



CENTRAL CALIFORNIA

Zero Net Energy Contributions to Sustainable Buildings

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Provider Name/Logo

American Institute of Architects, San Joaquin Chapter

Course Title

ZNE Contributions to Sustainable Buildings

Speaker Name

Loren Aiton



AIA
San Joaquin



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Course Description

This presentation talks about ZNE as green building strategy, integrated design, relation to the CABuilding standards and relation to LEED



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Learning Objectives

At the end of the this course, participants will be able to:

Attendees will walk away with a solid high-level understanding of:

1. ZNE as Green Building Strategy
2. How ZNE is a tool to achieve other Green Building goals through integrated design
3. How ZNE contributes to satisfying the California Green Building Standards Code
4. How ZNE contributes to multiple LEED credits and LEED Certification



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What is Zero Net Energy?

- We often think of Zero Net Energy as a thing, referring to it almost as if it were a noun.
- The US Department of Energy common definition for a Zero Net Energy Building is:
“an energy-efficient building where, on a source energy basis, the actual annual delivered energy is less than or equal to the on-site renewable exported energy.”





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Zero Net Energy
by itself
Does Not
A Sustainable Building
Make

But it can make significant
contributions beyond the obvious



CALGreen Building Code

Residential Mandatory Measures

4.106.2	Storm water drainage and retention during construction	4.410.2	Recycling by occupants
4.106.3	Grading and paving	4.503.1	General
4.106.4	Electric vehicle (EV) charging for new construction	4.504.1	Protection during construction
4.106.4.1	EV charging: 1- & 2-family dwellings/townhouses	4.504.2.1	Adhesives, sealants and caulks
4.106.4.1.1	with attached private garages		
4.106.4.2	EV charging for multifamily dwellings	4.504.2.2	Paints and coatings
4.106.4.2.1	EV charging space (EV space) locations	4.504.2.3	Aerosol paints and coatings
4.106.4.2.2	E charging space (EV space) dimensions	4.504.3	Carpet systems
4.106.4.2.3	Single EV space required	4.504.3.1	Carpet cushion
4.106.4.2.4	Multiple EV spaces required	4.504.3.2	Carpet adhesive
4.106.4.2.5	Identification	4.504.4	Resilient flooring systems
4.201.1	Energy Efficiency	4.504.5	Composite wood products
4.303.1	Water conserving plumbing fixtures and fittings	4.504.5.1	Documentation
4.303.2	Standards for plumbing fixtures and fittings	4.505.2	Concrete slab foundations
4.304.1	Outdoor potable water use in landscape areas	4.505.2.1	Capillary break
4.406.1	Rodent proofing	4.505.3	Moisture content of building materials
4.408.1	Construction waste reduction of at least 65%	4.506.1	Bathroom exhaust fans
4.408.2	Construction waste management plan	4.507.2	Heating and air conditioning system design
4.408.3	Waste management company	702.1	Installer training
4.408.4	Waste stream reduction alternative	702.2	Special inspection
4.410.1	Operation and maintenance manual	703.1	Documentation



CALGreen Building Code

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4.201.1 Energy Efficiency



CALGreen Building Code

Nonresidential Mandatory Measures

5.106.1	Storm Water Pollution Prevention Plan	5.504.1.3	Temporary Ventilation
5.106.4	Bicycle Parking	5.504.3	Protection of Ducts and HVAC Equip during construction
5.106.5.2	Designated Parking	5.504.4.1	Adhesives, Sealants and Caulks
5.106.5.3	Electric Vehicle (EV) Charging	5.504.4.3	Paints and Coatings
5.106.8	Light Pollution Reduction	5.504.4.4	Carpet Systems
5.201.1	Energy Efficiency	5.504.4.5	Composite Wood Products
5.303.1	Water Efficiency Meters	5.504.4.6	Resilient Flooring Systems
5.303.3	Water Conserving Plumbing Fixtures	5.504.5.3	Filters
5.303.4	Areas of Additions or Alteration	5.504.7	Environmental Tobacco Smoke (ETS) Control
5.303.6	Standards for Plumbing Fixtures and Fittings	5.505.1	Indoor Moisture Control
5.304.2	Outdoor water use in landscaping \geq 500 SF	5.506.1	Outside Air Delivery
5.304.3	Outdoor water use in rehabilitated landscapes \geq 2,500 SF	5.506.2	Carbon Dioxide (CO ₂) Monitoring
5.304.4	Outdoor water use in landscape areas 2500 SF or less	5.507.4	Acoustical Control
5.304.5	Graywater or rainwater use in landscape areas	5.507.4.1	Prescriptive Method
5.407.1	Weather Protection	5.507.4.2	Performance Method
5.407.2	Moisture Control	5.508.1	Ozone Depletion and Greenhouse Gas Reductions
5.408.1	Construction Waste Management	5.508.2	Supermarket Refrigerant Leak Reduction
5.408.2	Universal Waste	5.508.2.1	Refrigerant Piping
5.408.3	Excavated Soil and Land Clearing Debris	5.508.2.2	Valves
5.410.1	Recycling by Occupants	5.508.2.3	Refrigerated Service Cases
5.410.2	Commissioning	5.508.2.4	Refrigerant Receivers
5.410.4	Testing and Adjusting	5.508.2.5	Pressure Testing
5.503.1	Fire Places	5.508.2.6	Evacuation
5.503.1.1	Woodstoves		



