

Green California Summit and Exposition  
Educational Session

# BUILDING COMMISSIONING

*CAL*Green® *and the*

*California Energy Code*



# BUILDING COMMISSIONING

*CAL*Green® and the  
California Energy Code

## MODERATOR

Dave Walls, Executive Director  
Sustainability Programs  
International Code Council



# BUILDING COMMISSIONING

*CAL*Green® and the  
California Energy Code

## PANELISTS

**Gregory Mahoney, CBO, LEED® AP, CASp, CFM**  
Chief Building Official, City of Davis

**Orry Nottingham, P. E., CAP, Inc.**  
Certified Commissioning Professional (CCP), Energy Measurement and Verification

**Enrique M. Rodriguez, Associate Construction Analyst**  
California Building Standards Commission

**Courtney Ward, Energy Commission Specialist, CEM, LEED AP, CMVP**  
Standards Implementation Office Efficiency Division, California Energy Commission

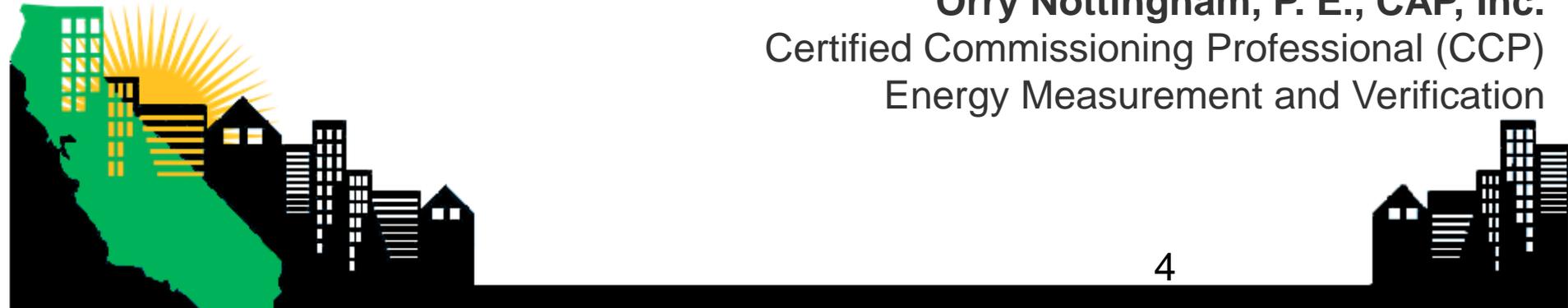


# BUILDING COMMISSIONING

**CALGreen**® and the  
California Energy Code

**Commissioning is the right thing to do, it establishes a best practice to achieve building performance, healthy environment, and predicted energy use and efficiency.**

**Orry Nottingham, P. E., CAP, Inc.**  
Certified Commissioning Professional (CCP)  
Energy Measurement and Verification



## BUILDING COMMISSIONING



and the  
California Energy Code

**Commissioning is a philosophy**, it should be done because it is a good thing to do, not just because it is in the California codes, and no matter, Cx will contribute to life cycle of the building in terms of on-going Operations and Maintenance costs, reliability, failure rates, and quality of life.



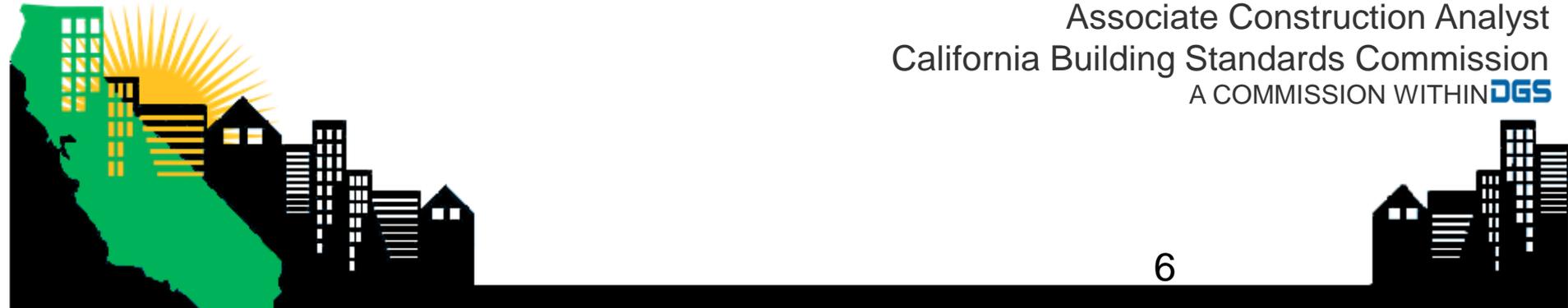


# California Building Standards Commission presents



*CAL*Green®

**Enrique M. Rodriguez**  
Associate Construction Analyst  
California Building Standards Commission  
A COMMISSION WITHIN **DGS**



## Session Goals

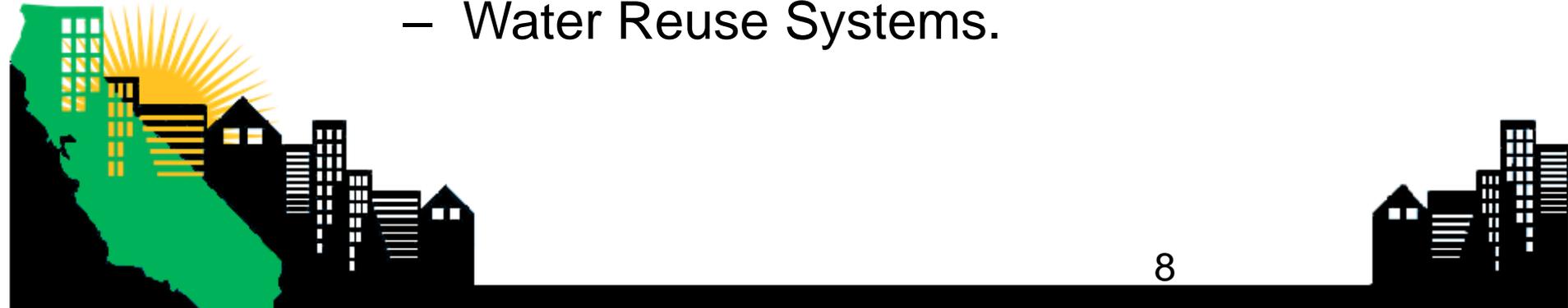
- CALGreen Nonresidential Commissioning
- 2015 Triennial Code Adoption Cycle

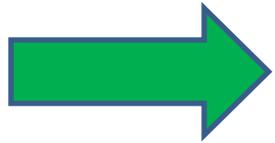


## Chapter 5- Division 5.4 Building Maintenance and Operation

CALGreen Commissioning for new buildings 10,000 square feet and over, for all **non-energy** related systems (**not required** for Tenant Improvements, unconditioned warehouses or parking garages):

- Renewable Energy Systems,
- Landscape Irrigation Systems,
- Water Reuse Systems.





