ENERGY EFFICIENCY

2010 California Energy Code, Title 24 Part 6

2010 CBC Chapter 13 references directly to 2010 California Energy Code which provides requirements for mechanical and electrical consumption limits and specifies calculations to be provided as part of permit submittal. This section is often just referred to as "Title 24" even though it is truly just Part 6 of Title 24. California currently has the strictest Energy Code in the nation.

CALGREEN

2010 California Green Building Standards, Title 24 Part 11

2010 CALGreen is the first Green Building Code in the nation and it provides three tiers of compliance - mandatory measures , tier 1 voluntary measures and tier 2 voluntary measures. Each jurisdiction has the right to adopt either Tier 1 or Tier 2, but mandatory level is required throughout California. For purposes of this class we will be reviewing only non-residential mandatory measures. For more information, the entire text of 2010 CALGreen is available online in PDF format at the California Building Commission website. Since we will not be using this section directly, sections of the code are not quoted verbatim as they were in other lectures.

Intent

Purpose of this Code is to improve public health, safety and general welfare by enhancing the design and construction of buildings through the use of building concepts having reduced negative impact or positive environmental impact and encouraging sustainable construction practices in the following categories:

1. Planning and Design
2. Energy Efficiency
3. Water efficiency and conservation
4. Material conservation and resource efficiency
5. Environmental quality

The provisions of this code shall apply to every newly constructed building or structure and only the initial tenant or occupant improvements to a project.

Site Development

Intent of this section is to outline planning, design and development methods that include environmentally responsible site selection, building design, building siting and development to protect, restore and enhance the environmental quality of the site and respect the integrity of adjacent properties.

1. *Storm water pollution prevention plan* - should be implemented to prevent soil loss by storm water run-off and/or wind erosion, of sedimentation, and/or of dust air pollution

2. *Bicycle parking and changing rooms* – bicycle racks shall be provided for 5 percent of visitor motorized vehicle parking capacity (minimum of 2)
3. *Designated parking* - for low-emitting, fuel-efficient and carpool/van pool vehicles shall be provided, at least 8 percent total.
4. *Light pollution reduction* - shall be provided by using one of provided strategies, including shielding exterior luminaires or containing interior luminaires within each source.
5. *Grading and Paving* – shall be planned and developed to keep surface water away from buildings.

Energy Efficiency

Energy efficiency shall be maintained based on current California Energy Code.

Water Efficiency and Conservation

Intent of this section is to conserve water used indoors, outdoors and in wastewater conveyance.

1. *Meters* – separate meters shall be installed for each tenant space for buildings over 50,000 square feet and any building or space with projected consumption of over 1000 gal/day
2. *20 percent Savings* – plumbing fixtures that will reduce the overall use of potable water within the building by 20 percent shall be provided
3. *Wastewater reduction* – each building shall reduce the generation of wastewater by either installation of water-conserving fixtures or utilizing non-potable water systems
4. *Plumbing Fixtures and Fittings* – all plumbing fixtures (water closets and urinals) and fittings (faucets and showerheads) shall comply with flow requirements listed in CALGreen
5. *Water budget* – shall be developed for landscape irrigation use
6. *Outdoor potable water use* – separate meters shall be installed for indoor and outdoor potable water use for landscaped areas 1000-5000 square feet in size
7. *Irrigation design* – install irrigation controllers and sensors for landscape projects 1000-2500 square feet in size

Material Conservation and Resource Efficiency

Intent of this section is to achieve material conservation and resource efficiency through protection of buildings from exterior moisture, construction waste diversion, employment of techniques to reduce pollution through recycling of materials, and building commissioning or testing and adjusting.

