

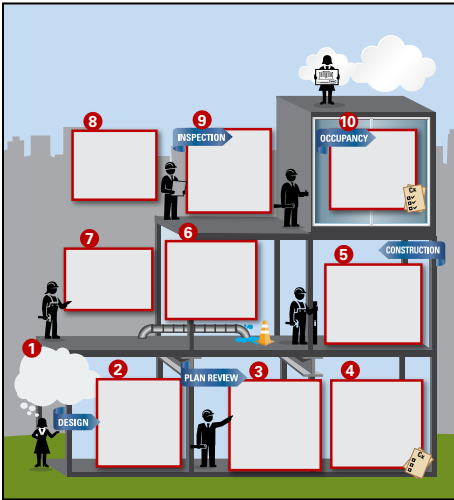
What is Commissioning?

California's Building Energy Efficiency Standards (Energy Standards), Title 24, Part 6 defines commissioning as "a systematic quality assurance process that spans the entire design and construction process, including verifying and documenting that building systems and components are planned, designed, installed, tested, operated and maintained to meet the owner's project requirements."

Closely related to acceptance testing, commissioning (also commonly referred to as Cx) involves functional testing during construction, but also includes activities during design that will ensure the building systems and associated controls will meet the owner's energy and operating efficiency goals.

Commissioning requirements for all newly constructed nonresidential buildings are included in the 2016 Energy Standards Title 24, Part 6. Many of these requirements were moved from Title 24, Part 11 (CalGreen), where commissioning was originally incorporated into state building code in 2008.

Why?: Commissioning is critical to realizing the energy savings during building operation that were intended by the building design.



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Relevant Code Sections

2016 California Building Energy Efficiency Standards, Title 24, Part 6:

- [Section 120.8](#) – Nonresidential Building Commissioning

Relevant Compliance Forms

- [NRCC-CXR-01-E](#): for Design Review Kickoff
- [NRCC-CXR-02-E](#): Construction Documents Design Review Checklist
- [NRCC-CXR-03-E](#): for "simple" HVAC systems
- [NRCC-CXR-04-E](#): for "complex" HVAC systems
- [NRCC-CXR-05-E](#): Design Review Signature Page

Roles and Responsibilities

Because commissioning spans the entire building delivery process from pre-design through occupancy, many parties are involved, making communication and coordination paramount. Understanding and assigning roles early in the commissioning process is key to success.

Below is a list of who may need to participate in the commissioning process.

- Owner, owner's representative or facility operator
- Designers (architect and MEP)
- Design Reviewer
- Plans Examiner
- General Contractor*
- Key Subcontractors (HVAC, controls, TAB, etc.)*
- Acceptance Test Technician (ATT)*
- Commissioning Authority (CxA)*
- Building Inspector*

* These parties are generally only involved in the commissioning process for buildings with nonresidential conditioned floor area 10,000ft² or greater when [§120.8\(f\)](#)- [§120.8\(i\)](#) are required.



The most appropriate person to fill each of these roles depends on the experience and expertise of the project team. The Energy Standards do not specify who must function as the Commissioning Authority. However, there are restrictions on who may act as the Design Reviewer.

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

Table 1. Design Reviewer Specifications, per §120.8(d) (references 10-103(a)1 in Title 24, Part 1)

Commissioning Requirements

Commissioning requirements are included in Section 120.8 of the Energy Standards and apply to all newly constructed nonresidential buildings, though the extent of the requirements depends on the size of the conditioned floor area. Commissioning requirements for nonresidential spaces within high-rise residential and hotel/motel buildings are based on the conditioned floor area (CFA) of nonresidential spaces only (excluding all residential living spaces and guestrooms).

Table 2 illustrates which requirements apply based on conditioned floor area.

Commissioning Requirements	Conditioned Floor Area		When
	< 10k ft ²	≥ 10k ft ²	
Owner's Project Requirements (OPR) (§120.8(b))		X	Pre-Design
Basis of Design (BOD) (§120.8(c))		X	Draft during Schematic Design, update as necessary
Design Review (§120.8(d))	X	X	Preliminary at 50% Design / Final at 90% Design
Commissioning specifications in Construction Docs (CD) (§120.8(e))	X	X	Draft at 50% Design / Final at 90% Design
Commissioning Plan (§120.8(f))		X	Draft at 90% Design / Final during Construction
Functional Performance Tests (§120.8(g))		X	Construction
Operation & Maintenance (O&M) Training (§120.8(h))		X	Occupancy
Commissioning Report (§120.8(i))		X	Draft during Construction / Final during Occupancy

Table 2. Commissioning Requirements in Title 24, Part 6



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Don't Forget About CALGreen!

Title 24, Part 11 (CALGreen) also includes requirements for commissioning in Chapter 5 - Nonresidential Mandatory Measures. These requirements are complementary to the Energy Standards requirements, but be sure to read through them as additional systems such as renewable energy, landscape irrigation and water reuse systems are covered here.

Functional Performance Test Procedures

Per [Section 120.8\(g\)](#), functional testing performed to satisfy commissioning requirements must be performed in accordance with acceptance testing procedures outlined in other sections of the Energy Standards.

Why?: To demonstrate the correct installation and operation of each component, system and system-to-system interface.

Note that functional performance tests needed for commissioning are based on the systems documented in the Owner's Project Requirements (OPR) and Basis of Design (BOD) documents, and may be more comprehensive than the project's required acceptance tests. Not being included in the OPR/BOD does not exempt a system from acceptance test requirements outlined in other sections of the Energy Standards.

