

# 2015 INTERNATIONAL ENERGY CONSERVATION CODE

## **COMMISSIONING REQUIREMENTS, APPLICATION AND ENFORCEMENT**

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# 2015 IECC

## Mechanical System Commissioning – C408.2

- **Mechanical and Service Water Heating System Commissioning and Completion- Prior to final mechanical and plumbing inspections, the registered design professional or approved agency shall provide evidence of mechanical system commissioning and completion**
  - Excludes air conditioning systems less than 40 tons
  - Excludes hotel room and apartments
- **Construction documents must include commissioning requirements**

# 2015 IECC

## Mechanical System Commissioning – C408.2.1

**Commissioning Plan developed by registered design professional or approved agency**

- **Narrative of activities and personnel included**
- **Listing of equipment and systems**
- **Functions to be tested**
- **Test conditions**
- **Measurable criteria**

# HVAC System Test and Balance C408.2.2

- **Test and Balance required to accepted engineering standards.**
- **Air and water flow rates measured and adjusted to tolerances provided in product specifications**
- **Air supply outlets and zone terminal devices shall be equipped with means for balancing.**
- **Hydronic heating and cooling coils shall be equipped with means for balancing and measuring flow**

## HVAC System Test and Balance C408.2.5.3

- Written test and balance report required
  - Should be reviewed by Commissioning Provider
  - Should be included in Systems Manual
  - Should be available for review by Building Official

# 2015 IECC

## Mechanical System Commissioning – C408.2.3

- **Functional Performance Testing – Equipment**
  - **Installation and operation**
  - **Sequence of operation**
  - **Maintenance serviceability**
- **Controls and Economizers**
  - **Calibrated**
  - **Adjusted**
  - **Operate to approved plans and specifications**

# 2015 IECC

## Mechanical System Commissioning–C408.2.4

- **Preliminary Commissioning Report (by Design Professional or Approved Agency) with deficiencies, deferred testing and conditions required.**
  - **Owner shall certify receipt of the preliminary report prior to final inspection**
  - **Code official can request a copy**

# 2015 IECC

## Mechanical System Commissioning-C408.2.5

- **DOCUMENTATION:** Construction documents shall require delivery to owner within 90 days of Certificate of Occupancy:
  - Record Drawings with performance data
  - Systems Manual with submittals, O&M manuals, control system data with sequence of operation, service and maintenance data and schedules
  - Systems Balancing Report
  - Final Commissioning Report with functional and performance testing procedures, final results, and open issues

# 2015 IECC

## Lighting Commissioning-C408.3

- Lighting system functional testing- Prior to final inspection, registered design professional shall provide evidence of lighting control system testing including hardware and software programming and adjustment.
  - Occupant sensor controls
  - Time switch controls
  - Daylight responsive controls
- This evidence shall be provided to the building official

# 2015 IECC

## Lighting Commissioning-C408.3

- **Lighting System Construction documents shall require a final report to owner within 90 days of CO.**
  - **NOTE: This report does not need to be presented to the Building Official unless requested.**

# 2015 IECC - Existing Buildings

- **C502 Additions shall comply with new construction requirements**
- **C503 Alterations shall comply with new construction requirements with some variations**
- **C504 Repairs not normally required to comply.**
- **C505 Change in Occupancy requires IECC compliance if energy use is increased**

# Building Codes and Standards

- Building Codes
  - **Building, Mechanical, Plumbing, Electrical**
- Energy Codes
  - **Energy Code (IECC-2015), ASHRAE Standard 90.1**
- Green Codes and Programs
  - **International Green Construction Code (IGCC-2015)**
  - **ASHRAE 189.1 Standard for Design of High Performance Green Buildings**
  - **LEED, Green Globes, Living Building Challenge, 2030 Challenge, Etc.**
  - **Local Green Codes**
- NOTE: Codes shown in **RED** include commissioning

# Commissioning Definition in IECC

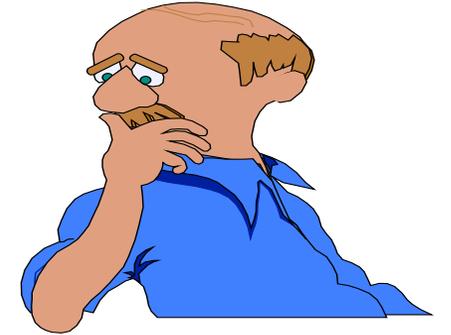
- **Building Commissioning : A process that verifies and documents that the selected building systems have been designed, installed, and function according to the owner's project requirements and construction documents, and to minimum code requirements.**