## Comply with the California Energy Code

Part 6, Title 24 Section 120.8 for energy related systems:

- HVAC
- Indoor Lighting Systems and Controls
- Water Heating Systems



## Chapter 5- Division 5.4 Building Maintenance and Operation

CALGreen Nonresidential Commissioning requirements include:

- Owner or Owners Representative Project Requirements (OPR)
- Basis of Design (BOD)
- Commissioning plan
- Functional performance testing



## Chapter 5- Division 5.4 Building Maintenance and Operation

CALGreen Nonresidential Commissioning requirements include:

- Documentation and training
  - Systems manual
  - Systems operations training
- Commissioning report



## Chapter 5- Division 5.4 Building Maintenance and Operation

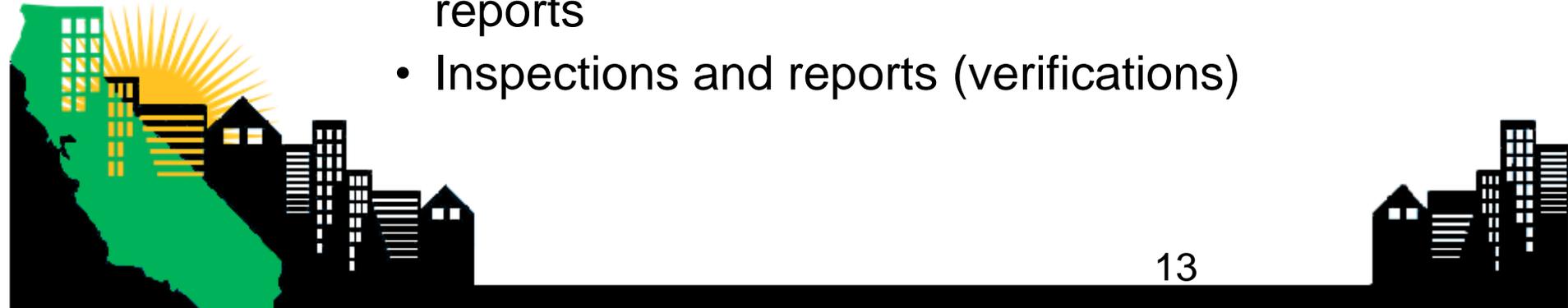
- Verification of compliance for Commissioning
  - Commissioning plan, including qualifications of commissioning team
  - Results of performance tests
  - Commissioning report



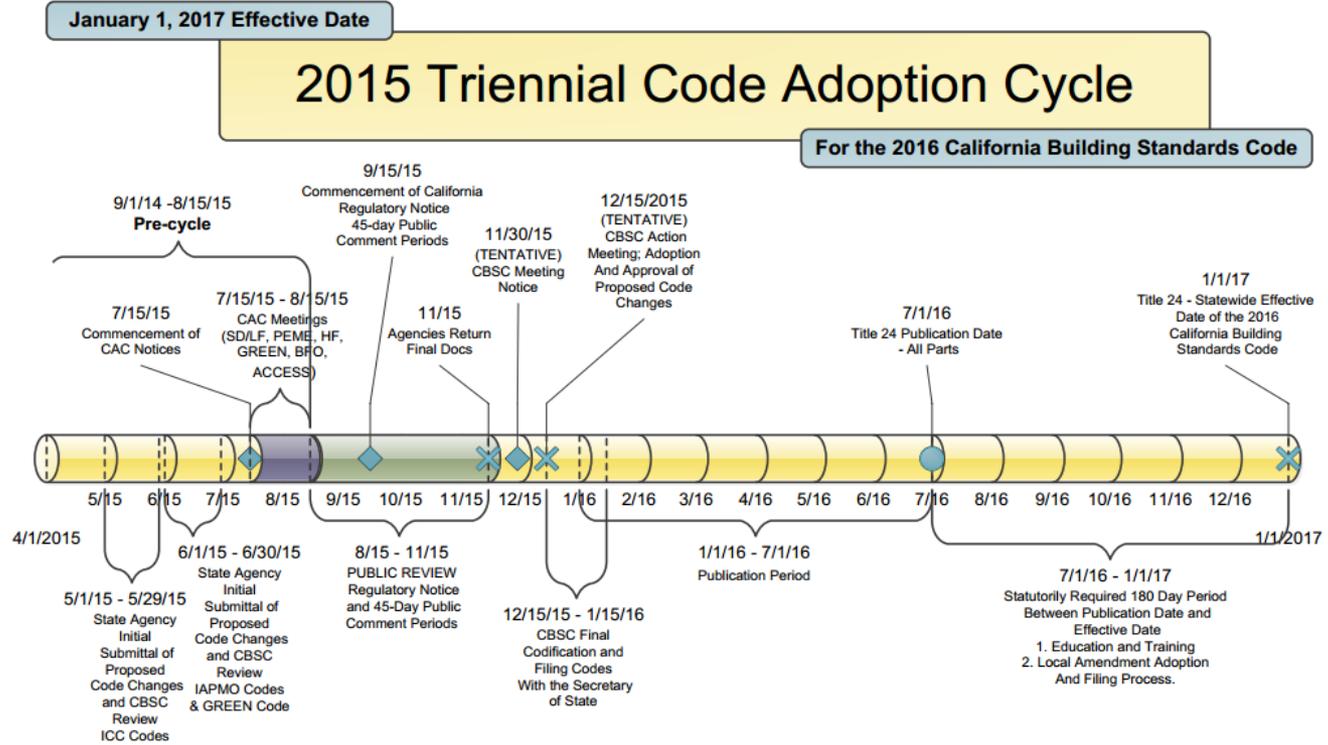
## Chapter 5- Division 5.4 Building Maintenance and Operation

### Testing and adjusting

- Applies to all new buildings under 10,000 square feet including energy related systems. Also required for new systems designed to serve an addition or an alteration.
  - Procedures
    - HVAC Balancing
  - Reporting:
    - Operation & Maintenance (O&M) manual reports
    - Inspections and reports (verifications)



# What's Next?

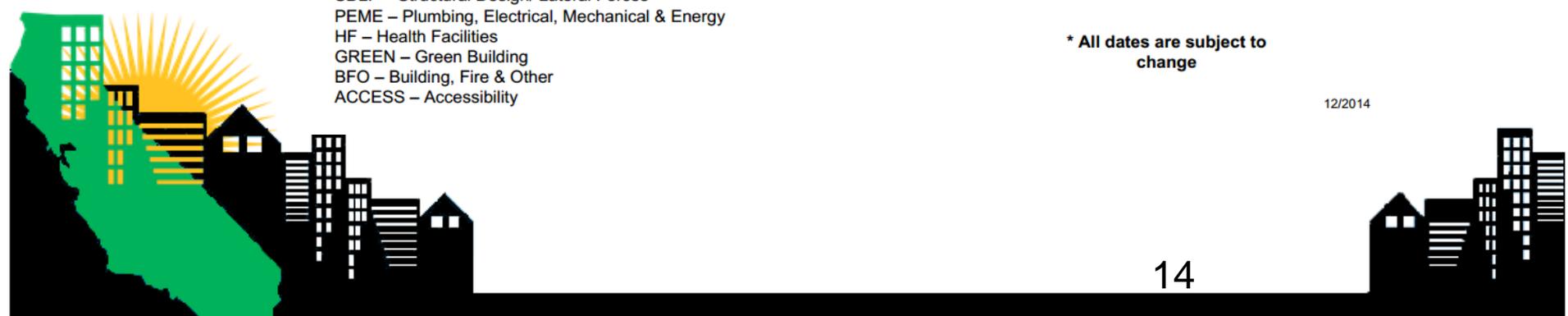


**CAC Committees:**

- SDLF – Structural Design/ Lateral Forces
- PEME – Plumbing, Electrical, Mechanical & Energy
- HF – Health Facilities
- GREEN – Green Building
- BFO – Building, Fire & Other
- ACCESS – Accessibility

