

Design Review and Commissioning



What Is Included in this Fact Sheet?

The 2022 California Building Energy Efficiency Standards (Energy Code or Title 24, Part 6) specifies design review and Commissioning requirements for nonresidential buildings.

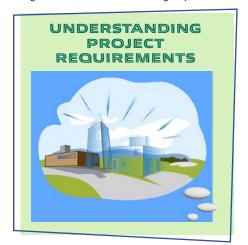








Figure 1. Commissioning Requirements For Nonresidential Buildings

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Table of Contents

Commissioning Requirements	. 2
Occupancies and Buildings Covered in this Fact Sheet	
Start Early!	
Key Terms	
Commissioning Process	
Commissioning Forms	. (
For More Information	1(

What Is Design Review and Commissioning and the Importance of Compliance?

Commissioning (Cx) is a quality assurance process to verify that a building and its systems are planned, designed, installed, operated and maintained as the owner intended and that the building staff are prepared to operate and maintain the building's systems and equipment. Design review is a secondary review of the construction documents (drawings and specifications) that seeks to improve compliance with existing Title 24, Part 6, regulations, encourage adoption of best practices in design, and encourage designs that are constructable and maintainable.

Full Commissioning, which includes all Commissioning tasks, design review and documentation, is required for newly constructed nonresidential buildings that have $\geq 10,000 \text{ ft}^2$ of conditioned space. For buildings with $< 10,000 \text{ ft}^2$ of conditioned space, only design review and acceptance and verification testing requirements are required. See <u>Table 1</u> and <u>Table 2</u> for a list of nonresidential building and occupancy types that have Commissioning requirements in the 2022 Energy Code. See <u>Table 3</u> for an overview of the Commissioning process.

If the newly constructed building is a mixed-use building with any "R" occupancies (hotel, motel and multifamily), only the conditioned nonresidential occupancies of the mixed-use building are required to meet the design review and Commissioning requirements. In an "R" occupancy, all areas of the building, including common use areas, are not subject to these requirements.

Commissioning is not required for the following:

- ★ Additions to existing buildings
- → Alterations of existing buildings
- → Multifamily, hotel or motel buildings (Occupancy R)
- → Licensed healthcare facilities (Occupancy I)

Commissioning Requirements

Commissioning requirements are included in §120.8 of the Energy Code and apply to newly constructed nonresidential buildings except healthcare facilities. Healthcare facilities must instead comply with the applicable requirements of Chapter 7 of the

California Administrative Code (Title 24, Part 1). Mixed use, such as hotel/motel and high-rise residential projects that have nonresidential occupancies, trigger Commissioning requirements. These requirements apply to systems serving the nonresidential occupancies of the building. Areas that are intended for use by

residents of the dwelling units (i.e. lobby, gym, laundry room and other common areas within the "R" occupancy) are not subject to meeting the Commissioning requirements. See Table 1 below for examples of building types subject to Commissioning and Table 2 for building types that are not.

