

## Table of Contents

Table of Contents.....	1
12. Building Commissioning Guide .....	1
12.1 Introduction .....	1
12.1.1 Selecting Trained Personnel for Commissioning.....	2
12.2 Introduction .....	3
12.2.1 Intent .....	3
12.2.2 Compliance Method.....	3
12.3 Basis of Design (BOD).....	4
12.3.1 Intent .....	5
12.3.2 Compliance Method.....	5
12.4 Design phase design review .....	6
12.4.1 Intent .....	7
12.4.2 Compliance Method.....	7
12.5 Commissioning Measures .....	8
12.5.1 Intent .....	9
12.5.2 Existing Law or Regulation .....	9
12.5.3 Compliance Method.....	9
12.6 Commissioning plan.....	10
12.6.1 Intent .....	10
12.6.2 Existing Law or Regulation .....	10
12.6.3 Compliance Method.....	10
12.7 Functional performance testing.....	12
12.7.1 Intent .....	12
12.7.2 Existing Law or Regulation .....	12
12.7.3 Compliance Method.....	12
12.8 Documentation and training .....	13
12.8.1 Intent .....	14
12.8.2 Compliance Method.....	14
12.8.3 Intent .....	16
12.8.4 Compliance Method.....	17
12.9 Commissioning report .....	18
12.9.1 Intent .....	18
12.9.2 Compliance Method.....	18
12-10 Commissioning Compliance Forms .....	19

(This page left intentionally blank)

## 12. Building Commissioning Guide

**Commissioning.** For all new nonresidential buildings, commissioning shall be included in the design and construction process of the building project to verify that the building energy systems and components meet the owner's or owner representative's project requirements. For buildings less than 10,000 square feet, only the design review requirements (Design Phase, Design Review and Commissioning Measures shown in the Construction Documents) shall be completed.

**Summary of Commissioning Requirements.** The following items shall be completed:

- 12-1 Introduction
- 12-2 Owner's or owner representative's project requirements;
- 12-3 Basis of design;
- 12-4 Design phase design review;
- 12-5 Commissioning measures shown in the construction documents;
- 12-6 Commissioning plan;
- 12-7 Functional performance testing;
- 12-8 Documentation and training; and
- 12-9 Commissioning report.
- 12-10 Commissioning Compliance Forms

---

### 12.1 Introduction

The purpose of this code is to improve public health, safety and general welfare by enhancing the design and construction of buildings through the use of concepts that reduce negative and increase positive environmental impacts. Commissioning is a vital element in this effort:

#### Acronyms

- BOD            Basis of Design
- Cx             Commissioning
- FPT            Functional Performance Test
- HVAC          Heating, Ventilating, and Air Conditioning
- O&M          Operations and Maintenance
- OPR            Owner's Project Requirements

#### Glossary

- **Acceptance Criteria** - The conditions that must be met for systems or equipment to meet defined expected outcomes.
- **Commissioning (Cx)** - Building commissioning as required in this code involves a quality assurance process that begins during design and continues to occupancy. Commissioning verifies that the new building and its systems are planned,

designed, installed, tested, operated and maintained as the owner intended, and that building staff are prepared to operate and maintain its systems and equipment.

- **Owner** - The individual or entity holding title to the property on which the building is constructed.
- **Commissioning Coordinator**– 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.
- **Commissioning Team** - The key members of each party involved with the project designated to provide insight and carry out tasks necessary for a successful commissioning project. Team members may include the commissioning coordinator, owner or owner's representative, building staff, design professionals, contractors or manufacturer's representatives, and testing specialists.
- **Independent Third-Party Commissioning Professional** - A commissioning consultant contracted directly by the owner who is not responsible or affiliated with any other member of the design and construction team.
- **Operation and Maintenance (O&M) Manuals** - Documents that provide information necessary for operating and maintaining installed equipment and systems.
- **Owner Representative** – An individual or entity assigned by the owner to act and sign on the owner's behalf.
- **Sequence of Operation** – A written description of the intended performance and operation of each control element and feature of the equipment and systems.

#### **Scope of the Commissioning Requirements**

- All building systems and components covered by Sections 110.0, 120.0, 130.0, and 140.0 shall be included in the scope of the commissioning requirements, excluding covered processes.

### **12.1.1 Selecting Trained Personnel for Commissioning**

It is essential that there is a single person designated to lead and manage the commissioning activities. In practice, this individual has been referenced by various identifiers such as commissioning authority, agent, provider, coordinator, lead, etc. In this manual the term commissioning coordinator is used.

The commissioning coordinator shall manage and facilitate the commissioning process, including managing the development and implementation of the commissioning tasks and associated documentation. Trained personnel shall execute the tasks and may include appropriate members of the owner's staff, contractors, and design team, as well as independent commissioning professionals.

The designated commissioning coordinator may be an independent third-party commissioning professional, a project design team member (e.g. engineer or architect), an owner's engineer

or facility staff, contractor or specialty sub-contractor. Methods of evaluating the designated commissioning coordinator and trained personnel include review of the following:

- Technical knowledge
- Relevant experience
- Potential conflict of interest
- Professional certifications and training
- Communication and organizational skills
- Reference and sample work products

---

## 12.2 Introduction

**Section 120.8(b). Owner’s or Owner representative’s Project Requirements (OPR).** The energy-related expectations and requirements of the building shall be documented before the design phase of the project begins. This documentation shall include the following:

1. Energy efficiency goals;
2. Ventilation requirements;
3. Project program, including facility functions and hours of operation, and need for after hours operation; and
4. Equipment and systems expectations.

### 12.2.1 Intent

The Owner’s Project Requirements (OPR) documents the functional requirements of a project and expectations of the building use and operation as it relates to systems being commissioned. The document describes the physical and functional building characteristics desired by the owner and establishes performance and acceptance criteria. The OPR is most effective when developed during pre-design and used to develop the Basis of Design (BOD) during the design process. The level of detail and complexity of the OPR will vary according to building use, type and systems.

