The California State University
OFFICE OF THE CHANCELLOR

CPDC Bulletin

22-010

☒ Information	☐ Administrative	☐ Procedural	☒ Technical ☒ CCR Title 24 ☒ Design ☐ Construction ☐ Inspection

Bulletin: Title 24 Part 6, 2022 Code Cycle Updates

Effective Date:	**January 1, 2023**
From:	**Energy, Sustainability & Transportation; Planning & Design**
Item No.	**Informational/Technical**

The purpose of this memo is to inform Executive Facilities Officers, Directors of Facilities, energy managers, and other members of the CSU (CALIFORNIA STATE UNIVERSITY,) community on the anticipated impacts of the 2022 cycle of updates to Title 24 Part 6, also known as California Energy Code. The new cycle of energy code will be in effect January 1, 2023. This bulletin has been developed with the concurrence of CSU's Mechanical Review Board (MRB).

Solar and Battery Requirements

All upcoming new building and major renovation projects should plan for installation of solar and battery systems. This may include purchasing solar and battery systems or financing through a power purchase agreement (PPA) when allowed by the local electric utility[1]. There are two paths to complying with Title 24: the prescriptive path, and the performance path. The prescriptive path requires buildings to meet system-specific design parameters to comply, whereas the performance path allows for a whole-building approach. CSU has historically followed the performance pathway, with the caveat that each individual assembly (envelope, HVAC (Heating Ventilating and Air Conditioning), etc.) must comply on its own merits, in addition to achieving an overall performance of 10% better than the energy code minimum requirements.

While tradeoffs are allowed using the performance compliance path, the solar requirement is roughly the equivalent of an 8 kBtu/SF-yr reduction in annual energy usage intensity. It will be difficult to offset the entire solar PV requirement with only energy efficiency.

In addition to costs directly related to the installation of solar and battery systems, in certain cases campuses should also budget for an adder of up to $300,000 for costs related to interconnection. These additional dollars will be necessary where new installations, coupled with existing "behind-the-meter" systems (i.e., campus-side systems), will result in a total installed solar PV capacity exceeding 1 MW. The added cost is associated with utility-required service entrance feeder recloser costs and will comprise both utility-imposed and customer direct costs.

[1] For example, CSUN and CSULA are not allowed to interconnect PPAs with LADWP.

Authority: Per Title 24 Part 2, Chapter 1, Division II §104.1:

> *"The building official shall have the authority to render interpretations of this code and to adopt policies and procedures in order to clarify the application of its provisions. Such interpretations, policies and procedures shall be in compliance with the intent and purpose of this code. Such policies and procedures shall not have the effect of waiving requirements specifically provided for in this code."*

Noting that CSU is its own Authority-Having Jurisdiction, larger campus installations of solar and battery that become operational in 2022 or later may be used for credit towards building-level compliance with Title 24 Part 6. These discussions should involve the Campus Deputy Building Official, Energy Manager, and Campus Planner. Work with the Chancellor's Office CPDC (Capital Planning Design and Construction) to ensure that the accounting of these components is accurate. In addition, if campuses want to utilize area outside of main campus for installations, consult CPDC.

An exception to the requirement for new photovoltaic installation may be made, on a project-by-project basis, when campuses are able to substantiate existing excess PV capacity connected behind-the-meter using trend data. The code-mandated size calculated using equation 140.10-A in Title 24 Part 6 §140.10 (Prescriptive Requirements for Photovoltaic and Battery Storage Systems) is the maximum amount that may be allotted out of the campus' excess PV capacity towards the building project. Battery storage requirements still apply.

Electrification

The new cycle of energy code rewards electrification rather than penalizing it, as it has done in the past. The baseline model against which the compliance software compares proposed building performance now includes single zone heat pumps, rather than solely gas-fired equipment. Note that the new CSU Sustainability Policy requires that no new natural gas equipment be installed after the year 2035, with exceptions for academic program needs.

More details and accompanying documentation will follow in the coming months. Please contact the Associate University Engineer, Director of Architecture, or Chief of Energy, Sustainability & Transportation with any questions.

Attachments: 2022 Title 24 Part 6 §140.10
CALBO Slides

Weblinks:

- California Energy Commission, Building Energy Efficiency Standards Page
  - https://www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards

Applicability: All Structures owned or occupied by the State including Auxiliary Services. Design Services, Permit Process, Construction Services, Public Private Partnerships, Lease and Acquisitions.