Occupancies and Buildings Covered in this Fact Sheet									
Building Type	Code	Occupancy Group and Building Type California Building Code §§303-309, 311-312	Examples of Building Types Subject to Commissioning						
		Assembly: Buildings or spaces where groups of people gather for civic, social or	Occupancy Group A: Assembly						
	Α	religious functions, recreation, food or drink consumption, entertainment, awaiting transportation, or television and movie production, among other uses	Examples: Auditoriums, convention centers (assembly buildings), libraries, tenant lease spaces*, theaters						
		Business: Buildings or spaces for office, professional or service-type transactions,	Occupancy Group B: Business						
	В	including storage of records and accounts	Examples: Financial institutions, offices, restaurants, tenant lease spaces*						
			Healthcare facilities are exempt.						
	_	Education: Buildings or spaces used for more than 6 persons at any one time for	Occupancy Group E: Education						
	E	educational purposes through the 12th grade	Examples: Schools for any number of students at any grade level						
		Factory: Buildings or spaces used for assembling, disassembling, fabricating,	Occupancy Group F: Factory						
	F	finishing, manufacturing, packaging, repair or processing operations that are not classified as a Group H hazardous or Group S storage occupancy	Examples: Warehouses, tenant lease spaces*						
Nonresidential	Н	High Hazard: Buildings or spaces that involve the manufacturing, processing,	Occupancy Group H: High hazard						
Buildings		generation or storage of materials that constitute a substantial physical or health hazard	Examples: Factories or storage facilities for hazardous materials						
	I-2	Institutional: Hospitals and 24-hour medical care facilities	Occupancy Group I-2: Institutional						
			Healthcare facilities are exempt from Energy Code Commissioning but must mee the Commissioning requirements of the California Department of Health Care Access and Information (HCAI).						
	М	Mercantile: Buildings or spaces used to display and sell merchandise to the	Occupancy Group M: Mercantile						
		public, plus supporting areas for stocks of goods, wares or merchandise	Examples: Grocery stores, retail stores, tenant lease spaces*						
	•	Storage: Buildings or spaces used to store materials that are not classified as	Occupancy Group S: Storage						
	S	hazardous	Examples: Self storage facilities						
	U	Miscellaneous: Accessory buildings and structures and miscellaneous structures	Occupancy Group U: Miscellaneous						
		not classified in any specific occupancy	Examples: Nonresidential accessory buildings						

Table 1. Occupancies and Buildings Covered in this Fact Sheet - Examples of Building Types Subject to Commissioning



Building Types NOT Subject to Commissioning

Table 2 below lists types of residential buildings that are NOT subject to Commissioning requirements.

Occupancies and Buildings NOT Covered in this Fact Sheet								
Building Type	Code	Occupancy Group and Building Type California Building Code §310	Examples of Building Types <u>NOT</u> Subject to Commissioning					
Single-family Buildings	R-3	Residential Group R-3: Buildings with 2 or fewer dwelling units for permanent residents	Single-family: Occupancy Group R-3 buildings with 2 or fewer dwelling units Single-family buildings are exempt.					
	R-2	Residential Group R-2 : Buildings with 3 or more dwelling units for permanent residents	Multifamily: A building, other than hotel or motel, of Occupancy Group R-2, R-3 or R-4					
Multifamily Buildings	R-3 R-4	Residential Group R-3: Some multifamily congregate residences with primarily permanent residents Residential Group R-4: Supervised residential environments for more than 6	Multifamily buildings are exempt. This includes common use spaces intended for use by the residents of the dwelling units, such as lobby, gym, laundry room and other common areas within the R occupancy.					
		ambulatory clients and up to 16 total residents, excluding staff	Nonresidential occupancies in mixed-use buildings are required to meet Commissioning requirements when applicable.					
	R-1	Residential Group R-1: Buildings with sleeping units for primarily transient	Residential Group R-1: Hotel and motel					
Hotel and Motel Buildings		occupants	Hotel and motel buildings are exempt. This includes common use spaces intended for use by the occupants of the guest rooms, such as lobby, gym, laundry room and other common areas within the R occupancy.					
			Nonresidential occupancies in mixed-use buildings are required to meet Commissioning requirements when applicable.					

 Table 2. Occupancies and Buildings NOT Covered in this Fact Sheet - Examples of Building Types NOT Subject to Commissioning



Start Early!



If your project requires Commissioning or design review, it is important to start the Commissioning process promptly to meet the 2022 Energy Code requirements. These include holding a design review kickoff meeting, and preparing the owner's project requirements (OPR) and basis of design (BOD) to complete the Commissioning design review. See Table 3 for a list of requirements.

Energy Code Ace[™] has developed the Virtual Compliance Assistant (VCA) to support you in understanding, completing and documenting the Commissioning process, as well as to help you in completing some of the required forms and verifying compliance. The VCA facilitates use of the Certificates of Compliance required for Commissioning and design review (NRCC-CXR-E used for Nonresidential and High-rise Multifamily buildings and LMCC-CXR-E used for Low-rise Multifamily buildings) as a design tool supporting the many layers associated with Commissioning and design review.

