



Cx in CA Codes The California Experience

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Key Points – Learning Objectives

- ❖ History of Cx in Codes and Rating Systems in California
- ❖ Overview and Scope of California Title 24, Part 6 Cx Requirements
- ❖ When are Cx requirements triggered
- ❖ Who does what?
- ❖ What do building officials need to know
- ❖ Certifications
- ❖ Resources



History of Cx in Codes and Rating Systems in California

- ❖ LEED was the first big driver for Cx in new buildings
- ❖ CHPS (Collaborative for High Performance Schools) followed with a less stringent Cx prerequisite
- ❖ 2005 Title 24, Part 6 took a baby step with “Acceptance Testing” (AT) requirements
- ❖ Title 24, Part 11 (CALGREEN) took it further with more requirements
- ❖ Title 24, Part 6 now includes all Cx requirements up to CO (combining Part 11 Cx and Part 6 AT and filling in gaps)



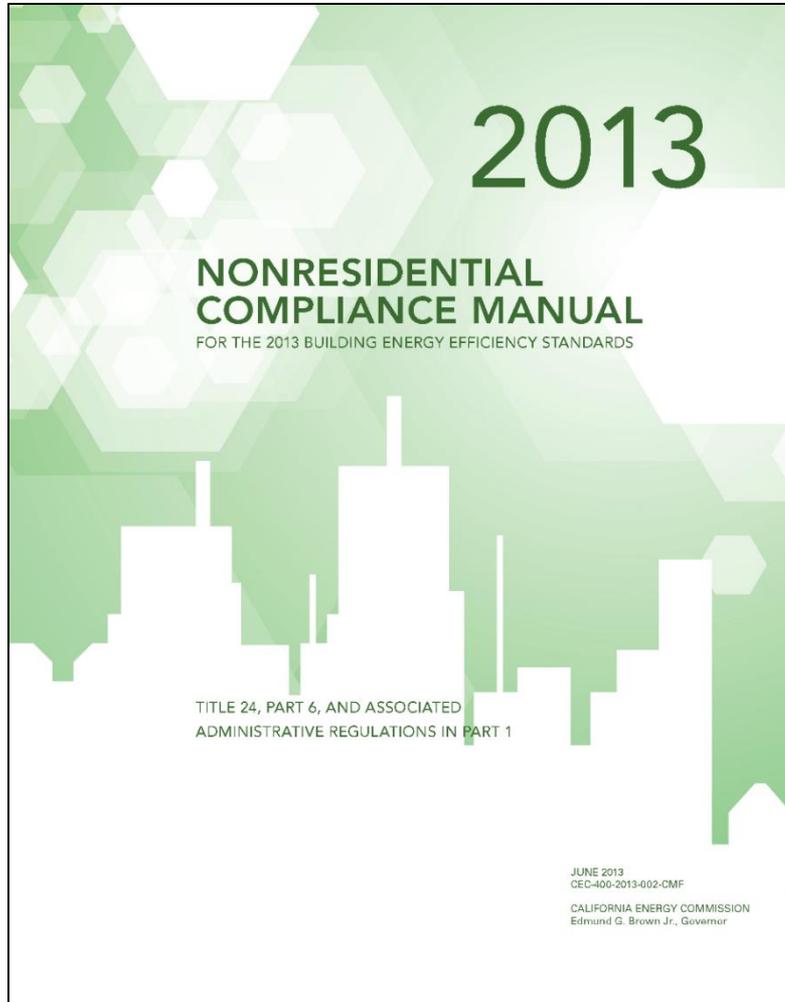
California Energy Commission Documents



Energy Standards: §120.8

- (a) Summary of Commissioning Requirements
- (b) Owner's or Owner Representative's Project Requirements (OPR)
- (c) Basis of Design (BOD)
- (d) Design Phase Design Review
- (e) Commissioning measures shown in the construction documents (Commissioning Specifications)
- (f) Commissioning Plan
- (g) Functional performance testing
- (h) Documentation and training
- (i) Commissioning report