### 12.2.2 Compliance Method

Compliance is demonstrated by the owner or owner’s representative developing and/or approving the Owner’s Project Requirements (OPR) document and can be defined as follows:

1. *Energy Efficiency Goals* – Establish goals and targets affecting energy efficiency which may include:
  - a. Overall energy efficiency (exceeding Title 24 by %)
  - b. Lighting system efficiency (exceeding Title 24 by %)
  - c. HVAC equipment efficiency & characteristics
  - d. Any other measures affecting energy efficiency desired by owner
    1. Building orientation and siting
    2. Daylighting
    3. Facade, envelope and fenestration
    4. Roof

5. Natural ventilation
  6. Onsite renewable power generation and net-zero energy use
  7. Landscaping and shading
2. *Ventilation Requirements* - For each program space describe indoor ventilation requirements including intended use and anticipated schedule
  3. *Project Program, including facility functions and hours of operation, and need for after hours operation* – Describe primary purpose, program and use of proposed project
    - a. Building size, number of stories, construction type, occupancy type and number
    - b. Building program areas including intended use and anticipated occupancy schedules
    - c. Future expandability and flexibility of spaces
    - d. Quality and/or durability of materials and building lifespan desired
    - e. Budget or operational constraints
    - f. Applicable codes
  4. *Equipment and Systems Expectations* – Describe the following for each system commissioned:
    - a. Level of quality, reliability, equipment type, automation, flexibility, maintenance and complexity desired
    - b. Specific efficiency targets, desired technologies, or preferred manufacturers for building systems
    - c. Degree of system integration, automation, and functionality for controls; i.e. load shedding, demand response, energy management
  5. *Enforcement*

At their discretion, the building official confirms demonstrated compliance at *Plan Review* by:

    - a) Receipt of a copy of the OPR document (optional), and
    - b) Receipt of a form signed by the owner or owner representative attesting that the OPR has been completed and approved by the owner.

---

## 12.3 Basis of Design (BOD)

**Section 120.8(c). Basis of Design (BOD).** A written explanation of how the design of the building systems meets the OPR shall be completed at the design phase of the building project, and updated as necessary during the design and construction phases. The Basis of Design document shall cover the following systems:

1. Heating, ventilation, air conditioning (HVAC) systems and controls
2. Indoor lighting system and controls
3. Water heating systems and controls
4. Covered processes

### 12.3.1 Intent

The Basis of Design (BOD) describes the building systems to be commissioned and outlines design assumptions not indicated in the design documents. The design team develops the BOD to describe how the building systems design meets the Owner's Project Requirements (OPR), and why the systems were selected. The BOD is most effective when developed early in the project design and updated as necessary throughout the design process.

### 12.3.2 Compliance Method

Compliance requires the completion of the BOD document, which should include the following:

1. Heating, Ventilation, Air Conditioning (HVAC) Systems and Controls
  - a. Provide narrative description of system – system type, location, control type, efficiency features, outdoor air ventilation strategy, indoor air quality features, environmental benefits, other special features.
  - b. Describe reasons for system selection – why chosen system is better than alternatives, considering issues such as comfort, performance, efficiency, reliability, flexibility, simplicity, cost, owner preference, site constraints, climate, maintenance, acoustics
  - c. Provide design criteria including the following:
    - Load calculation method/software
    - Summer outdoor design conditions, °F drybulb and °F wetbulb
    - Winter outdoor design conditions, °F drybulb and °F wetbulb
    - Indoor design conditions, °F drybulb cooling, %RH cooling; °F drybulb heating, %RH heating
    - Applicable codes, guidelines, regulations and other references used
    - Load calculation assumptions
  - d. Sequence of Operations – operating schedules, setpoints, may refer to plans or specifications
  - e. Describe how system meets the OPR
2. Indoor Lighting System and Controls
  - a. Provide narrative description of system – type of fixtures, lamps, ballasts, controls
  - b. Describe reason for system selection – why chosen system better than alternatives, considering issues such as visual comfort, performance, efficiency, reliability, cost, flexibility, owner preference, color rendering, integration with daylighting, ease of control
  - c. Provide design criteria for each type of space including the following:
    - Applicable codes, guidelines, regulations and other references used
    - Illumination design targets (footcandles) and lighting calculation assumptions
  - d. Provide lighting power design targets for each type of space
    - Title 24 lighting power allowance and lighting power design target (watts/ft<sup>2</sup>)

- e. Describe how system meets the OPR
3. Water Heating Systems and Controls
- a. Provide narrative description of system – system type, control type, location, efficiency features, environmental benefits, other special features
  - b. Describe reason for system selection – why chosen system is better than alternatives, considering issues such as performance, efficiency, reliability, space constraints, cost, utility company incentives, owner preference, ease of maintenance
  - c. Water heating load calculations
  - d. Describe how system meets the OPR
4. Covered Processes
- a. Provide narrative description of system – type, performance, control type, energy savings, payback period
  - b. Describe reason for system selection – why chosen system is better than alternatives, considering issues such as performance, efficiency, reliability, flexibility, simplicity, expandability, cost, payback period, utility company incentives, owner preference
  - c. Sequence of Operation – operating schedules, setpoints, storage capacity
  - d. Describe how system meets the OPR

**Enforcement**

At their discretion, the building official confirms demonstrated compliance at *Plan Review* by:

- a. Receipt of a copy of the BOD document (optional), or
- b. Receipt of a form signed by the owner, owner's representative, architect, engineer or designer of record, attesting that the BOD has been completed and meets the requirements of the OPR.

---

## 12.4 Design phase design review

### Section 120.8(d). Design phase design review.

1. **Design Reviewer Requirements.** For buildings less than 10,000 square feet, design phase design review may be completed by the design engineer. Buildings between 10,000 and 50,000 square feet require completion of the Design Review Checklist by either an engineer in-house to the design firm but not associated with the building project, or a third party design engineer. For buildings larger than 50,000 square feet or for buildings with complex mechanical systems, an independent review of these documents by a third party design engineer is required.
2. **Design Review.** During the schematic design phase of the building project, the owner or owner's representative, design team and design reviewer must meet to discuss the project scope, schedule and how the design reviewer will coordinate with the project team. The

building owner or owner's representative shall include the Design Review Checklist compliance form in the Certificate of Compliance documentation (see Section 10-103).

- 3. Construction Documents Design Review:** The construction documents design review compliance forms list the items that shall be checked by the design reviewer during the construction document review. The completed forms shall be returned to the owner and design team for review and sign-off. The building owner or owner's representative shall include the construction documents design review compliance forms in the Certificate of Compliance Documentation (see Section 10-103).

#### **12.4.1 Intent**

The intent of design phase design review is to improve compliance with existing Title 24 Part 6 code requirements, encourage adoption of best practices in design, and lead to designs that are constructible and maintainable.