# Commissioning Results

- Discovering What Doesn't Work, Under Controlled Conditions, Early Enough To Not Impact Occupants/Users, and To Make Corrections To Produce a Facility That Operates as Intended

# Commissioning Process Requirements

- Requirements Documented
- Design Meets Requirements
- Construction Meets Design Documents
- Systems Tested to Verify Performance
- Operators Trained
- Documentation and Records



# Commissioning Standards and Guidelines

- ASHRAE Standard 202-2013, The Commissioning Process for Facilities and Systems
- ASHRAE Guideline 0-2013, The Commissioning Process
- ASHRAE Guideline 1.1-2007, The HVAC Commissioning Process
- NIBS/ASHRAE Guideline 3, The Total Building Commissioning Process
- ASHRAE Guideline 1.4-2014, Procedures for Producing Building Systems Manual for the Commissioning Process
- ASHRAE Guideline 1.5-2012, Commissioning Smoke Control Systems

# ASHRAE Standard 202 - 2013

## Activity

## Deliverable

- |                                   |   |                                    |
|-----------------------------------|---|------------------------------------|
| - Initiate Commissioning Process  | ↓ | Roles and Responsibilities         |
| - Project Requirements            | ↓ | Owner's Project Requirements (OPR) |
| - Develop Commissioning Plan      | ↓ | Commissioning Process Plan         |
| - Design Approach to Requirements | ↓ | Basis of Design (BOD)              |

# ASHRAE Standard 202 - 2013

## Activity

## Deliverable

- |                            |   |                                      |
|----------------------------|---|--------------------------------------|
| - Set Contractor Cx Req.   | ↓ | Cx Specifications Requirements       |
| - Review Design            | ↓ | Design Review Report                 |
| - Review Submittals        | ↓ | Submittal Review Report              |
| - Observation<br>& Testing | ↓ | Construction Checklists<br>& Reports |

# ASHRAE Standard 202 - 2013

<u>Activity</u>		<u>Deliverable</u>
- Issues Resolution	↓	Issues Log
- Assemble Systems Manual	↓	Systems Manual
- Conduct Training	↓	Training Plans and Records
- Post Occupancy Operation	↓	End of Warranty Cx Report
- Commissioning Process Report		Cx Process Report

# Phases of Commissioning

- Pre-Design- Owner's Project Requirements (Design intent), Commissioning Plan, Scope and Budget for Commissioning
- Design- Basis of Design, Plans and Specifications, Commissioning Plan for Specific Project, Training Requirements.
- Construction - Procedures, Submittals, Verification, Functional Testing, Documentation, Systems Manuals, Training
- Occupancy and Operations- Retesting, Remodeling, Maintenance, Seasonal Testing

# COMMISSIONING SUMMARY

- All Requirements Defined
- Integrated Design for All Systems
- Energy Use Modeled to Meet Codes and Requirements
- Construction Meets Design
- Performance is Verified = Testing
- Operations Defined and Operators Trained
- Project is Documented

# WHO DOES COMMISSIONING?

- The Commissioning Team managed by the COMMISSIONING PROVIDER
- The COMMISSIONING PROVIDER needs;
  - Independence
  - Experience
  - Testing Equipment
  - Trained Support Personnel
  - Certification

# COMMISSIONING PROVIDER

- **1 Independence.** The commissioning provider should be objective, competent and independent from the contractor responsible for the work being inspected and the designer of the systems. The entity shall also disclose possible conflicts of interest so that objectivity can be confirmed.

# COMMISSIONING PROVIDER

- **2. Experience.** The commissioning provider should have commissioning experience in management of the commissioning process and on the type and size of project being considered. The *approved* provider shall have completed the commissioning process on a minimum of two projects of equal or larger scope and complexity, or can demonstrate adequate experience and training in the fundamentals and application of the commissioning process.

# COMMISSIONING PROVIDER

- **3. Equipment.** The commissioning provider shall have (or have access to) adequate equipment to perform the required commissioning and functional and performance testing activities for each system. The equipment shall be periodically calibrated in accordance with manufacturer's specifications.

# COMMISSIONING PROVIDER

- **4. Personnel.** An approved provider shall employ experienced personnel educated in conducting, supervising and evaluating tests, inspections, and commissioning. Some system commissioning requires licenses and other certifications such as elevator and fire protection systems.

# COMMISSIONING PROVIDER

- **5. Certification.** Certification of the commissioning provider could be required according to the provisions of ISO 17024. There are currently several organizations that offer that certification.

