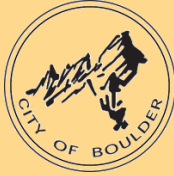


How-to Guide for Boulder’s Building Performance Ordinance Efficiency Requirements



Step-by-step guidance for commercial and industrial building owners to conduct an energy assessment, perform retro-commissioning and upgrade lighting to comply with ordinance requirements.

April 2022

Contents

- 1. Building Performance Ordinance**..... 2
 - 1.1 Is My Building Affected? 2
 - 1.2 Compliance Deadlines..... 2
- 2. Energy Assessments and Retrocommissioning** 4
 - 2.1 Energy Assessment Scope and Report..... 4
 - 2.2 Retrocommissioning (RCx) Scope and Report 5
 - 2.3 Costs and Cost Savings Opportunities 6
 - 2.4 Selecting a Service Provider 9
 - 2.5 Preparing for and Managing the Process..... 10
 - 2.6 Reporting Findings to the City..... 12
- 3. Lighting Upgrades**..... 13
 - 3.1 Summary of Requirements 13
 - 3.2 Preparing for and Managing the Lighting Upgrade 14
- Appendix A: Required Retrocommissioning Scope**..... 15
- Appendix B: RCx Report Sample Outline**..... 18
- Appendix C: How to Maintain and Track Your Energy Savings**..... 19
- Glossary** 21

1. Building Performance Ordinance

In support of community energy and climate goals, the City of Boulder enacted the Boulder Building Performance Ordinance (Ordinance No. 8071) on October 20, 2015. The ordinance requirements, found in the Boulder Revised Code Title 10, Chapter 7.7¹, mandate privately-owned commercial and industrial buildings and city-owned buildings to do the following:

- 1) Annually rate and report (R&R) building energy consumption using ENERGY STAR Portfolio Manager (or approved alternative);
- 2) Perform energy assessments within three years of first energy use reporting deadline and every ten years thereafter;
- 3) Perform retrocommissioning (RCx) within three years of first reporting deadline and every ten years thereafter with cost effective RCx measures implemented within two years of the study; and
- 4) Implement one-time lighting upgrades to meet specific sections of the current International Energy Conservation Code (IECC) requirements.

This document provides guidance and recommendations on how building owners can comply with the efficiency requirements (energy assessments, RCx and lighting upgrades) of the ordinance.²

1.1 Is My Building Affected?

To verify whether a building is required to comply with these requirements:

- 1) **Check the Affected Building List.** The City of Boulder posts a list every year of the affected buildings subject to the requirements for the coming year. Check this list on the program website at www.BoulderBuildingPerformance.com.
- 2) **Determine if the building meets an exemption path.** The City of Boulder structured these requirements to reward efficient building owners. If an owner has constructed, purchased or upgraded a building with high levels of energy efficiency, they are encouraged to review the [Exemption Reference Guide](#) to see if the building qualifies for any of the exemption pathways. If an owner has determined their building is affected and is not eligible for an exemption pathway the owner must comply with the efficiency requirements of energy assessments, retrocommissioning, and lighting upgrades, as outlined in the following sections.

1.2 Compliance Deadlines

The compliance deadlines to meet the efficiency requirements are listed in the table below. These phased deadlines allow building owners time to plan for the upcoming requirements and associated investments.

¹ The Boulder Revised Code is available at: https://library.municode.com/co/boulder/codes/municipal_code

² Additional information including Frequently Asked Questions can be found at www.BoulderBuildingPerformance.com

Efficiency Requirement Compliance Deadlines				
Affected Buildings	Energy Assessment	Retrocommissioning	RCx Measure Implementation	Lighting Upgrade
City buildings $\geq 10,000$ sf*	May 1, 2019	May 1, 2022	May 1, 2024	May 1, 2022
Existing buildings** $\geq 50,000$ sf New buildings*** $\geq 10,000$ sf	June 1, 2019	June 1, 2022	June 1, 2024	June 1, 2022
Existing buildings $\geq 30,000$ and $< 50,000$ sf	December 31, 2021	June 1, 2023	June 1, 2025	June 1, 2023
Existing buildings $\geq 20,000$ and $< 30,000$ sf	June 1, 2023	June 1, 2025	June 1, 2027	June 1, 2025
<p><i>*City buildings $\geq 5,000$ sf must complete lighting upgrades but are not subject to energy assessments or retrocommissioning.</i></p> <p><i>**Existing buildings that meet the definition of a Large Industrial Campus (three or more buildings, at least partially used for manufacturing, served by a central plant or single utility meter) have custom requirements and deadlines due to their unique nature.</i></p> <p><i>***Any commercial or industrial building for which an initial building permit was issued on or after January 31, 2014.</i></p>				

2. Energy Assessments and Retrocommissioning

This section provides information on the implementation of the energy assessment and retrocommissioning requirements of the ordinance. Compliance checklists are available online at <https://bouldercolorado.gov/services/building-performance-ordinance#section-1822> and should be used by affected building owners to ensure compliance with these requirements.