#### **12.4.2 Compliance Method**

Compliance requires completion of the Design Review Kickoff and Construction Document checklists by the design reviewer. Requirements for the design reviewer are spelled out in Section 120.8(d)1. The following steps are required to complete this requirement:

1. Design Review Kickoff - Initial Schematic Review
  - a. An in-person meeting is held between the project owner (or owner's representative), design team representatives (including mechanical and electrical design engineers, project architect), commissioning coordinator and design reviewer.
  - b. Meeting topics to be discussed include the following:
    - i. Discuss Project Coordination, including design reviewer involvement;
    - ii. Identify Project Scheduling, including design review;
    - iii. Review Project scope;
    - iv. Review Owner's Project Requirements and Basis of Design;
    - v. Discuss Design Elements and Assumptions;
    - vi. Discuss HVAC System Selection;
    - vii. Identify Construction Documents Design Review checklists to be completed;
    - viii. Discuss Energy Efficiency Measures; and
    - ix. Complete and Sign Certificate of Compliance – Cx Design Review Kickoff form NRCC-CXR-01-E.
2. Construction Document Review
  - a. The Design team provides the design reviewer with a set of drawing plans and specifications late in design as agreed upon in Design Review Kickoff meeting, typically around 90% CD completion
  - b. The Design reviewer provides a review of the construction documents:
    - i. Prescriptive Path Compliance. Projects following the Prescriptive Path will use compliance forms provided in the Design Review Kickoff meeting

(Certificate of Compliance – Cx Construction Documents-General, -Simple HVAC Systems, and –Complex Mechanical Systems forms NRCC-CXR-02-E through NRCC-CXR-04-E )

- ii. Performance Path Compliance. Projects following the Performance Path for compliance will use compliance forms provided in the Design Review Kickoff meeting (Certificate of Compliance – Cx Construction Documents-General, -Simple HVAC Systems, and –Complex Mechanical Systems forms NRCC-CXR-02-E through NRCC-CXR-04-E)
- c. Completed compliance forms are submitted to the design team and project owner for consideration.
- d. The Designer provides a response on the Construction Document compliance forms. The design reviewer is not required to provide a second review of the Construction Documents for compliance purposes.
- e. Certification of Completion - The design reviewer, design engineer, and owner/owner's representative sign the Certificate of Compliance – Cx Design Review Signature Page form NRCC-CXR-05-E indicating that the construction documents design review has been completed.

Qualifications for the design reviewer are based on the project size and complexity of mechanical systems. The design reviewer must be a licensed professional engineer that meets the following:

1. Buildings <10,000 square feet: engineer-of-record (self-review) or contractor if engineer-of-record not required
2. Buildings >10,000 square feet AND <50,000 square feet: qualified, in-house engineer with no other project involvement OR third party engineer
3. Buildings > 50,000 square feet OR buildings <50,000 square feet with complex mechanical systems: third party design engineer.

The commissioning coordinator who meets the above requirements may also complete the construction documents design review.

### ***Enforcement***

Compliance is demonstrated by completion of the compliance forms NRCC-CXR-01-E through NRCC-CXR-04-E, as applicable, and signature form NRCC-CXR-05-E. See section 12-10 Commissioning Compliance Forms for additional information on completing these forms.

---

## **12.5 Commissioning Measures**

**Section 120.8(e): Commissioning measures shown in the construction documents.** Include commissioning measures or requirements in the construction documents (plans and specifications). Commissioning measures or requirements should be clear, detailed and complete to clarify the commissioning process. These requirements should include the list of systems and assemblies commissioned, testing scope, roles and responsibilities of contractors, requirements for meetings, management of issues, the commissioning schedule, operations and maintenance manual development and training, and checklist and test form development, execution and documentation. Include, for information only, roles of non-contractor parties.

**12.5.1 Intent**

Include commissioning measures or requirements in the construction documents (plans and specifications). Commissioning measures or requirements should be clear, detailed and complete to clarify the commissioning process.

**12.5.2 Existing Law or Regulation**

Title 24 Part 6 requires that specific functional test forms (Certificate of Acceptance) be included in the construction documents. These test forms are a subset of the broader commissioning requirements described herein.

**12.5.3 Compliance Method**

Compliance is achieved by including commissioning requirements in the project specifications. The commissioning specifications should include the following:

1. Primary (and optionally all) commissioning requirements are included in the general specification division (typically Division 1) and clear cross references of all commissioning requirements to and from the general division are included to ensure all subcontractors are held to them.
2. A list of the systems and assemblies covered by the commissioning requirements.
3. Roles and responsibilities of all parties including:
  - I. General contractor and subcontractors, vendors, construction manager
  - II. Commissioning coordinator
  - III. Owner, facility staff
  - IV. Architect and design engineers
  - V. Including the non-contractor parties in the construction specifications is for information only to provide the contractor with context for their work
  - VI. Include who writes checklists and tests, who reviews and approves test forms, who directs tests, who executes tests, who documents test results and who approves completed tests. These roles may vary by system or assembly.
4. Meeting requirements.
5. Commissioning schedule management procedures.
6. Issue and non-compliance management procedures.
7. Requirements for execution and documentation of installation, checkout and start up, including controls point-to-point checks and calibrations.
8. Specific testing requirements by system, including:
  - I. Monitoring and trending
  - II. Opposite season or deferred testing requirements, functions and modes to be tested
  - III. Conditions of test
  - IV. Acceptance criteria, and any allowed sampling
  - V. Include details of the format and rigor of the test forms required to document test execution
  - VI. Including example forms is recommended
9. Submittal review requirements and approval process.
10. Content, authority and approval process of the commissioning plan.
11. Commissioning documentation and reporting requirements.
12. Facility staff training requirements and verification procedures.
13. O&M manual review and approval procedures.
14. System's manual development and approval requirements and procedures.
15. Definitions section.

### **Enforcement**

At their discretion, the building official confirms demonstrated compliance at *Plan Review* by:

- a) Receipt of a copy of the commissioning specifications (optional), or
- b) Receipt of a form signed by the owner or owner representative or designer of record attesting that the owner-approved commissioning specifications are included in the construction documents.

---

## **12.6 Commissioning plan**

**Section 120.8(f). Commissioning plan.** Prior to permit issuance a commissioning plan shall be completed to document how the project will be commissioned and shall be started during the design phase of the building project. The Commissioning Plan shall include the following:

1. General project information
2. Commissioning goals
3. Systems to be commissioned.
4. Plans to test systems and components, which shall include:
  - a. An explanation of the original design intent
  - b. Equipment and systems to be tested, including the extent of tests
  - c. Functions to be tested
  - d. Conditions under which the test shall be performed
  - e. Measureable criteria for acceptable performance
  - f. Commissioning team information including roles
  - g. Commissioning process activities, schedules and responsibilities. Plans for the completion of commissioning requirements listed in Sections 120.8(g) through 120.8(i) shall be included.