**\* All dates are subject to change**

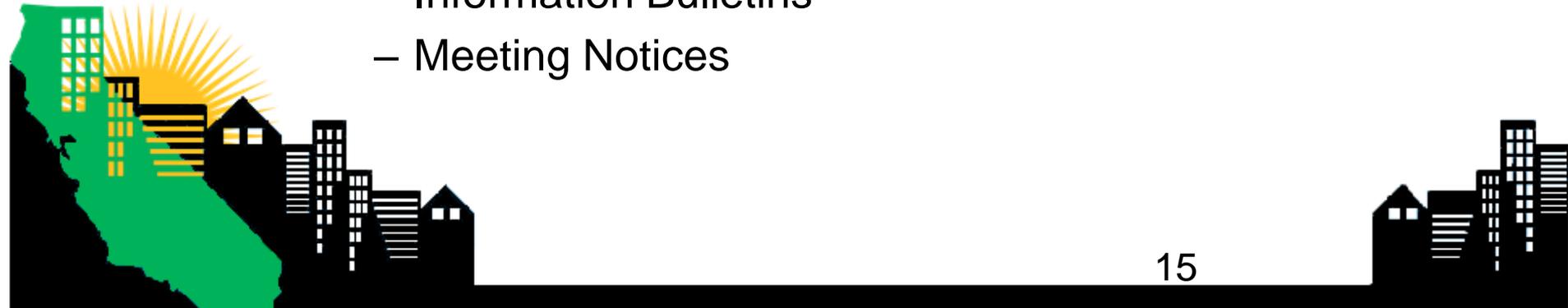
12/2014



# California Building Standards Commission

**Use the web! [www.bsc.ca.gov](http://www.bsc.ca.gov)**

- Reformatted CBSC website for easier access to code information
  - Rulemaking Processes
  - Code Cycles
  - Current Codes
  - Guidebooks and other resources
  - Information Bulletins
  - Meeting Notices



Home

## Welcome to the California Building Standards Commission

**2015 TRIENNIAL CODE ADOPTION CYCLE**

**CODE ZONE AHEAD** **NOW UNDER WAY...**

CBSC is authorized by **California Building Standards Law** to administer the many **processes** related to the development, adoption, approval, publication, and implementation of California's building codes.

The **California Building Standards Code**, Title 24 serves as the basis for the design and construction of buildings in California. Improved safety, sustainability, maintaining consistency, new technology and construction methods, and reliability are paramount to the development of building codes during each **Triennial and Intervening Code Adoption Cycle**.

California's building codes are published in their entirety every three years. Intervening Code Adoption Cycles produce Supplement pages half-way (18 months) into each triennial period. Amendments to California's building standards are subject to a lengthy and transparent public participation process throughout each code adoption cycle.

### 2015 Triennial Code Adoption Cycle

The 2015 Triennial Code Adoption Cycle will culminate with the publication of the 2016 California Building Standards Code, Title 24, California Code of Regulations. The 2016 Code will be published on or before July 1,

**GOVERNOR** [Visit His Webpage](#)

Edmund G. Brown Jr.

**SECRETARY**  
California  
Government  
Operations  
Agency

Marybel Batjer

**ACTING DIRECTOR**  
Department  
of General  
Services

Esteban Almanza

BSC Executive Director  
**Jim McGowan**

### Current Code

- Click here to access all parts of the 2013 current code

### Education & Outreach

- Click for Local Amendments Webinar
- Click for 2013 CALGreen Nonresidential Webinar
- Click for 2013 CALGreen Commissioning Webinar

### Featured Links

- 2013 Current Code
- 2013 Intervening Cycle

# BUILDING COMMISSIONING



*and the*

*California Energy Code*

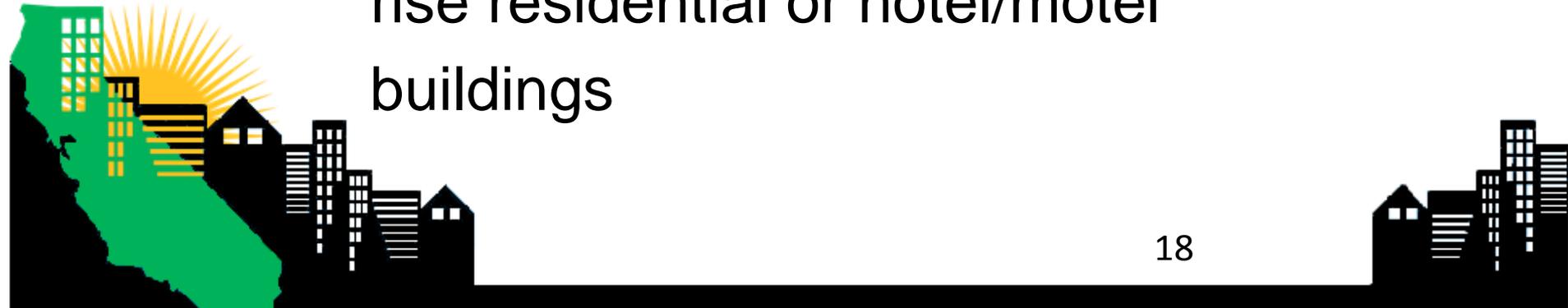
**Courtney Ward, CEM, LEED AP, CMVP**  
Efficiency Division



# 2013 Title 24 Part 6 Cx Triggers

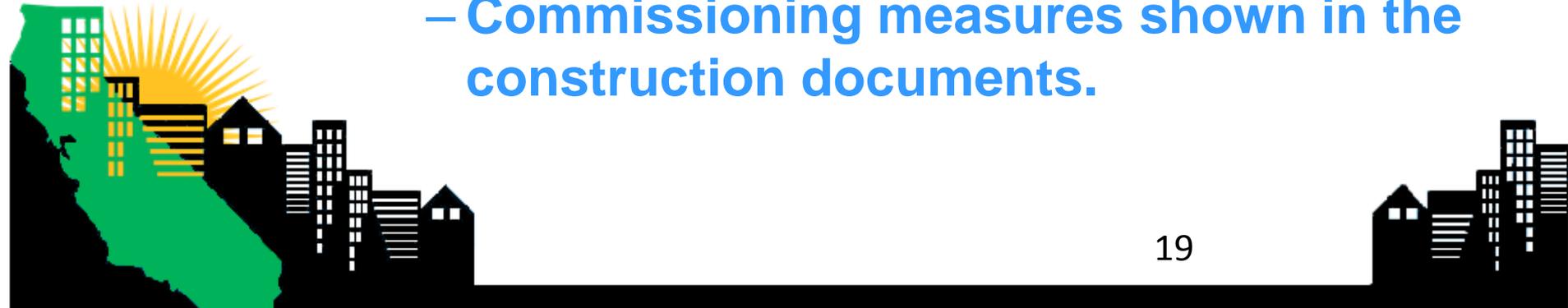
All **newly constructed** nonresidential buildings  **$\geq 10,000$  ft<sup>2</sup> trigger all Cx** requirements