1. *Weather protection* – provide a weather-resistant exterior wall and foundation envelope as required by California Building and Energy Codes
2. *Moisture control* – prevent irrigation spray on structures and prevent water intrusion into buildings through openings and entries
3. *Construction waste diversion* – establish construction waste management plan

4. *Construction waste management plan* – provide documentation of waste management plan as noted in the CALGreen
5. *Construction waste* – recycle and/or salvage for reuse a minimum of 50 percent of non-hazardous construction and demolition debris
6. *Excavated soil and land clearing debris* – 100 percent of vegetation and soils debris shall be reused or recycled
7. *Recycling by occupants* – provide readily accessible recycling areas for entire building
8. *Commissioning* – for new buildings over 10,000 square feet building commissioning for all building systems covered by California Energy Code, process systems and renewable energy systems shall be included in design and construction process
9. *Testing and adjusting* – testing and adjusting of systems is required for buildings under 10,000 square feet

Environmental Quality

Intent of this section is to reduce the quantity of air contaminants that are odorous, irritating, and/or harmful to the comfort and well-being of a building's installers, occupants and neighbors.

1. *Install only a direct-vent sealed-combustion gas or sealed wood-burning fireplace or a sealed woodstove*
2. *Covering of duct openings and protection of mechanical equipment during construction*
3. *Finish material pollutant control* – adhesives, sealants, caulks, paints, coatings, carpet systems, and composite wood products shall comply with listed standards
4. *Resilient flooring systems* – shall comply with VOC-emission limits listed
5. *Filters* – in mechanically ventilated buildings occupied areas shall have air filtration media for outside and return air
6. *Environmental tobacco smoke (ETS) control* – smoking shall be prohibited within 25 feet of entries and air intake areas
7. *Indoor moisture control* – buildings shall comply with current California Building Code
8. *Outside air delivery* – minimum requirements of current California Building Code shall be met
9. *Carbon dioxide (CO2) monitoring* – buildings equipped with demand control ventilation shall have CO2 sensors and ventilation controls per current California Energy Code
10. *Acoustical control* – exterior assemblies shall have minimum rating of 50 STC and windows shall have minimum rating of 30 STC, while assemblies separating tenant spaces and tenant and public spaces shall have 40 STC rating
11. *Ozone depletion and global warming reductions* – HVAC and refrigeration equipment shall not contain CFCs and fire suppression equipment shall not contain halons

LEED

What is LEED?

LEED, or Leadership in Energy and Environmental Design, is an internationally-recognized green building certification system. Developed by the U.S. Green Building Council (USGBC) in March 2000, LEED provides building owners and operators with a framework for identifying and implementing practical and measurable green building design, construction, operations and maintenance solutions. LEED promotes sustainable building and development practices through a suite of rating systems that recognize projects that implement strategies for better environmental and health performance.

Rating Systems

Currently, the following LEED Rating Systems are available:

1. New Construction (NC)
2. Existing Buildings: Operations & Maintenance (EB: O&M)
3. Commercial Interiors (CI)
4. Core & Shell (CS)
5. Schools (SCH)
6. Retail
7. Healthcare (HC)
8. Homes
9. Neighborhood Development (ND)

For the purposes of this class we will explore only Commercial Interiors (CI) requirements in more detail. Each rating system has pre-requisite credits allows for maximum of 100 points (plus 6 possible innovation points and 4 regional priority points) and provides four levels of certification:

1. Certified 40–49 points
2. Silver 50–59 points
3. Gold 60–79 points
4. Platinum 80 points and above

LEED 2009 for Commercial Interiors

Sustainable Sites 21 Possible Points

 Credit 1 Site Selection 1-5
To encourage tenants to select buildings that employ best practices systems and green strategies.
 Credit 2 Development Density and Community Connectivity 6

To channel development to urban areas with existing infrastructure, protect greenfields and preserve habitat and natural resources.
 Credit 3.1 Alternative Transportation—Public Transportation Access 6
To reduce pollution and land development impacts from automobile use.
 Credit 3.2 Alternative Transportation—Bicycle Storage and Changing Rooms 2
To reduce pollution and land development impacts from automobile use.
 Credit 3.3 Alternative Transportation—Parking Availability 2
To reduce pollution and land development impacts from automobile use.