### **12.6.1 Intent**

The Commissioning Plan (Cx Plan) establishes the commissioning process guidelines for the project and commissioning team's level of effort. It identifies the required Cx activities to ensure that the Owner's Project Requirements (OPR) and the Basis of Design (BOD) are met. The Cx Plan also includes a commissioning schedule from design to occupancy.

### **12.6.2 Existing Law or Regulation**

Review local county, city or jurisdiction ordinances for any applicable commissioning planning requirements.

### **12.6.3 Compliance Method**

Compliance is demonstrated by preparation of a project specific Cx Plan that includes the elements listed in the code section above. The following gives guidance for developing the components of the Commissioning Plan:

1. *General project information* - Provide project identifying information including but not limited to the following:
  - Project Name, Owner, Location,
  - Building type, Building area,
  - Project Schedule
  - Contact information of individual/company providing the commissioning services
  
2. *Commissioning Goals* – Document the commissioning goals, including, but not limited to:
  - Meeting code requirements for commissioning
  - Meeting OPR and BOD requirements
  - Carrying out requirements for commissioning activities as specified in plans and specifications
  
3. *Systems to be commissioned* – See BOD
  - a. *An explanation of the original design intent* - Document the performance objectives and design intent for each system listed to be commissioned in a written narrative
    - Refer to the OPR and BOD documents
  - b. *Equipment and systems to be tested, including the extent of tests*
    - Provide a list of equipment and systems to be tested
    - Describe the range and extent of tests to be performed for each system component, and interface between systems
  - c. *Functions to be tested* - Provide example functional test procedures to identify the level of testing detail required
  - d. *Conditions under which the test shall be performed* - Identify the conditions under which the major operational system functions are to be tested, including:
    - Normal operations and part-load operations
    - Seasonal testing requirements
    - Restart of equipment and systems after power loss
    - System alarm confirmations
  - e. *Measurable criteria for acceptable performance* - Include measurable criteria for acceptable performance of each system to be tested
  
4. *Commissioning Team Information* - Provide a contact list for all Commissioning team members, including but not limited to:
  - a. Owner, owner's representative
  - b. Architect, Engineers
  - c. Designated commissioning representative
  - d. General contractor, sub-contractors, and construction manager
  
5. *Commissioning process activities, schedules and responsibilities*
  - a. Establish prescribed commissioning process steps and activities to be accomplished by the Cx team throughout the design to occupancy
  - b. For each phase of the work, define the roles and responsibilities for each member of the Cx team
  - c. List the required Cx deliverables, reports, forms and verifications expected at each stage of the commissioning effort
  - d. Include the confirmation process for the O&M manual, systems manual and the facility operator and maintenance staff training

### **Enforcement**

At their discretion, the building official confirms demonstrated compliance at *Plan Review* by:

- a) Receipt of a copy of the Commissioning Plan (optional), or
- b) Receipt of a form signed by the owner or owner representative attesting that the Cx Plan has been completed.

---

## **12.7 Functional performance testing**

**Section 120.8(g): Functional performance testing.** Functional performance tests shall demonstrate the correct installation and operation of each component, system, and system-to-system interface in accordance with the acceptance test requirements. Functional performance testing reports shall contain information addressing each of the building components tested, the testing methods utilized, and include any readings and adjustments made.

### **12.7.1 Intent**

Develop and implement the functional performance tests to document (as set forth in the Commissioning Plan) that all components, equipment, systems and system-to-system interfaces were installed as specified, and operate according to the Owner's Project Requirements, Basis of Design, and plans and specifications.

The following systems to be functionally tested are listed in the Basis of Design:

1. Heating, ventilation, air conditioning (HVAC) systems and controls
2. Indoor lighting system and controls
3. Water heating system and controls
4. Covered processes

### **12.7.2 Existing Law or Regulation**

Title 24 Acceptance Testing requirements call for functional testing of some systems and equipment. Refer to Chapter 13: Acceptance Requirements, located in this Nonresidential Compliance Manual for further guidance.

### **12.7.3 Compliance Method**

Compliance is demonstrated by developing and implementing test procedures for each piece of commissioned equipment and interfaces between equipment and systems according to the building-specific Commissioning Plan. Tests should include verification of proper operation of all equipment features, each part of the sequence of operation, overrides, lockouts, safeties, alarms, occupied and unoccupied modes, loss of normal power, exercising a shutdown, startup, low load through full load (as much as possible) and back, staging and standby functions, scheduling, energy efficiency strategies and loop tuning. Title 24 Acceptance Requirements, discussed in Chapter 13, are required and will contribute toward compliance with section 120.8(g), but do not cover all necessary testing.

**Elements of acceptable test procedures include:**

1. Date and Party – Identification of the date of the test and the party conducting the test.
2. Signature Block – Signature of the designated commissioning lead and the equipment installing contractor attesting that the recorded test results are accurate.
3. Prerequisites – Any conditions or related equipment checkout or testing that needs to be completed before conducting this test.
4. Precautions – Identification of the risks involved to the test team members and the equipment and how to mitigate them.
5. Instrumentation – Listing of the instrumentation and tools necessary to complete the test.
6. Reference – In each procedure item, identify the source for what is being confirmed (e.g., sequence of operation ID, operating feature, specification requirement, etc.).
7. Test Instructions – Step-by-step instructions of how to complete the test, including functions to test and the conditions under which the tests should be performed.
8. Acceptance Criteria – Measurable pass / fail criteria for each step of the test, as applicable.
9. Results – Expected system response and space to document the actual response, readings, results and adjustments.
10. Return to Normal – Instructions that all systems and equipment are to be returned to their as-found state at the conclusion of the tests.
11. Deficiencies – A list of deficiencies and how they were mitigated.

**Enforcement**

At their discretion, the building official confirms demonstrated compliance during *Field Inspection* by:

1. Receipt of a copy of completed and signed Functional Performance Tests that indicate any deficiencies have been corrected (optional), or
2. Receipt of a form signed by the owner, owner representative or commissioning coordinator attesting that the Functional Performance Tests have been completed and any deficiencies corrected.