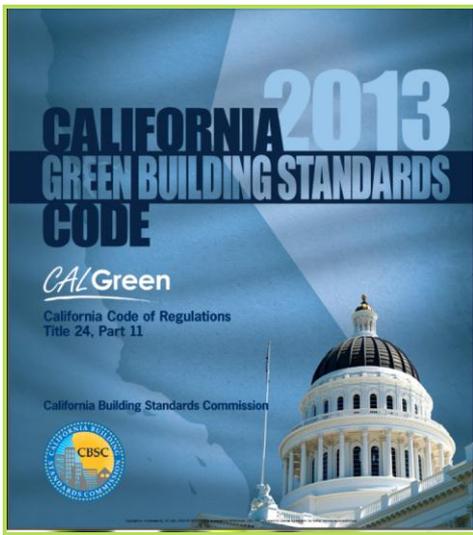
- This does not include additions and alterations
- Mixed occupancy portions of high-rise residential or hotel/motel buildings



# 2013 Title 24 Part 6 Cx Triggers

- Includes all mandatory, prescriptive and performance features covered under Part 6 for **conditioned spaces**
  - ***EXCEPT covered process*** (§120.6 and §140.9)
- For buildings < **10,000 ft<sup>2</sup>** :
  - **Design Review**
  - **Commissioning measures shown in the construction documents.**





## What's The Difference?

- Title 24 Part 6 (all building systems and components covered by Sections 110.0, 120.0, 130.0 and 140.0 excluding covered process)
  - Ventilation
  - Space-Conditioning Systems and Controls
  - Water Heating Systems and Controls
  - Lighting Systems and Controls
  - Electrical Power Distribution
  - Envelope (insulation, fenestration, cool roof, etc.)
  - Acceptance Testing

### ✦ Title 24 Part 11

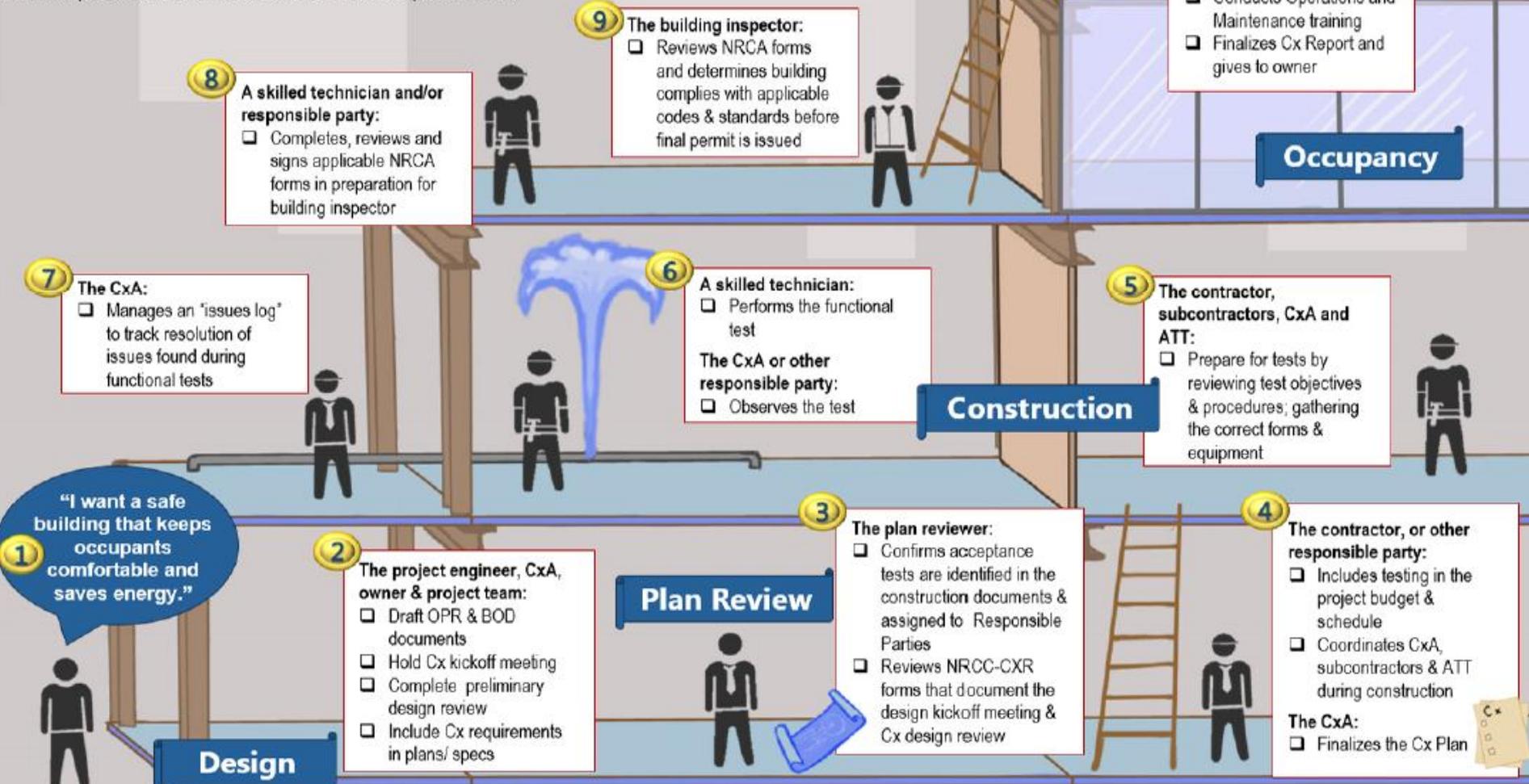
- ✧ Renewable Energy Systems
- ✧ Landscape Irrigation Systems
- ✧ Water Reuse Systems
- ✧ Covered Process



**Resources:**  
Energy Code Ace: CX Factsheet [www.energycodeace.com](http://www.energycodeace.com)  
CA Commissioning Collaborative: [www.cacx.org](http://www.cacx.org)  
Title 24 Part 6 2013 Nonresidential Manual: [www.energy.ca.gov](http://www.energy.ca.gov)

**New Nonresidential Buildings CFA <10,000 ft<sup>2</sup>:** Cx Specifications, NRCC-CXR, and NRCA (ATT) requirements only  
**New Nonresidential Buildings CFA ≥10,000 ft<sup>2</sup>:** Every aspects of Cx required  
**Multi-family/Hotel & Motel/Covered Process:** N/A

**Cx:** Commissioning/ **CxA:** Commissioning Authority/ **CFA:** Conditioned Floor Area  
**ATT:** Acceptance Test Technician/ **NRCA/NRCC:** Compliance forms