Forms: Which and When

During Schematic Design:

- [NRCC-CXR-01-E](#): Records that the requirement to hold a design review kickoff meeting between the owner, architect, design engineer and design reviewer has been met and that the OPR and BOD were reviewed during the meeting
 - Signed by the Principal Designer (Responsible Person)

Why?: The Energy Standards dictate that the commissioning process starts in early design.

At 90% Construction Documents:

- [NRCC-CXR-02-E](#): Records that applicable envelope, lighting/daylighting, water heating and general HVAC code elements are included and are well documented in the construction documents
 - Completed by the Designer and the Design Reviewer
 - Signed by the Documentation Author and the Principle Designer (Responsible Person)
- [NRCC-CXR-03-E](#): Supplemental information for "simple" HVAC systems, **OR**
- [NRCC-CXR-04-E](#): Supplemental information for "complex" HVAC systems (See Figure 1)
 - Completed by the Designer and the Design Reviewer
 - Signed by the Documentation Author and the Principle Designer (Responsible Person)
- [NRCC-CXR-05-E](#): Records that the required construction documents design review has been completed for the project
 - Completed and signed by Owner/Owner's Representative, Design Architect/Engineer, the Design Reviewer **and** the Principle Designer (Responsible Person)

Why?: The Energy Standards dictate that all the completed, signed certificates are to be made available with the building permit(s) issued for the building, and to the enforcement agency for all applicable inspections.

Notes:

- All newly constructed nonresidential projects are required to complete the design review certificates of compliance, regardless of project size (See Table 1).
- Although there are no commissioning forms other than the certificates of compliance, the NRCA forms (certificates of acceptance) are used to document functional performance tests for the inspector to review.

"Simple" HVAC Systems include:
(a) Unitary or packaged equipment listed in Tables 110.2-A, 110.2-B, 110.2-C and 110.2-E that each serve one zone; OR
(b) Two-pipe, heating only systems serving one or more zones
"Complex" HVAC Systems include:
(a) Fan systems each serving multiple thermostatically controlled zones; OR
(b) Built-up air handler systems (non-unitary or non-packaged HVAC equipment); OR
(c) Hydronic or steam heating systems; OR
(d) Hydronic cooling systems

Figure 1. "Simple" vs. "Complex" HVAC Systems

For More Information

Commissioning Process

- Energy Design Resources e-news #96 (“Commissioning for Compliance”):
energydesignresources.com/resources/e-news/e-news-96-commissioning.aspx
 - Includes tips and tricks and a handy graphic that shows when during project delivery the commissioning requirements should be implemented.

Roles and Responsibilities

- Building Commissioning Guide in Nonresidential Compliance Manual:
energy.ca.gov/2015publications/CEC-400-2015-033/chapters/chapter_12_building_commissioning_guide.pdf
 - Section 12.1 of this guide outlines roles and information on how to find a qualified Commissioning Authority
- California Commissioning Collaborative:
cacx.org/resources/provider_list.php
 - Provider List that may be valuable when searching for a Commissioning Authority
- Energy Standards Section 10-103(a)1:
energycodeace.com/site/custom/public/referenceace-2016/index.html#!Documents/10103permitcertificateinformationalandenforcementrequirementsfor.htm#sect10_103_a1
 - Specifies who can act as the Design Reviewer
- California Energy Commission’s Acceptance Test Technician Certification Provider webpage:
energy.ca.gov/title24/attcp/
 - For information on becoming a certified ATT

Functional Performance Testing Requirements

- Chapter 13 Acceptance Requirements in the Nonresidential Compliance Manual:
energy.ca.gov/2015publications/CEC-400-2015-033/chapters/chapter_13_acceptance_requirements.pdf
 - An overview of acceptance testing requirements, the process and the forms are further detailed in Chapter 13. Section 13.1 includes a list of certificate of acceptance forms by building component for new or modified tests.
- Nonresidential Reference Appendices NA7:
energycodeace.com/site/custom/public/reference-ace-2016/Documents/appendixna7installationandacceptancerequirementsfornonresidential.htm
 - This Section of the Nonresidential Appendices includes test procedures, roles and responsibilities and other details related to acceptance testing

Compliance Forms

- Energy Design Resources e-news #96 (“Commissioning for Compliance”):
energydesignresources.com/resources/e-news/e-news-96-commissioning.aspx
 - Includes more detail on each compliance form, including when it should be completed
- Building Commissioning Guide in Nonresidential Compliance Manual:
energy.ca.gov/2015publications/CEC-400-2015-033/chapters/chapter_12_building_commissioning_guide.pdf
 - Section 12.10 has detailed instructions on completing the compliance forms associated with commissioning
- NRCA forms:
energy.ca.gov/2015publications/CEC-400-2015-033/appendices/forms/NRCA/
 - The certificates of acceptance themselves are useful to understand required documentation
- NRCC Forms:
energy.ca.gov/2015publications/CEC-400-2015-033/appendices/forms/NRCC/
 - The certificates of compliance themselves are useful to understand required documentation

California Energy Commission Information & Services

- Energy Standards Hotline: 1-800-772-3300 (Free) or Title24@energy.ca.gov
- Online Resource Center:
energy.ca.gov/title24/orc/
 - The Energy Commission’s main web portal for Energy Standards, including information, documents, and historical information

Additional Resources

- EnergyCodeAce.com
An online “one-stop-shop” providing free resources and training to help appliance and building industry professionals decode and comply with Title 24, Part 6 and Title 20. The site is administered by California’s investor-owned utilities. Please register with the site and select an industry role for your profile in order to receive messages about all our free offerings!



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