Plan Check Services, Mechanical/Electrical Peer Review Services.

End of Bulletin

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SECTION 140.10 – PRESCRIPTIVE REQUIREMENTS FOR PHOTOVOLTAIC AND BATTERY STORAGE SYSTEMS

(a) Photovoltaic Requirements.

All newly constructed building types specified in Table 140.10-A, or mixed occupancy buildings where one or more of these building types constitute at least 80 percent of the floor area of the building, shall have a newly installed photovoltaic (PV) system meeting the minimum qualification requirements of Reference Joint Appendix JA11. The PV size in kW_{dc} shall be not less than the smaller of the PV system size determined by Equation 140.10-A, or the total of all available Solar Access Roof Areas (SARA) multiplied by 14 W/ft².

1. SARA include 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.
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 space that is otherwise not available due to compliance with other building code requirements if confirmed by the Executive Director.

EQUATION 140.10-A PHOTOVOLTAIC DIRECT CURRENT SIZE

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

WHERE:

kW_{PVdc} = Size of the PV system in kW

CFA = Conditioned floor area in square feet

A = PV capacity factor specified in Table 140.10-A for the building type

Where the building includes more than one of the space types listed in Table 140.10-A, the total PV system capacity for the building shall be determined by applying Equation 140.10-A to each of the listed space types and summing the capacities determined for each.

EXCEPTION 1 to Section 140.10(a). No PV system is required where the total of all available SARA is less than three percent of the conditioned floor area.

EXCEPTION 2 to Section 140.10(a). No PV system is required where the required PV system size is less than 4 kW_{dc}.

EXCEPTION 3 to Section 140.10(a). No PV system is required if the SARA contains less than 80 contiguous square feet.

EXCEPTION 4 to Section 140.10(a). 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.

EXCEPTION 5 to Section 140.10(a). Multi-tenant buildings in areas where a load serving entity does not provide either a Virtual Net Metering (VNEM) or community solar program.

(b) Battery Storage System Requirements.

All buildings that are required by Section 140.10(a) to have a PV system shall also have a battery storage system meeting the minimum qualification requirements of Reference Joint Appendix JA12. The rated energy capacity and the rated power capacity shall be not less than the values determined by Equation 140.10-B and Equation 140.10-C. Where the building includes more than one of the space types listed in Table 140.10-B, the total battery system capacity for the building shall be determined by applying Equations 140.10-B and 140.10-C to each of the listed space types and summing the capacities determined for each space type and equation.

EQUATION 140.10-B - BATTERY STORAGE RATED ENERGY CAPACITY

$$kWh_{batt} = kW_{PVdc} \times B / D^{0.5}$$

WHERE:

kWh_{batt} = Rated Useable Energy Capacity of the battery storage system in kWh

kW_{PVdc} = PV system capacity required by section 140.10(a) in kWdc

B = Battery energy capacity factor specified in Table 140.10-B for the building type

D = Rated single charge-discharge cycle AC to AC (round-trip) efficiency of the battery storage system

EQUATION 140.10-C - BATTERY STORAGE RATED POWER CAPACITY

$$kW_{batt} = kW_{PVdc} \times C$$

WHERE:

kW_{batt} = Power capacity of the battery storage system in kWdc

kW_{PVdc} = PV system capacity required by section 140.10(a) in kWdc

C = Battery power capacity factor specified in Table 140.10-B for the building type

EXCEPTION 1 to Section 140.10(b). No battery storage system is required if the installed PV system size is less than 15 percent of the size determined by Equation 140.10-A.

EXCEPTION 2 to Section 140.10(b). No battery storage system is required in buildings with battery storage system requirements with less than 10 kWh rated capacity.

EXCEPTION 3 to Section 140.10(b). For multi-tenant buildings, the energy capacity and power capacity of the battery storage system shall be based on the tenant spaces with more than 5,000 square feet of conditioned floor area. For single-tenant buildings with less than 5,000 square feet of conditioned floor area, no battery storage system is required.

EXCEPTION 4 to Section 140.10(b). In climate zone 1, no battery storage system is required for offices, schools, and warehouses.