CALGreen Building Code

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5.303.4	Areas of Additions or Alterations	5.508.2.6	Smoke (ETS) Control
5.303.6	Standards for Plumbing		
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5.201.1 Energy Efficiency



LEED v4 New Construction

Location and Transportation

- Credit LEED for Neighborhood Development Location
- Credit Sensitive Land Protection
- Credit High Priority Site
- Credit Surrounding Density and Diverse Uses
- Credit Access to Quality Transit
- Credit Bicycle Facilities
- Credit Reduced Parking Footprint
- Credit Green Vehicles

Sustainable Sites

- Prereq Construction Activity Pollution Prevention
- Credit Site Assessment
- Credit Site Development - Protect or Restore Habitat
- Credit Open Space
- Credit Rainwater Management
- Credit Heat Island Reduction
- Credit Light Pollution Reduction

Water Efficiency

- Prereq Outdoor Water Use Reduction
- Prereq Indoor Water Use Reduction
- Prereq Building-Level Water Metering
- Credit Outdoor Water Use Reduction
- Credit Indoor Water Use Reduction
- Credit Cooling Tower Water Use
- Credit Water Metering

Energy and Atmosphere

- Prereq Fundamental Commissioning and Verification
- Prereq Minimum Energy Performance
- Prereq Building-Level Energy Metering
- Prereq Fundamental Refrigerant Management
- Credit Enhanced Commissioning
- Credit Optimize Energy Performance
- Credit Advanced Energy Metering
- Credit Demand Response
- Credit Renewable Energy Production
- Credit Enhanced Refrigerant Management
- Credit Green Power and Carbon Offsets

Materials and Resources

- Prereq Storage and Collection of Recyclables
- Prereq Construction and Demolition Waste Management Planning
- Credit Building Life-Cycle Impact Reduction
- Credit Building Product Disclosure and Optimization - EPDs
- Credit Building Product Disclosure and Optimization - Raw Materials
- Credit Building Product Disclosure and Optimization - Material Ingredients
- Credit Construction and Demolition Waste Management

Indoor Environmental Quality

- Prereq Minimum Indoor Air Quality Performance
- Prereq Environmental Tobacco Smoke Control
- Credit Enhanced Indoor Air Quality Strategies
- Credit Low-Emitting Materials
- Credit Construction Indoor Air Quality Management Plan
- Credit Indoor Air Quality Assessment
- Credit Thermal Comfort
- Credit Interior Lighting
- Credit Daylight
- Credit Quality Views
- Credit Acoustic Performance

Innovation

- Credit Innovation
- Credit LEED Accredited Professional

Regional Priority

- Credit Regional Priority: Specific Credit
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- Credit Regional Priority: Specific Credit



LEED v4 New Construction

Location and Transportation

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- Credit Construction and Demolition Waste Management

Minimum Energy Performance
Building-Level Energy Metering
Optimize Energy Performance
Advanced Energy Metering
Renewable Energy Production

Credit LEED Accredited Professional

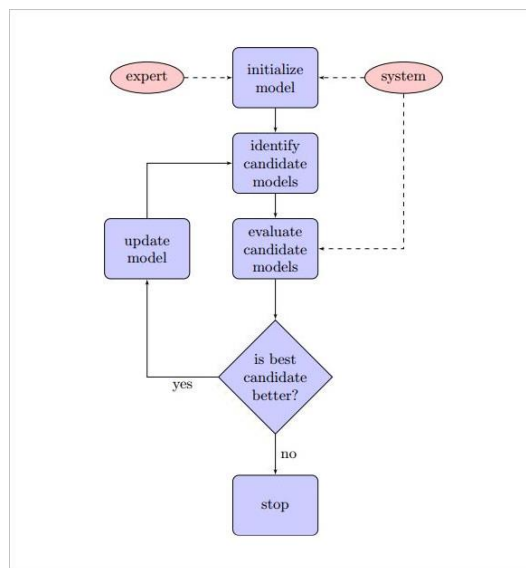
Regional Priority

- Credit Regional Priority: Specific Credit
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Zero Net Energy as a Process