---

## 12.8 Documentation and training

**Section 120.8(h). Documentation and training.** A Systems Manual and Systems Operations Training are required.

**Section 120.8(h)1. Systems manual.** Documentation of the operational aspects of the building shall be completed within the Systems Manual and delivered to the building owner or representative and facilities operator. The Systems Manual shall include the following:

1. Site information, including facility description, history and current requirements.
2. Site contact information

3. Instructions for basic operations & maintenance, including general site operating procedures, basic troubleshooting, recommended maintenance requirements, and a site events log
4. Description of major systems
5. Site equipment inventory and maintenance notes
6. A copy of all special inspection verifications required by the enforcing agency or the Standards.

### **12.8.1 Intent**

The Systems Manual documents information focuses on the operation of the building systems. This document provides information needed to understand, operate, and maintain the equipment and systems and informs those not involved in the design and construction of the building systems. This document is in addition to the record construction drawings, documents, and the Operation & Maintenance (O&M) Manuals supplied by the contractor. The Systems Manual is assembled during the construction phase and available during the contractors' training of the facility staff.

### **12.8.2 Compliance Method**

Compliance is demonstrated by providing the Systems Manual. The information in the Systems Manual includes the following information:

#### *1. Site information, including facility description, history and current requirements*

##### a) Site Information

- i. Location of property - Address
- ii. Site acreage
- iii. Local utility information:
  - a. Water service provider
  - b. Natural/LPG gas service provider
  - c. Electrical service provider
  - d. Telecommunications service provider
  - e. Other service provider

##### b) Facility Description

- i. Use/Function
- ii. Square footage
- iii. Occupancy Type
- iv. Construction Type
- v. Basis of design
- vi. Location of major systems & equipment

##### c) Project History

- i. Project requirements
  - Owner's Project Requirements (OPR)
  - Basis of Design (BOD)
- ii. Project undocumented events
- iii. Record Drawings & Documents
- iv. Final control drawings and schematics
- v. Final control sequences
- vi. Construction documents - Location or delivery information:

- a. Mechanical & electrical drawings
  - b. Specifications
  - c. Submittals
  - d. Project change orders and information
  - d) Current requirements
    - i. Building operating schedules
    - ii. Space temperature, humidity, & pressure, CO2 setpoints
    - iii. Summer and winter setback schedules
    - iv. Chilled & hot water temperatures
    - v. As-built control setpoints and parameters
2. *Site contact information*
- a) Owner information
  - b) Emergency contacts
  - c) Design Team: Architect, Mechanical, Engineer, Electrical Engineer, etc.
  - d) Prime Contractor contact information
  - e) Subcontractor information
  - f) Equipment supplier contact information
3. *Basic operation & maintenance, including general site operating procedures, basic trouble shooting, recommended maintenance requirements site events log*
- a) Basic operation
    - i. Written narratives of basic equipment operation
    - ii. Interfaces, interlocks and interaction with other equipment and systems
    - iii. Initial maintenance provide by contactor
  - b) General site operating procedures
    - i. Instructions for changes in major system operating schedules
    - ii. Instructions for changes in major system holiday & weekend schedules
  - c) Basic troubleshooting
    - i. Cite any recommended troubleshooting procedures specific to the major systems and equipment installed in the building.
    - ii. Manual operation procedures
    - iii. Standby/Backup operation procedures
    - iv. Bypass operation procedures
    - v. Major system power fail resets and restarts
    - vi. Trend log listing
  - d) Recommended maintenance events log
    - i. HVAC air filter replacement schedule & log
    - ii. Building control system sensor calibration schedule & log
  - e) Operation & Maintenance Manuals - Location or delivery information
4. *Major systems*
- a) HVAC systems & controls
    - i. Air conditioning equipment (chillers, cooling towers, pumps, heat exchanges, thermal energy storage tanks, etc)
    - ii. Heating equipment (boilers, pumps, tanks, heat exchanges, etc.)
    - iii. Air distribution equipment (fans, terminal units, accessories, etc.)
    - iv. Ventilation equipment (Fans, accessories, and controls)
    - v. Building automation system (workstation, servers, panels, variable frequency drives, local control devices, sensors, actuators, thermostats, etc.)
  - b) Indoor lighting systems & controls
    - i. Lighting control panels

- ii. Occupancy sensors
    - iii. Daylight harvesting systems
  - c) Renewable energy systems
    - i. Photovoltaic panels & inverters
    - ii. Wind powered electrical generators & inverters
  - d) Landscape irrigation systems
    - i. Water distribution diagrams
    - ii. Control system
  - e) Water reuse systems
    - i. Reclaimed water system for indoor use
    - ii. Reclaimed water for irrigation use
- 5. *Site equipment inventory and maintenance notes*
  - a) Spare parts inventory
  - b) Frequently required parts and supplies
  - c) Special equipment required to operate or maintain systems
  - d) Special tools required to operate or maintain systems
- 6. *A copy of all special inspection verifications required by the enforcing agency of this code*
- 7. *Other resources and documentation*

### **Enforcement**

At their discretion, the building official confirms demonstrated compliance during *Field Inspection* by:

- a. Receipt of a copy of the Systems Manual (optional), or
- b. Receipt of a form signed by the owner or owner representative attesting that the System's Manual has been completed.

**Section 120.8(h)2. Systems operations training.** The training of the appropriate maintenance staff for each equipment type or system shall be documented in the commissioning report. Training materials shall include the following:

- 1. System and equipment overview (i.e. what is the equipment, what is its function, and with what other systems or equipment does it interface)
- 2. Review and demonstration of operation, servicing, and preventive maintenance
- 3. Review of the information in the Systems Manual
- 4. Review of the record drawings on the systems and equipment

### **12.8.3 Intent**

The systems operation training verifies that a training program is developed to provide training to the appropriate maintenance staff for each equipment type and/or system and that this training program is documented in the commissioning report. The systems operations training program is specified in the project specifications for the major systems listed. The System Manual, Operation and Maintenance (O&M) documentation, and record drawings are prepared and available to the maintenance staff prior to implementation of any training or the development of a written training program. The training program is to be administered by the commissioning coordinator or other responsible party when the appropriate maintenance staff is made available to receive training.