# Forms

- NRCC-CXR-01-E
  - Design Review Kickoff
- NRCC-CXR-02-E
  - Basic Review Checklist
- NRCC-CXR-03-E
  - Simple HVAC Review Checklist
- NRCC-CXR-04-E
  - Complex HVAC Review Checklist
- NRCC-CXR-05-E
  - Design Review Signature Page

STATE OF CALIFORNIA  
**DESIGN REVIEW KICKOFF**  
 CEC-NRCC-CXR-01-E (Revised 06/14) CALIFORNIA ENERGY COMMISSION 

CERTIFICATE OF COMPLIANCE		NRCC-CXR-01-E
Design Review Kickoff		(Page 1 of 2)
Project Name:	Date Prepared:	

<b>A. General Information</b>		
Climate Zone:	Building Type:	Conditioned Area (sf):
Reviewer's Name:	Reviewer's Agency:	
Enforcement Agency:	Permit Number:	
Enforcement Agency Use: Checked by	Enforcement Agency Use: Date	
<b>DATE OF DESIGN REVIEW KICKOFF</b>		/ /
<b>DESIGN REVIEW CHECKLISTS PROVIDED TO DESIGN TEAM</b>		YES <input type="checkbox"/> NO <input type="checkbox"/>
<b>DESIGN REVIEWER QUALIFICATIONS:</b>		
<input type="checkbox"/> <10,000 ft <sup>2</sup> : design engineer		
<input type="checkbox"/> >10,000 ft <sup>2</sup> and <50,000ft <sup>2</sup> : in-house engineer not associated with project or third-party design engineer		
<input type="checkbox"/> >50,000 ft <sup>2</sup> or complex mechanical system: third-party design engineer		
<b>LIST OF MEETING ATTENDEES:</b>		
<input type="checkbox"/> Owner: _____ <input type="checkbox"/> Design Reviewer: _____		
<input type="checkbox"/> Project Manager: _____ <input type="checkbox"/> Design Engineer(s): _____		
<b>DOCUMENTS RECEIVED BY DESIGN REVIEWER FOR DESIGN REVIEW KICKOFF:</b>		
<input type="checkbox"/> Owner's Project Requirements <input type="checkbox"/> Basis of Design or Narrative		
<input type="checkbox"/> Drawing Set (issue & date): _____		
<input type="checkbox"/> Specifications: _____ <input type="checkbox"/> Other: _____		

<b>DESIGN REVIEW MEETING TOPICS:</b>
<b>PROJECT SCOPE:</b>
<b>DESIGN ELEMENTS AND ASSUMPTIONS:</b>
<b>HVAC SYSTEM SELECTION:</b>
<b>RECOMMENDED ENERGY EFFICIENCY MEASURES:</b>
<b>OTHER COMMENTS:</b>
<b>COORDINATION:</b>
TARGET CONSTRUCTION DOCUMENT REVIEW DATE:
TARGET PERMIT SUBMITTAL DATE:



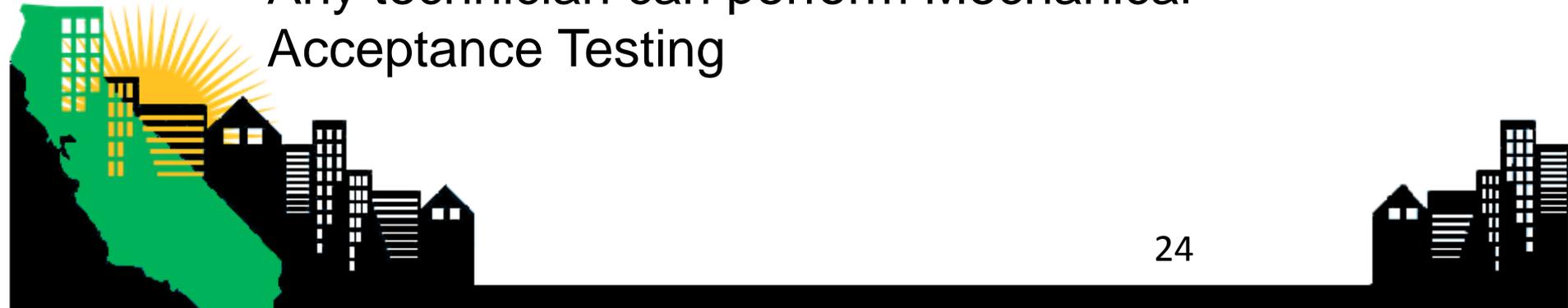
# Functional Performance Tests

- **Acceptance Test Technician (ATT)-**  
A Field Technician is certified by an authorized Acceptance Test Technician Certification Provider.
- The ATT ensures that the building lighting controls and mechanical systems are operating as they were designed.



# Functional Performance Tests

- Lighting Controls ATTCP
  - Threshold Requirements have been met (Section 10-103-A(b))
  - Only Certified ATTs can perform Lighting Controls Acceptance Testing
- Mechanical ATTCP
  - Threshold Requirements have NOT been met (Section 10-103-B(b))
  - Any technician can perform Mechanical Acceptance Testing



# California Energy Code Resources

- California Energy Commission (CEC) Efficiency Division's Educational Resources Webpage:  
[http://www.energy.ca.gov/efficiency/educational\\_resources.html](http://www.energy.ca.gov/efficiency/educational_resources.html)
- ListServ (Efficiency, Building Standards, Blueprint):  
<http://www.energy.ca.gov/efficiency/listservers.html>
- Blueprint:  
<http://www.energy.ca.gov/efficiency/blueprint/>