The VCA is available at no cost in the Energy Code Ace website at <u>Virtual Compliance Assistant</u>.

Key Terms

Basis of Design (BOD): A written explanation of how the design of the building systems meets the OPR that must be completed at the design phase of the building project and updated as necessary during the design and construction phases and must cover the following systems and components:

- → HVAC systems and controls
- → Indoor lighting system and controls
- → Water-heating systems and controls
- → Any building envelope component considered in the OPR
- → Other: Any other building equipment or systems listed in the OPR such as photovoltaics (PV) and battery storage

Commissioning Agent: Either a third-party Commissioning provider or an experienced member of the design team or owner's staff who plans, schedules and coordinates the Commissioning team to implement the Commissioning process

Commissioning Plan: Prior to permit issuance, a Commissioning plan must be completed to document how the project will be commissioned during construction. It must include Commissioning goals, systems to be commissioned, and the plans to test those systems and components, including any required acceptance testing or HERS verification required by the Energy Code.

Design Reviewer: The person who reviews the design documents to ensure the design will likely meet the OPR and Energy Code requirements

Functional Performance Test (FPT): Test to ensure that all components, equipment, systems and system-to-system interfaces were installed as specified, and operate according to the OPR, BOD, and plans and specifications

Operations and Maintenance (0&M) Manuals: Documents that provide information necessary for operating and maintaining installed equipment and systems

Owner's Project Requirements (OPR): A document that establishes the owner's goals, requirements and expectations for everything related to energy consumption and operation and that documents the energy-related expectations and requirements of the building before the design phase of the project, including:

- ★ Energy efficiency goals
- → Ventilation requirements
- Project program, including facility functions and hours of operation and need for after-hours operation
- → Equipment and systems expectations
- → Building envelope performance expectations

VIRTUAL COMPLIANCE ASSISTANT WELCOME SCREEN

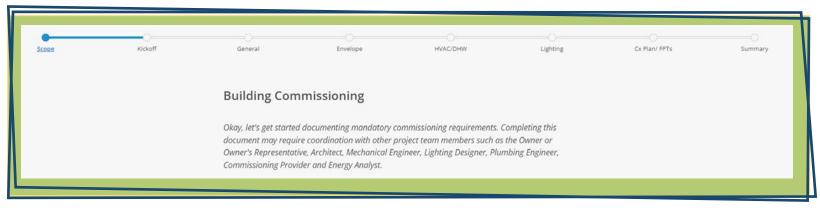
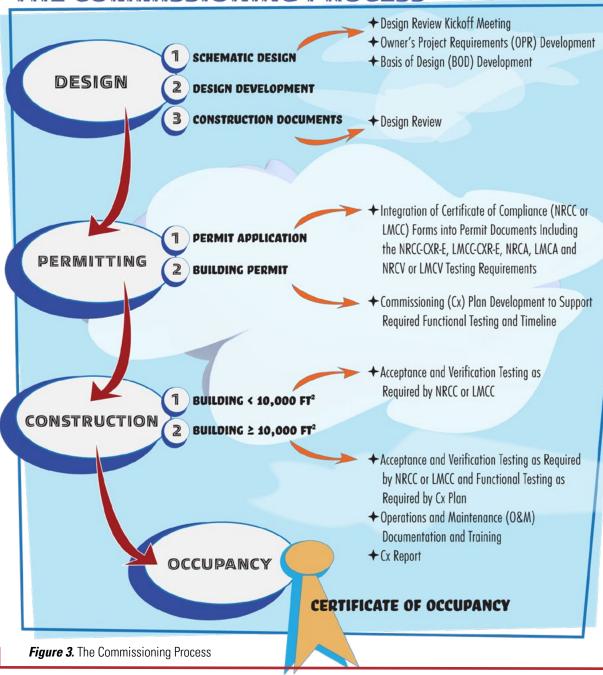


Figure 2. Virtual Compliance Assistant Welcome Screen



THE COMMISSIONING PROCESS



Commissioning Process

The most appropriate person to fill each of the roles in <u>Table 4</u> depends on the experience and expertise of the project team. The Energy Code does not specify who must function as the commissioning agent. However, there are restrictions in <u>§120.8(d)1</u> on who may act as the design reviewer. See the Commissioning Design Review section and <u>Table 5</u> for more information.

