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INTRODUCTION

Chapter 7 Introduction

This chapter covers the requirements in multifamily buildings (dwelling units and common use areas) for solar photovoltaic and battery storage systems in newly constructed buildings and solar readiness requirements for newly constructed building and additions to existing buildings.

Table 7-1: Excerpt from Table 100.0-A Application of Standards provides an overview of the location of the solar photovoltaic, battery storage and solar readiness requirements that apply to multifamily occupancies in the Energy Code.

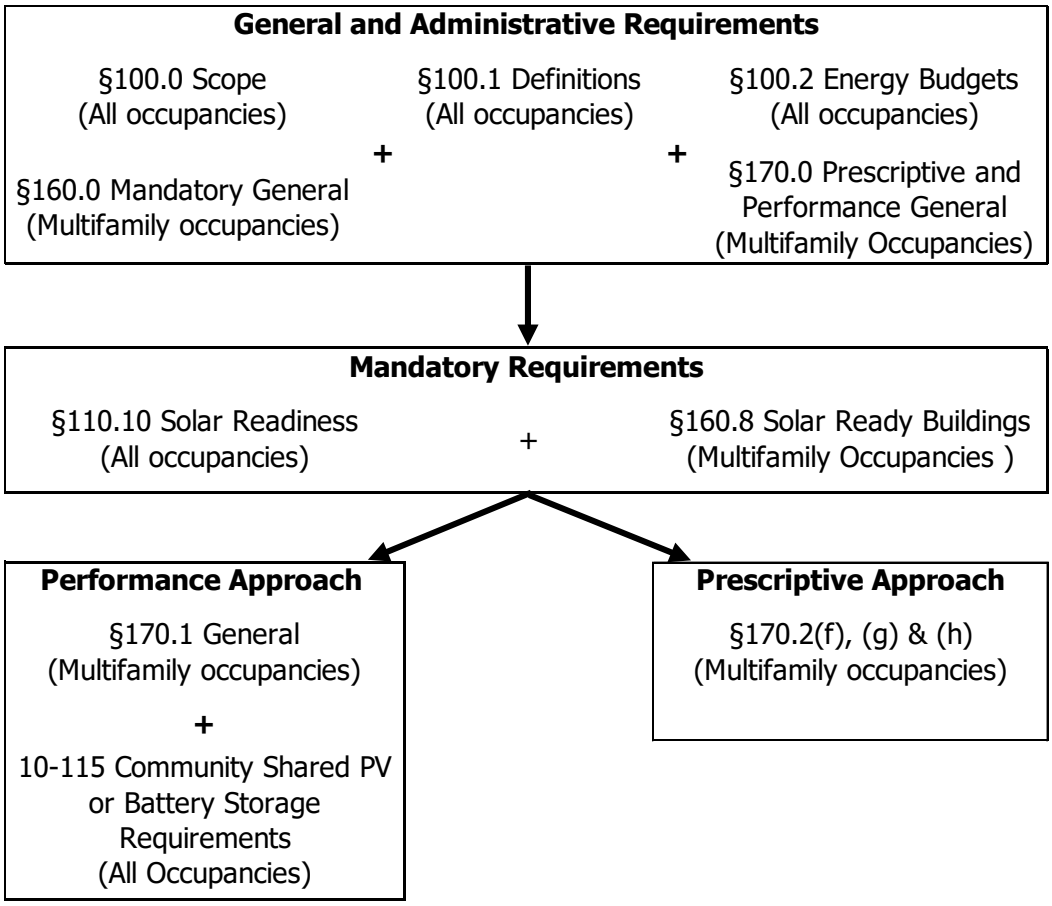
Table 7-1: Excerpt from Table 100.0-A Application of Standards

Application	Mandatory	Prescriptive	Performance	Additions/ Alterations
General[1]	160.0	170.0	170.0	180.0
Solar Readiness (When PV not installed)	110.10, 160.8	N/A	N/A	180.1(a)1B Exception (*Additions),* N/A (Alterations)
Solar PV and Battery Energy Storage Systems[2]	N/A	170.2(f), 170.2(g), 170.2(h),	170.1(a), 10-115	N/A

1. Guidance on General Requirements from Sections 160.0, 170.0 and 180.0 are included in the Multifamily Compliance Manual Chapter 1 General Requirements. Guidance specific to multifamily solar photovoltaic, battery storage and solar readiness is included in this chapter.
2. Section 10-115 provides community shared solar electric or Battery Energy Storage System (BESS) compliance options that may be used to partially or totally use the performance method to comply with the on-site solar electric generation system and/or BESS requirements.

Figure 7-1: Flowchart Guidance for Application of Newly Constructed Multifamily Solar Photovoltaic, Battery Storage and Solar Readiness Requirements and Figure 7-2: Flowchart Guidance for Application of Addition or Alteration of Multifamily Solar Photovoltaic, Battery Storage and Solar Readiness Requirements below illustrate the applicable sections for newly constructed buildings and additions or alterations to existing buildings.

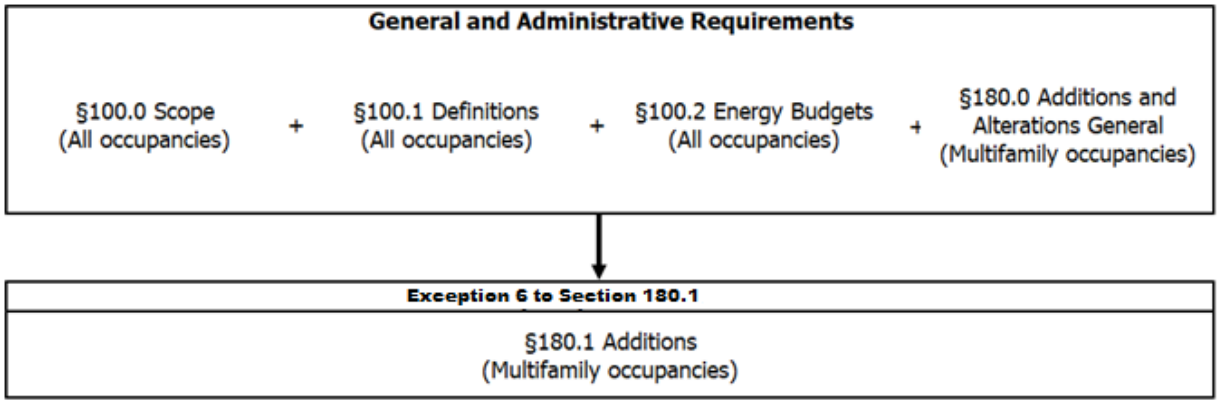
Figure 7-1: Flowchart Guidance for Application of Newly Constructed Multifamily Solar Photovoltaic, Battery Storage and Solar Readiness Requirements



Newly Constructed Buildings Compliance Approaches

Source: California Energy Commission

Figure 7-2: Flowchart Guidance for Application of Addition or Alteration of Multifamily Solar Photovoltaic, Battery Storage and Solar Readiness Requirements



Source: California Energy Commission

10-115 – COMMUNITY SHARED SOLAR ELECTRIC GENERATION SYSTEM OR COMMUNITY SHARED BATTERY ENERGY STORAGE SYSTEM COMPLIANCE OPTION FOR ON-SITE SOLAR ELECTRIC GENERATION OR BATTERY ENERGY STORAGE REQUIREMENTS

(a) Community Shared Solar Electric Generation System or Battery Energy Storage System (BESS) Offset. If approved by the commission, a community shared solar system, other community shared renewable system, community shared BESS, or combination of the aforementioned systems (hereinafter referred to as a community shared solar or BESS) may be used as a compliance option to partially or totally meet the on-site solar electric generation system and/or BESS that is otherwise required by Section 140.0(c), 150.1(a)3, or 170.0(a)3 of Title 24, California Code of Regulations, Part 6. To be approved, the community shared solar electric generation or community shared BESS must demonstrate, to the Commission's satisfaction, that all the following requirements will be met:

1. **Enforcement Agency.** The community shared solar electric generation system and/or community shared BESS shall be installed and available for enforcement agency site inspection no later than the point in time the enforcement agency must physically verify compliance of the building which would otherwise be required to have an on-site solar electric generation and/or BESS, and shall not cause delay in the process of enforcement agency review and approval of that building. The enforcement agency shall have jurisdiction and facilitated access to make site inspections. All documentation for the community solar electric generation system and/or community solar BESS that is required to demonstrate compliance for the building shall be completed prior to building permit application.
2. **Energy Performance.** The community shared solar electric generation system and/or community shared BESS shall be demonstrated to provide the same or better energy performance equal to the partial or total compliance with the energy performance of the on-site solar electric generation and/or BESS that would otherwise have been required for the building, computed by compliance software certified for use by the Commission.
3. **Participating Building Energy Savings Benefits.** The community shared solar electric generation system and/or community shared BESS shall provide energy saving benefits directly to the building. The energy savings benefits allocated to the building shall be in the form of:

A. actual reductions in the energy consumption of the participating building;

B. energy reduction credits that will result in virtual reductions in the building's energy consumption that is subject to energy bill payments; or

C. payments to the building that will have an equivalent effect as energy bill reductions.

The reduction in the building's energy bill resulting from A, B, or C above shall be greater than the added cost to the building resulting from the building's share in the community shared solar and/or BESS.

4. **Durability, Participation, and Building Opt-out.**

A**. Durability**. The community shared solar electric generation system and/or community shared BESS shall be designed and installed to provide the energy savings benefits to the participating building(s) specified in Section 10-115(a)3 for a period of no less than 20 years.