California Energy Commission Documents



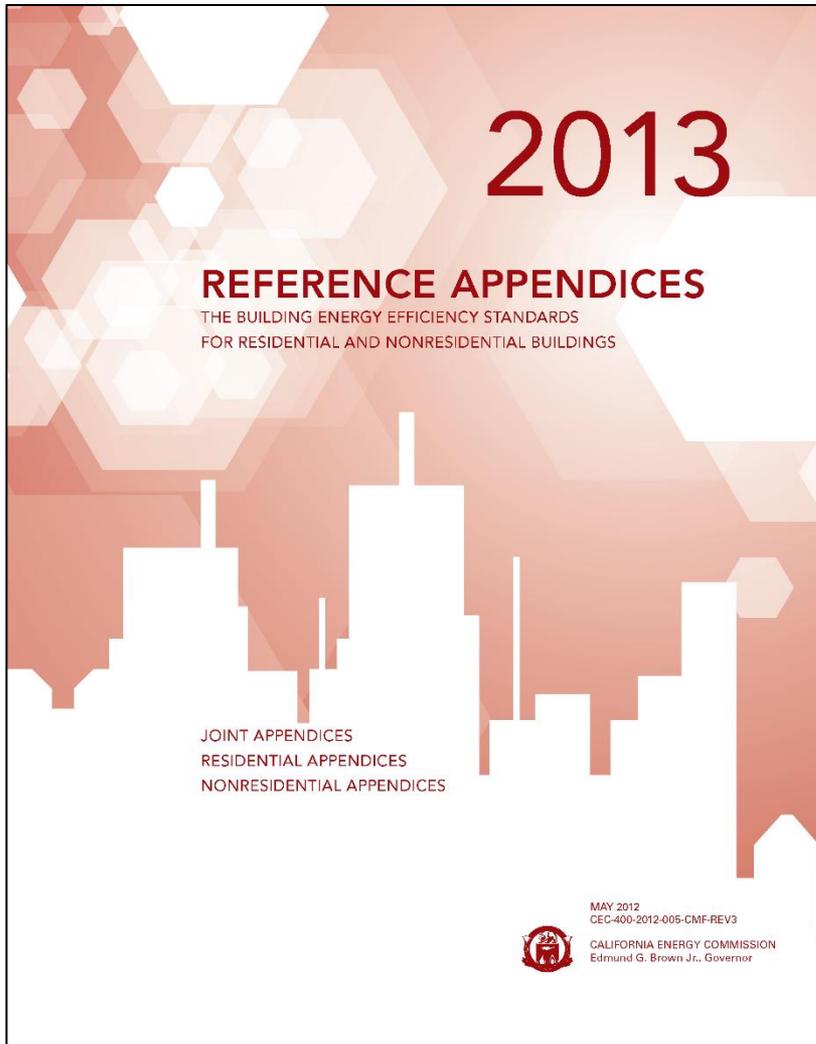
Chapter 12

❖ Building Commissioning Guide

- Triggers
- Exceptions
- Requirements
- Documentation



California Energy Commission Documents



Nonresidential Appendix NA7

❖ Installation and Acceptance Requirements

- NA7.4: Envelope
- NA7.5: Mechanical
- NA7.6: Lighting
 - 7.7 Indoor
 - 7.8 Outdoor
 - 7.9 Signs



When is Cx Required?

All **new** nonresidential buildings

- ❖ *This does not include additions and alterations*
- ❖ *This does not include high-rise residential or hotel/motel buildings*

Commissioning Requirements in Part 6	Conditioned Space	
	<10k ft ²	≥ 10k ft ²
OPR (§120.8(b))		X
BOD (§120.8(c))		X
Design Review (§120.8(d))	X	X
Commissioning in Construction Docs (§120.8(e))	X	X
Commissioning Plan (§120.8(f))		X
Functional Performance Tests (§120.8(g))		X
O&M Training (§120.8(h))		X
Commissioning Report (§120.8(i))		X

Who is involved?