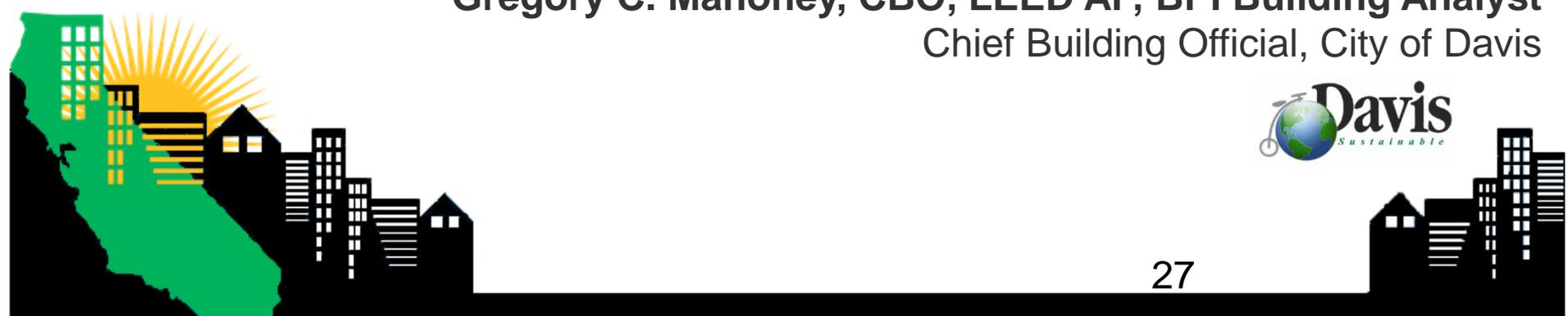
# California Energy Code Resources

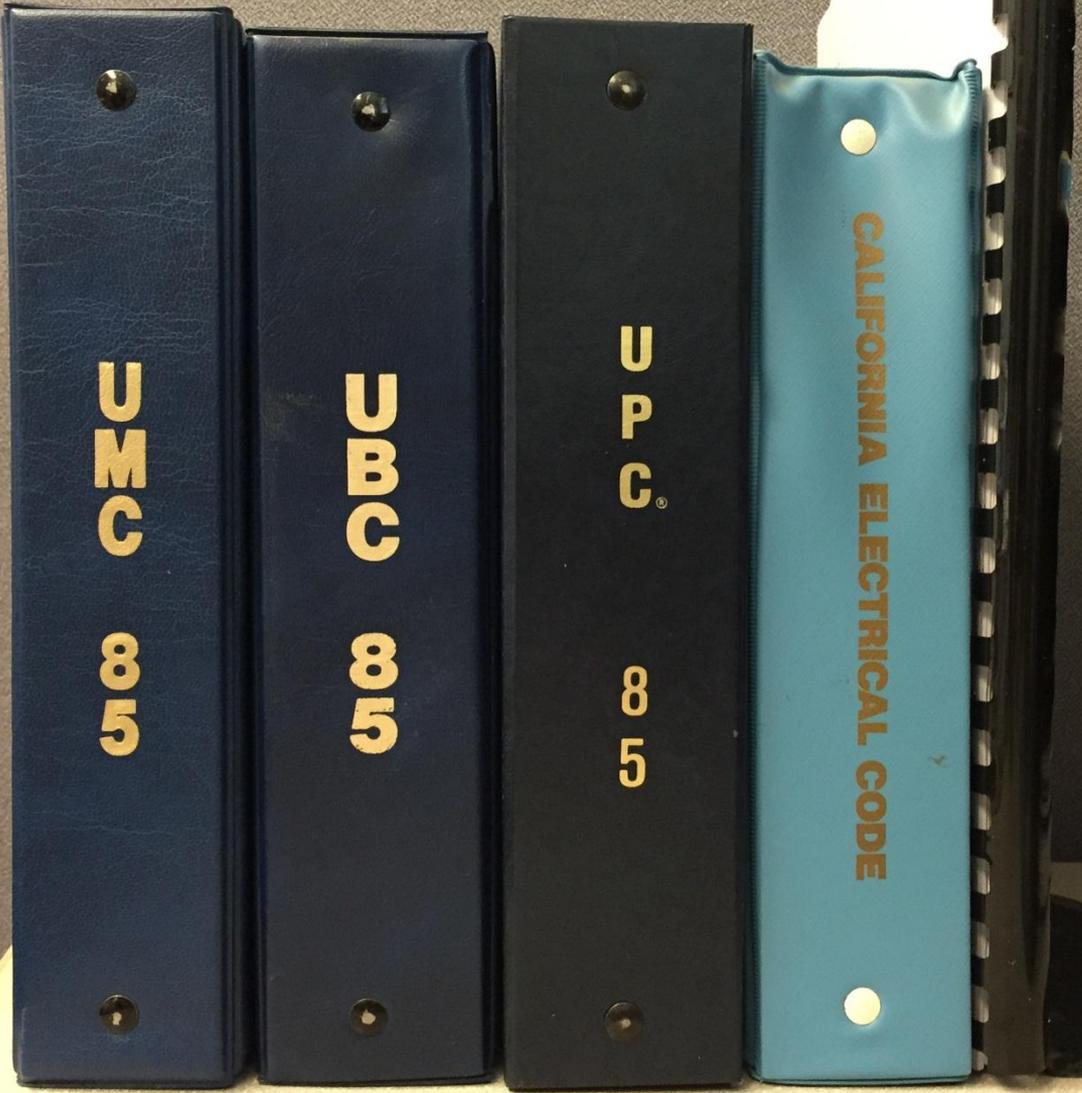
- Energy Code Ace:  
<http://energycodeace.com/>
- Energy Design Resources Website:  
<http://energydesignresources.com/>
- Software:
  - [http://www.energy.ca.gov/title24/2013standards/2013\\_computer\\_prog\\_list.html](http://www.energy.ca.gov/title24/2013standards/2013_computer_prog_list.html)



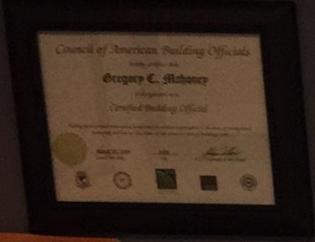
# CODE REQUIRED COMMISSIONING

**Gregory C. Mahoney, CBO, LEED AP, BPI Building Analyst**  
Chief Building Official, City of Davis





CALIFORNIA ADMINISTRATIVE CODE  
California Code of Regulations Title 24  
Part 1  
CALIFORNIA STATE BOARD OF ELECTRICAL EXAMINERS  
CBSC



- 2010 CALIFORNIA ADMINISTRATIVE CODE
- 2010 CALIFORNIA BUILDING CODE
- 2010 CALIFORNIA BUILDING CODE
- 2010 CALIFORNIA RESIDENTIAL CODE
- 2010 CALIFORNIA ELECTRICAL CODE
- 2010 CALIFORNIA MECHANICAL CODE
- 2010 CALIFORNIA PLUMBING CODE
- 2010 CALIFORNIA ENERGY CODE
- 2010 CALIFORNIA FIRE CODE
- 2010 CALIFORNIA GREEN BUILDING STANDARDS CODE
- 2010 CALIFORNIA ADMINISTRATIVE CODE
- 2013 CALIFORNIA BUILDING CODE
- 2013 CALIFORNIA BUILDING CODE
- 2013 CALIFORNIA ELECTRICAL CODE
- 2013 CALIFORNIA MECHANICAL CODE
- 2013 CALIFORNIA PLUMBING CODE
- 2013 CALIFORNIA RESIDENTIAL CODE
- 2013 CALIFORNIA GREEN BUILDING STANDARDS CODE
- 2013 NON-RESIDENTIAL COMPLIANCE MANUAL
- 2013 RESIDENTIAL COMPLIANCE MANUAL
- NON-RESIDENTIAL FORMS
- 2013 REFERENCE APPENDICES
- FEMA (ICS)



D FLOODPLAIN MANAGER PROGRAM (CFM® Program)