- Zero Net Energy performance is an end result of a process
- Let's consider that process and see how other aspects of sustainable building can benefit from it





Designing Zero Net Energy Buildings

Designing a Zero Net Building starts with an Integrated Design Process

- integrated design involves a “whole building design” approach
- Involves all project stake holders, designers, builders, owners, and users
- Involves looking integration of architecture and building systems through the entire design process from project inception





Designing Zero Net Energy Buildings

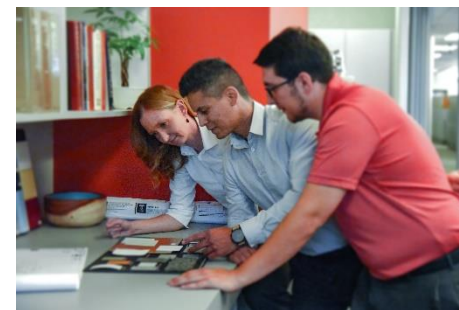
Designing a Zero Net Building starts with an Integrated Design Process

- Project team to be composed of architect, mechanical and electrical engineers, building owners, and where possible building contractors.

“At the core of an integrated project are collaborative, integrated and productive teams composed of key project participants.”

AIA Integrated Project Delivery Guide 2007

https://info.aia.org/SiteObjects/files/IPD_Guide_2007.pdf



Everybody working together on everything in the project



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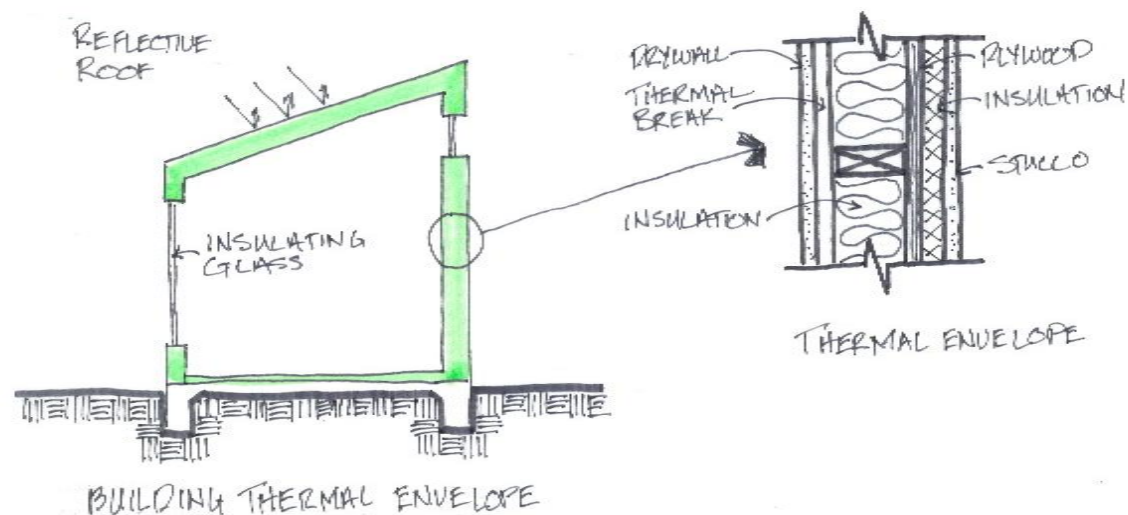
The ZEN of ZNE