B. **Participation.** The Administrator(s) approved by the Energy Commission pursuant to Section 10-115(b)1 shall ensure that all participating buildings, which use the community shared solar and/or community shared BESS to comply with Section 140.0(c), 150.1(a)3, or 170.0(a)3, remain participating buildings for no less than a 20-year period ("Participation Period"), regardless of who owns or occupies the participating building, unless the building owner discontinues participation after causing the on-site solar electric generation system to be installed and interconnected pursuant to the Opt-Out Requirements. For purposes of this Section, "Opt-Out Requirements" shall mean installation and interconnection of an on-site solar electric generation system that meets or exceeds. the requirements of Section 140.0(c), 150.1(a)3, or 170.0(a)3 in effect at the time the builder applied for the original building permit for the participating building. To demonstrate compliance, the Administrator shall require either:

i. **Equitable Servitude.** As a condition for a building to participate, participating builders shall impose an equitable servitude through a properly recorded declaration of covenants, conditions and restrictions ("CC&Rs") or other properly recorded covenant, deed restriction or other legally binding method referenced in each deed transferring title for each participating building. This equitable servitude shall run with the land and obligate the original owner(s)/tenant(s) and all subsequent owner(s)/tenant(s) of the participating building to maintain the building's participation in the community shared solar and/or community shared BESS for the Participation Period, or ensure installation and interconnection of an on-site solar electric generation system that satisfies the Opt-Out Requirements. The equitable servitude shall specify that in order to discontinue participation in the community shared solar and/or BESS, the building owner must satisfy the Opt-Out Requirements. The builder shall ensure that the equitable servitude provides the Administrator approved by the Commission the right to enforce the above provisions. The equitable servitude shall remain in force for a period of 20 years from the date of first participation of the building in the community shared solar and/or BESS. The equitable servitude shall not be revocable. The equitable servitude shall be delivered to all responsible parties through transfer disclosure statements.

ii. **Other system**. The Commission may approve another program, structure, or system by which an Administrator (or other entity approved by the Commission) ensures the requirements of this Section 10-115(a)4B will be satisfied for a Participation Period of no less than 20 years.

C. **Compliance Documentation.** The Administrator shall maintain record(s) of the compliance documentation that determined the requirements for the on-site solar electric generation system and/or BESS to comply with the standards in effect at the time the builder applied for the original building permit, and which establishes participants' obligations to meet the Opt-Out Requirements. The Administrator shall provide a copy of this compliance documentation upon a participating building owner's request, to every new owner of a participating building when the Administrator is notified that title has transferred, and to any participating building owner who requests to Opt-Out.

D. **Building Opt-Out.** At any time during the Participation Period, a participating building owner shall have the option to discontinue the participation of the building in the community shared solar and/or BESS ("Opt-Out") if the building satisfies the Opt-Out Requirement.

i. Prior to Opt-Out, the building owner shall demonstrate that they have installed such an on-site solar electric generation system and met the Opt-Out Requirements by providing documentation from the installer of the on-site solar system or an attestation of the building owner with supporting documentation. The building owner

shall be responsible for all costs associated with documenting that the on-site solar generation system satisfies the Opt-Out Requirements.

ii. Upon receiving documentation regarding Opt-Out from a building owner, the Administrator shall compare the documentation to the compliance documentation specified in Section 10-115(a)4C and confirm whether, based on the documentation, the installed solar system meets or exceeds the Opt-Out Requirements. Within 30 days of a building owner providing documentation, the Administrator shall provide written confirmation to the building owner whether, based on the Administrator's review of that documentation, the on-site solar generation system satisfies the Opt-Out Requirements. The Administrator may, at its discretion, verify the documentation through a physical inspection. The Administrator shall maintain record of the documentation that demonstrates and confirms the on-site solar generation system met the Opt-Out requirements for the remainder of the Participation Period.

iii. Upon a building owner's exercise of the Opt-Out, all costs and benefits associated with participation in the community shared solar and/or BESS shall cease. If any balance of costs or benefits is owed to either party at the time of Opt-Out, such balance shall be paid to that party.

iv. The Administrator (or other entity approved by the Commission pursuant to Section 10-115(a)4Bii) shall not impose any penalty related to a participating building's Opt-Out, or charge participants for recuperation of unrealized revenue that would have been expected to accrue beyond the end of participation. If the Administrator (or other entity approved by the Commission) plans to charge any other fees at the time of building Opt-Out, the Application for Commission Approval shall explain the purpose of those fees.

5. **Additionality.** The community shared solar electric generation system and/or community shared BESS shall provide the energy savings benefits specified in Section 10-115(a)3 exclusively to the participating building(s). Those energy savings benefits shall in no way be attributed to other purposes or transferred to other buildings or property.

A. The participating building(s) shall be served primarily by renewable resources developed specifically for the community solar electric generation system.

B. Other renewable resources may be used when participating buildings are permitted before the renewable resources developed for the program start operating or after they cease operating. During these times, other renewable resources may be used to meet the requirements of Section 10-115(a)4 for each participating building.

C. The renewable resources, including those developed primarily to serve participating buildings and those utilized to serve participating buildings during the time periods described in Section 10-115(a)5B for the purpose of meeting the requirements of Section 10-115(a)4, shall meet the following requirement:

i. For each renewable resource used to serve participating buildings, bundled Renewable Energy Credits (RECs), which satisfy the criteria of Portfolio Content Category 1, shall be retired and tracked in the Western Renewable Energy Generation Information System (WREGIS) on the behalf of program participants, to ensure that they will not be allocated to or used for any other purpose, including Renewable Performance Standard (RPS) compliance, resale of RECs or renewable generation to any other person or entity, or any other mandatory or voluntary renewable electricity program requirement or claim.

D. Renewable resources developed to serve participating buildings may also be used to serve other loads when there is excess generation beyond what is needed to serve participating buildings. Any excess generation used for such other loads shall be isolated from the generation serving participating buildings and shall not result in violation of Section 10-115(a)5C.

6. **Location.** The community shared solar electric generation system and/or community shared BESS shall be located on a distribution system of the load serving entity providing service to the participating buildings. The distribution system shall have an electrical voltage less than 100kV.

7. **Size.** The community shared solar electric generation system and/or community shared BESS shall not be served by any individual source larger than 20 MW.

8. **Accountability and Recordkeeping.** Applicants for Commission approval of community shared solar electric generation systems and/or community shared BESSs shall be accountable to all parties who relied on these systems for partial or total compliance with the on-site solar electric generation and/or BESS that would otherwise be required, including but not limited to builders of the buildings, owners of the buildings, enforcement agencies, and the Commission.

   A. Each year beginning twelve months after initial approval, the Administrator shall provide to the Commission a report demonstrating the previous year's compliance with each requirement of Section 10-115.

   B. Recordkeeping regarding compliance with the requirements in Sections 10-115(a) shall be maintained over the period of time specified in Section 10-115(a)4 for each building for which the community shared solar electric generation or BESS is used to demonstrate partial or total compliance. Access to these records shall be provided to any entity approved by the Commission for auditing compliance with these requirements.

(b) Application for Commission Approval. Any entity may apply to the Commission for approval to administer a community shared solar electric generation or community shared BESS to provide partial or total compliance with the on-site solar electric generation system and/or BESS required by Section 150.1 of Title 24, California Code of Regulations, Part 6. Once approved, the entity shall be the Administrator of the community shared solar electric generation or community shared BESS.

1. The application shall demonstrate to the Commission's satisfaction that each of the requirements specified in Section 10-115(a) will be met and shall include detailed explanation of the actions that will be taken by the applicant to ensure that each requirement is met over the period of time specified in Section 10-115(a)4 for each building for which a partial or total offset is used to demonstrate compliance.

2. All applicants have the burden of proof to establish that their application should be granted.

3. Applications from public agencies shall be submitted to the Energy Commission only after public review through at least one public meeting within the jurisdiction of the public entity or service area of the load-serving entity and adoption by the public agency. The Commission shall have the authority to not approve any application that the Commission determines to be inconsistent with the requirements of Section 10-115.

(c) Executive Director Approval of Revised Applications. The Administrator of an approved community shared solar electric generation system and/or community shared BESS shall submit a revised application demonstrating compliance with the Section 10-115 requirements to the Executive Director for approval, when:

1. A new renewable resource is proposed to be added to a community shared solar electric generation system and/or community shared BESS, and/or

2. The Commission modifies the requirements of Section 10-115 in a building standards rulemaking. Such modified requirements would not apply retroactively to the buildings for which building permit applications are submitted prior to the effective date of the modified standards or to the continued use of previously approved renewable resources developed to serve a community shared solar electric generation system and/or community shared BESS.

Within 60 days of receiving a revised application, the Executive Director may either: approve the revised application by letter if the Executive Director concludes that the requirements of Section 10-115 will be met, request the Administrator to resubmit their revised application with changes, or disapprove the application. If the Executive Director disapproves the application, the applicant may request that the Commission review the Executive Director's determination. The petition must be filed in writing in accordance with Title 20, California Code of Regulations, Section 1208 within 15 days of the date of the filing of the Executive Director's determination and must state the basis for requesting review of the Executive

Director's determination. Within 45 days of receiving a request for review, the Commission shall issue a written decision affirming or modifying the Executive Director's determination. If the Commission does not issue a written decision within 45 days, the request for review shall be deemed denied. The Administrator shall have the burden of proof to establish that its revised application should be approved.

NOTE: Authority: Sections 25213, 25218, 25218.5, 25402, 25402.1, and 25605, Public Resources Code. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.8, 25605, and 25943, Public Resources Code

«» Commentary for Section 10-115

The 2025 Energy Code allows the possibility for the required solar photovoltaics on the site of the residential building to be offset by community-shared solar electric generation. "Community-shared solar electric generation" means solar electric generation, battery storage or other renewable technology electric generation that is provided as part of a community or neighborhood program that is approved to share the generation resources it develops with individual homes to demonstrate compliance with the Energy Code. Also, the batteries that otherwise would be installed in combination with photovoltaics on the building site to comply with battery storage requirements for multifamily buildings with four or more habitable stories or to gain performance standards compliance credit potentially for multifamily buildings with three habitable stories or less could be offset by a community-shared BESSs can be combined or separate. All of these possibilities are hereinafter referred to as "community-shared solar electric generation systems."BESSs can be combined or separate. All of these possibilities are hereinafter referred to as "community-shared solar electric generation systems."

