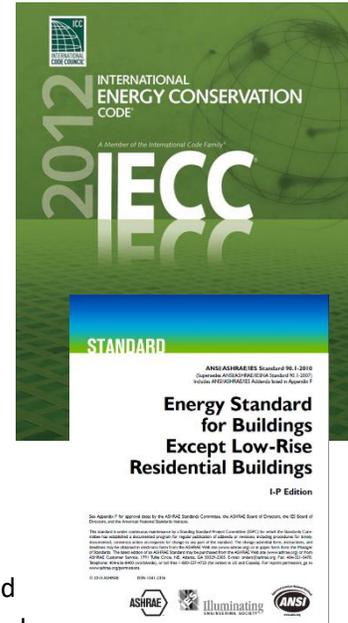


System Commissioning

Montana Commercial Energy Code Tech Sheet 2012 IECC

In Montana, the state government establishes the building codes that are enforced by both the state and local code jurisdictions. Montana adopted the *2012 International Energy Conservation Code (IECC)*. This edition of the code includes significant new provisions regarding the commissioning of mechanical and lighting systems. The IECC allows use of the *ASHRAE 90.1-2010: Energy Standard for Buildings Except Low-Rise Residential Buildings (ASHRAE 90.1)* as an alternative compliance path. The purpose of this Tech Sheet is to help designers and builders better understand the commissioning requirement of the IECC and how commissioning can improve energy efficiency.



What is Commissioning?

According to the IECC, building commissioning is a process that verifies and documents that the selected building systems have been designed, installed, and function according to the project's construction documents and code requirements. A new section, C408, was added to the IECC to detail commissioning requirements. While previous editions of the IECC addressed some commissioning requirements, the new provisions are significantly more detailed and specific. ASHRAE 90.1 also addresses commissioning but is much more general in nature and not overly stringent.

You can design the best building in the world and still end up with a building that doesn't perform to its full potential. Commissioning, functional testing, and balancing are ways of identifying things that "aren't right" and fixing them.



Why is Commissioning Important?

Heating, ventilation, and air-conditioning (HVAC) systems and lighting controls continue to become more complex, in an effort to improve energy efficiency. Design intent is often lost in construction and controls settings. Commissioning verifies that systems are installed and operate as specified and identifies system components that have not been installed or set up properly. Lawrence Berkley National Laboratory (LBNL) has found that building commissioning results in a 13% improvement in energy performance. The text box at top of the next page includes the most common faults found in commercial buildings during commissioning identified by that same LBNL report.

Common Faults in Commercial Buildings

- Leaking ducts
- Lights left on in unoccupied space
- Improper refrigerant charge
- Insufficient evaporator air flow
- Control component failure
- Improper controls hardware installation
- HVAC left on in unoccupied space
- Air flow not balanced
- Dampers not working properly
- Improper controls setup
- Software programming errors
- Valve leakage

Who May Provide Commissioning Services?

The IECC requires that a *registered design professional (RDP)* or *approved agency* develop the mechanical systems commissioning plan. The IECC also requires that a RDP provide evidence of mechanical system commissioning and completion.

The IECC states that the code official may require that the personnel performing the lighting functional testing be independent of the project design and construction. No such provision is included regarding mechanical system function testing.

HVAC System Commissioning Responsibilities

One of the challenging characteristics of commissioning is coordinating the many entities involved in the commissioning process. The text box below summarizes commissioning responsibilities for a typical project.

HVAC System Commissioning Responsibilities

Owner

- Select project architect and engineer (A&E) team with understanding of commissioning functions
- Transmit letter to code official certifying that Preliminary Commissioning Report has been received

Project A&E

- Include Commissioning Plan in construction documents

RDP (may be the Project A&E or approved agency)

- Develop commissioning plan for inclusion in construction documents submitted for building permit
- Develop, certify, and submit Preliminary Commissioning Report to owner (code official may also request a copy)
- Develop and submit to owner Final Commissioning Report

Not Specified in the IECC

- Perform systems adjusting and balancing and develop balancing report
- Perform functional performance testing
- Develop the operation and maintenance manuals

Commissioning Exemptions and Requirements

The IECC details the commissioning tests and reports associated with code compliance but also identifies two important exemptions from the mechanical system commissioning. There are no exemptions for lighting systems functional testing. In buildings where the total mechanical equipment capacity is less

than 480,000 Btu/h cooling capacity and 600,000 Btu/h heating capacity, no commissioning is required. Simple HVAC systems that serve dwelling units and sleeping units in hotels, motels, and boarding houses are also exempt in the IECC. ASHRAE 90.1 requires HVAC system commissioning for all projects but requires that a commissioning plan be included in design documents only for buildings larger than 50,000 ft² unless it is a warehouse or semi-heated space.

Commissioning Requirements Summary

2012 IECC

Required if Heating \geq 600,000 Btu/h and Cooling \geq 480,000 Btu/h:

- Drawings and Manuals
- Systems Adjustments & Balancing
- HVAC Functional Testing
- Lighting Functional Testing
- Commissioning Report

Level of commissioning detailed in code.

ASHRAE 90.1-2010

Commissioning Required for all Projects:

- Drawings
- Manuals
- HVAC System Balancing

HVAC Commissioning Plan Required if building is $>$ 50,000 ft²

Level of commissioning left up to design professional.

Commissioning Testing and Balancing

During the construction phase of the project the IECC requires specific testing and balancing procedures depending on the types of equipment and systems present in the building. In most cases these tasks will be performed by a contractor. Functional performance testing is commonly performed by commissioning agent. The text box below outlines the required tests and procedures required by the IECC.

Mechanical Systems Tests and Reports Summary

System Adjusting and Balancing

- Air and water flow rates measured and systems must be balanced
- Air system balancing
- Supply air outlets and zone terminal devices equipped with means to balance
- Discharge dampers prohibited on fan motors \geq 10 hp
- Hydronic systems balancing as required by the IECC
- Heating and cooling coils equipped with means for balancing
- Capability to measure pressure across the pump

Functional Performance Testing

- Equipment - Testing must include all modes and sequences including part-load, full-load, and emergency, back-up, and alarms
- Controls - Test calibrated, adjusted, and operation in accordance with specification. Sequences must be functionally tested
- Economizers - Air economizers tested for function as designed

Preliminary Commissioning Report

- Itemization of deficiencies
- Note deferred tests
- Climatic conditions needed for deferred tests

Final Commissioning Report

- Report completion may occur up to six months after occupancy to allow testing under winter design, summer design, and full outside air conditions.
- Results of functional performance test
- Itemization of deficiencies
- Functional performance test procedures

Light System Commissioning

The IECC does not require a commissioning plan for lighting as it does for HVAC systems. Neither does it detail final documentation requirements for lighting. The character of the final lighting systems commissioning documentation is therefore a judgement of the code official. The code official may require an approved independent party be responsible for performance testing, documentation, and submittal to the code official.



The IECC and Traditional Commissioning Practices

By requiring the A&E or RDP to certify the Commissioning Report, the IECC functionally extends traditional A&E responsibilities related to commissioning. The IECC has some requirements that deviate from commissioning industry standard methods and terminology. The IECC assigns the term *Commissioning Plan* to information that was typically included in the commissioning specifications. Traditionally this plan was not included in the construction documents, only the specifications. Industry professionals should be aware that the Commissioning Plan must be in the construction documents, and compose it accordingly so that it has the full weight of construction specifications.



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