### **12.8.4 Compliance Method**

The written training program includes: (a) learning goals and objectives for each session, (b) training agenda, topics, and length of instruction for each session, (c) instructor information and qualifications, (d) location of training sessions (onsite, off-site, manufacturer's or vendor's facility), (e) attendance forms, (f) training materials, and (g) description on how the training will be archived for future use:

1. *Systems/equipment overview*
  - a. Review OPR and BOD related to the major systems and equipment
  - b. Describe system type and configuration
  - c. Explain operation all major systems and equipment and how it interfaces with other systems and equipment
  - d. Describe operation of critical devices, controls and accessories
  - e. Review location of the major systems and equipment
  - f. Describe operation of control system for each system, location of critical control elements, and procedures to properly operate control system
  - g. Review recommendations for implementation to reduce energy and water use
2. *Review and demonstration of servicing/preventive maintenance*
  - a. Explain location or delivery contact of the Operation & Maintenance manuals
  - b. Review of all manufacturer's recommended maintenance activities to maintain warranty
  - c. Review and demonstrate frequent maintenance activities (air filter replacement, lubrication, fan belt inspection and/or replacement, condenser water treatment, etc.), and suggested schedule.
  - d. Review and demonstrate typical servicing procedures and techniques (electrical current, pressure, and flow readings, etc; calibration procedures, point trending, power fail restart procedures, etc.)
  - e. Locate, observe and identify major equipment, systems, accessories and controls
  - f. Review emergency shut-offs and procedures
3. *Review the Systems Manual*
  - a. Describe use of Systems Manual
  - b. Review elements of Systems Manual
  - c. Explain how to update and add revisions to Systems Manual
4. *Review record drawings on the systems/equipment*
  - a. Explain location or delivery contact of the record drawings
  - b. Review record drawings, revisions, and changes to original design drawings
  - c. Review equipment schedules and compare with actual installed systems

#### **Enforcement**

At their discretion, the building official confirms demonstrated compliance during *Field Inspection* by:

1. In the event appropriate maintenance staff is made available to receive training for each equipment type and/or system installed in the building.
  - a. Receipt of a copy of the written training program and completed attendance forms, or
  - b. Receipt of a form signed by the owner or owner representative attesting that the training program and delivery of training has been completed

2. In the event appropriate maintenance staff are unavailable to receive training for each equipment type and/or system installed in the building.
  - a. Receipt of a copy of the training program provided to the owner or owner's representative (optional), or
  - b. Receipt of a form signed by the owner or owner representative attesting that the written training program has been provided.

---

## 12.9 Commissioning report

**Section 120.8(i): Commissioning report.** A complete report of commissioning process activities undertaken through the design, construction and reporting recommendations for post-construction phases of the building project shall be completed and provided to the owner or representative.

### 12.9.1 Intent

The Commissioning Report documents the commissioning process and test results. The report includes confirmation from the commissioning coordinator verifying that commissioned systems meet the conditions of the Owner's Project Requirements (OPR), Basis of Design (BOD), and Contract Documents.

### 12.9.2 Compliance Method

The components of the Commissioning Report include the following and are defined as follows:

1. Executive summary of process and results of commissioning program – including observations, conclusions and any outstanding items.
2. History of any system deficiencies and how resolved
  - a. Include outstanding deficiencies and plans for resolution
  - b. Include plans for seasonal testing scheduled for a later date
3. System performance test results and evaluations
4. Summary of training process completed and scheduled
5. Attach commissioning process documents
  - a. Commissioning Plan
  - b. Owners Project Requirements (OPR)
  - c. Basis of Design (BOD)
  - d. Executed installation checklists
  - e. Executed Functional Performance Test (FPT) forms
  - f. Recommendations for end-of-warranty review activities

**Enforcement:**

At their discretion, the building official confirms demonstrated compliance during *Field Inspection* by:

- a. Receipt of a copy of the Commissioning Report (optional), or
- b. Receipt of a form signed by the owner or owner representative attesting that the Cx Report has been completed.

## 12.10 Commissioning Compliance Forms

Building Commissioning Compliance forms NRCC-CXR-01-E through NRCC-CXR-05-E must be completed by all projects, regardless if the project is following the Prescriptive or Performance compliance method. Design Engineers should use the forms to document exceptions to the prescriptive requirements and how compliance will be achieved through alternate efficiency measures and best practice items. Contractors accepting the responsibilities of the engineer under the provision of the Business and Profession Code may sign the forms in place of the design engineer.

### **NRCC-CXR-01-E – Certificate of Compliance – Cx Design Review Kickoff**

This form is used to document that the requirement to hold a design review kickoff meeting between the owner, design engineer and design reviewer has been met. The intent of the kickoff meeting is to discuss the project scope, design, project schedule, and the design reviewer's involvement using schematic design documents, the Owner's Project Requirements and the Basis of Design. The kickoff meeting should be held during the schematic design phase. The design reviewer will deliver the appropriate Certificates of Compliance – Cx Construction Documents to the project design team at the kickoff meeting for guidance in development of the construction documents.

#### **A. Project Information**

PROJECT NAME is the title of the project, as shown on the Code Compliance Forms.

DATE PREPARED provide the date that the form was prepared.

#### **B. General Information**

This section consists of data entry requirements, all of which are self-explanatory. Enter data as instructed:

- **CLIMATE ZONE** is the California Climate zone in which the project is located. See Reference Joint Appendix JA2 for a listing of climate zones.
- **BUILDING TYPE** is specified because code requirements and design decisions are influenced by building type. It is possible for a building to include more than one building type.
- **CONDITIONED FLOOR AREA** has a specific meaning under the Standards. The number entered here should match the floor area entered on the other forms.
- **REVIEWER'S NAME** identifies the reviewer by name.
- **REVIEWER'S AGENCY** identifies the agency that the reviewer is representing.
- **ENFORCEMENT AGENCY** identifies who has enforcement jurisdiction such as the county or city. The enforcement agency is the entity that issued the building permit.
- **PERMIT NUMBER** is the number issued by the enforcement agency and is located on the building permit.

#### **C. Date of Design Review Kickoff**

Provide date that the design review kickoff meeting was held.

#### **D. Design Review Checklists Provided to Design Team**

State if blank copies of the relevant construction documents design review checklists have been provided to the design team for their information. This allows the design team the opportunity to review those requirements that will be evaluated during the construction

documents design review process which occurs towards the end of construction document development.

#### **E. Design Reviewer Qualifications**

This section consists of three check boxes that are used to identify the qualifications of the design reviewer based on project size and complexity of mechanical systems. Contractors accepting the responsibilities of the engineer under the provisions of the Business and Profession Code may also complete and sign these certificates. The commissioning coordinator who meets the requirements of 120.8(d) may also fill the role of design reviewer. Complete the check box for the qualification being met by the project's design reviewer.