🗧 Title 24, Part 11 (CALGreen)

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



Commissioning Process Overview

Table 3 below supports the various tasks required for either Design Review or Commissioning. The table lists requirements based on project conditioned floor area, and it shows how the Virtual

Compliance Assistant can support the process. Table 3 also explains which team members are responsible for each task and when the task should be accomplished in the project timeline.

Commissioning Process Overview								
Phase	Tasks and Documents	When Required by Energy Code: Conditioned Space		What the Virtual Compliance Assistant (VCA)	Roles and Responsibilities	When		
		< 10,000 ft ²	≥ 10,000 ft ²	Provides				
	Design Review Kickoff Meeting §120.8(d)1 Compliance Manual Commissioning Guide Ch. 13.4.2A	Required	Required	Documentation of the meeting date and participants via the NRCC-CXR-E or LMCC-CXR-E Certificate of Compliance form, reminders can be utilized to support design and construction schedule.	Roles include building owner, design team, engineers and energy analysts who participate in the design review kickoff meeting in which they: Discuss the project scope, schedule and how the design reviewer will coordinate with the project team. Discuss who the design reviewer will be as specified by the Energy Code.	Hold meeting whe project team is selected.		
	Owner's Project Requirements (OPR) §120.8(b) Compliance Manual Commissioning Guide Ch. 13.2	Not Required	Required	Includes template, if desired, for OPR.	Roles include building owner or owner's representative who develops the OPR.	Develop in the pre-design phase.		
Dooine	Basis of Design (BOD) §120.8(c) Compliance Manual Commissioning Guide Ch.	Not Required	Required	Includes template, if desired, for BOD.	Roles to develop the BOD include:	Draft during		
Design					Mechanical Designer/Engineer: HVAC systems and controls and water heating systems and controls.	schematic design and update as		
	13.3				Electrical Designer/Engineer: Indoor lighting system and controls	necessary.		
					Designer/Architect: Any building envelope component that should be considered			
					Other: Any other building equipment or systems listed in the OPR such as photovoltaics (PV) and battery storage.			
	Design Review §120.8(d) Compliance Manual	§120.8(d) Compliance Manual Commissioning Guide Ch.		Includes template, if desired, for design review.	Roles include the design reviewer who meets the minimum requirements based on project size and the mechanical equipment type.	Complete and include form in the construction documents for the plan check.		
	Commissioning Guide Ch. 13.4				The completed and signed NRCC-CXR-E Certificate of Compliance indicates that the construction documents design review has been completed.			



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Commissioning Process Overview							
Phase	Tasks and Documents	When Required by Energy Code: Conditioned Space		What the Virtual Compliance Assistant (VCA)	Roles and Responsibilities	When	
		< 10,000 ft ²	≥ 10,000 ft ²	Provides			
	Commissioning Measures in Construction Documents §120.8(e) Compliance Manual Commissioning Guide Ch. 13.5	Required	Required	All applicable NRCC or LMCC indicates what testing is required during construction (e.g., envelope, lighting and Performance reports).	The design team member identified as responsible during the design review kickoff meeting (such as the energy consultant or applicable design professional) provides these measures.	Include in the construction documents submitted for plan check.	
Permitting	Commissioning Plan §120.8(f) Compliance Manual Commissioning Guide Ch. 13.6	Not Required	Required	Includes template, if desired, for the Commissioning plan.	Commissioning agent completes and distributes the Commissioning plan, which includes an overall plan for testing systems and components supporting: + An explanation of the original design intent + Equipment and systems to be tested, including the extent of tests + Functions to be tested + Conditions under which the test must be performed + Measurable criteria for acceptable performance + Commissioning team information + Commissioning process activities, schedules and responsibilities	Produce before construction begins and share with construction team. Include a draft of the Commissioning plan in construction documents submitted for plan check.	
✓ Milestone: Permit Application Submitted; Permit Issued							