Water Efficiency 11 Possible Points

 Prerequisite 1 Water Use Reduction Required
To increase water efficiency within the tenant space to reduce the burden on municipal water supply and wastewater systems.
 Credit 1 Water Use Reduction 6-11
To further increase water efficiency within the tenant space to reduce the burden on municipal water supply and wastewater systems.

Energy and Atmosphere 37 Possible Points

 Prerequisite 1 Fundamental Commissioning of Building Energy Systems Required
To verify that the project's energy-related systems are installed and calibrated to performing according to the owner's project requirements, basis of design and construction documents. Benefits of commissioning include reduced energy use, lower operating costs, fewer contractor callbacks, better building documentation, improved occupant productivity, and verification that the systems perform in accordance with the owner's project requirements.
 Prerequisite 2 Minimum Energy Performance Required
To establish the minimum level of energy efficiency for the tenant space systems to reduce environmental and economic impacts associated with excessive energy use.
 Prerequisite 3 Fundamental Refrigerant Management Required
To reduce stratospheric ozone depletion.
 Credit 1.1 Optimize Energy Performance—Lighting Power 1–5
To achieve increasing levels of energy conservation beyond the referenced standard to reduce environmental and economic impacts associated with excessive energy use.
 Credit 1.2 Optimize Energy Performance—Lighting Controls 1–3
To achieve increasing levels of energy conservation beyond the prerequisite standard to reduce environmental and economic impacts associated with excessive energy use.
 Credit 1.3 Optimize Energy Performance—HVAC 5–10
To achieve increasing levels of energy conservation beyond the prerequisite standard to reduce environmental and economic impacts associated with excessive energy use.
 Credit 1.4 Optimize Energy Performance—Equipment and Appliances 1–4
To achieve increasing levels of energy conservation beyond the prerequisite standard to reduce environmental and economic impacts associated with excessive energy use.
 Credit 2 Enhanced Commissioning 5

To verify and ensure that the tenant space is designed, constructed and calibrated to operate as intended.

 Credit 3 Measurement and Verification 2-5

To provide for the ongoing accountability and optimization of tenant energy and water consumption performance over time.

 Credit 4 Green Power 5

To encourage the development and use of grid-source, renewable energy technologies on a net zero pollution basis.

Materials and Resources 14 Possible Points

 Prerequisite 1 Storage and Collection of Recyclables Required

To facilitate the reduction of waste generated by building occupants that is hauled to and disposed of in landfills.

 Credit 1.1 Tenant Space—Long-Term Commitment 1

To encourage choices that will conserve resources, reduce waste and reduce the environmental impacts of tenancy as they relate to materials, manufacturing and transport.

 Credit 1.2 Building Reuse—Maintain Interior Nonstructural Components 1-2

To extend the life cycle of existing building stock, conserve resources, retain cultural resources, reduce waste and reduce environmental impacts of new buildings as they relate to materials manufacturing and transport.

 Credit 2 Construction Waste Management 1-2

recovered resources back to the manufacturing process and reusable materials to appropriate sites.

 Credit 3.1 Materials Reuse 1-2

To reuse building materials and products to reduce demand for virgin materials and reduce waste, thereby lessening impacts associated with the extraction and processing of virgin resources.

 Credit 3.2 Materials Reuse—Furniture and Furnishings 1

To reuse building materials and products to reduce demand for virgin materials and reduce waste, thereby reducing impacts associated with the extraction and processing of virgin resources.

 Credit 4 Recycled Content 1-2

To increase demand for building products that incorporate recycled content materials, thereby reducing impacts resulting from extraction and processing of virgin materials.

 Credit 5 Regional Materials 1-2

To increase demand for building materials and products that are extracted and manufactured within the region, thereby supporting the regional economy and reducing the environmental impacts resulting from transportation.

 Credit 6 Rapidly Renewable Materials 1

To reduce the use and depletion of finite raw materials and long-cycle renewable materials by replacing them with rapidly renewable materials.

 Credit 7 Certified Wood 1

To encourage environmentally responsible forest management.