#### **F. List of Meeting Attendees**

Meeting attendees should be identified on this section of the form. Mechanical and/or electrical engineers may be identified under the design engineer check box.

#### **G. Documents Received by Design Reviewer for Design Review Kickoff**

Complete the check boxes and identify information received by the design reviewer prior to or during the kickoff meeting. These documents will be used to inform the design reviewer on which forms (NRCC-CXR-01-E through NRCC-CXR-05-E) will require completion at the end of design.

#### **H. Design Review Meeting Topics**

The meeting topics section identifies five areas that should be discussed between the owner, design engineer(s), design reviewer and project manager. These topics include the following:

The **PROJECT SCOPE** section should include a brief description of the project including topics such as type of building occupancy and function, building hours of operation, number of building occupants, and O&M requirements of staff or contracted services.

**DESIGN ELEMENTS AND ASSUMPTIONS** should include a description of the approach taken in designing the building's envelope, mechanical, service hot water, and electrical systems and may reference the Basis of Design and Owner's Project Requirements. Also included in this section are assumptions on building loads, i.e. typical versus unique or specialty plug loads.

**HVAC SYSTEM SELECTION** identifies the HVAC system type and the reasoning behind that selection to include items such as energy efficiency requirements, building limitations (i.e. no mechanical equipment on the roof), owner preferences, etc..

The **RECOMMENDED ENERGY EFFICIENCY MEASURES** section includes a brief discussion of efficiency measures that may be incorporated based on the OPR, BOD and discussion of project scope and HVAC system selection.

**OTHER COMMENTS** includes topics such as building lighting approach and daylight harvesting, occupied period lighting controls, unoccupied egress lighting, outdoor lighting control, HVAC controls, building sustainability goals, etc.

#### **I. Coordination**

The design reviewer, owner, design engineer and project manager should coordinate on timing of the construction documents design review. The construction documents design review and completion of forms NRCC-CXR-02-E through NRCC-CXR-04-E should occur late in the construction document phase, so the timing must be coordinated such that the design engineer can review the completed forms and provide any required changes prior to the project schedule permit submittal date.

## **J. Signatures**

The CERTIFICATE OF COMPLIANCE is signed and dated by the owner, design engineer and design, indicating that the meeting has been held with all required participants in attendance.

## **NRCC-CXR-02-E – Certificate of Compliance – Cx Construction Documents - General**

NRCC-CXR-02-E or the Construction Document Certificate of Compliance is the design review checklist that must be completed by all projects, regardless if the HVAC system type is complex or simple. The purpose of the form is to document that applicable code elements are included and are well-documented in the construction documents. Not all code elements are included in the checklists. Rather, the forms focus on items known to be more frequently overlooked or to contain insufficient detail. No second review of issues raised is required by the design reviewer:

### **A. Project Information**

- **PROJECT NAME** is the title of the project, as shown on the Code Compliance Forms.
- **DATE PREPARED** provide the date that the form was prepared.

### **B. General Information**

**CLIMATE ZONE** is the California Climate zone in which the project is located. See Reference Joint Appendix JA2 for a listing of climate zones.

**BUILDING TYPE** is specified because code requirements and design decisions are influenced by building type. It is possible for a building to include more than one building type.

**CONDITIONED FLOOR AREA** has a specific meaning under the Standards. The number entered here should match the floor area entered on the other forms.

**REVIEWER'S NAME** identifies the reviewer by name.

**REVIEWER'S AGENCY** identifies the agency that the reviewer is representing.

**ENFORCEMENT AGENCY** identifies who has enforcement jurisdiction such as the county or city. The enforcement agency is the entity that issued the building permit.

**PERMIT NUMBER** is the number issued by the enforcement agency and is located on the building permit.

### **C. Design Review Checklist**

The Construction Document checklist is broken into categories of envelope, lighting, service hot water heating and HVAC Design – All Buildings, ventilation rates, demand control ventilation, economizers, duct design, acceptance and commissioning. Each measure in the checklist is identified as a mandatory, prescriptive or best practice item. There are two sections to be completed – the first three columns to the right of the measure description should be completed by the design reviewer. The next three columns to the far right are to be completed by the design engineer (referred to as designer on the form).

**Design Reviewer Section:** Each measure should be categorized using the following three options: 1) “Yes. Complies”, 2) “Does Not Comply”, and 3) “Consider Better Practice”. A measure may have both “Yes. Complies” and “Consider Better Practice” completed. If “Consider Better Practice” is checked, the design reviewer should identify the best practice measure that should be considered using the Notes section.

**Designer Section:** For those measures identified by the design reviewer as “Does Not Comply”, the designer should respond with one of the following: “Complies”, “Will Include in

Next Draft”, or “Not Included – State Reason”. The notes section should also be used to clarify why a measure either complies or will not be included.

### **NRCC-CXR-03-E – Certificate of Compliance – Cx Construction Documents – Simple HVAC Systems**

NRCC-CXR-03-E or the Construction Document – Simple HVAC Systems Certificate of Compliance is the design review checklist that must be completed by all projects that have HVAC systems that are NOT defined as Complex, per Section 100.1.

COMPLEX MECHANICAL SYSTEMS are systems that include 1) fan systems each serving multiple thermostatically controlled zones; or 2) built-up air handler systems (non-unitary or non-packaged HVAC equipment); or 3) hydronic or steam heating systems; or 4) hydronic cooling systems. Complex systems are NOT the following: (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.

For projects that have more than one system type, the CERTIFICATE OF COMPLIANCE form applicable to each system type should be completed. In other words, if a project has a chilled water system with variable air volume air handlers serving the majority of the building and a packaged DX rooftop unit serving an individual space, both NRCC-CXR-03-E and NRCC-CXR-04-E should be completed.

#### **A. Project Information**

- **PROJECT NAME** is the title of the project, as shown on the Code Compliance Forms.
- **DATE PREPARED** provide the date that the form was prepared.