The 2019 Energy Code first allowed the possibility for the Energy Code requirement for PV on the site of the residential building to be fully or partially offset by community shared solar electric generation.

For these offsets to become available, entities who wish to serve as administrators of a proposed community-shared solar electric generation system must apply to the Energy Commission for approval, demonstrating that the requirements specified in Section 10-115 of the Energy Code are met. The Energy Commission will review these applications to determine if the applicant meets these requirements.

Any entity may apply to serve as administrator of a proposed community-shared solar electric generation system. Potential entities include, but are not limited to, utilities or load serving entities, developers, builders, solar companies, or local governments. The entity will be responsible for ensuring that the requirements for approval are met throughout at least a 20-year period for each building that uses shares of the community-shared solar electric generation system to offset the onsite solar electric generation and batteries, which would otherwise be required for the building to comply with the Energy Code. Throughout that period, the administrator will be accountable to

builders, building owners, enforcement agencies, the Energy Commission, and other parties who relied on these systems for offset compliance with the Energy Code. Records demonstrating compliance with the requirements must be maintained over that period, with access to those records provided to any entity approved by the Energy Commission.

Entities interested in applying to serve as an administrator of a proposed community-shared solar electric generation system should become thoroughly familiar with the requirements for approval specified in Section 10-115 and contact the CEC Building Standards Branch for further discussion and explanation of the requirements as necessary. «»

SECTION 110.10 – MANDATORY REQUIREMENTS FOR SOLAR READINESS

(a) Covered occupancies.

1. **Single-family residences.** Single-family residences located in subdivisions with ten or more single-family residences and where the application for a tentative subdivision map for the residences has been deemed complete or approved by the enforcement agency, which do not have a photovoltaic system installed, shall comply with the requirements of Sections 110.10(b) through 110.10(e)
2. **Low-rise multifamily buildings.** Low-rise multifamily buildings that do not have a photovoltaic system installed shall comply with the requirements of Sections 110.10(b) through 110.10(d).
3. **Hotel/motel occupancies and high-rise multifamily buildings.** Hotel/motel occupancies and high-rise multifamily buildings with ten habitable stories or fewer, that do not have a photovoltaic system installed, shall comply with the requirements of Sections 110.10(b) through 110.10(d).
4. **Nonresidential buildings.** Nonresidential buildings with three habitable stories or fewer, other than I-2 and I-2.1 buildings, that do not have a photovoltaic system installed, shall comply with the requirements of Sections 110.10(b) through 110.10(d).

«» Commentary for Section 110.10(a):

These requirements in Section 110.10 are mandatory for newly constructed buildings and additions where the total roof area is increased by at least 2,000 square feet. The solar-ready requirement is implemented when designing the building rooftop and associated equipment and when the building is not installing a photovoltaic system to comply with Section 170.2(f) or 170.2(g) or voluntarily to meet Exception 1 to Section 110.10(b)1B. Requirements for additions with new roof area greater than 2,000 square feet are specified in the Exception to Section 180.1(a)1B. The intent is to reserve a

penetration-free and shade-free portion of the roof for the potential future installation of a solar energy system, plan for a pathway for connecting the components of the system, and install a main electrical service panel that will enable the future system. There are no requirements to install panels, conduit, piping, or mounting hardware. **«»**

(b) Solar zone.

1. **Minimum solar zone area.** The solar zone shall have a minimum total area as described below. The solar zone shall comply with access, pathway, smoke ventilation, and spacing requirements as specified in Title 24, Part 9 or other Parts of Title 24 or in any requirements adopted by a local jurisdiction. The solar zone total area shall be comprised of areas that have no dimension less than five feet and are no less than 80 square feet each for buildings with roof areas less than or equal to 10,000 square feet or no less than 160 square feet each for buildings with roof areas greater than 10,000 square feet.

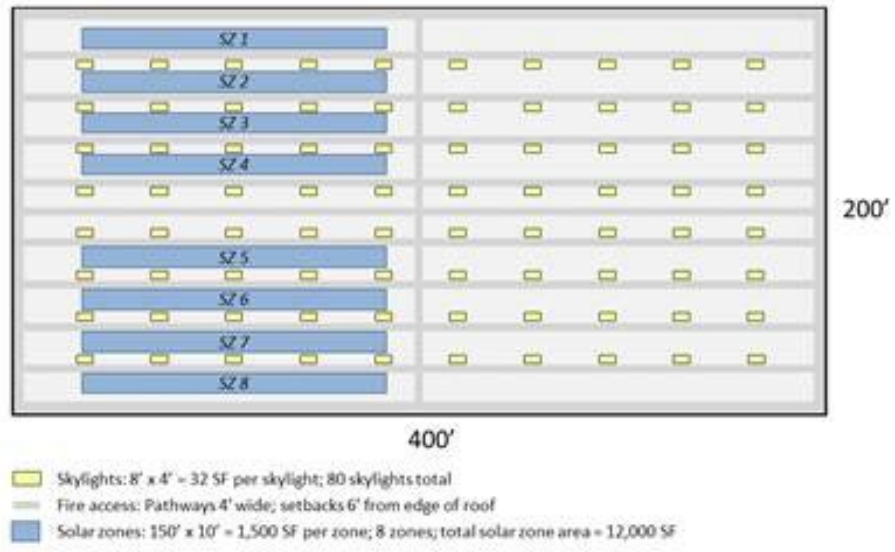
«» Commentary for Section 110.10(b)1:

The solar zone is a designated place where solar panels can be installed at a future date if the owner chooses to do so.

The total solar zone can be composed of multiple smaller areas. To enable a future solar system to fit within a reserved solar area(s), subareas are to meet minimum space dimension requirements. A subarea cannot be narrower than 5 feet in any dimension. If the total roof area is 10,000 sq. ft or less, each subarea must be at least 80 sq. ft. If the total roof area is greater than 10,000 sq. ft, each subarea must be at least 160 sq. ft.

Figure 7-3: Solar Zone Layout Showing Subareas, Skylights, and Fire Access below illustrates a solar zone layout that is composed of eight smaller subareas. The sum of all the smaller areas must equal the minimum total solar zone area. For example, the sum of all areas for a hypothetical building must be at least 11,616 sq. ft. The solar zones in this example total 12,000 sq. ft., which is greater than the minimum required for the hypothetical building. The solar zones must also comply with fire code requirements, including, but not limited to, setback and pathway requirements. Current setback and pathway requirements can be found in Title 24 Part 2 Section 3111, Title 24 Part 2.5 Section R324, and Title 24 Part 9 Section 1205.

Figure 7-3: Solar Zone Layout Showing Subareas, Skylights, and Fire Access



Source: California Energy Commission

California Fire Code Solar Access Requirements

The current versions of Title 24, Part 2, California Building Code (multifamily), Section 3111; Part 2.5, California Residential Code (single family up to 2 dwelling units), Section R324; and Part 9, California Fire Code (multifamily), Section 1205 of include requirements for installing rooftop solar photovoltaic systems. These regulations cover the marking and location of DC conductors and access and pathways for photovoltaic systems. «»

B. Multifamily buildings, hotel/motel occupancies and nonresidential buildings. The solar zone shall be located on the roof or overhang of the building or on the roof or overhang of another structure located within 250 feet of the building or on covered parking installed with the building project, and shall have a total area no less than 15 percent of the total roof area of the building excluding any skylight area. The solar zone requirement is applicable to the entire building, including mixed occupancy.

«» Commentary for Section 110.10(b)1B:

Other structures include, but are not limited to: other buildings, trellises, arbors, patio covers, carports, gazebos, and similar accessory structures. «»

Exception 1 to Section 110.10(b)1B: High-rise multifamily buildings, hotel/motel occupancies, and nonresidential buildings with a permanently installed solar electric system having a nameplate DC power rating, measured under Standard Test Conditions, of no less than one watt per square foot of roof area.

«» Commentary for Exception 1 to Section 110.10(b)1B:

If a photovoltaic system meeting the requirements of Exception 1 is installed, the solar readiness requirements do not apply. The compliant solar electric system must be permanently installed with a nameplate direct current (DC) power rating of no less than 1 watt per sq. ft of roof area. The nameplate rating must be measured under standard test conditions. This exception cannot be used to meet the prescriptive photovoltaic requirements of Sections 170.2(f) or 170.2(g). **«»**

> **Exception 2 to Section 110.10(b)1B:** High-rise multifamily buildings, hotel/motel occupancies with a permanently installed domestic solar water-heating system complying with Section 150.1(c)8Biii.

«» Commentary for Exception 2 to Section 110.10(b)1B:

When a solar water heating system (SWH) is permanently installed meeting the prescriptive solar water heating system requirements of Section 170.2(d)3C, the solar readiness requirements do not apply. **«»**

> **Exception 3 to Section 110.10(b)1B:** Buildings with a designated solar zone area that is no less than 50 percent of the potential solar zone area. The potential solar zone area is the total area of any low-sloped roofs where the annual solar access is 70 percent or greater and any steep-sloped roofs oriented between 90 degrees and 300 degrees of true north where the annual solar access is 70 percent or greater. Solar access is the ratio of solar insolation including shade to the solar insolation without shade. Shading from obstructions located on the roof or any other part of the building shall not be included in the determination of annual solar access.

«» Commentary for Exception 3 to Section 110.10(b)1B:

The solar zone area may be reduced if the roof is shaded by obstructions that are not part of the building and beyond the designer's control, such as existing buildings, telephone poles, communication towers, trees, or other objects, and therefore cannot meet the 15% designated solar zone requirements of Section 110.10(b)1B at ≥ 70% annual solar access. Once the potential solar zone at ≥ 70% annual solar access is determined, and if it is not ≥ 15% of the total roof area, then the reduced solar zone area up to 50% of the minimum solar zone area would be required.

When determining solar zone area, solar access shall not take into account shading from objects that are included in the building project because the designer has control of potential obstructions such as the building itself, its HVAC equipment, outdoor lights, landscape features and other similar objects. This exception cannot be used for the prescriptive photovoltaic requirements of Sections 170.2(f) or 170.2(g).