2.1 Energy Assessment Scope and Report

Affected building owners are required to complete energy assessments beginning 3 years following their first R&R deadline and every 10 years after. The energy assessment must meet or exceed the ASHRAE requirements as listed in [Standard 211](#) published by the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) in 2018.

Energy Assessment Scope

The scope of the energy assessment required depends on the size of the building as shown in the table below.

Affected Building Size	Level of Assessment
Buildings < 50,000 sf	ASHRAE Level I Energy Assessment Can be met through participation in Xcel Energy's Business Energy Assessment Program
Buildings ≥ 50,000 sf	ASHRAE Level II Energy Assessment

A Level I energy assessment is a high-level sweep for no-cost/low-cost energy saving opportunities. Activities include an assessment of energy bills and a brief site inspection of the building. Xcel Energy currently offers a program that meets these requirements.³

A Level II energy assessment identifies the no-cost/low-cost opportunities, and also includes an in-depth analysis of energy costs, energy usage and building characteristics as well as a more refined survey of how energy is used in the building. Owners are provided enough detail from a Level II energy assessment to get a quote from contractors for specific upgrades and activities to implement following the assessment.⁴ Note: Xcel Energy's program does NOT meet the scope of a Level II assessment.

All energy assessments for compliance must be conducted by a professional energy assessment firm that is listed on the City of Boulder's [qualified service provider list](#).

Energy Assessment Report

Level I Energy Assessment Report

The Level I energy assessment report must include everything required by ASHRAE guidelines, as well as a summary of available rebates and incentives, a recommendation on RCx benefits, and a statement of

³ See the Xcel Energy website to verify program offerings: <https://co.my.xcelenergy.com/s/business/cost-savings>

⁴ As part of the bidding process for a Level II energy assessment, the service provider must conduct a preliminary assessment to scope and price the assessment, including a quick evaluation of potential for RCx at the building (see [2.5.2 Service Provider Responsibilities](#) for additional information).

whether the building’s lighting systems and controls meet each lighting requirement in the Building Performance Ordinance. See the Level I energy assessment report template on the [website](#) under “Energy Assessments” for guidance.

If the energy assessment is conducted through a local energy utility program, such as Xcel Energy’s Onsite Energy Audit program, the report produced for that program will satisfy the requirements of the ordinance.

Level II Energy Assessment Report

The Level II energy assessment report must include everything required by ASHRAE guidelines. The Level II energy assessment report template for the City of Boulder is based upon the ASHRAE Processes for Commercial Building Energy Audits 2011,⁵ and the Investor Confidence Project’s Energy Performance Protocol for Standard and Large Commercial Energy Audits.⁶ See the Level II energy assessment report template on the [website](#) under “Energy Assessments” for guidance.

2.2 Retrocommissioning (RCx) Scope and Report

Affected building owners are required to perform retrocommissioning beginning 5 years following their first R&R deadline and every 10 years after. Cost-effective measures (with a simple payback of less than or equal to two years) must be implemented within two years of the study.

Retrocommissioning⁷ is a process that improves a building's operations and maintenance procedures to enhance overall building performance and is designed to improve the efficiency of existing building operations by “tuning up” and calibrating existing functional systems to run as efficiently as possible through low- or no-cost improvements. RCx measures are typically operational in nature and can be implemented without major equipment changes or work.

Retrocommissioning Scope

The scope of the RCx study depends on the size of the building, as shown in the table below.

Affected Building Size	Scope of RCx
Buildings < 50,000 sf	Participate in the Xcel Energy Business Energy Assessment program* or meet the scope outlined in the City Manager Rules**
Buildings ≥ 50,000 sf	Complete a Retro-commissioning Report with a Qualified Service Provider and meet the Required Retro-commissioning Study scope outlined in the City Manager Rules**
*See Xcel Energy for more information on programs, eligibility, and rebate offerings. **The RCx scope outlined in the City Manager Rules is included in Appendix A: Required Retrocommissioning Scope	

If the RCx is conducted through a local energy utility program, the scope for that program will satisfy the requirements of the ordinance, as long as it addresses both electricity and natural gas-consuming equipment and controls.⁸ Building owners will be required to submit BOTH the report produced by the

⁵ ASHRAE, “Procedures for Commercial Building Energy Audits”, second edition, 2011.