Indoor Environmental Quality 17 Possible Points

 Prerequisite 1 Minimum Indoor Air Quality Performance Required

To establish minimum indoor air quality (IAQ) performance to enhance indoor air quality in buildings, thus contributing to the comfort and well-being of the occupants.

 Prerequisite 2 Environmental Tobacco Smoke (ETS) Control Required

To prevent or minimize exposure of building occupants, indoor surfaces and ventilation air distribution systems to environmental tobacco smoke (ETS).

 Credit 1 Outdoor Air Delivery Monitoring 1

To provide capacity for ventilation system monitoring to promote occupant comfort and well-being.

 Credit 2 Increased Ventilation 1

To provide additional air ventilation to improve indoor air quality for improved occupant comfort, well-being and productivity.

 Credit 3.1 Construction Indoor Air Quality Management Plan—During Construction 1

To reduce indoor air quality (IAQ) problems resulting from construction or renovation and promote the comfort and well-being of construction workers and building occupants.

 Credit 3.2 Construction Indoor Air Quality Management Plan—Before Occupancy 1

To reduce indoor air quality (IAQ) problems resulting from construction or renovation and promote the comfort and well-being of workers and occupants.

 Credit 4.1 Low-Emitting Materials—Adhesives and Sealants 1

To reduce the quantity of indoor air contaminants that are odorous, potentially irritating and/or harmful to the comfort and well-being of installers and occupants.

 Credit 4.2 Low-Emitting Materials—Paints and Coatings 1

To reduce the quantity of indoor air contaminants that are odorous, irritating and/or harmful to the comfort and well-being of installers and occupants.

 Credit 4.3 Low-Emitting Materials—Flooring Systems 1

To reduce the quantity of indoor air contaminants that are odorous, irritating and/or harmful to the comfort and well-being of installers and occupants.

 Credit 4.4 Low-Emitting Materials—Composite Wood and Agrifiber Products 1

To reduce the quantity of indoor air contaminants that are odorous, irritating and/or harmful to the comfort and well-being of installers and occupants.

 Credit 4.5 Low-Emitting Materials—Systems Furniture and Seating 1

To reduce the quantity of indoor air contaminants that are odorous, irritating and/or harmful to the comfort and well-being of installers and occupants.

 Credit 5 Indoor Chemical and Pollutant Source Control 1

To minimize building occupant exposure to potentially hazardous particulates, biological contaminants and chemical pollutants that degrade air and water quality.

 Credit 6.1 Controllability of Systems—Lighting 1

To provide a high level of lighting system control for individual occupants or groups in multi-occupant spaces (e.g., classrooms and conference areas) and promote their productivity, comfort and well-being.

 Credit 6.2 Controllability of Systems—Thermal Comfort 1

To provide a high level of thermal comfort system control1 for individual occupants or groups in multi-occupant spaces (e.g., classrooms and conference areas) and promote their productivity, comfort and well-being.

 Credit 7.1 Thermal Comfort—Design 1

To provide a comfortable thermal environment that promotes occupant productivity and well-being.

 Credit 7.2 Thermal Comfort—Verification 1

To provide for the assessment of occupant thermal comfort over time.

 Credit 8.1 Daylight and Views—Daylight 1-2

To provide occupants with a connection between indoor spaces and the outdoors through the introduction of daylight and views into the regularly occupied areas of the tenant space.

 Credit 8.2 Daylight and Views—Views for Seated Spaces 1

To provide the building occupants a connection to the outdoors through the introduction of daylight and views into the regularly occupied areas of the tenant space.

Innovation in Design 6 Possible Points

 Credit 1 Innovation in Design 1-5

To provide design teams and projects the opportunity to achieve exceptional performance above the requirements set by the LEED Green Building Rating System and/or innovative performance in Green Building categories not specifically addressed by the LEED Green Building Rating System.

 Credit 2 LEED Accredited Professional 1

To support and encourage the design integration required by LEED to streamline the application and certification process

Regional Priority 4 Possible Points

 Credit 1 Regional Priority 1-4

To provide an incentive for the achievement of credits that address geographically specific environmental priorities.