Example: A 2,000 ft² roof is shaded by trees and is shown with a solar assessment study that only 150 ft² of the roof has an annual solar access ≥ 70%. In this example, the 15% of roof at 300 ft² would not be required, only 75 ft² (50% of 150 ft²) would be required for solar readiness. **«»**

Exception 4 to Section 110.10(b)1B: Low-rise and high-rise multifamily buildings with all thermostats in each dwelling unit are demand response controls that comply with Section 110.12(a), and are capable of receiving and responding to Demand Response Signals prior to granting of an occupancy permit by the enforcing agency. In addition, either A or B below:

«» Commentary for Section 4 to Section 110.10(b)1B:

A "demand-responsive control" is defined in Section 100.1. as an "automatic control capable of receiving and automatically responding to a demand response signal." The technical specifications for compliant demand responsive control thermostats are specified in JA5. In addition to a demand responsive thermostat in each dwelling unit, one of the following options must also be used to meet this exception. This exception cannot be used for the prescriptive photovoltaic requirements of Sections 170.2(f) or 170.2(g). «»

A. In each dwelling unit, comply with one of the following measures:

   i. Install a dishwasher that meets or exceeds the ENERGY STAR Program requirements with either a refrigerator that meets or exceeds the ENERGY STAR Program requirements or a whole house fan driven by an electronically commutated motor; or

   ii. Install a home automation system that complies with Section 110.12(a) and is capable of, at a minimum, controlling the appliances and lighting of the dwelling and responding to demand response signals; or

   iii. Install alternative plumbing piping to permit the discharge from the clothes washer and all showers and bathtubs to be used for an irrigation system in compliance with the *California Plumbing Code* and any applicable local ordinances; or

   iv. Install a rainwater catchment system designed to comply with the *California Plumbing Code* and any applicable local ordinances, and that uses rainwater flowing from at least 65 percent of the available roof area.

B. Meet the Title 24, Part 11, Section A4.106.8.2 requirements for electric vehicle charging spaces.

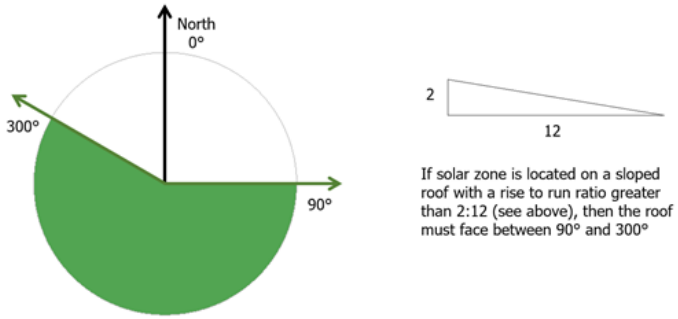
Exception 5 to Section 110.10(b)1B: Buildings where the roof is designed and approved to be used for vehicular traffic or parking or for a heliport.

2. **Azimuth range.** All sections of the solar zone located on steep-sloped roofs shall have an azimuth range between 90 degrees and 300 degrees of true north.

«» Commentary for Section 110.10(b)2:

This range of azimuths ensures an ample solar exposure if a solar energy system is installed in the future. On a low-sloped roof (rise-to-run ratio equal to or less than 2:12, or 10 degrees), the azimuth requirement does not apply.

Figure 7-4: Azimuth of Roof If Solar Zone Is Located on Steep-Sloped Roof



Source: California Energy Commission

«»

3. **Shading.**

   A. No obstructions, including but not limited to, vents, chimneys, architectural features and roof mounted equipment, shall be located in the solar zone.

   B. Any obstruction, located on the roof or any other part of the building that projects above a solar zone shall be located at least twice the distance, measured in the horizontal plane, of the height difference between the highest point of the obstruction and the horizontal projection of the nearest point of the solar zone, measured in the vertical plane.

   Exception to Section 110.10(b)3: Any roof obstruction, located on the roof or any other part of the building, that is oriented north of all points on the solar zone.

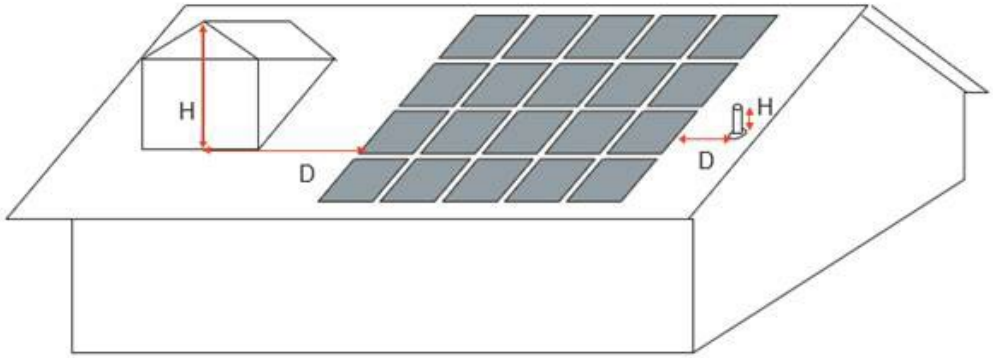
«» Commentary for Section (110.10)b:3

Obstructions such as vents, chimneys, architectural features, or roof-mounted equipment cannot be located in the solar zone. This requirement ensures the solar zone remains clear and open for the future installation of a solar energy system.

Any obstruction located on the roof or any other part of the building that projects above the solar zone must be located at a sufficient horizontal distance away from the solar zone such that the obstruction will not shade the solar zone. The following equation and Figure 7-5: Schematic of Allowable Setback for Rooftop Obstructions describe the allowable distance between any obstruction and the solar zone. For each obstruction, the horizontal distance ("D") from the obstruction to the solar zone has to be at least two times the height difference ("H") between the highest point of the obstruction and the horizontal projection of the nearest point of the solar zone.

$$D \geq 2H$$

Figure 7-5: Schematic of Allowable Setback for Rooftop Obstructions



Source: California Energy Commission

«»

4. **Structural design loads on construction documents.** For areas of the roof designated as solar zone, the structural design loads for roof dead load and roof live load shall be clearly indicated on the construction documents.

Note: Section 110.10(b)4 does not require the inclusion of any collateral loads for future solar energy systems.

«» Commentary for Section 110.10(b)4:

The structural design load documentation requirements apply if any portion of the solar zone is located on the roof of the building. This documentation is required so that at the time of a future solar PV installation, the structural design loads of the roof at the time the building was permitted are known. The Energy Code does not require estimating the structural loads of possible future solar equipment. «»

(c) Interconnection pathways.

1. The construction documents shall indicate a location reserved for inverters and metering equipment and a pathway reserved for routing of conduit from the solar zone to the point of interconnection with the electrical service.
2. For single-family residences and central water-heating systems, the construction documents shall indicate a pathway for routing of plumbing from the solar zone to the water-heating system

«» Commentary for Section 110.10(c)1:

All buildings that include a solar zone must also include a plan for how a future photovoltaic or solar water heating system would be connected to the electrical or plumbing system of the building. The construction documents must indicate the following:

A location for inverters and metering equipment for future solar electric systems. The allocated space should be appropriately sized for a PV system that could cover the entire solar zone.

A pathway for routing conduit from the solar zone to the point of interconnection with the electrical service. The design drawings must show where the conduit would be installed if a system were installed at a future date. There is no requirement to install conduit.

A pathway for routing plumbing from the solar zone to the water-heating system connection. The design drawings must show where the plumbing would be installed if a SWH system were installed at a future date. There is no requirement to install piping.

This requirement is not applicable if compliance is achieved by using Exceptions 1, 2, or 4 in lieu of a designated solar zone. **«»**

(d) Documentation. A copy of the construction documents or a comparable document indicating the information from Sections 110.10(b) through 110.10(c) shall be provided to the occupant.

«» Commentary for Section 110.10(d):

A copy of the construction documents that show the solar zone, the structural design loads, and the interconnection pathways must be provided to the building occupant. The building occupant must also receive a copy of compliance document NRCC-SAB-E or LMCC-SAB-E. The document copies are required so that the solar-ready information is available if the occupant decides to install a solar energy system in the future. This requirement is not applicable if compliance is achieved by using Exceptions 1, 2, or 4 in lieu of a designated solar zone. **«»**

(e) Main electrical service panel.

1. The main electrical service panel shall have a minimum busbar rating of 200 amps.
2. The main electrical service panel shall have a reserved space to allow for the installation of a double pole circuit breaker for a future solar electric installation. The reserved space shall be permanently marked as “For Future Solar Electric”.

«» Commentary for Section 110.10(e)2:

These main electrical service panel specifications are required to enable the possible future installation of a solar electric system without a panel change at that time. **«»**

Note**:** Authority: Sections 25213, 25218, 25218.5, 25402, 25402.1, and 25605, Public Resources Code. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.8, 25605, and 25943, Public Resources Code.

SECTION 160.8 – MANDATORY REQUIREMENTS FOR SOLAR READY BUILDINGS

(a) Solar ready buildings. Newly constructed multifamily buildings shall meet the requirements of Section 110.10 applicable to the building project.

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, Public Resources Code. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, and 25943, Public Resources Code.

«» Commentary for Section 160.8(a):

The requirements for solar-ready buildings are mandatory measures for newly constructed multifamily buildings that do not have a PV system because the building either qualifies for an exception in Section 170.2(f) or Section 170.2(g) or complies with the PV requirements using community shared solar as a performance compliance option. The solar-ready requirement must be addressed when designing the roof and associated equipment of a building, as described in the previous section. The intent is to reserve a penetration-free and shade-free portion of the roof for the potential future installation of a solar energy system, plan for a pathway for connecting the components of the system, and install a main electrical service panel that will enable the future system. There are no requirements to install solar panels, conduit, piping, or mounting hardware. **«»**

SECTION 170.1 – PERFORMANCE APPROACH

A building complies with the performance approach if the energy consumption calculated for the proposed design building is no greater than the energy budget calculated for the standard design building using Commission-certified compliance software as specified by Sections 10-109, 10-116 and the Alternative Calculation Method Reference Manual.