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Commissioning Process Overview										
Phase	Tasks and Documents	When Required by Energy Code: Conditioned Space		What the Virtual Compliance Assistant (VCA)	Roles and Responsibilities	When				
		< 10,000 ft ²	\geq 10,000 ft ²	Provides						
	Functional Performance Testing and Documentation	Not Required	Required	Includes template, if desired, for functional testing.	The contractor (or responsible party) coordinates testing with the Commissioning agent who is overseeing and	Perform testing throughout				
	<u>§120.8(g)</u>				documenting testing results.	construction.				
	Compliance Manual Commissioning Guide Ch. 13.7									
	Operations and Maintenance (0&M) Systems Manual	Not Required	Required	Records that documentation has been provided.	The operation of the building and its systems must be included in the systems manual, and the manual must be delivered to the building owner or representative	Develop manual before occupancy.				
	§120.8(h)1					before occupancy.				
	Compliance Manual				and facilities operator.					
	Commissioning Guide Ch. 13.8									
Construction	Systems Operation Training	Not Required	Required	equired Records that training has been provided.	The training of the maintenance staff for each equipment type or system must be documented in the	Conduct training before occupancy.				
	<u>§120.8(h)2</u>			been provided.	Commissioning report.	before occupancy.				
	Compliance Manual Commissioning Guide Ch. 13.9									
	Commissioning Report	Not Required	Required	Records that documentation	The Commissioning agent completes and provides the report to the building owner or representative.	Provide report before occupancy				
	<u>§120.8(i)</u>			has been provided.	The report confirms that commissioned systems meet	permit is granted.				
	Compliance Manual Commissioning Guide Ch. 13.10				the conditions of the OPR, BOD and contracts.					
	Seminosioning duide on. 10.10				It documents Commissioning Process activities undertaken through the design and construction phases of the project and may include recommendations for post-construction phases of the building project.					
	✓ Milestone: Certificate of Occupancy Issued									

✓ Milestone: Certificate of Occupancy Issued

BOD = Basis of Design; **HVAC** = Heating, Ventilation and Air Conditioning; **O&M** = Operations and Maintenance; **OPR** = Owner's Project Requirements; **VCA** = Virtual Compliance Assistant.

Table 3. Commissioning Process Overview



Commissioning Design Reviewer Qualifications

The Energy Code in §120.8(d) specifies the qualifications required for the Commissioning design reviewer by building size and system complexity. See Table 4. (For a list of the required commissioning forms for nonresidential, mixed-use and low-rise multifamily buildings, see Table 5.)

Functional Performance Testing vs. Acceptance Testing

Per §120.8(g), functional testing performed to satisfy Commissioning requirements in nonresidential buildings (other than healthcare facilities) must be performed in accordance with acceptance testing procedures outlined in other sections of the Energy Code 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 as supported in the Commissioning plan and may be more comprehensive than the project's required acceptance tests. Not being included in the OPR or BOD does not exempt a system from acceptance test requirements outlined in other sections of the Energy Code.

For more information on acceptance test requirements, see the Nonresidential and Multifamily Buildings Acceptance
Testing Fact Sheet.

Commissioning Forms

For a list of the required Commissioning forms for nonresidential, mixed-use low-rise multifamily buildings, see Table 5.