# CALIFORNIA CODE ENFORCEMENT SOURCEGUIDE



## California Solar Permitting Guidebook

Improving Permit Review and Approval for Small Solar Photovoltaic (PV) Systems

## Certified Access Specialist Program Practice Standards and Best Practices Handbook

INTERNATIONAL RESIDENTIAL AND TWO-FAMILY DWELLINGS CODE

2013 IRC

CALIFORNIA 2013 GREEN BUILDING STANDARDS CODE

2013 BUILDING ENERGY EFFICIENCY STANDARDS FOR RESIDENTIAL AND NONRESIDENTIAL BUILDINGS

AB 1236 TEXT

TITLE 24, PART 6 AND ASSOCIATED ADMINISTRATIVE REGULATIONS IN PART 1

CALIFORNIA LAW  
CIVIL CODE

CALIFORNIA LAW

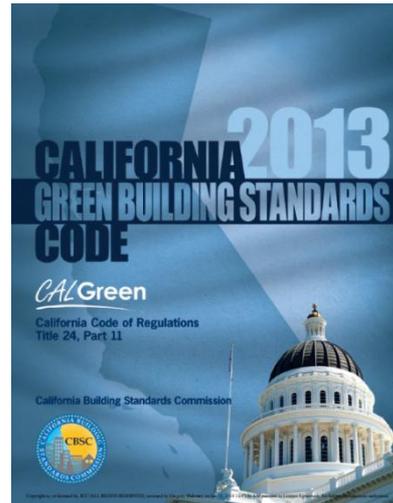
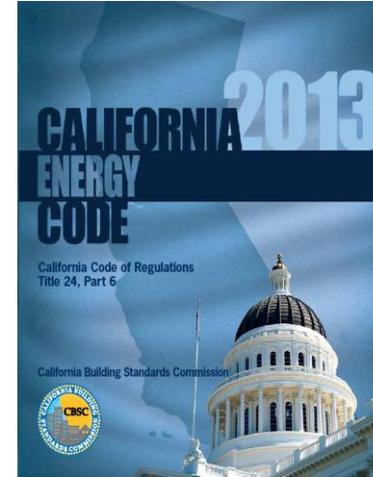
CALIFORNIA HEALTH AND SAFETY CODE

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...prohibits the charging of a subscription fee on persons  
...use an electric vehicle charging station, as defined, th  
...payment of a fee and prohibits a requirement for persons

# Why Commission?

- **2013 California Energy Code**  
Section 120.8 – Building Commissioning
- **2013 California Green Building Standards (CALGreen):**  
Section 5.410.2 - Commissioning



# Roadblocks to compliance

- Lack of awareness of code requirements
- Lack of personnel
- Lack of resources/training
- Lack of expertise and experience in commissioning
- Lack of clear direction for code officials regarding roles and responsibilities



# Commissioning Requirements

## Defined

- Commissioning Required
- Trained Personnel
- Owners Project Requirements
- Basis of Design
- Commissioning Plan Required
- Functional Testing Required
- Documentation and Training
- Commissioning Report

## Unclear

- Who is ultimately responsible for compliance?
- Who is responsible for verification of compliance?
- Does the AHJ have a role in QA/QC?
- Is the Report required to be completed prior to final sign-off?
- Does the AHJ have a role in final review of the Report?



# Steps to Compliance

- Building Department staff needs to be informed about commissioning requirements
- Define expectations for staff review and inspection
- Notify applicants early on in the process (Design Review)
  - What is required
  - Scope of review and inspection



# Who Performs Commissioning?

“Commissioning shall be performed by trained personnel with experience on projects of comparable size and complexity.”

*CAL*Green®

- Trained personnel may include members of owner staff, contractor and design team as well as independent commissioning professionals.
- It is essential that there is a single person designated to lead and manage the commissioning activities.



# Who Performs Commissioning?

Methods of evaluating the trained personnel include review of:

1. Technical knowledge
2. Relevant experience
3. Potential conflict of interest concerns
4. Professional certifications and training
5. Communication and organizational skills
6. Reference and sample work products

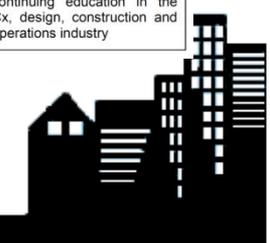


# CX Provider (IAS AC-476)

An individual or agency identified by the Owner and approved by the AHJ who is responsible for the overall building commissioning and leads, plans, schedules, and coordinates the commissioning team to implement the Commissioning Process.

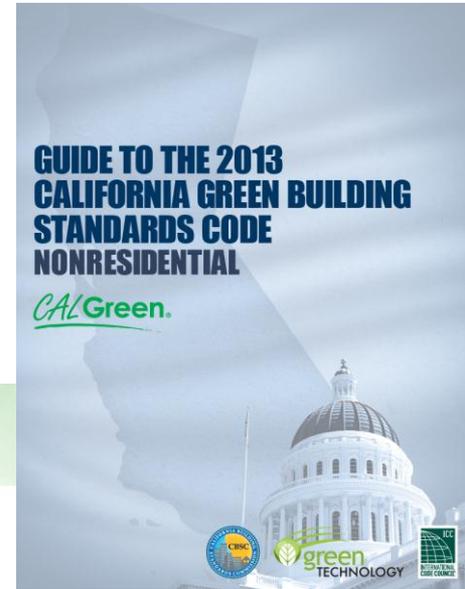
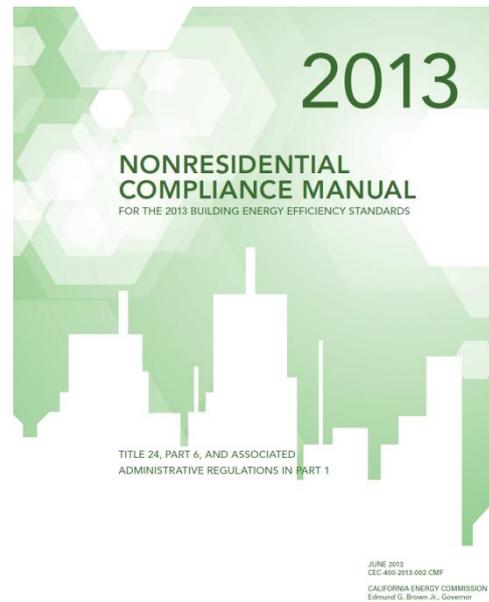
Also referred to as:  
Commissioning Agent  
Commissioning Authority

	Educational Requirements	Work Experience Requirements	Cx Experience (can be satisfied by training program)	Successful Examination
Option A	Four-year undergraduate degree or higher in a building science field from an accredited institution	Minimum 3 years as Cx Provider	1. Training program and/or Cx Provider of Record for min 3 qualifying projects from design phase thru completion of construction  2. Min 150,000 SF and \$30,000,000 construction costs	Pass an exam on commissioning and applicable fundamentals, demonstrating knowledge of the Cx process, design, construction, operations and maintenance fundamentals  After passing exam maintain good standing in the Cx industry and undertake continuing education in the Cx, design, construction and operations industry
Option B	Four-year undergraduate degree or higher in a non-building science field from an accredited institution, or  Two-year undergraduate degree in a building science field from an accredited institution, or  Completed apprentice program from a nationally recognized and accredited program in a technical applicable field	Minimum 3 years as Cx Provider and  Minimum 5 years technical applicable experience	1. Training program and/or Cx Provider of Record for min 3 qualifying projects from design phase thru completion of construction  2. Min 150,000 SF and \$30,000,000 construction costs	Pass an exam on commissioning and applicable fundamentals, demonstrating knowledge of the Cx process, design, construction, operations and maintenance fundamentals  After passing exam maintain good standing in the Cx industry and undertake continuing education in the Cx, design, construction and operations industry
Option C	Two-year undergraduate degree in a non-building science field from an accredited institution, or  High school diploma or GED	Minimum 3 years as Cx provider and  Minimum 7 years technical applicable experience	1. Training program and/or CxA for min 3 qualifying projects from design phase thru completion of construction  2. Min 150,000 SF and \$30,000,000 construction costs	Pass an exam on commissioning and applicable fundamentals, demonstrating knowledge of the Cx process, design, construction, operations and maintenance fundamentals  After passing exam maintain good standing in the Cx industry and undertake continuing education in the Cx, design, construction and operations industry



# RESOURCES

- Nonresidential Compliance Manual
- Guide to CALGreen Nonresidential
- ICC 1000



**ICC 1000**  
APPLICATION OF THE COMMISSIONING PROCESS  
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This applies to all docs...both attachments to emails as well as anything we post.

