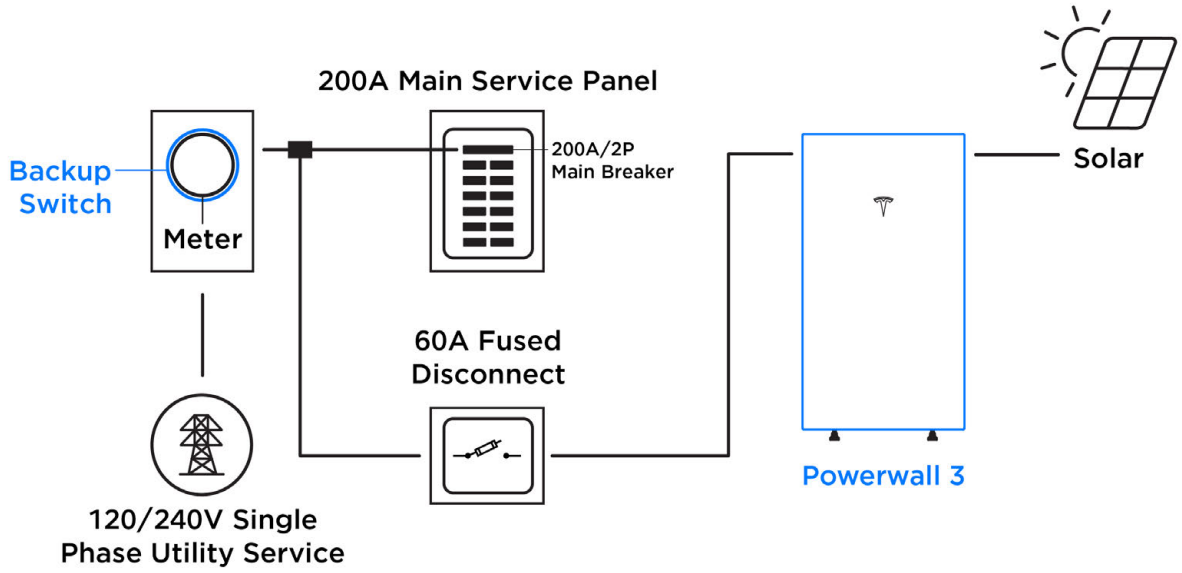
ELECTRICAL DESIGN CONSIDERATIONS



• Powerwall 3 interconnected on the load side of the service • A 60A overcurrent protection device in the main panel • The Backup Switch acting as the islanding relay at the meter • The Power Control System in the Powerwall units limit the current and loading on the bus and conductors to meet 705.13 requirements • Main Service Panel does not support hold down kit requirement, so Powerwall 3 breaker is placed in subpanel that can support hold down	NEC 2020 / 2023 705.13

