

California's updated Title 24

Electrical distribution compliance



This white paper is intended to serve as a guide to help understand Title 24 requirements for electrical distribution panels.

Introduction

California's Title 24, Part 6, Building Energy Efficiency Standards, §130.5 call for the ability to meter various types of electrical loads. Updates to the standard went into effect in 2017 and require provisions for metering individual panels or loads, even if the meter is to be installed in the future. Section 130.5 applies to new electrical system installations or when complete electrical systems are replaced. The requirement does not apply to modifications made in existing electrical systems, such as adding a new breaker to an electrical panel.

What to monitor

Depending on the application, different types of metering are required to comply with Title 24, Part 6 §130.5. Applications have been organized into several categories, dependent on the type of branch devices used, and the electrical service rating of the panel.

The recently updated California Energy Commission's Title 24 regulation specifies additional energy monitoring requirements that make smart electrical distribution achievable. As demand for intelligent, more efficient and sustainable building construction increases, there is a need for electrical distribution panels that can adapt/expand with new requirements.

For service entrance applications, a wide variety of metering options are available to meet Part 6 §130.5(a) requirement to monitor the main line side of the panel. Single point meters such as utility-supplied meters, or integrated meters available from the panelboard manufacturer, that provide instantaneous kW monitoring capabilities can meet this requirement.

For applications with panelboard service greater than 50 kVA, energy consumption monitoring should be grouped by load type, location in building, or in another category as defined by Title 24. The monitoring of load circuits can be easily accomplished with a variety of products readily available in the electrical distribution market.

The ability to monitor different types of electrical loads is outlined in Part 6 Table §130.5(B), provided on page 2.

Table 130.5-B Minimum requirements for separation of electrical load

Electrical load type	Electrical services rated 50 kVA or less	Electrical services rated more than 50 kVA and less than or equal to 250 kVA	Electrical services rated more than 250 kVA and less than or equal to 1000 kVA	Electrical services rated more than 1000 kVA
Lighting including exit and egress lighting and exterior lighting	Not required	All lighting in aggregate	All lighting disaggregated by floor, type or area	All lighting disaggregated by floor, type or area
HVAC systems and components including chillers, fans, heaters, furnaces, package units, cooling towers, and circulation pumps associated with HVAC	Not required	All HVAC in aggregate	All HVAC in aggregate and each HVAC load rated at least 50 kVA	All HVAC in aggregate and each HVAC load rated at least 50 kVA
Domestic and service water system pumps and related systems and components	Not required	All loads in aggregate	All loads in aggregate	All loads in aggregate
Plug load including appliances rated less than 25 kVA	Not required	All plug load in aggregate Groups of plug loads exceeding 25 kVA connected load in an area less than 5000 sf	All plug load separated by floor, type or area Groups of plug loads exceeding 25 kVA connected load in an area less than 5000 sf	All plug load separated by floor, type or area All groups of plug loads exceeding 25 kVA connected load in an area less than 5000 sf
Elevators, escalators, moving walks, and transit systems	Not required	All loads in aggregate	All loads in aggregate	All loads in aggregate
Other individual non-HVAC loads or appliances rated 25 kVA or greater	Not required	All loads in aggregate	All loads in aggregate	All loads in aggregate
Industrial and commercial load centers 25 kVA or greater including theatrical lighting installations and commercial kitchens	Not required	All loads in aggregate	All loads in aggregate	All loads in aggregate
Renewable power source (net or total)	Each group	Each group	Each group	Each group
Loads associated with renewable power source	Not required	All loads in aggregate	All loads in aggregate	All loads in aggregate
Charging stations for electric vehicles	All loads in aggregate	All loads in aggregate	All loads in aggregate	All loads in aggregate

Expense of grouping breakers by load type

Grouping breakers into subsections of a panel can consume both time and money. Intricate layouts require engineering time and other resources to design, and require significant attention to detail in the physical wiring. Material costs increase along with the panel footprint as bus lengths grow and large current transformers (CTs) are added between the bus bar subsections. This method consumes more space in the panel and subsequently decreases circuit density and flexibility, especially when additional branch devices are needed post-commissioning.

Branch monitoring upgrade solution

Branch Circuit Monitoring (BCM) upgradable panels are a practical, cost effective way to meet Title 24 Part 6 §130.5(b) requirements. This method provides freedom to place branch devices anywhere in a panel regardless of load type. This means that panels can be installed with less labor since there is no further time dedicated to validating the construction of a complex layout.

Further, up-front investment in CTs and meters is not required as Title 24 requires that provisions be made for the ability to monitor loads in the future. When the decision to add a meter is made, measurements can

be aggregated into the desired grouping. This can be achieved without removing or rewiring the branch devices, regardless of their location inside the panel.