(a) Energy budget. The Energy budget is expressed in terms of long-term system cost (LSC) and source energy:

1. **Long-term system cost (LSC).** The LSC energy budget is determined by applying the mandatory and prescriptive requirements of the standard design to the proposed design building and has two components, the Efficiency LSC and the Total LSC.
   A. The Efficiency LSC energy is the sum of the LSC energy for space-conditioning, water heating, mechanical ventilation, lighting and the self-utilization credit.
   B. The Total LSC energy is the sum of the Efficiency LSC energy and LSC energy from the photovoltaic system, battery energy storage systems (BESS), and demand flexibility.
2. **Source energy.** The source energy budget is determined by applying the mandatory and prescriptive requirements of the standard design, except with a consumer gas or propane water heater, to the proposed design building.

Exception to Section 170.1(a): A community shared solar electric generation system, or other renewable electric generation system, and/or community shared BESS, that provides dedicated power, utility energy reduction credits or payments for energy bill reductions to the permitted building and is approved by the Energy Commission as specified in Title 24, Part 1, Section 10-115, may offset part or all of the solar electric generation system or BESS LSC energy required to comply with the standards, as calculated according to methods established by the Commission in the Nonresidential ACM Reference Manual.

«» Commentary for Section 170.1(a):

Using the performance approach, the PV array orientation is modeled as proposed. Any direction, including due north may be modeled; however, the more the orientation deviates from the southwest optimum, the worse the system performs, resulting in a larger PV system size to meet the same load. Designers and energy consultants may choose to model various orientations during the design phase to determine the preferred system size and orientation.

The California Flexible Installation (CFI) is a simplified modeling option in the performance approach. This option allows flexibility for a specific range of PV array azimuths and tilts, as long as the minimum shading criterion specified in JA11.3 is met. To use the CFI option for compliance:

For CFI1, the PV array azimuth angle must be anywhere between 150 to 270 degrees from true north, and the tilt must be anywhere between roof pitches of 0:12 to 7:12.

For CFI2, the PV array azimuth angle must be anywhere between 105 to 300 degrees from true north, and the tilt must be anywhere between roof pitches of 0:12 to 7:12.

As specified by Section 170.1, the Energy Code establishes energy budgets for showing compliance with the performance standards expressed in Long-term System Cost (LSC) and Source Energy. The LSC energy budget is partitioned into Efficiency LSC and Total LSC energy budgets. The Efficiency LSC energy budget is the sum of the LSC energy for space-conditioning, water heating, mechanical ventilation, and lighting. The Efficiency LSC also includes a self-utilization credit when a battery energy storage system (BESS) is installed in addition to PV. The Total LSC energy budget is the sum of the Efficiency LSC and LSC energy from the photovoltaic system, battery energy storage systems (BESS), and other demand flexibility compliance options that the CEC has approved. **«»**

(b) Compliance demonstration requirements for performance standards.

1. Certificate of Compliance and Application for a Building Permit. The application for a building permit shall include documentation pursuant to Sections 10-103(a)1 and 10-103(a)2 that demonstrates, using an approved calculation method, that the building has been designed so that its source energy and LSC energy consumption do not exceed the standard design energy budgets for the applicable climate zone.
2. Field verification of individual dwelling unit systems. When performance of installed features, materials, components, manufactured devices or systems above the minimum specified in Section 170.2 is necessary for the building to comply with Section 170.1, or is necessary to achieve a more stringent local ordinance, field verification shall be performed in accordance with the applicable requirements in the following subsections, and the results of the verification(s) shall be documented on applicable Certificates of Installation pursuant to Section 10-103(a)3 and applicable Certificates of Verification pursuant to Section 10-103(a)5.

NOTE: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, Public Resources Code. Reference: Sections 25007, 25008, 25218.5, 25310, 25402, 25402.1, 25402.4, 25402.5, 25402.8, and 25943, Public Resources Code.

SECTION 170.2 – PRESCRIPTIVE APPROACH

Prescriptive requirements for photovoltaic systems for low-rise multifamily buildings are specified in Section 170.2(f), for photovoltaic systems for high-rise multifamily buildings in Section 170.2(g), and for battery energy storage systems (BESS) in Section 170.2(h).

«» Commentary for Solar PV Prescriptive Requirements:

The prescriptive compliance approach for solar PV systems is summarized in Table 7-2: Guide to Solar PV Prescriptive Requirements, which provides the sequence of steps that identifies if the PV system's installation is required and the corresponding requirements for each step to comply with the prescriptive approach.

Table 7-2: Guide to Solar PV Prescriptive Requirements

Step	Three or fewer stories	Four or more stories
Check for virtual energy bill credit program with the load serving entity (typically the electric utility company)	N/A	If virtual energy bill credit program is not available, PV is not required unless there is a CEC-approved community solar program available. Solar readiness will then apply.
Check with Enforcement Authority if high snow load design exception applies	If the roof and required PV structure cannot support the snow load design, PV is excepted, and solar readiness applies.	If the roof and required PV structure cannot support the snow load design, PV is not required, and solar readiness will apply.
Calculate Solar Access Roof Area (SARA) using CEC-approved solar assessment tool	If SARA is less than 3% of Conditioned Floor Area (CFA), no PV is required, and solar readiness will apply. If SARA is greater than 3% of CFA, proceed to the following steps	If SARA is less than 3% of Conditioned Floor Area (CFA), no PV is required, and solar readiness will apply. If SARA is greater than 3% of CFA, proceed to the following steps
Check contiguous SARA	When the SARA for any individual roof area is less than 80 contiguous ft², that area is not included in determining PV kW sizing. When the SARA for any	When the SARA for any individual roof area is less than 80 contiguous ft², that area is not included in determining PV kW sizing. When the SARA for any

Step	Three or fewer stories	Four or more stories
	individual roof area is ≥ 80 contiguous ft², that roof area is included in determining PV kW sizing. If there is no SARA with ≥ 80 contiguous ft² on any portion of the roof, PV is not required, and solar readiness will apply.	individual roof area is ≥ 80 contiguous ft², that roof area is included in determining PV kW sizing. If there is no SARA with ≥ 80 contiguous ft² on any portion of the roof, PV is not required, and solar readiness will apply.
Calculate prescriptive PV size using both the prescriptive equation (based on CFA) and the SARA approach	Calculate PV size using Equation 170.2-C and SARA*14W/ft^2 (for low-slope roofs) or SARA*18W/ft^2 (for steep-slope roofs). Determine the lower PV size for the two approaches.	Calculate PV size using Equation 170.2-D and SARA*14W/ft^2 (for low-slope roofs) or SARA*18W/ft^2 (for steep-slope roofs). Determine the lower PV size for the two approaches.
Check that the lower calculated PV size is more than minimum requirement	If PV size for the building is less than 4kW, PV is not required, and solar readiness applies	If PV size for the building is less than 4kW, PV is not required, and solar readiness applies.
Check for PV size reduction when battery energy storage system (BESS) is installed	If ≥7.5 kWh BESS is installed complying with JA12 requirements, PV size can be reduced by 25%.	Check BESS requirements for compliance with Section 170.2(h).
Provide Certificate of Compliance and solar assessment report supporting compliant design	This could be the LMCC-PRF-01-E if using the performance approach, or the LMCC-SAB-E if using the prescriptive approach.	This could be the NRCC-PRF-01-E if using the performance approach, or the NRCC-SAB-E if using the prescriptive approach.

Source: California Energy Commission

The installed PV system for any multifamily building must meet the applicable requirements specified in JA11 for both the prescriptive and performance approach. Requirements include provisions for system orientation, shading criteria, solar access verification, remote monitoring, and interconnection.

When using the prescriptive approach, the weighted average annual solar access must be at least 98% across all solar panels and is to be verified by the installing contractor with the Certificate of Installation. If the solar access is less than 98%, then the performance approach may be used.

The PV system must be integrated with a monitoring system that can provide remote monitoring capability to its user. The monitoring data must be accessible through a web-based portal and a mobile device application that enables the building manager, owner, or occupants to monitor the performance of their PV system. This data can be useful to identify, report, and correct performance issues with the panels, inverters, shading, or other issues that may adversely impact the performance of the PV system. At a minimum, the building manager, building owner, or occupants must have access to the following information:

The nominal kW rating of the PV system.

Number of PV modules and the nominal watt rating of each module.

Hourly (or 15-minute interval), daily, monthly, and annual kWh production in numeric and graphic formats for the system.

Running total of daily kWh production.

Daily kW peak power production.

Current kW production of the entire PV system.

Interconnection Requirements

The installed inverters must be tested in accordance with the applicable requirements in UL1741 and UL1741 Supplement A.

The PV system and the associated components, including the inverters, must comply with the California Public Utilities Commission (CPUC) Electric Tariff Rule 21, which governs CPUC-jurisdictional interconnections for all net energy metering customers. Rule 21 requires that inverters have certain capabilities to ensure proper operation of the electrical grid as solar photovoltaic systems are interconnected.

Solar Assessment

A solar assessment tool that is certified by the Executive Director, and complies with JA11.4.1 requirements, must be used to document and verify the shading conditions of the PV system. The results of the solar access verification tool are used to determine the SARA. The CEC approved list of solar assessment tools can be found here: https://www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards/solar-assessment-tools

The CEC approved solar assessment tools can be of one of the following types:

Physical tool that measures the availability of solar energy on installation site

Software tool that models the physical features of the building and surrounding shading conditions including roofs and trees, and then calculates their solar potential by analyzing it against historical weather data

Satellite or drone imaging data if it can demonstrate solar access percentages similar to on-site measurements.

Table 7-3: Solar Access Verification Tool Requirements summarizes the Energy Commission's required functionality for developing a solar access verification tool as specified in JA11.4.1.