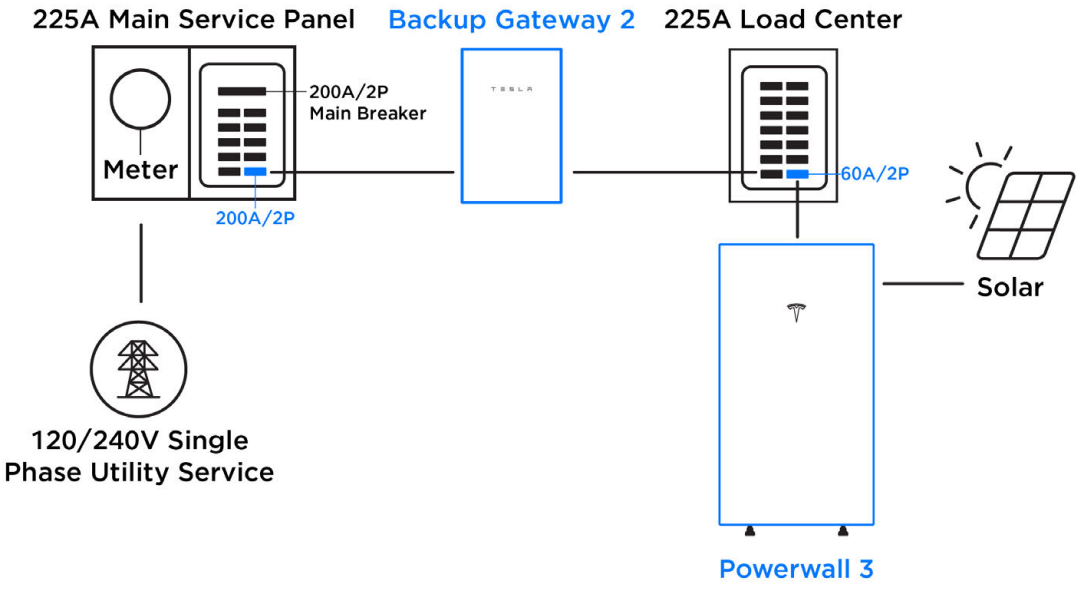


• (2) Powerwall 3 units interconnected on the load side of the service • Overcurrent protection device in a load center with backup loads • The Backup Gateway acting as the islanding relay	NEC 2020 / 2023 705.13

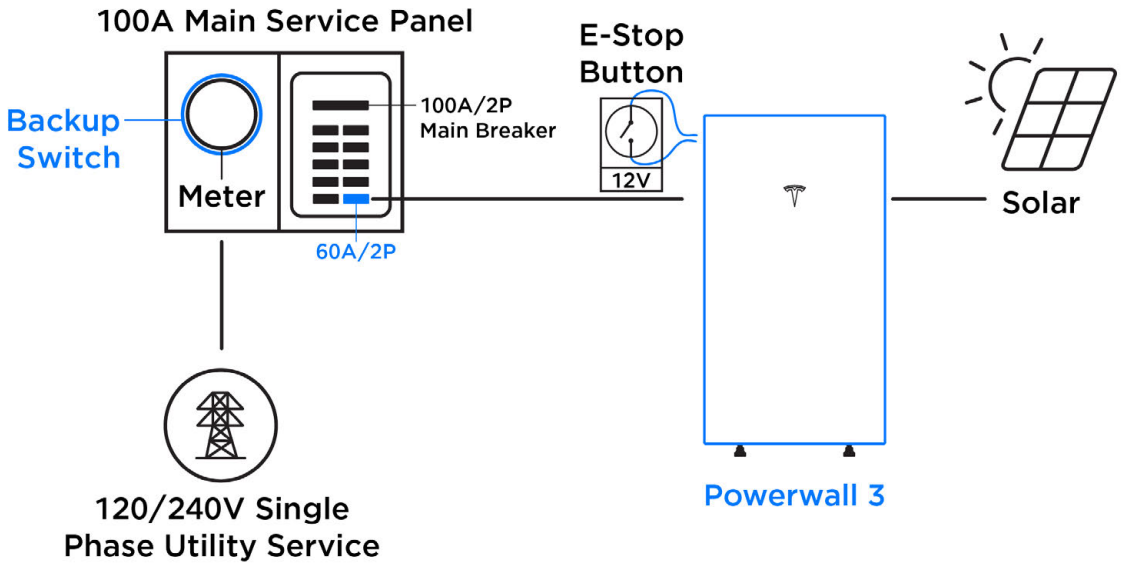


• *Powerwall 3 interconnected on the supply side of the service in the main panel • Overcurrent protection device in the Powerwall load center • The Backup Switch acting as the islanding relay at the meter • Note that there cannot be any backup loads downstream of the supply side connection	NEC 2020 / 2023 705.13

*Supply side configurations will only be used in areas where detached service meters are allowed.