Designing Zero Net Energy Buildings

The Zero Net Energy Design Process

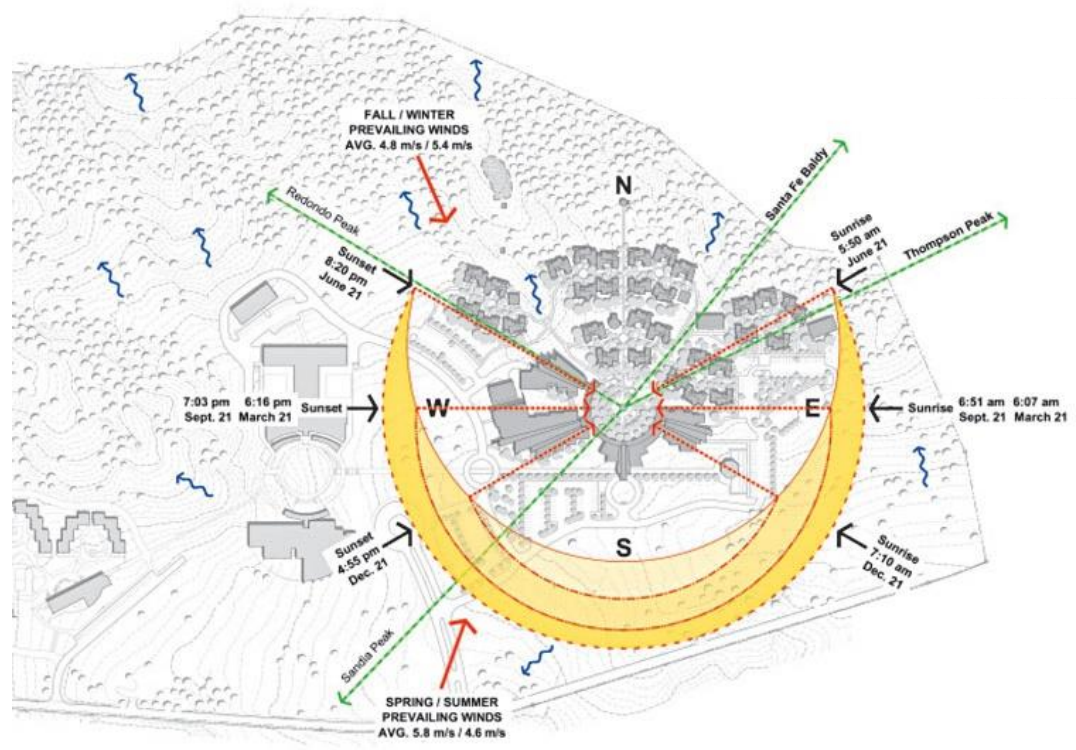
- Optimizing Building Power Efficiency
- Develop On-Site Power Generation





Sustainable Building Contributions

Site Analysis – Looking beyond the obvious





Sustainable Building Contributions

Site Analysis – Looking beyond the obvious

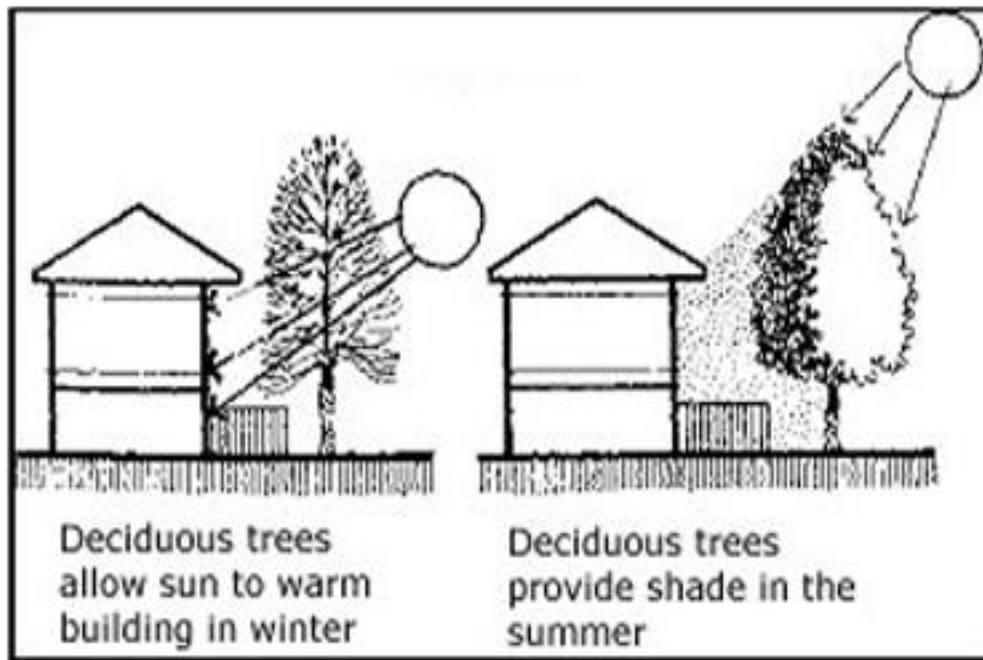
- ZNE Strategies
 - Building Orientation
 - Building Shape
 - Solar Access
 - Energy generation type and location
- Other Sustainable Strategies contributing to ZNE
 - Landscaping to support energy efficiency



Sustainable Building Contributions

Site Analysis – Looking beyond the obvious

- Landscape trees shading eastern and western walls





Sustainable Building Contributions

Site Analysis – Looking beyond the obvious

- Landscape trees shading eastern and western walls
 - Shading for sun exposure of eastern and western walls to cut summer heat gains potentially reducing heat load, Energy Efficiency