The BCM upgradable panel remains Title 24 compliant when one load type is wired per branch, as is the requirement for many other Title 24 solutions.

BCM kit installation

When the decision to install a BCM upgrade kit is made, the process to implement in the field is simple, with minimal downtime. Since the panel is already sized to hold a meter, upgrade kits can be quickly installed without impact to panel footprint. Split core CTs enable installation without removal or rewiring of branch devices. The field-installable upgrade path is illustrated below.

BCM upgrade compliance validation

Example 8-8, from the California Energy Commission's Nonresidential Compliance Manual illustrates how a BCM panel, where each circuit is serving only one load type, meets §130.5(b) requirements by providing for future CTs and meter installation. The example from the Compliance Manual is provided below.

Meter ready panels - split section area for current transformers (CT)

Split bus panels are a cost-effective solution for disaggregating multiple types of loads that can be metered separately in the future using additive/subtractive current transformer winding techniques. Up to seven sections can be configured in the panel, with space in between each section for future CTs. The quantity of the branches in each section is flexible and can be any multiple of six 1-pole branches. The accurate and inexpensive AMP1 meter can be used for the future metering, which must be separately mounted.

Figure 1: BCM-Ready Panel comes with provisions to mount the upgrade kit to enable metering once it is required. BCM upgrade kits contain current transformers and meter. Together, these two parts create a fully metered panel.

Figure 2: Example 8-8 from California Energy Commission's Nonresidential Compliance Manual

Figure 3: Split bus panels

Figure 1

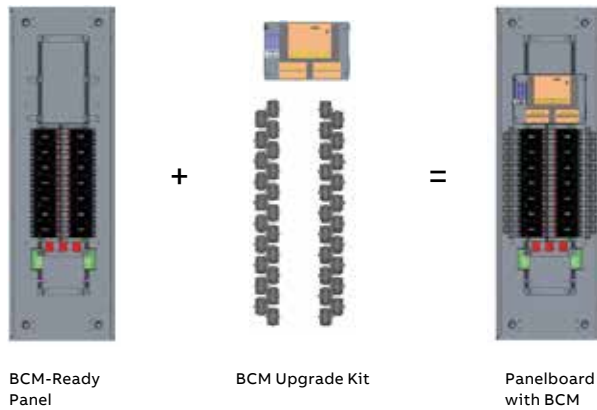


Figure 2

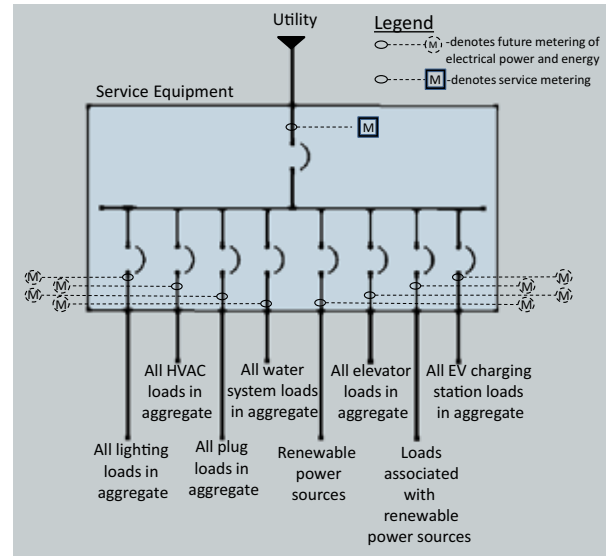


Figure 3



Conclusion

Branch Circuit Monitoring (BCM) upgradable panelboards allow the ability to meter each branch circuit individually without the complexity and cost of physically grouping similar branch devices together within the panel. Title 24 compliance can be attained with BCM upgradable panels no matter where a branch device is located in the panel, provided a single load type is wired per branch. The BCM upgradable panelboards provide more installation flexibility and better density per panel than disaggregated load monitoring.

The field upgrade kit can be installed after the panel is commissioned. The kits include a meter and split core CTs. BCM upgradable panels retain density and flexibility when adding additional branch devices regardless if metering has been implemented.

Planning for future branch circuit monitoring provides much needed flexibility in panel layout, capability, and breaker density while still meeting California Title 24 requirements for the ability to meter by load type.

BCM upgradable panels deliver the benefit of installing simple, low cost panels that meet current regulatory needs while still providing a cost effective, compact path to be ready for the future.

References

- California Energy Commission. "2016 Building Energy Efficiency Standards for Residential ..." California Energy Commission, June 2015. Retrieved from ww2.energy.ca.gov/2015publications/CEC-400-2015-037/CEC-400-2015-037-CMF.pdf.
- California Energy Commission. "2016 Nonresidential Compliance Manual." California Energy Commission, Nov. 2015. Retrieved from ww2.energy.ca.gov/title24/2016standards/nonresidential_manual.html.