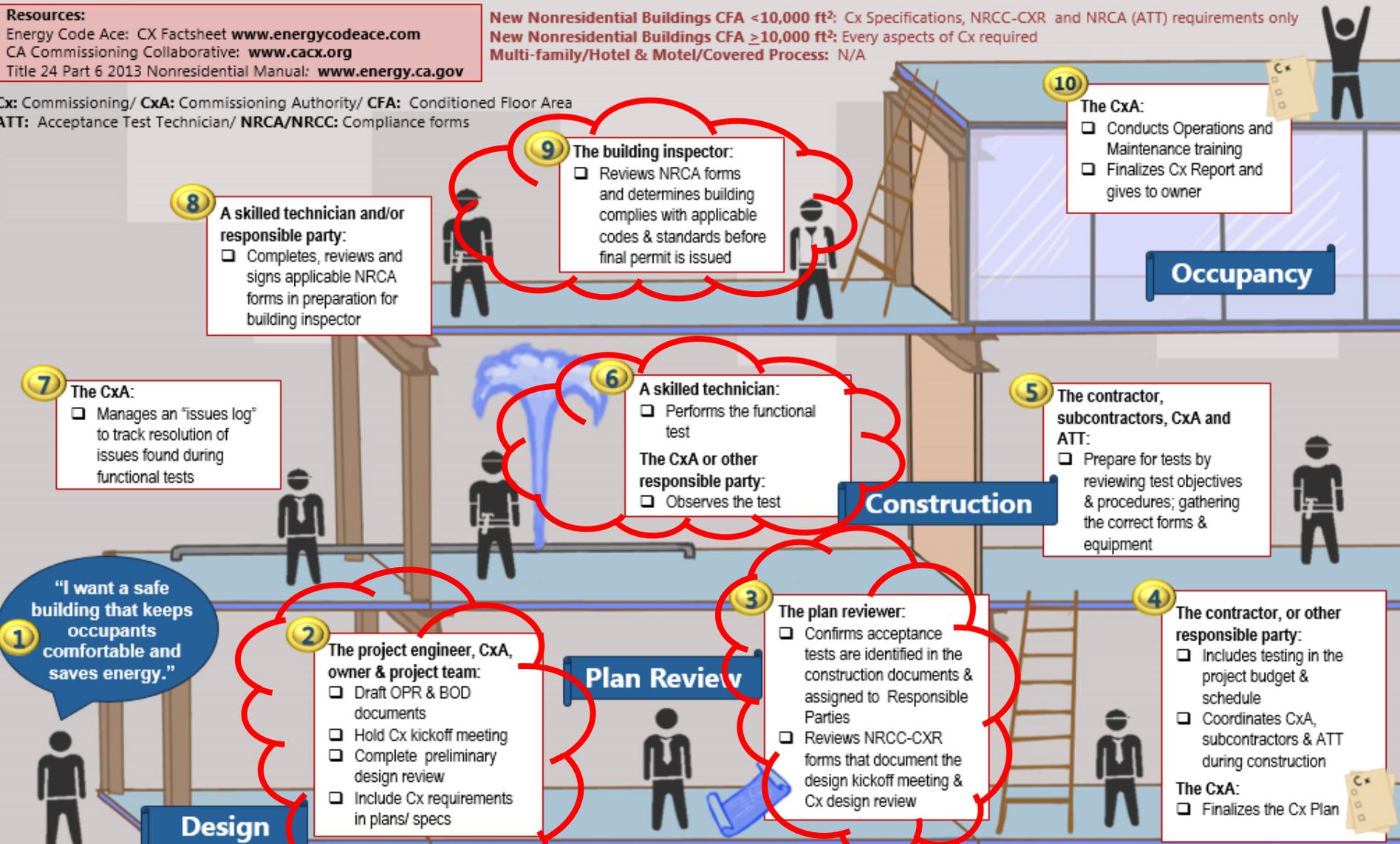
-  ✦ **Owner or Owner's Representative** - The individual or entity holding title to the property on which the building is constructed, or acting on the owner's behalf.
-  ✦ **Commissioning Authority (i.e. Cx Agent)**– The person who plans, schedules and coordinates the commissioning team to implement the commissioning process. This can be *either* a third-party commissioning provider *or* an experienced member of the design team or owner's staff.
-  ✦ **Design Reviewer** – Conducts the design review (qualifications later).
-  ✦ **Acceptance Test Technician**- a Field Technician as defined in Section 10-102 who is certified by an authorized Acceptance Test Technician Certification Provider pursuant to the requirements of Sections 10-103-A or 10-103-B.
-  ✦ **Contractor**- Coordinates and includes testing on site with Commissioning Authority, subcontractors, Acceptance Test Technicians and Building Inspector in addition to reviewing test objectives, procedures and gathering the correct forms & equipment