**DRAFT**

March 27, 2014  
Updated April 2, 2014  
By Formatting and Style Committee  
Committee Update April 17, 2014  
Committee Update May 28, 2014  
Committee Update September 16 & 25, 2014  
Committee Update December 2, 2014



## BUILDING COMMISSIONING

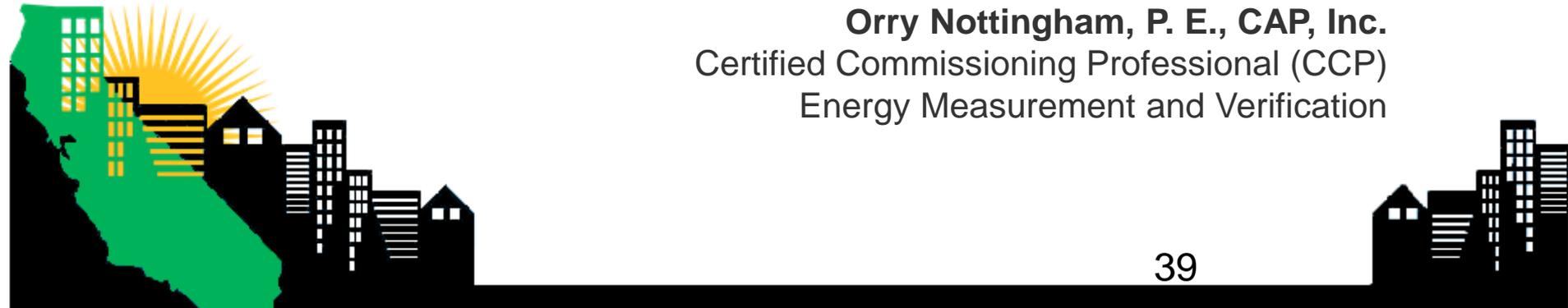
**CALGreen**® and the  
California Energy Code

# What will the story of a building become?

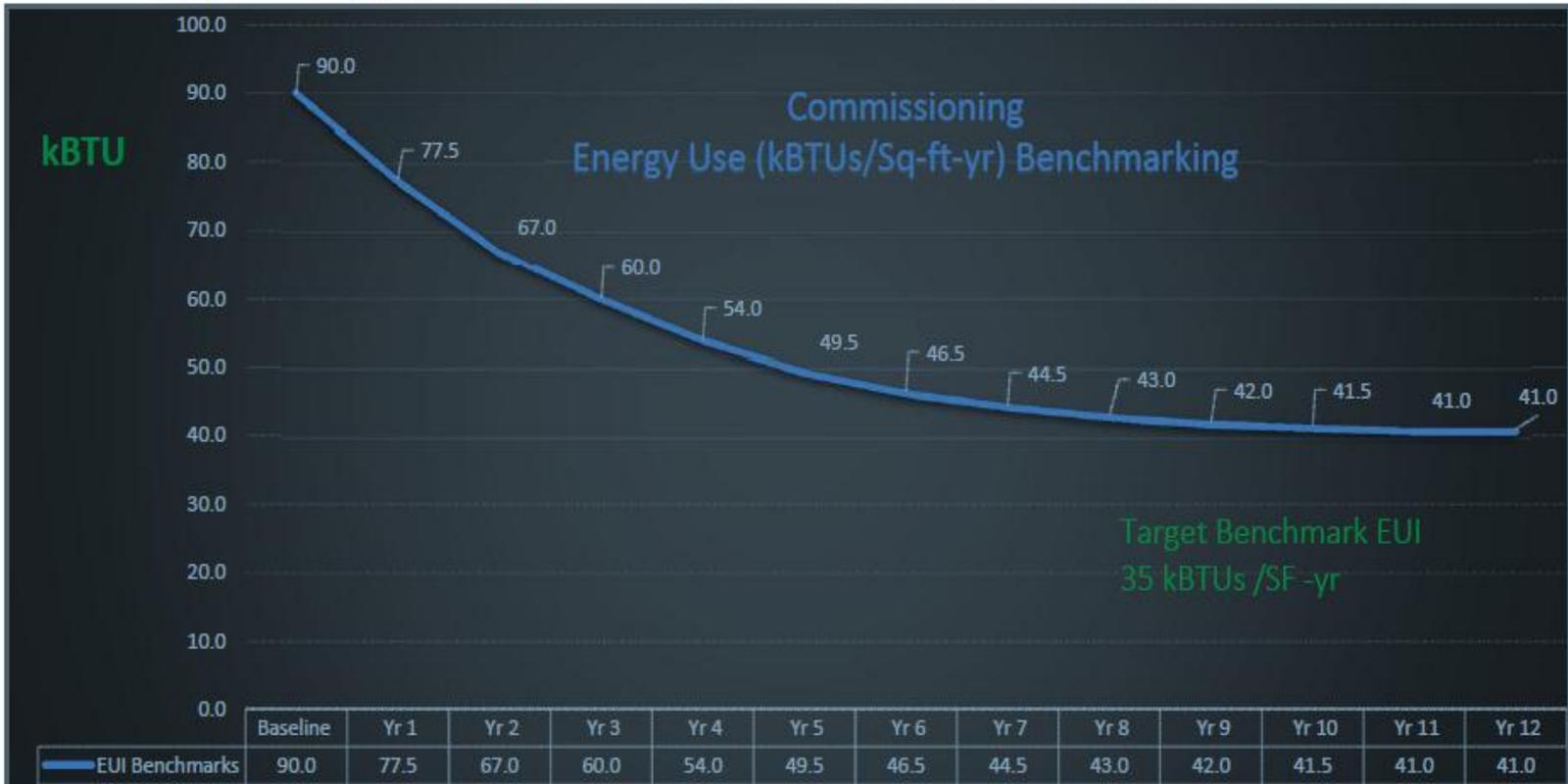
- **Good** report or **Bad** report?

**It's a choice!**

Orry Nottingham, P. E., CAP, Inc.  
Certified Commissioning Professional (CCP)  
Energy Measurement and Verification



# ARE YOU COMMISSIONING YOUR BUILDING'S ENERGY SYSTEMS?



## Commissioning

- Applies industry standard commissioning process, energy efficiency measures, and metrics including benchmarking to a building's energy systems.
- Reduces energy use *present levels over 75kBTUs to a target goal within 35 kBTUs/SF per year* throughout all buildings; to operate and maintain its energy performance "sweet spot" over the life of the building.

## Benchmarking

- Is aimed to manage, facilitate, and maintain a building's energy use to within the building energy systems "sweet spot"

# Are there any questions?