# COMMISSIONING ENFORCEMENT

- The AHJ needs assurance that the required commissioning activities are completed before a permit is issued. The AHJ can request a copy of all the documents for review or rely on the approval and summary documents by the Commissioning Provider and Owner or owner's representative.
- Project Requirements before permit
  - Designation of an *approved* Commissioning Provider
  - Commissioning requirements in the project documents
  - An acceptable commissioning plan

# Contract Documents Commissioning Requirements

- List of equipment to be commissioned
- Performance requirements for that equipment
- Contractor participation
- Training
- Documentation

# Commissioning Plan Contents

- A narrative of the commissioning process developed specifically for the project.
- The roles and responsibilities for the commissioning providers and the commissioning team through final commissioning activities.
- Documentation of communication channels and processes including the distribution of the commissioning plan, logs, testing documents and reports during the design and construction process.
- A detailed description of conditions and schedules of the commissioning process activities, and the list of operations, functions, systems, and assemblies that will be commissioned. Measurable performance criteria shall be included where not shown on the construction documents.

# Commissioning Plan Contents

- The project design documentation and submittal review procedures and reports.
- Inspection checklists and testing forms, issues and resolution log, and commissioning progress reports to be used during the project to communicate and track commissioning and inspection process information, including format, approvals and distribution.
- The procedures to follow for resolution where the commissioning evaluation does not meet the Owner's Project Requirements or design documents.

# Commissioning Checklist for Permit

COMMISSIONING PLAN DOCUMENTATION FOR PERMIT		
Project Name: _____		
Project Address: _____		Permit Number: _____
Commissioning Provider: _____		
Company/Entity address : _____		
CxPro Phone Number: _____		CxPro email address: _____
CxPro Certification (if required) _____		
ITEM #	COMMISSIONING DOCUMENTATION COMPLETED	APPROVAL
1.	<b>Commissioning Project Design Requirements</b>	
	Project commissioning requirements, listing of equipment to be commissioned, system performance requirements, commissioning specification shown on project contract documents.	
1.	<b>Commissioning Plan</b>	
	Initial commissioning plan (for Permit) completed with required contents and provided for Owner and AHJ review	
1.	<b>Design Review</b>	
	Commissioning design documents review, report completed with response	
<b>Commissioning Provider Acknowledgement</b>		
I have reviewed the documents and verified that they meet the owner's project requirements:		
Name: _____		
Company Name _____		
CxPro Signature: _____		Date: _____

- Could be used with permit application
- Lists information normally required by Building Official
- Could be used for project control and scheduling

# Commissioning Checklist for Permit

## COMMISSIONING PLAN DOCUMENTATION FOR PERMIT

**Project Name:** \_\_\_\_\_

**Project Address:** \_\_\_\_\_ **Permit Number:** \_\_\_\_\_

**Commissioning Provider:** \_\_\_\_\_

**Company/Entity address :** \_\_\_\_\_

**CxPro Phone Number:** \_\_\_\_\_ **CxPro email address:** \_\_\_\_\_

**CxPro Certification (if required)** \_\_\_\_\_

# Commissioning Checklist for Permit

 COMMISSIONING DOCUMENTATION COMPLETED	APPROVAL
<b>1. Commissioning Project Design Requirements</b>	
Project commissioning requirements, listing of equipment to be commissioned, system performance requirements, commissioning specification shown on project contract documents.	
<b>2. Commissioning Plan</b>	
Initial commissioning plan (for Permit) completed with required contents and provided for Owner and AHJ review	
<b>3. Design Review</b>	
Commissioning design documents review, report completed with response	

# Commissioning Checklist for Permit

- **Commissioning Provider Acknowledgement**

- I have reviewed the documents and verified that they meet the project requirements:

- Name: \_\_\_\_\_

Company Name \_\_\_\_\_

CxPro Signature: \_\_\_\_\_

Date: \_\_\_\_\_

# Commissioning Requirements for Final Inspection

- **Preliminary Commissioning Report**
- Listing and performance of commissioned equipment, systems, and assemblies, including a review of the HVAC test and balance report.
- Issue and resolution logs including itemization of deficiencies found during testing and commissioning that have not been corrected at the time of report preparation.
- Deferred tests that cannot be performed at the time of preliminary report.
- A plan for the completion of commissioning including climatic and other conditions required for performance of the deferred tests.