Table 140.10-A – PV Capacity Factors

	Factor A – Minimum PV Capacity (W/ft² of conditioned floor area)		
Climate Zone	**1, 3, 5, 16**	**2, 4, 6-14**	**15**
Grocery	2.62	2.91	3.53
High-Rise Multifamily	1.82	2.21	2.77
Office, Financial Institutions, Unleased Tenant Space	2.59	3.13	3.80
Retail	2.62	2.91	3.53
School	1.27	1.63	2.46
Warehouse	0.39	0.44	0.58
Auditorium, Convention Center, Hotel/Motel, Library, Medical Office Building/Clinic, Restaurant, Theater	0.39	0.44	0.58

Table 140.10-B – Battery Storage Capacity Factors

	Factor B – Energy Capacity	**Factor C – Power Capacity**
Storage-to-PV Ratio	**Wh/W**	**W/W**
Grocery	1.03	0.26
High-Rise Multifamily	1.03	0.26
Office, Financial Institutions, Unleased Tenant Space	1.68	0.42
Retail	1.03	0.26
School	1.87	0.46
Warehouse	0.93	0.23

Auditorium, Convention Center, Hotel/Motel, Library, Medical Office Building/Clinic, Restaurant, Theater	0.93	0.23

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, 25402.8, and 25943, Public Resources Code.

PV and Battery Storage Prescriptive Requirements

Nonresidential § 140.10(a-b)

- Added new section
- PV and battery storage requirements
  - Grocery, high-rise multifamily, office, financial, unleased tenant space, retail, school, warehouse, auditoriums, convention center, hotel/motel, library, medical office/clinic, restaurant, theater
- Climate zone dependent
- Added Tables 140.10-A and 140.10-B

Photovoltaic Prescriptive Requirements

Nonresidential Table 140.10-A

Table 140.10-A – PV Capacity Factors

Building Type	**Factor A – Minimum PV Capacity (W/ft² of conditioned floor area) Climate Zones 1, 3, 5, 16**	***Factor A – Minimum PV Capacity (W/ft² of conditioned floor area)* Climate Zones 2, 4, 6-14**	**Factor A – Minimum PV Capacity (W/ft² of conditioned floor area) Climate Zone 15**
Grocery	2.62	2.91	3.53
High-Rise Multifamily	1.82	2.21	2.77
Office, Financial Institutions, Unleased Tenant Space	2.59	3.13	3.80
Retail	2.62	2.91	3.53
School	1.27	1.63	2.46
Warehouse	0.39	0.44	0.58
Auditorium, Convention Center, Hotel/Motel, Library, Medical Office Building/Clinic, Restaurant, Theater	0.39	0.44	0.58

Photovoltaic Prescriptive Requirements

Nonresidential § 140.10(a)

Solar Available Roof Area

Conditioned Floor Area

PV exceptions

- No PV system where total SARA is less than 3% of CFA
- No PV system when required PV system is less than 4 kWdc
- No PV system if SARA is less than 80 contiguous square feet
- Per enforcement-authority-approved roof design not possible for PV system to meet snow loads per ASCE 7-16, Chapter 7
- Multi-tenant buildings in areas where utility does not provide virtual net metering (VNEM) or community solar program

Battery Storage Prescriptive Requirements

Nonresidential Table 140.10-B

Table 140.10-B Battery Storage Capacity Factors

	Factor B – Energy Capacity	Factor C – Power Capacity
Storage-to-PV Ratio	**Wh/W**	**W/W**
Grocery	1.03	0.26
High-Rise Multifamily	1.03	0.26
Office, Financial Institutions, Unleased Tenant Space	1.68	0.42
Retail	1.03	0.26
School	1.87	0.46
Warehouse	0.93	0.23
Auditorium, Convention Center, Hotel/Motel, Library, Medical Office Building/Clinic, Restaurant, Theater	0.93	0.23

Battery Storage Prescriptive Requirements

Nonresidential § 140.10(b)

Battery storage exceptions

- No system required if installed PV system size less than 15% of size determined by Equation 140.10-A
- No system required in buildings with battery storage system requirements less than 10 kWh rated capacity
- For multi-tenant buildings, energy capacity and power capacity of system based on tenant spaces with more than 5,000 square feet of CFA
- No system required for single-tenant buildings with less than 5,000 square feet of CFA
- No system required in climate zone 1 for offices, schools, warehouses