Commissioning Design Reviewer Qualifications Commission (Cx) and Design Review §120.8 (NRCC-CXR-E) / HC: Use OSHPD Cx Requirements $> 50,000 \text{ ft}^2 \text{ or } \ge 10,000 \text{ ft}^2$ **Building Size** < 10,000 ft² 10,000 - 50,000 ft² and Complex Systems* + Complex System(s) serving ≥ 10,000 ft² → Complex System(s) serving < 10,000 ft² System **→** Simple System(s) serving ≤ 50,000 ft² → Simple System(s) serving > 50,000 ft² A licensed professional A qualified engineer or An independent review by a third-party architect in-house to engineer, architect or contractor engineer, architect or **Allowed Design** contractor, including the the design firm but not engineer or architect of record associated with the project, Reviewer a third-party engineer,

architect or contractor

*Complex and Simple Systems:

Complex mechanical systems include any of the following:

- → Fan systems serving multiple thermostatically controlled zones
- → Built-up air handler systems (non-unitary or non-packaged HVAC equipment)
- → Hydronic or steam heating systems
- **→** Hydronic cooling systems

Simple mechanical systems have any of the following:

→ Unitary or packaged equipment listed in Tables 110.2-A, 110.2-B, 110.2-C and or 110.2-E that each serves one zone Two-pipe, heating-only systems that serve one or more zones

Table 4. Commissioning Design Reviewer Qualifications

Commissioning Forms Required by Building Type									
Building Type	Certificates Certificates of Compliance of Acceptance		Certificates of Verification	Cx Specific when ≥ 10,000 ft² CFA of NR Occupancy					
Nonresidential and High-rise Multifamily Buildings	NRCC-CXR-E	NRCA-###-##-A or F	NRCV-MCH-##-H	OPR, BOD, Cx Plan, O&M Manual, Cx Report					
Mixed-use Low-rise Multifamily Buildings	LMCC-CXR-E	NRCA-###-##-A or F	LMCV-MCH-##-H	OPR, BOD, Cx Plan, O&M Manual, Cx Report					

BOD = Basis of Design; **CFA** = Conditioned Floor Area; **Cx** = Commissioning, **O&M** = Operations and Maintenance; **OPR** = Owner's Project Requirements.

Table 5. Commissioning Forms Required by Building Type



For More Information

CALIFORNIA ENERGY COMMISSION

www.energy.ca.gov

Learn more about the California Energy Commission (CEC) and its programs on its website.

2022 Building Energy Efficiency Standards

Explore the main CEC web portal for the 2022 Energy Code, including information, documents and historical information.

2022 Building Energy Efficiency Standards Summary

Download this visual summary of the Energy Code's purpose, current changes and impact.

Energy Code Hotline

Call: 1-800-772-3300 (Free) Email: <u>Title24@energy.ca.gov</u>

Online Resource Center

Use these online resources developed for building and enforcement communities to learn more about the Energy Code

Nonresidential & Multifamily Compliance Manual Chapter 13 - Commissioning Guide



www.energycodeace.com

Stop by this online "one-stop-shop" for no-cost tools, training and resources designed to help you comply with California's Title 24. Part 6 and Title 20.



Energy Code Ace Tools

Explore this suite of interactive tools to understand the compliance process, required forms, installation techniques and energy efficiency regulations in California.

Reference Ace

Navigate the Title 24, Part 6 Energy Code using an index, keyword search and hyperlinked text.

Q&Ace

Search our online knowledge base or submit your question to Energy Code Ace experts.

Virtual Compliance Assistant

Get interactive help to fill in NRCC or LMCC Forms.



Energy Code Ace Training

On-demand, live in-person and online training alternatives are tailored to a variety of industry professionals and address key measures.

Of Special Interest:

- ♦ 2022 Title 24, Part 6 Essentials Nonresidential Standards: What's New
- ♦ 2022 Title 24, Part 6 Essentials Nonresidential Standards: What Is Acceptance Testing?



Energy Code Ace Resources

Downloadable materials provide practical and concise guidance on how and when to comply with California's building and appliance energy efficiency standards.

Of Special Interest:

Fact Sheets

♦ Nonresidential and Multifamily Buildings Acceptance Testing Fact Sheet

Create an account on the Energy Code Ace site and select an industry role for your profile in order to receive messages about all our offerings!



















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