# Commissioning Checklist for Final Inspection

**COMMISSIONING DOCUMENTATION for FINAL INSPECTION and CO**

Project Name: \_\_\_\_\_  
 Project Address: \_\_\_\_\_ Permit Number: \_\_\_\_\_  
 Commissioning Provider  
 (CxPro): \_\_\_\_\_  
 Company/CxPro address : \_\_\_\_\_  
 CxPro Phone Number: \_\_\_\_\_ CxPro email address: \_\_\_\_\_  
 CxPro Certification (if required) \_\_\_\_\_

COMMISSIONING DOCUMENTATION	APPROVAL CxPro INITIAL
<b>Project Commissioning Requirements</b>	
Project commissioning requirements included in project contract documents.	
<b>Commissioning Plan</b>	
Commissioning Plan with checklists (before start of functional testing) completed.	
<b>Contractor and Construction Instructions</b>	
Plans and commissioning specifications utilized.	
<b>Design and Construction Submittal Review</b>	
Design documents review and construction submittal review and reports completed	
5. Commissioning Issue and Resolution Log Issues and Resolution Logs completed up to time of final inspection with open items shown.	
6. Commissioning Testing Commissioning checklists completed up to time of final inspection	
7. Equipment Commissioned and to be commissioned Listing of equipment with commissioning complete. Listing of equipment that remain to be commissioned and deferred tests. Plan for completion.	
8. Test and Balance Report Test and balance of HVAC completed and report reviewed.	
9. Systems Manual Project documentation and Systems O&M Manual completed with available information for use in training program before occupancy	
10. Commissioning Report Preliminary Commissioning Report available (at time of final inspection for CO) and submitted to Owner and to AHJ (if required).	
<b>Commissioning Provider Acknowledgement</b>	
I have reviewed the documents and verified that they meet the owner's project requirements:	
CxPro Name: _____	
Company Name _____	
Signature: _____ Date: _____	
The project documents include the items listed in this form and have been received by the owner or owner's representative:	
Name: _____	
Owner      Owner's Representative	
Company Name _____	
Signature: _____ Date: _____	

- Could be used for approval before final inspection
- Could be used by contractor and commissioning provider for scheduling and project management.

# Final Inspection Commissioning Checklist

## COMMISSIONING DOCUMENTATION for FINAL INSPECTION and CO

**Project Name:** \_\_\_\_\_

**Project Address:** \_\_\_\_\_ **Permit Number:** \_\_\_\_\_

**Commissioning Provider (CxPro):** \_\_\_\_\_

**Company/CxPro address :** \_\_\_\_\_

**CxPro Phone Number:** \_\_\_\_\_ **CxPro email address:** \_\_\_\_\_

**CxPro Certification (if required)** \_\_\_\_\_

# Final Inspection Commissioning Checklist

<small>ITEM #</small> <b>COMMISSIONING DOCUMENTATION</b>	<b>APPROVAL</b> <b>CxPro INITIAL</b>
<b>1. Project Commissioning Requirements</b>	
Project commissioning requirements included in project contract documents.	
<b>2. Commissioning Plan</b>	
Commissioning Plan with checklists (before start of functional testing) completed.	
<b>3. Contractor and Construction Instructions</b>	
Plans and commissioning specifications utilized.	
<b>4. Design and Construction Submittal Review</b>	
Design documents review and construction submittal review and reports completed	
<b>5. Commissioning Issue and Resolution Log</b>	
Issues and Resolution Logs completed up to time of final inspection with open items shown.	

# Final Inspection Commissioning Checklist

<b>6. Commissioning Testing</b>	
Commissioning checklists completed up to time of final inspection	
<b>7. Equipment Commissioned and to be commissioned</b>	
Listing of equipment with commissioning complete. Listing of equipment that remain to be commissioned and deferred tests. Plan for completion.	
<b>8. Test and Balance Report</b>	
Test and balance of HVAC completed and report reviewed.	
<b>9. Systems Manual</b>	
Project documentation and Systems O&M Manual completed with available information for use in training program before occupancy	
<b>10. Commissioning Report</b>	
Preliminary Commissioning Report available (at time of final inspection for CO) and submitted to Owner and to AHJ (if required).	

# Final Inspection Commissioning Checklist

## Commissioning Provider Acknowledgement

I have reviewed the documents and verified that they meet the project requirements:

CxPro Name: \_\_\_\_\_

Company Name \_\_\_\_\_

CxPro Signature: \_\_\_\_\_ Date: \_\_\_\_\_

## Owner/Owner's Representative Acknowledgement

The project documents include the items listed in this form and have been received by the owner or owner's representative

Name: \_\_\_\_\_

Owner

Owner's Representative

Company Name \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

# FINAL COMMISSIONING REPORT

- Delivered to Owner -Not required for Building Official unless requested
- Final Commissioning Report Contents:
  - Functional and performance test procedures with measurable criteria
  - Results of functional and performance tests
  - Disposition of deficiencies and details of corrective measures
  - Other items required by commissioning plans

# QUESTIONS

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