Table 7-3: Solar Access Verification Tool Requirements

Category	Requirements
Input	Physical features of building and other obstructions that shade the PV array that are specified in JA11.3 Historical weather data
Solar Access Tool Calculations	Calculate annual solar access percentage of each individual solar array. Calculate annual solar access percentage as a weighted average of the whole. Include all obstructions, including any tree that is planted on the building lot or neighboring lots including any existing trees on the building lot or neighboring lots and trees planned to be planted in association with the building permit included in the landscape documents. Do not include horizon shading in the calculation
Reporting	Produce a shade report with a summary of the PV system, including the address of the project, individual array panel count, orientation, annual solar access percentage, and weighted average of the PV system as whole.

Source: California Energy Commission

«»

(f) Photovoltaic requirements—three habitable stories or fewer. All multifamily buildings up to three habitable stories shall have a newly installed photovoltaic (PV) system or newly installed PV modules meeting the minimum qualification requirements specified in Joint Appendix JA11. The annual electrical output of the PV system shall be no less than the smaller of a PV system size determined using Equation 170.2-C, or the total Solar Access Roof Area (SARA) multiplied by 18 for steep-sloped roofs or SARA multiplied by 14 for low-sloped roofs.

A. SARA includes the area of the building's roof space capable of structurally supporting a PV system, and the area of all roof space on covered parking areas, carports, and all other newly constructed structures on the site that are compatible with supporting a PV system per Title 24, Part 2, Section 1511.2.

B. SARA does NOT include:

i. Any roof area that has less than 70 percent annual solar access. Annual solar access is determined by dividing the total annual solar insolation, accounting for shading obstructions, by the total annual solar insolation if the same areas were unshaded by obstructions. For steep-sloped roofs, only shading from existing permanent natural or manmade obstructions that are external to the dwelling, including but not limited to trees, hills and adjacent structures, shall be considered for annual solar access calculations. For low slope roofs, all obstructions including those that are external to the dwelling unit, and obstructions that are part of the building design and elevation features, shall be considered for the annual solar access calculations.

ii. Occupied roof areas as specified by CBC Section 503.1.4.

iii. Roof area that is otherwise not available due to compliance with:

a. Other state building code requirements, or

b. Local building code requirements if local building code requirements are confirmed by the Executive Director.

«» Commentary for Section 170.2(f):

The installed PV system for any multifamily building must meet the applicable requirements specified in JA11 for both the prescriptive and performance approach. Requirements include provisions for system orientation, shading criteria, solar access verification, remote monitoring, and interconnection requirements.

When there is a state building code requirement that would not allow PV systems to be installed on a specific area of the roof, that roof area is removed from the SARA. This can include Fire Code setback provisions, Mechanical Code setback and access provisions, and Building Code envelope maintenance system setback provisions.

Some local building codes or ordinances require the roof to be used for specific purposes, such as for "living roofs." Areas of the roof that are required by local building codes to be used for specific purposes can be removed from the SARA if the CEC's Executive Director has approved the SARA removal for the specific local code/ordinance. The local enforcement agency must apply to the CEC for that approval.

For multifamily buildings up to three habitable stories that have a steep sloped roof, existing permanent natural or manmade obstructions that are external to the building (such as trees, hills and adjacent structures) may be determined using solar assessment tools to be shading obstructions that reduce the annual solar access for a particular roof area to be less than 70 percent. Roof areas shaded to this extent by those obstructions are not included in the SARA. Obstructions that are part of the building design cannot be considered as shading obstructions and cannot be used to reduce the SARA. Once the SARA is determined for the steep sloped roof, the SARA is multiplied by 18 watts to determine the minimum PV sizing (any roof area with a northernly azimuth between 300 degrees and 90 degrees from true north is not considered in the SARA consistent with exception 1 to Section 170.2(f)).

EQUATION 170.2-C ANNUAL PHOTOVOLTAIC ELECTRICAL OUTPUT

$$kW_{PV} = (CFA \times A)/1000 + (N_{DU} \times B)$$

where:

kW_{PV}	=	kW_{dc} size of the PV system.
CFA	=	Conditioned floor area.
N_{DU}	=	Number of dwelling units.
A	=	CFA adjustment factor from Table 170.2-T.
B	=	Dwelling unit adjustment factor from Table 170.2-T

Exception 1 to Section 170.2(f): For steep slope roofs, SARA shall not consider roof areas with a northerly azimuth that lies between 300 degrees and 90 degrees from true north. No PV system is required if the SARA is less than 80 contiguous square feet.

«» Commentary for Exception 1 to Section 170.2(f):

When a roof has a pitch greater than 2:12 (steep sloped roof), any roof area with a northernly azimuth between 300 and 90 degrees is not included in the SARA.

When any individual roof area has a SARA that is less than 80 contiguous square feet, no PV system is required for that individual roof area. «»

Exception 2 to Section 170.2(f): No PV system is required when the minimum PV system size specified by Section 170.2(f) is less than 4 kW_{dc}.

«» Commentary for Exception 2 to Section 170.2(f):

When the Section 170.2(f) requires a PV kW of less than 4 kWdc for the entire building, PV will not be required. «»

Exception 3 to Section 170.2(f): Buildings with enforcement-authority-approved roof designs, where the enforcement authority determines it is not possible for the PV system, including panels, modules and components and supports and attachments to the roof structure, to meet the requirements of American Society of Civil Engineers (ASCE) Standard 7-16, Chapter 7, Snow Loads.

«» Commentary for Exception 3 to Section 170.2(f):

If the building is in an area that receives large amounts of snow, PV systems are not required when the enforcement authority determines, consistent with the American Society of Civil Engineers (ASCE) Standard 7-16, Chapter 7, that heavy snow loads in that specific location cannot be met for PV systems.

Exception 4 to Section 170.2(f): For buildings that are approved by the local planning department prior to January 1, 2020, with mandatory conditions of approval:

a. Shading from roof designs and configurations for steep slope roofs shall be considered for the annual solar access calculations; and

b. Roof areas that are not allowed to have PVs by the mandatory conditions of approval shall not be considered in determining the SARA.

«» Commentary for Exception 4 to Section 170.2(f):

Before January 1, 2020, the Energy Code did not include PV requirements; therefore, the building design presented for approval at the planning department would not have included PV in compliance with the Energy Code. The planning department may have mandatory conditions of approval that allow roof designs and configurations that would potentially shade PV panels or limit the roof area where PV panels could be installed. For steep sloped roofs, any planning department approved roof designs/configurations that shade the roof shall be considered in determining the annual solar access. Also, any roof areas that the planning department expressly did not allow to have PVs in the mandatory conditions shall not be excluded from the SARA. Exception 4 does not apply if the building was approved by the planning department on or after January 1, 2020. **«»**

Exception 5 to Section 170.2(f): PV system sizes determined using Equation 170.2-C may be reduced by 25 percent if installed in conjunction with a BESS. The BESS shall meet the qualification requirements specified in Joint Appendix JA12 and have a minimum cycling capacity of 7.5 kWh as specified in Joint Appendix JA12.

«» Commentary for Exception 5 to Section 170.2(f):

Battery energy storage systems are not required for multifamily buildings 3 stories or less, but a minimum cycling capacity sizing of 7.5 kWh or greater per building, can be utilized to reduce the PV system sizing. This might be desired when there are limitations to the amount of PV panels that can be located on the project site. **«»**

TABLE 170.2-T CFA AND DWELLING UNIT ADJUSTMENT FACTORS

CLIMATE ZONE	A—CFA	B—DWELLING UNITS
1	0.793	1.27
2	0.621	1.22
3	0.628	1.12
4	0.586	1.21
5	0.585	1.06
6	0.594	1.23
7	0.572	1.15
8	0.586	1.37
9	0.613	1.36

10	0.627	1.41
11	0.836	1.44
12	0.613	1.40
13	0.894	1.51
14	0.741	1.26
15	1.56	1.47
16	0.59	1.22

(g) Photovoltaic requirements—more than three habitable stories. All newly constructed building types specified in Table 170.2-U, or mixed occupancy buildings where at least 80 percent of the floor area of the building serves one or more of these building types shall have a newly installed photovoltaic (PV) system meeting the minimum qualification requirements of Reference Joint Appendix JA11. The PV capacity in kW_{dc} shall not be less than the smaller of the minimum rated PV system capacity determined by Equation 170.2-D, or the total of all available Solar Access Roof Areas (SARA) multiplied by 18 for steep-sloped roofs or multiplied by 14 for low-sloped roofs. In mixed occupancy buildings, the minimum rated PV system capacity for the building shall be determined by applying Equation 170.2-D to the conditioned floor area of each of the listed building types and summing the capacities determined for each.

«» Commentary for Section 170.2(g):

The installed PV system for any multifamily building must meet the applicable requirements specified in JA11 for both the prescriptive and performance approach. Requirements include considerations such as system orientation, shading criteria, solar access verification, remote monitoring, and interconnection requirements. **«»**

1. SARA includes the area of the building's roof space capable of structurally supporting a PV system, and the area of all roof space on covered parking areas, carports and all other newly constructed structures on the site that are compatible with supporting a PV system as specified by Title 24, Part 2, Section 1511.2.

2. SARA does not include:

   A. Any area that has less than 70 percent annual solar access. Annual solar access is determined by dividing the total annual solar insolation (accounting for shading obstructions) by the total annual solar insolation if the same areas were unshaded by those obstructions. For all roofs, all obstructions including those that are external to the building, and obstructions that are part of the building design and elevation features, may be considered for the annual solar access calculations.

   B. Occupied roofs as specified by CBC Section 503.1.4.

   C. Roof area that is otherwise not available due to compliance with:

      i. Other state building code requirements, or

      ii. Local building code requirements if the local building code requirements are confirmed by the Executive Director.

«» Commentary for Section 170.2(g)2:

If a building includes an occupied roof area meeting the requirements of the California Building Code (Title 24, Part 2) for occupied roofs (Section 503.1.4), that roof area is not included in the SARA.