⁶ “Investor Confidence Project”, Commercial Protocols, <http://www.eepformance.org/project-development.html>

⁷ The term “recommissioning” is often used interchangeably with “retrocommissioning.” Both terms refer to the process of bringing a building’s operations in line with the intent of the original and optimal design.

⁸ If a building owner applies for a local utility program and is denied participation in the program because it is not applicable/no opportunities are identified, this may be cause for an exemption. See the Exemption Reference

Xcel study AND the completed Xcel Energy Recommissioning/Building Tune-up Rebate Application to the city.

If the RCx is conducted outside of a local energy utility program, the scope of the RCx shall include the activities listed in **Appendix A: Required Retrocommissioning Scope**. A monitoring-based commissioning (MBCx) approach may be used to investigate and evaluate building systems as part of the RCx process. However, while monitoring based commissioning is an excellent strategy to maintain the persistence of savings generated from a full RCx effort, but it is not a substitute for the RCx.

<p>All RCx measures that are “cost effective” – defined as having an estimated simple payback of two years or less – are required to be implemented within two years of the RCx study deadline.</p> <p><i>The simple payback period is the cost of the measures (less any rebates and incentives) divided by the energy cost savings, yielding the payback period in years. For example, if a measure costs \$5,000 and the energy savings for that measure are worth \$1,000 per year, then the payback period is five years.</i></p>	
--	--

Retrocommissioning Report

If the RCx is conducted through a local energy utility program, the report produced for that program AND an uploaded copy of the Xcel Recommissioning/Building Tune-up Rebate Application will satisfy the requirements of the ordinance. If the RCx is conducted outside of a local energy utility program, then the RCx report shall include summaries of building use, systems, operations and results of each completed RCx activity. It must also include a table of recommended RCx measures that clearly indicates the measures that must be implemented per the ordinance requirements. Please refer to **Appendix B: RCx Report Sample Outline** for an example report outline.

All RCx studies for compliance must be conducted by a service provider that is listed on the City of Boulder’s [qualified service provider list](#).

Once a building owner has determined the scope of the energy assessment and retrocommissioning required for their building, they can begin planning for the requirements, which includes estimating costs, determining cost savings opportunities, selecting a service provider, and preparing for and managing the process.

2.3 Cost Savings Opportunities

To plan for compliance with the efficiency requirements owners should estimate the associated investments. It is recommended that owners solicit quotes/cost proposals from at least three service providers. After receiving estimates of potential upfront costs, a building owner should evaluate the

Guide for more information: <https://bouldercolorado.gov/sites/default/files/2020-12/bpoefficiencyreqhowtoguideforboulder2020sept-1-2020.pdf>

opportunities to realize cost savings through implementing services concurrently, participating in existing utility and city programs, and identifying applicable rebate and financing offers.

2.3.1 Rebate and Incentive Programs

There are opportunities for cost savings by participating in existing utility or city programs.

Energy Assessments

Buildings less than 50,000 sf must perform a Level I energy assessment. Xcel Energy offers a [Business Energy Assessment](#) in which building owners may apply to receive an ASHRAE Level I Energy Assessment.

Buildings 50,000 sf or larger must submit a Level II Energy Assessment.

Retrocommissioning

Buildings less than 50,000 square feet can participate in Xcel Energy's [Business Energy Assessment program](#) as a means to compliance with the city's Retro-commissioning requirement.

Buildings larger than 50,000 square feet must work with a [Qualified Service Provider](#) to complete a Retro-commissioning Analysis. Unfortunately, at this time, there are no rebates or incentives available through Xcel Energy.

Rebates, Incentives, and Financing Options

Additional savings opportunities are available through existing rebates, grants and incentives that help offset some of the costs of implementing the efficiency requirements.

The first place to look for available rebates and incentives is the City of Boulder website under [Energy Rebates and Resources](#), which lists helpful information and links to various programs. The following table provides a high-level review of rebates and incentives currently available.

