Energy Efficiency

Purpose: Reduce environmental impacts and increased operational costs associated with excessive energy use.

Energy Prerequisite 1: Minimum Energy Performance

Required	P1.1. The school design must exceed the Title 24-2005 California energy efficiency standards by 10%.

Energy-efficient schools save money while conserving non-renewable energy resources and reducing atmospheric emissions of pollutants and greenhouse gases. Since it's inception in the late 1970s, the state energy code, Title 24, has been very effective in reducing energy use: Californians are the second smallest energy user per capita in the nation. Title 24 was last updated in 2005, and although the code was made more stringent, there are numerous cost-effective, practical, and straightforward measures that can reduce energy use. Note that Title 24-2005 currently covers only *regulated* energy, and does not include plug loads (including kitchen and lab equipment). School designs must comply with this credit by using the performance approach.

Energy efficiency will not happen in a vacuum. Commissioning, maintenance, and training are vitally important to the performance of the school and its systems. Commissioning involves a rigorous quality assurance program that ensures the building is designed appropriately and built as it is designed. No building can perform optimally without maintenance. Training is critically important to ensure that the teachers and maintenance staff understand how to maintain and operate the building systems. When turnover occurs, appropriate documentation must be on-hand to ensure that new team members are properly trained.

The school must use 10% less TDV energy than the Title 24 baseline building. These calculations must be modeled in compliance with all the rules outlined in the California Alternative Compliance Manual (ACM). It provides guidance for establishing building base case development and analysis.

Resources

CHPS Best Practices Manual, Volume II. Energy efficiency is affected by most of the guidelines. In particular, consult the Daylighting, Electric Lighting, HVAC, Building Envelope, and Site Planning Chapters.

Three documents from the California Energy Commission give detailed descriptions of the state energy code. Access them all at http://www.energy.ca.gov.

- Title 24-2005 Regulations is the actual energy code text.
- The Nonresidential Manual thoroughly explains the nonresidential requirements of Title 24-2005. This is the reference for interpreting the code language.
- The Nonresidential Alternative Calculation Method (ACM) Approval Manual is primarily intended for those persons who want to design a calculation computer program for use with the energy standards. Because it describes all of the underling computer baseline and modeling assumptions, it is also used as a resource for those preparing energy models. The Nonresidential ACM Manual itself is not used for compliance with the Energy Efficiency Standards.

Energy Credit 1: Superior Energy Performance

1.1. By integrating the design of system components to increase energy efficiency, reduce the source energy of the proposed design to be below what is required by the California energy efficiency standards (Title 24).

2 points	15% reduction in total net energy use compared to Title 24-2005 baseline.
4 points	20% reduction in total net energy use compared to Title 24-2005 baseline.
6 points	25% reduction in total net energy use compared to Title 24-2005 baseline.
8 points	30% reduction in total net energy use compared to Title 24-2005 baseline.
10 points	35% reduction in total net energy use compared to Title 24-2005 baseline.

Investments in energy efficiency measures are cost-effective, and net reductions of 20% to 30% are feasible. A wide array of measures can reduce energy use, with the amount of energy saved depending on local climate, the quality of the design, whether the interactions between the building systems have been optimized, the extent of commissioning, and the amount of training given to teachers and staff. Consider opportunities throughout the school in the following areas:

- Daylighting: optimize the daylighting design to minimize glare and eliminate direct beam light in the classroom, use daylighting controls designed to dim or turn-off electric lights when sufficient daylight is available.
- HVAC systems: use high efficiency equipment, correctly size for the estimated demands of the facility, use economizers and other controls that optimize system performance.
- Electric lighting: use high efficiency products, optimize the number of light fixtures in each room, use occupant sensors and other control devices that ensure peak system performance, successfully integrate electric lighting and daylighting strategies.
- Enclosure: Ensure that walls, floors, roofs, and windows of the school are as energy efficient as cost-effectively possible.
- Commissioning. Commissioning is increasingly important as more savings are expected through energy conservation measures. It ensures that the school is built as designed, and operates as expected. See Credit 4: Commissioning for more information.

Include additional integrated design measures to increase the energy efficiency of the school. Perform energy analysis for selected design elements that affect energy performance and document compliance. Follow the requirements and guidelines outlined in the Title 24 ACM manual. The unit of measure for performance is TDV energy. The design earns from two to 10 points, based on the level of savings achieved. Interpolation to whole number point levels is allowed. For example, 22.5% savings would earn five points. Extrapolation is not allowed.

Resources

CHPS Best Practices Manual, Volume II. Much of Volume II is dedicated to energy efficient design strategies including the chapters on Daylighting, Electric Lighting, HVAC, and Building Envelope.

LEED™ Reference Guide: Energy and Atmosphere Credit 1: Optimize Energy Performance.