When there is a building code requirement that would not allow PV systems to be installed on a specific area of the roof, that roof area is not included in the SARA. This can include Fire Code setback provisions, Mechanical Code setback and access provisions, and Building Code envelope maintenance system setback provisions.

Some local building codes or ordinances require the roof to be used for specific purposes, such as for "living roofs". Areas of the roof that are required to be used for specific purposes can be removed from the SARA if the CEC's Executive Director has approved the SARA removal for the specific local code/ordinance.

For multifamily buildings with four or more habitable stories, shading obstructions shall be considered for solar access calculations include all obstructions including those that are external to the building and all obstructions that are part of the building design and elevation features.

The PV system should eliminate or avoid shading from any obstruction to the array. Obstructions include the following:

Any vent, chimney, architectural feature, mechanical equipment, or other obstruction that is on the roof or any other part of the building.

Any part of the neighboring terrain.

Any tree that is mature at the time of installation of the PV system.

Any tree that is planted on the building lot or neighboring lots or planned to be planted as part of landscaping for the building associated with the building permit. (The expected shading must be based on the mature height of the tree.)

Any existing neighboring building or structure.

Any planned neighboring building or structure that is known to the applicant or building owner.

Any telephone or other utility pole that is closer than 30 ft. from the nearest point of the array.

Any obstruction located directly north of the array does not count as a shading obstruction.

For prescriptive compliance, the weighted average of annual solar access, determined by a solar access verification tool approved by the CEC to meet JA11.4 requirements, across each solar panel must be at least 98 percent. If the annual solar access is less than 98%, then the building does not meet the prescriptive requirement and the performance compliance method must be used instead.

The individual roof areas that constitute SARA must have greater than 70 percent annual solar access. If any individual roof area has a SARA that is less than 80 contiguous sq. ft., no PV is required for that individual roof area.

The code language specifies that the only local code requirements that are permissible for excluding area from SARA are those that have been confirmed by the Energy Commission Executive Director. **«»**

EQUATION 170.2-D PHOTOVOLTAIC DIRECT CURRENT CAPACITY

$kW_{PVdc} = (CFA \times A)/1000$

where:

kW_{PVdc} = Minimum rated PV system capacity in kW.

CFA = Conditioned floor area in square feet.

A = PV capacity factor in W/square foot as specified in Table 170.2-U for the building type.

Exception 1 to Section 170.2(g): No PV system is required where the total of all available SARA is less than 3 percent of the conditioned floor area.

«» Commentary for Exception 1 to Section 170.2(g):

The resulting SARA square footage is compared to the total conditioned floor area of the building. If the SARA ft² is less than 3% of the total CFA, a PV system is not required and solar readiness will apply. «»

Exception 2 to Section 170.2(g): No PV system is required where the required PV system capacity is less than 4 kW_{dc}.

«» Commentary for Exception 2 to Section 170.2(g):

When Section 170.2(g) requires a PV kW of less than 4 kW_{dc} for the entire building, PV will not be required and solar readiness will apply. «»

Exception 3 to Section 170.2(g): No PV system is required if the SARA contains less than 80 contiguous square feet.

«» Commentary for Exception to 3 Section 170.2(g):

When any individual roof area has a SARA that is less than 80 contiguous square feet, no PV system is required for that individual roof area. «»

Exception 4 to Section 170.2(g): Buildings with enforcement-authority-approved roof designs, where the enforcement authority determines it is not possible for the PV system, including panels, modules, components, supports and attachments to the roof structure, to meet ASCE 7-16, Chapter 7, Snow Loads.

«» Commentary for Exception 4 to Section 170.2(g):

If the building is in an area that receives large amounts of snow, PV systems are excepted when the enforcement agency determines, consistent with the American Society of Civil Engineers (ASCE) Standard 7-16, Chapter 7 that heavy snow loads in that specific location cannot be met with PV systems. «»

Exception 5 to Section 170.2(g): Multifamily buildings with more than three habitable stories in areas where a load serving entity does not provide a program where PV generation is compensated through virtual energy bill credits. This exception does not apply where the Commission has approved a community solar program for showing compliance as specified in Title 24, Part 1, Section 10-115, or where a load-serving entity provides a program where PV generation is compensated through virtual energy bill credits for occupants of nonresidential and hotel/motel tenant spaces to receive energy bill benefits from netting of energy generation and consumption.

«» Commentary for Exception 5 to Section 170.2(g):

When the load serving entity does not support a virtual energy bill credit program (the list of load serving entities can be found here: https://www.energy.ca.gov/sites/default/files/2023-09/California_Electric_Load-Serving_Entities_ADA.xlsx) , and the CEC has not approved a community solar program that is able to serve the project address, then PV will not be required for multifamily buildings with more than three habitable stories. Community solar programs are

approved each code cycle, and when approved, are identified on the CEC's website under the applicable code cycle. «»

Table 170.2-U – PV Capacity Factors (W/ft² of conditioned floor area)

Building Type	CZ 1	CZ 2	CZ 3	CZ 4	CZ 5	CZ 6	CZ 7	CZ 8	CZ 9	CZ 10	CZ 11	CZ 12	CZ 13	CZ 14	CZ 15	CZ 16
Events & Exhibit	3.48	4.28	3.66	4.32	3.77	4.05	4.28	4.83	4.63	4.80	5.04	4.44	4.95	4.36	5.48	3.38
Library	0.39	3.23	2.59	3.25	2.48	2.74	3.04	3.49	3.32	3.69	3.79	3.32	3.79	3.37	4.49	2.84
Hotel/Motel	1.69	1.90	1.66	1.97	1.69	1.87	1.94	2.22	2.09	2.20	2.30	2.05	2.30	2.02	2.72	1.73
Office, Financial Institution, Unleased Tenant Space, Medical Office Building/Clinic	2.59	3.13	2.59	3.13	2.59	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.13	3.80	2.59
Restaurant	8.55	9.32	8.16	9.65	8.21	8.73	9.11	10.18	9.75	10.28	10.85	9.73	10.69	9.73	12.25	8.47
Retail, Grocery	3.14	3.49	3.01	3.61	3.05	3.27	3.45	3.83	3.65	3.81	4.09	3.64	3.99	3.71	4.60	3.21
School	1.27	1.63	1.27	1.63	1.27	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	1.63	2.46	1.27
Warehouse	0.39	0.44	0.39	0.44	0.39	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.58	0.39
Religious Worship	4.25	4.65	3.49	4.52	3.72	4.29	4.64	5.89	5.30	5.67	5.89	4.99	5.78	4.63	7.57	3.90
Sports & Recreation	2.47	1.97	1.54	2.03	1.60	1.84	1.98	2.63	2.47	2.60	2.75	2.20	2.72	2.15	4.03	1.81
Multifamily > 3 stories	1.82	2.21	1.82	2.21	1.82	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.77	1.82

(h) Battery Energy Storage System (BESS) requirements—more than three habitable stories. All buildings that are required by Section 170.2(g) to have a PV system shall also have a BESS meeting the minimum qualification requirements of Reference Joint Appendix JA12. The rated energy capacity shall be not less than the Minimum Rated Useable Energy Capacity determined by Equation 170.2-E, or by Equation 170.2-F if SARA was used to determine the PV capacity in Section 170.2-D. and the rated power capacity shall be not less than the Minimum Power Capacity determined by Equation 170.2-G. In mixed occupancy buildings, the total battery system capacity for the building shall be determined by applying the Minimum Rated Usable Energy Capacity to each of the listed building types and summing the capacities determined for each.

«» Commentary for Section 170.2(h):

As specified by Section 170.2(h), multifamily buildings with four or more habitable stories are required to have battery storage under the prescriptive approach if solar PV is installed and meets the prescriptive requirements of Section 170.2(g). Multifamily buildings with three or less habitable floors have no prescriptive battery energy storage system requirements, but can include battery energy storage systems in the performance approach to qualify for a self-utilization credit or as a demand flexibility compliance measure.

In the performance approach, battery energy storage systems can be installed as a stand-alone system with a compliance cycling capacity of at least 5 kWh per building. This is an additional compliance credit for multifamily buildings three habitable stories or

less, and a compliance option for four stories or more. When utilized, battery energy storage systems (BESS) are required to meet the qualifications of Joint Appendix JA12 for both the prescriptive and performance approach.

The primary function of the battery energy storage system is load shifting to harmonize the onsite PV system with the grid and deliver benefits to the environment, building owner, and building occupants. Installation of battery energy storage systems maximize self-utilization of PV array output, and limit grid exports to the benefit of the grid and the ratepayer. This is done by charging the battery from the PV system when there is limited electrical load at the building and the cost of electricity is low, usually in midday, and discharging to reduce the electrical load of the building when the cost of electricity is high, usually in the late afternoon and early evening hours.

The JA12 requirements are designed to ensure that the BESS remains in an active control mode and prevent the BESS from remaining in the backup mode indefinitely. While maintaining compliance with these requirements, the BESS can receive the latest firmware, software, control strategy, and other important updates.

All control strategies including Basic Control, Time-of-Use (TOU) Control, and Advanced Demand Response Control shall meet the following JA12 General Control Requirements.

Remote Capability: The BESS must have the capability of being remotely programmed to change the charge and discharge periods and to remotely switch between control strategies.

Charging Behavior: When combined with an on-site solar photovoltaic system, the BESS shall first charge from an on-site photovoltaic system when the photovoltaic system production is greater than the on-site electrical load. The BESS also may charge from the grid during off-peak TOU hours of the day if allowed by the load serving entity. In anticipation of severe weather, Public Safety Power Shutoff events, or demand response signal, the BESS may charge from the grid at any time if allowed by the load serving entity.

Discharge Behavior: During discharge, the BESS shall be programmed to first meet the electrical load of the building. If during the discharge period the electrical load of the building is less than the maximum discharge rate, the BESS shall have the capability to discharge electricity into the grid upon receipt of a demand response signal from the load serving entity or a third-party aggregator.