Rebates, Grants, Incentives and Financing Options	
Opportunity	Information
Xcel Energy Prescriptive Rebates	Xcel Energy can help owners reduce energy use, maximize efficiencies, and minimize costs by providing a wide variety of energy efficiency, expertise, and rebate programs. These include: lighting; heating and cooling; motors; and custom efficiency programs (for energy-efficiency investments that exceed standard options but are not covered under standard conservation programs).
Energy Smart Rebates, Incentives and Tax Credits	EnergySmart rebates, incentives and tax credits are available. In addition, the city has added funds to develop new custom rebates for measures identified in the ordinance-required energy assessments, which will be available in 2016. For more information, call 303-441-1300.
Solar Energy Rebates	Solar Rebates are available to Boulder residents and businesses that have installed solar electric or solar thermal (hot water) systems on their property. The city may rebate approximately 15 percent of the city sales and use tax paid on materials and permits for the solar installation. To be eligible, taxpayers must file a rebate application within 12 months of the city's final inspection.
Solar Grants	Solar Grants are available for installation of solar electric and solar thermal (hot water) systems for: site-based nonprofit organization and nonprofit organizations leasing city-owned facilities; low- or moderate-income housing owned by nonprofits; and individual residences that are part of an affordable housing program. These grants will only apply to buildings owned or leased by nonprofits with lease terms of twenty years or more. Grants are issued twice a year with applications accepted on a rolling basis. There is no maximum grant amount; however, in most cases, grants will be no more than 50 % of the total project cost after rebates, incentives and tax credits. <i>Grants are subject to funding availability. Income tax must be paid on the grant amount for the year received.</i>
Elevations Energy Loans	Elevations Energy Loans are available through Energy Smart and Elevations Credit Union, who are working together to offer a wide range of low-interest loans for a variety of energy efficiency and renewable energy upgrades.
Colorado Commercial Property Assessed Clean Energy (C-PACE) Program	C-PACE is an innovative financing mechanism that helps commercial, industrial and multi-family property owners access affordable, long-term financing for energy upgrades. C-PACE allows building owners to finance (for up to 20 years) qualifying energy efficiency and clean energy improvements through a voluntary assessment on their property tax bill. Property owners pay for the improvements over time through this additional charge on their property tax bill. Capital provided under the C-PACE program is secured by a lien on the property, so low-interest capital can be raised from the private sector.

If the building receives fuel from an energy provider other than Xcel Energy, contact that provider directly and ask about their energy efficiency programs. The [Colorado Energy Office](#) also provides information and links to other funding sources such as the Green Colorado Credit Reserve (GCCR), and other special programs for government buildings and schools.

Also, Energy Performance Contracting (EPC), a turnkey approach to making upgrades, is available for larger commercial buildings and projects. EPC allows building owners to finance assessment, design, implementation and measurement and verification phases of projects through a company that is reimbursed through the energy cost savings realized from the upgrades. If owners prefer this turn-key approach, they can start with the [Colorado Energy Office list](#) of Energy Services Companies (ESCO) that provide these services.

2.4 Selecting a Service Provider

To comply with the energy assessment or RCx study requirements, building owners must use a qualified service provider. The following steps will help an owner select the best provider for their needs:

- 1) Review the city's [qualified service provider list](#). All service providers offering energy assessments and RCx services for compliance purposes must be on the city's qualified service provider list.
 - a) Lighting upgrade service providers do not need to be on the city's qualified list. Building owners can use any provider they choose to meet the city's lighting requirements.
- 2) Define the budget, scope of work and time frame of the effort – including which specific services, building areas and systems you want included in the effort.
- 3) Request multiple quotes from service providers based on your requirements.
 - a) Owners can request quotes for multiple services, such as lighting upgrades, or concurrent services, such as the energy assessment and RCx combined.
 - b) Ask the questions outlined below, compare quotes and make a selection based on which provider best meets your specific criteria.

Helpful Questions to Consider When Evaluating Service Providers:

1. *Is the provider on the city's [qualified service provider list](#)?*
2. *How many energy assessments or RCx studies has the provider completed on similar facilities?*
3. *How long has the provider been conducting energy assessments or RCx studies on similar facilities?*
4. *How recently has the provider conducted energy assessments or RCx studies on similar facilities?*
5. *Ask the provider for a sample report.*
6. *What types of capital efficiency, RCx operational, or lighting upgrades does the provider typically recommend for a building like ours?*
7. *Is the provider well versed in these Ordinance requirements?*
8. *Is the provider familiar with rebates and incentives offered by the utilities, City of Boulder, and [EnergySmart](#) for the services provided, and how will they help us obtain these rebates?*
9. *If the provider is offering to assist with assessing lighting updates, are they qualified and experienced with meeting City of Boulder and IECC lighting codes and do they provide the compliance submission as part of their service?*
10. *Is the provider local, and if not, how will this fact affect their work or fee?*
11. *Can they provide business references for similar scope in similar facilities?*