#### **B. General Information**

- **CLIMATE ZONE** is the California Climate zone in which the project is located. See Reference Joint Appendix JA2 for a listing of climate zones.
- **BUILDING TYPE** is specified because code requirements and design decisions are influenced by building type. It is possible for a building to include more than one building type.
- **CONDITIONED FLOOR AREA** has a specific meaning under the Standards. The number entered here should match the floor area entered on the other forms.
- **REVIEWER’S NAME** identifies the reviewer by name.
- **REVIEWER’S AGENCY** identifies the agency that the reviewer is representing.
- **ENFORCEMENT AGENCY** identifies who has enforcement jurisdiction such as the county or city. The enforcement agency is the entity that issued the building permit.
- **PERMIT NUMBER** is the number issued by the enforcement agency and is located on the building permit.

#### **C. Design Review Checklist**

The checklist is divided into the categories of Fan System design and Controls. As for the NRCC-CXR-02-E form, each measure in the checklist is identified as a mandatory, prescriptive or best practice item. There are two sections to be completed – the first three columns to the right of the measure description should be completed by the design reviewer. The next three columns to the far right are to be completed by the design engineer (referred to as designer on the form).

Design Reviewer Section: Each measure should be categorized using the following three options: 1) “Yes. Complies”, 2) “Does Not Comply”, and 3) “Consider Better Practice”. A measure may have both “Yes. Complies” and “Consider Better Practice” completed. If “Consider Better Practice” is checked, the design reviewer should identify the best practice measure that should be considered using the Notes section.

Designer Section: For those measures identified by the design reviewer as “Does Not Comply”, the designer should respond with one of the following: “Complies”, “Will Include in Next Draft”, or “Not Included – State Reason”. The notes section should also be used to clarify why a measure either complies or will not be included.

### **NRCC-CXR-04-E – Certificate of Compliance – Cx Construction Documents – Complex Mechanical Systems**

NRCC-CXR-04-E or the Construction Document – Complex Mechanical Systems Certificate of Compliance is the construction documents design review checklist that must be completed by all projects that have HVAC systems defined as Complex, per Section 100.1.

COMPLEX MECHANICAL SYSTEMS are systems that include 1) fan systems each serving multiple thermostatically controlled zones; or 2) built-up air handler systems (non-unitary or non-packaged HVAC equipment); or 3) hydronic or steam heating systems; or 4) hydronic cooling systems. Complex systems are NOT the following: (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.

For projects that have more than one system type, the CERTIFICATE OF COMPLIANCE form applicable to each system type should be completed. In other words, if a project has a chilled water system with variable air volume air handlers serving the majority of the building and a packaged DX rooftop unit serving an individual space, both NRCC-CXR-03-E and NRCC-CXR-04-E should be completed.

#### **A. Project Information**

- **PROJECT NAME** is the title of the project, as shown on the Code Compliance Forms.
- **DATE PREPARED** provide the date that the form was prepared.

#### **B. General Information**

- **CLIMATE ZONE** is the California Climate zone in which the project is located. See Reference Joint Appendix JA2 for a listing of climate zones.
- **BUILDING TYPE** is specified because code requirements and design decisions are influenced by building type. It is possible for a building to include more than one building type.
- **CONDITIONED FLOOR AREA** has a specific meaning under the Standards. The number entered here should match the floor area entered on the other forms.
- **REVIEWER’S NAME** identifies the reviewer by name.
- **REVIEWER’S AGENCY** identifies the agency that the reviewer is representing.
- **ENFORCEMENT AGENCY** identifies who has enforcement jurisdiction such as the county or city. The enforcement agency is the entity that issued the building permit.
- **PERMIT NUMBER** is the number issued by the enforcement agency and is located on the building permit.

### C. Design Review Checklist

The checklist is divided into the categories fan systems, supply air temperature reset, heat rejection equipment, chillers and boilers, hydronic systems – pumping and hydronic heat pump. As for the NRCC-CXR-02-E form, each measure in the checklist is identified as a mandatory, prescriptive or best practice item. There are two sections to be completed – the first three columns to the right of the measure description should be completed by the design reviewer. The next three columns to the far right are to be completed by the design engineer (referred to as designer on the form).

**Design Reviewer Section:** Each measure should be categorized using the following three options: 1) “Yes. Complies”, 2) “Does Not Comply”, and 3) “Consider Better Practice”. A measure may have both “Yes. Complies” and “Consider Better Practice” completed. If “Consider Better Practice” is checked, the design reviewer should identify the best practice measure that should be considered using the Notes section.

**Designer Section:** For those measures identified by the design reviewer as “Does Not Comply”, the designer should respond with one of the following: “Complies”, “Will Include in Next Draft”, or “Not Included – State Reason”. The notes section should also be used to clarify why a measure either complies or will not be included.

### NRCC-CXR-05-E – Certificate of Compliance – Cx Design Review Signature Page

This form documents that the required construction documents design review has been completed for the project.

#### A. Project Information

- **PROJECT NAME** is the title of the project, as shown on the Code Compliance Forms.
- **DATE PREPARED** provide the date that the form was prepared.

#### B. General Information

- **CLIMATE ZONE** is the California Climate zone in which the project is located. See Reference Joint Appendix JA2 for a listing of climate zones.
- **BUILDING TYPE** is specified because code requirements and design decisions are influenced by building type. It is possible for a building to include more than one building type.
- **CONDITIONED FLOOR AREA** has a specific meaning under the Standards. The number entered here should match the floor area entered on the other forms.
- **REVIEWER’S NAME** identifies the reviewer by name.
- **REVIEWER’S AGENCY** identifies the agency that the reviewer is representing.
- **ENFORCEMENT AGENCY** identifies who has enforcement jurisdiction such as the county or city. The enforcement agency is the entity that issued the building permit.
- **PERMIT NUMBER** is the number issued by the enforcement agency and is located on the building permit.

#### C. 120.8(d): DESIGN REVIEW

The **DATE OF DESIGN REVIEW KICKOFF** is the date the meeting was held with the project owner, design engineer and design reviewer. This date must be consistent with compliance form NRCC-CXR-01-E.

The owner, design engineer and design reviewer must all print, sign and date under the **DESIGN REVIEW KICKOFF** section to document that they participated in the kickoff meeting.

The **DATE OF CONSTRUCTION DOCUMENT CHECKLIST COMPLETION** is the date that forms NRCC-CXR-02-E through NRCC-CXR-04-E were completed by both the design reviewer and design engineer and presented to the owner.

The **CHECKLISTS COMPLETED** section checkboxes must be completed for each of the three construction documents design review checklists indicating which were completed.

A second set of signatures by the owner or owner's representative, design engineer and design reviewer are required to indicate that all checklists were completed by both the design reviewer and the design engineer and the owner received copies of these completed forms.

(This page left intentionally blank)