At the time of enforcement agency inspection, the BESS shall be installed and commissioned to meet one of the following control strategies in JA12.3.3.2.1 to JA12.3.3.2.5. JA12 includes three discharging control strategies.

The enforcement agency cannot enforce a particular control strategy after the BESS is installed and inspected. As a result, BESS can be operated with any JA12 control strategy, but the performance compliance software will only simulate time of use control strategy.

Basic Control: To qualify for the Basic Control strategy, when combined with an on-site solar photovoltaic system, the BESS shall only allow charging from an on-site photovoltaic system when the photovoltaic system production is greater than the on-site electrical load. The BESS shall discharge whenever the photovoltaic system production is less than the on-site electrical load.

Time-of-Use (TOU) Control: To qualify for the TOU Control strategy, when combined with an on-site solar photovoltaic system, the BESS shall begin discharging during the highest priced TOU hours of the day. The operation schedule shall be preprogrammed from the factory, updated remotely, or commissioned during the installation/commissioning of the system. At a minimum, the system shall be capable of programming three separate seasonal TOU schedules, such as spring, summer, and winter.

Advanced Demand Flexibility Control: Designed to bring the maximum value to the PV system generation by placing the charge/discharge functions of the BESS under the control of a load serving entity or a third-party aggregator. This control strategy enables discharging into the grid upon receiving a demand response signal from a grid operator. This option requires robust communication capabilities between the BESS and the load serving entity or the third-party aggregator. To qualify for the Advanced Demand Flexibility Control strategy, when combined with an on-site solar photovoltaic system, the BESS shall be programmed as either Basic Control or TOU control. The BESS shall meet the demand response control requirements specified in Section 110.12(a)1 and Section 110.12(a)2. Additionally, the BESS shall have the capability to change the charging and discharging periods in response to signals from the load serving entity or a third-party aggregator.

Controls for Separate Battery Energy Storage Systems

As specified in JA12.3.3.2.4, when a BESS system is installed separately from (not in combination with) an on-site solar photovoltaic system, including when the building is served by a community solar PV system to qualify for compliance, the BESS shall be programmed to:

Start charging from the grid during the lowest priced TOU hours of the day and start discharging during the highest priced TOU hours of the day, or

Meet all the demand response control requirements specified in Section 110.12(a)1 and Section 110.12(a)2, and shall have the capability to change the charging and discharging periods in response to signals from the load serving entity or a third-party aggregator.

Alternative Control Approved by the Executive Director

The Executive Director may approve applications for alternative control strategies that demonstrate equal or greater benefits to those strategies specified in JA12. To qualify for Alternative Control, the BESS shall be operated in a manner that increases self-utilization of the photovoltaic array output, responds to utility rates, responds to demand response signals, minimize greenhouse gas emissions from buildings, and/or

implements other strategies that achieve equal or greater benefits than those specified in JA12. This application to the Executive Director for the alternative control option shall be accompanied with clear and easy to implement algorithms for incorporation into the compliance software for compliance credit calculations.

Safety Requirements

The BESS shall be tested in accordance with the applicable requirements specified in UL 1973 and UL 9540. Inverters used with BESS shall be tested in accordance with the applicable requirements in UL 1741, UL 1741 Supplement SA or UL1741 Supplement SB.

Enforcement Agency Requirements

The local enforcement agency shall verify that all Certificate of Installations are valid. The BESS shall be verified as a model certified to the Energy Commission as qualified for credit as a BESS is commissioned. In addition, the enforcement agency shall verify that the BESS is commissioned and operational with one of the controls specified in JA12. The control strategy and the compliance cycling capacity at system installation, final inspection and commissioning, and final inspection by the enforcement agency shall be the control strategy and the compliance cycling capacity that was used in the Certificate of Compliance

Certification Documentation Requirements

A specification sheet showing usable capacity, compliance cycling capacity, roundtrip efficiency and an identification as a field assembled or integrated BESS shall be submitted to CEC for JA12 certification.

«»

EQUATION 170.2-E BATTERY ENERGY STORAGE SYSTEM MINIMUM RATED USABLE ENERGY CAPACITY

$kWh_{batt} = ((CFA \times B)/(1000 \times C^{0.5}))$

EQUATION 170.2-F - BATTERY ENERGY STORAGE SYSTEM MINIMUM RATED USABLE ENERGY CAPACITY, SARA-ADJUSTED

$kWh_{batt} = ((CFA \times B)/(1000 \times C^{0.5})) \times (kW_{PVdc,SARA}/kW_{PVdc})$

WHERE:

kWh_{batt}= Minimum Rated Usable Energy Capacity of the BESS in kWh.

kW_{PVdc} = Minimum Rated PV System Capacity in kW from Equation 170.2-D

$kW_{PVdc, SARA}$ = Minimum Rated PV System Capacity in kW from the SARA calculation.

CFA = Conditioned floor area that is subject to the PV system requirements of Section 170.2(g) in square feet.

B = BESS Capacity Factor in Wh/square foot as specified in Table 170.2-V for the building type.

C = Rated single charge-discharge cycle AC to AC (round-trip) efficiency of the BESS.

EQUATION 170.2-G BATTERY ENERGY STORAGE SYSTEM MINIMUM RATED POWER CAPACITY

$kW_{batt} = kWh_{batt} / 4$

WHERE:

kW_{batt} = Minimum Rated Power Capacity of the BESS in kWdc

kWh_{batt} = Minimum Rated Usable Energy Capacity of the BESS in kWh

Exception 1 to Section 170.2(h): No BESS is required if the installed PV system capacity is less than 15 percent of the capacity determined by Equation 170.2-D.

«» Commentary for Exception 1 to Section 170.2(h):

Multifamily buildings, with a designed and installed PV system that is less than 15% of the prescriptive size calculated by Equation 170.2-D, are not required to install battery storage. When utilizing this exception for compliance, documentation supporting the designed PV system sizing with less than 15% from the prescriptive equation is required. «»

Exception 2 to Section 170.2(h): No BESS is required in buildings with BESS requirements with less than 10 kWh minimum rated usable energy capacity.

«» Commentary for Exception 2 to Section 170.2(h):

When using either the prescriptive battery energy capacity Equation 170.2-F, or the performance approach, if the minimum BESS-rated usable energy capacity is less than 10 kWh, BESS is not required. «»

TABLE *170.2-V – BESS Capacity Factors (Wh/ft² of conditioned floor area)*

Building Type	CZ 1	CZ 2	CZ 3	CZ 4	CZ 5	CZ 6	CZ 7	CZ 8	CZ 9	CZ 10	CZ 11	CZ 12	CZ 13	CZ 14	CZ 15	CZ 16
Events & Exhibits	1.82	1.95	1.74	2.12	1.91	2.13	2.24	2.30	2.36	2.47	2.62	2.16	2.64	2.68	3.22	1.89
Library	0.37	7.17	5.97	6.75	5.64	6.08	6.19	7.13	7.18	7.56	7.17	6.93	6.88	6.81	7.93	6.40
Hotel/Motel	0.86	0.84	0.77	0.92	0.81	0.89	0.90	1.01	1.00	1.11	1.14	0.96	1.18	1.18	1.49	0.85
Office, Financial Institution, Unleased Tenant Space, Medical Office Building/Clinic	NR[1]	5.26	4.35	5.26	4.35	5.26	5.26	5.26	5.26	5.26	5.26	5.26	5.26	5.26	6.39	4.35
Restaurants	4.36	4.11	3.78	4.37	3.89	4.02	4.11	4.49	4.47	4.82	5.05	4.43	5.05	5.24	6.23	4.11
Retail, Grocery	1.89	1.82	1.71	1.82	1.72	1.80	1.76	1.92	1.97	2.05	2.22	1.95	2.16	2.29	2.66	1.91
School	NR[1]	3.05	2.38	3.05	2.38	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	4.60	2.38
Warehouse	NR[1]	0.41	0.37	0.41	0.37	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.41	0.54	0.37
Religious Worship	2.21	2.25	1.74	2.42	2.08	2.75	2.94	3.37	3.17	3.37	3.58	2.72	3.62	3.21	4.89	2.37
Sports & Recreation	1.26	0.98	0.76	1.14	0.86	1.20	1.23	1.57	1.53	1.65	1.83	1.27	1.86	1.57	3.02	1.13
Multifamily > 3 stories	1.88	2.27	1.88	2.27	1.88	2.27	2.27	2.27	2.27	2.27	2.27	2.27	2.27	2.27	2.85	1.88

Footnote to TABLE 170.2-V:

1. NR = Not Required

SECTION 180.1 – ADDITIONS

Additions to existing multifamily buildings shall meet the applicable requirements of Sections 110.0 through 110.9; Sections 160.0, 160.1, and 160.2(c) and (d); Sections 160.3 through 160.7; and either Section 180.1(a) or 180.1(b).

Exception 6 to Section 180.1: Photovoltaic and BESS, as specified in Sections 170.2(f) through 170.2(h), are not required for additions.

(a) Prescriptive approach. The envelope and lighting of the addition; any newly installed space-conditioning or ventilation system, electrical power distribution system, or water-heating system; any addition to an outdoor lighting system; and any new sign installed in conjunction with an indoor or outdoor addition shall meet the applicable requirements of Sections 110.0 through 110.12**;** 160.0, 160.1, and 160.2(c) and (d); and 160.3 through 170.2.

Exception to Section 180.1(a)1: Additions that increase the area of the roof by 2,000 square feet or less are not required to comply with the solar ready requirements of Section 160.8.

«» Commentary for Section 180.1(a):

Alterations and additions to existing multifamily buildings do not trigger PV and BESS requirements under the Energy Code, nor are they allowed as compliance options within the performance approach. The prescriptive and performance requirements for PV and battery storage only apply to newly constructed buildings. When an addition to an existing building increases the area of the roof by greater than 2,000 ft², that roof area will need to meet the mandatory solar readiness requirements as specified by the Exception to Section 180.1(a)1B. «»