The Title 24 Cx Process

Resources:
 Energy Code Ace: CX Factsheet www.energycodeace.com
 CA Commissioning Collaborative: www.cacx.org
 Title 24 Part 6 2013 Nonresidential Manual: www.energy.ca.gov

New Nonresidential Buildings CFA <10,000 ft²: Cx Specifications, NRCC-CXR and NRCA (ATT) requirements only
New Nonresidential Buildings CFA ≥10,000 ft²: 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



"I want a safe building that keeps occupants comfortable and saves energy."

1 **The project engineer, CxA, owner & project team:**

- Draft OPR & BOD documents
- Hold Cx kickoff meeting
- Complete preliminary design review
- Include Cx requirements in plans/ specs

2 **The plan reviewer:**

- Confirms acceptance tests are identified in the construction documents & assigned to Responsible Parties
- Reviews NRCC-CXR forms that document the design kickoff meeting & Cx design review

3 **The contractor, or other responsible party:**

- Includes testing in the project budget & schedule
- Coordinates CxA, subcontractors & ATT during construction

The CxA:

- Finalizes the Cx Plan

4 **The contractor, subcontractors, CxA and ATT:**

- Prepare for tests by reviewing test objectives & procedures; gathering the correct forms & equipment

5 **A skilled technician:**

- Performs the functional test

The CxA or other responsible party:

- Observes the test

6 **The CxA:**

- Manages an "issues log" to track resolution of issues found during functional tests

7 **A skilled technician and/or responsible party:**

- Completes, reviews and signs applicable NRCA forms in preparation for building inspector

8 **The building inspector:**

- Reviews NRCA forms and determines building complies with applicable codes & standards before final permit is issued

9 **The CxA:**

- Conducts Operations and Maintenance training
- Finalizes Cx Report and gives to owner

10 **Occupancy**



The Title 24 Cx Process



Design

The project engineer, CxA, owner & project team:

- ❖ Draft OPR & BOD documents
- ❖ Hold Cx kickoff meeting
- ❖ Complete preliminary design review
- ❖ Include Cx requirements in plans/ specs



The Title 24 Cx Process

Plan Review

The plan reviewer:

- ❖ Confirms acceptance tests are identified in the construction documents & assigned to Responsible Parties
- ❖ Reviews NRCC-CXR forms that document the design kickoff meeting & Cx design review



The Title 24 Cx Process

Plan Review

Who can do plan review?

Building Size	< 10,000 ft ²	10,000 - 50,000 ft ²	> 50,000 ft ²	Complex systems in Bldgs >10,000 ft ²
Allowed Design Reviewer	Any licensed professional engineer, including the engineer of record	A licensed professional engineer in-house to the design firm but not associated with the building project, or a third party licensed engineer	A third party licensed professional engineer	A third party licensed professional engineer



The Title 24 Cx Process

Acceptance Testing

A skilled technician:

❖ Performs the functional test

- Only certified ATT's can conduct functional tests that are part of required acceptance tests

The CxA or other responsible party:

❖ Observes the test



The Title 24 Cx Process

Acceptance Testing

Who can do Acceptance Testing?