• Powerwall 3 interconnected on the load side of the service • Overcurrent protection device in a load center with backup loads • The Backup Gateway acting as the islanding relay	NEC 2017 705.12(B)(2)(3)(b) NEC 2020 705.12(B)(3)(2) NEC 2023 705.12(B)(2)



• Powerwall 3 interconnected on the load side of the service • A 60A overcurrent protection device in the main panel • The Backup Switch acting as the islanding relay at the meter • 12V emergency stop button can be installed with the Powerwall 3 to initiate rapid shutdown per 690.12(C) requirements ◦ See the installation manual for additional details	NEC 2020 / 2023 705.13

APPENDIX A: CODE REQUIREMENTS

Because not every installation is governed by the same codes, it is important to know which codes (and which code years) are enforced by your local AHJ, as well as which state-level codes are enforced. The following table provides examples of code types, available code years for each type, an overview of what each code type covers, and the relevant sections for a Powerwall installation.

Code Type	Years	Covers	Important Sections	When is it important to know this code?
National Electric Code (NFPA 70)	2023 2020 2017 2014 2011	Electrical Safety	100 – Definitions 210 – Branch circuits 220 – Branch-circuit, feeder, and service load calculations 225 – Services 310 – Conductors for general wiring 690 – Solar Photovoltaic (PV) Systems 705 – Interconnected Electric Power Production Sources 706 – Energy Storage Systems	All regions
International Fire Code	2021 2018 2015 2012	Fire and Explosion Safety	Chapter 12 • 1205: Solar Photovoltaic Power Systems • 1207: Electrical Energy Storage Systems	Areas that use IFC for fire code
International Residential Code	2021 2018 2015 2012	Building, plumbing, mechanical, fuel gas and electrical requirements for detached one- and two-family dwellings and townhouses up to three stories	Chapter 3 • R324: Solar Energy Systems • R328: Energy Storage Systems	All regions
International Building Code	2021 2018 2015 2012	Applies to all building except detached one- and two-family dwellings and townhouses up to three stories	N/A – a general understanding of what the IBC covers is important	As needed
NFPA 1	2021 2018	Fire code	Chapter 17: Wildland Urban Interface Chapter 52: Energy Storage Systems	Areas that use NFPA 1 for fire code

APPENDIX A: CODE REQUIREMENTS

Code Type	Years	Covers	Important Sections	When is it important to know this code?
NFPA 855	2020	Energy Storage System Installation		Areas that use NFPA 855 for ESS installations

In addition to meeting all local and state code requirements, all installations must follow the product requirements provided in the applicable installation manual.

APPENDIX B: REVISION LOG

Revision	Date	Description
1.6	2024-07-25	• Updated *Design Considerations on page 2* to reflect the required Powerwall 3 circuit breaker sizes depending on configured maximum current / power output • Updated *Powerwall 3 DC System Sizing on page 7* to reflect that DC solar system size should be sized appropriately if Powerwall 3 is power / current limited
1.5	2024-07-02	• Updated *System Tie-in on page 2* to reflect fuse requirements if using a 60A fuse rather than a circuit breaker for Powerwall 3 overcurrent protection • Updated *Powerwall 3 Solar on page 2* with warning that where it is allowable to install only (1) MCI per string, MCI-1 must be used
1.4	2024-05-24	• Added link to *Tesla Solar Stringing Tool* to *Powerwall 3 DC System Sizing on page 7* • Corrected max branch breaker size in *Gateway 3 Tie-in on page 17* • Removed requirement for at least one string to have a voltage of 100V or greater from *Design Considerations on page 2* and *Powerwall 3 DC System Sizing on page 7* (no longer required when Powerwall 3 is on software version **24.12 or greater**)
1.3	2024-05-07	• Added note to *Design Considerations on page 2* that Backup Switch is not certified for installation in Canada • Updated *Powerwall 3 DC System Sizing on page 7* with recommendation to distribute the DC PV system across all Powerwall 3 units when installing multiple units
1.2	2024-04-25	Updated *Design Considerations on page 2*, *Metering Considerations on page 14*, and *Backup Switch / Backup Gateway 2 / Gateway 3 Tie-in on page 17* to include Gateway 3 as an Islanding Controller option
1.1	2024-03-21	• Added *AC-Coupled Solar System Sizing on page 11* • Updated *Design Considerations on page 2* and *Metering Considerations on page 14* to reflect new guidance for installing AC-coupled solar
1.0	2024-01-31	Initial publication