Sustainable Building Contributions

Site Analysis – Looking beyond the obvious

- Landscape trees shading eastern and western walls
 - Can open conversation about tree types to maximize the effectiveness of tree shading and to provide plant materials data for effective and efficient irrigation, CALGreen and LEED





Sustainable Building Contributions

Site Analysis – Looking beyond the obvious

- Landscape trees shading eastern and western walls
 - Planting areas around trees could potentially function as bio swale filtering parking lot run off water, LEED Rainwater credit





Sustainable Building Contributions

Site Analysis – Looking beyond the obvious

- Landscape trees shading eastern and western walls
 - View of trees outside of windows can act as visual relief to help fulfill LEED Quality Views credit and provide for health and well being of building users





Sustainable Building Contributions

Site Analysis – Looking beyond the obvious

- Solar car port arrays provide power production for building needs and export





Sustainable Building Contributions

Site Analysis – Looking beyond the obvious

- Solar car ports shade vehicle parking areas, keeps our cars from baking in the sun but also act shading for parking lot pavement reducing the Heat Island Effect, a sustainable building feature and LEED credit





Sustainable Building Contributions

Site Analysis – Looking beyond the obvious

- Solar car ports can also be used as shade structures over long term bicycle parking satisfying CALGreen covered bicycle parking requirements and LEED Bicycle Facilities credit





Sustainable Building Contributions

Energy Efficient Lighting – Looking beyond the obvious

- Color Perception and Apparent Brightness





Sustainable Building Contributions

Energy Efficient Lighting – Looking beyond the obvious

- LED Lighting is available in a range of “White” light colors

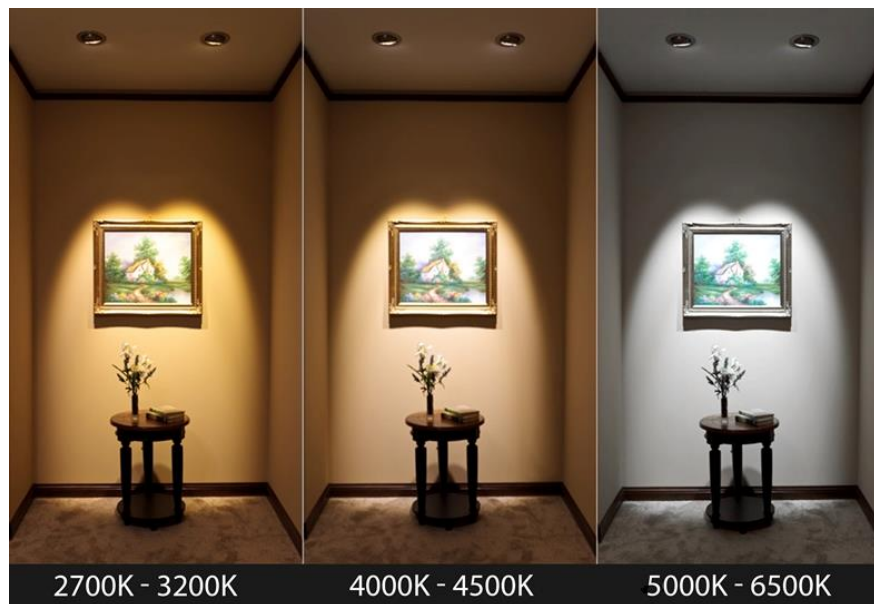




Sustainable Building Contributions

Energy Efficient Lighting – Looking beyond the obvious

- Greater Energy Efficiency by paying attention to light color selection



- Light color can have Health and Well Being Effects



Sustainable Building Contributions

Daylighting— Looking beyond the obvious

- Daylighting is an important strategy to reduce power demands for lighting





Sustainable Building Contributions

Daylighting— Looking beyond the obvious

- Part of an effective daylighting design is light penetration.
- Light penetration can be affected by many factors including color of potentially reflecting surfaces





Sustainable Building Contributions

Daylighting— Looking beyond the obvious

- Selection of materials for their potential reflective properties can also lead to a discussion on material types.
- In a sustainable building emphasis should be placed, where possible, on durable materials which are easily cleaned.
- Review of cleaning requirements with a focus on durable, low maintenance products, is a LEED EBOM Green Cleaning strategy.





Sustainable Building Contributions

In Summary

- Integrated Design can be used to achieve Zero Net Energy Goals and building Sustainability along the way
- Zero Net Energy Design can contribute to Sustainable Buildings beyond just energy efficiency
- By broadening the conversation the Design Team can find ways to add to the sustainability by looking beyond the obvious



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This concludes The American Institute of Architects
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