Collaboration! CxA, ATT (Acceptance Test Technicians), and relevant subs will likely all be involved

- ❖ The CxA cannot DO the functional testing unless they are a certified ATT, they may just observe.
- ❖ Only Certified Acceptance Test Technicians can perform the acceptance tests
 - ❖ Lighting Controls Acceptance Test Technicians (“Cool Cats”)
 - ❖ Mechanical Acceptance Test Technician
 - ❖ ATT may still need installing contractor or controls contractor to put the equipment through the various test conditions



The Title 24 Cx Process

Acceptance Testing

Who can do Acceptance Testing?

Acceptance Test Technician Certification Providers

The following Provider(s) have been approved to offer training and certification:

- Mechanical: National Environmental Balancing Bureau (NEBB)
 - Mechanical: National Energy Management Institute Committee (NEMIC)
 - Lighting: California Advanced Lighting Controls Training Program (CALCTP)
 - Lighting: National Lighting Contractors Association of America (NLCAA)
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- ❖ Threshold for requiring certified ATTs is 300
 - ❖ At present, only the lighting threshold has been met



The Title 24 Cx Process

Acceptance Testing

Who can do Acceptance Testing?

CALCTP (CA Advanced Lighting Controls Training Program)

- ❖ Started in 2008 as an initiative to increase the use of advanced lighting controls
- ❖ Expanded in 2010 with \$5M Dept of Labor grant
- ❖ Collaboration between CA utilities, trades (IBEW-NECA), lighting & controls manufacturers, CA Community Colleges (30 training sites)
- ❖ CALCTP-AT Technician = “cool cat”
 - 16 hours of lecture/lab in addition to prerequisites
 - Eligibility: Electrical contractors, electricians, PEs, CxAs



The Title 24 Cx Process



Inspection

The building inspector:

- ❖ Reviews NRCA forms and determines building complies with applicable codes & standards before final permit is issued

Chronology

<p>Pre-Design</p>	<ul style="list-style-type: none"> ■ Select CxA and “design reviewer” ■ Draft OPR
<p>Schematic Design</p>	<ul style="list-style-type: none"> ■ Draft BOD ■ Hold Design Cx Kickoff meeting [NRCC-CXR-01-E]
<p>Design Development</p>	<ul style="list-style-type: none"> ■ Begin drafting Cx specifications
<p>50% Construction Documents</p>	<ul style="list-style-type: none"> ■ Perform preliminary design review [NRCC-CXR-02-E; NRCC-CXR-03-E; NRCC-CXR-04-E](recommended, not required)
<p>90% Construction Documents</p>	<ul style="list-style-type: none"> ■ Finalize Cx specifications ■ Perform final design review [NRCC-CXR-02-E; NRCC-CXR-03-E; NRCC-CXR-04-E; NRCC-CXR-05-E] ■ Draft Cx Plan



Chronology

Construction

- Hold construction Cx kickoff (recommended, not required)
- Finalize Cx Plan
- Draft functional performance tests (FPT)
- Perform FPT
- Manage issues log (recommended, not required)
- Begin drafting Cx report

Occupancy

- Compile Systems Manual
- Conduct O&M training
- Finalize Cx Report

Resources

❖ 2013 Title 24 Documents Page

- <http://www.energy.ca.gov/title24/2013standards/index.html>

❖ EnergyCodeAce – IOU Code Training & Materials

- <http://energycodeace.com/content/home/>

❖ Savings By Design – Commissioning for Code Compliance

- <http://energydesignresources.com/resources/e-news/e-news-96-commissioning.aspx>



Thank You!!

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