- 4) Agree upon the scope of work
 - a) The owner can finalize the contract and requested scope of work with the service provider after deciding which services are needed (which may occur after the preliminary energy assessment scopes and prices the various requested services).
 - b) Make the service provider aware of any previously completed energy assessments, energy projects and upgrades including lighting to help clarify the required scope.
 - c) If an owner has a very large or complex project that would benefit from the additional work and cost of developing a formal request for qualification (RFQ) and/or request for proposal (RFP), a written scope of work should be included in the RFQ/RFP.

2.4.1 Service Provider Qualifications

Energy assessment providers and RCx providers must be pre-trained and listed on the City of Boulder [qualified service provider list](#). In order to be placed on this list, service providers must watch a mandatory training video and successfully pass a multiple-choice quiz on the requirements. Additionally, the service providers must possess certain professional qualifications.

Energy assessment service providers must meet at least one of the following qualifications for energy assessment services:

- 1) A registered design professional (either a Professional Engineer or Registered Architect), with at least three years professional experience performing energy assessments of equivalent scope on similar types of buildings;
- 2) A contractor approved by the local utility to perform energy assessments of equivalent scope on similar types of buildings as part of the utility's energy efficiency programs;
- 3) A contractor approved by the city to perform energy assessments of equivalent scope on similar types of buildings as part of the city's energy efficiency programs;
- 4) A Certified Energy Manager (CEM) or Certified Energy Auditor (CEA), certified by the Association of Energy Engineers (AEE), with at least three years professional experience performing energy assessments of equivalent scope on similar types of buildings;
- 5) A Building Energy Assessment Professional (BEAP) certified by ASHRAE, with at least three years professional experience performing energy assessments of equivalent scope on similar types of buildings; or
- 6) Other credentials based on review and approval, including:
 - a) Energy Management Certification from the Northwest Water and Energy Education Institute with at least three years professional experience performing energy assessments of equivalent scope on similar types of buildings

Retro-commissioning service providers must meet at least one of the following qualifications for retro-commissioning services:

- 1) Licensed Professional Engineer with three or more years of proven commissioning or retro-commissioning experience with similar buildings; or
- 2) Hold relevant certification(s) with Associated Air Balance Council, National Environmental Balancing Bureau, Association of Energy Engineers, Building Commissioning Association, University of Wisconsin or the American Society of Heating, Refrigeration, and Air-Conditioning Engineers as a commissioning authority with three or more years of proven commissioning or retro-commissioning experience with similar buildings; or
- 3) An individual or firm with five or more years of proven commissioning or retro-commissioning experience with similar buildings; or
- 4) A contractor approved by the local utility to perform retro-commissioning of equivalent scope on similar types of buildings as part of the utility's energy efficiency programs; or
- 5) Other credentials based on review and approval.

2.5 Preparing for and Managing the Process

Although the qualified provider will perform the vast majority of the work required for an energy assessment and RCx, there are tasks that the building owner must perform for the process to be

successful. These preparation steps are based on best practices, and are not ordinance requirements unless stated.

- 1) Draft a work plan to include the tasks for the owner and the tenants, such as compliance schedule, required meetings and attendees, and arrangements for the provider to access the building.⁹
- 2) Provide the service provider with access to all building energy data for the previous two years as well as the most recent bill for all utilities so they can determine the rates and carry out the utility analysis.
- 3) The energy assessor will also require lighting and HVAC documentation including items such as
 - a) Architectural drawings,
 - b) Equipment schedules,
 - c) One-line diagrams,
 - d) Controls diagrams,
 - e) Systems manuals,
 - f) Commissioning reports and testing, and
 - g) Testing, adjusting and balancing (TAB) reports, if available.
- 4) Ensure facility management personnel and, if applicable, outsourced firms who maintain the systems and/or manage the facility, are available to answer questions, provide access, and assist with the assessment when required.
- 5) Ensure that potential Level II energy assessors conduct a preliminary energy assessment during the bidding process that provides a scope and price for the energy assessment and determines the potential for RCx.

2.5.1 Owner and Tenant Responsibilities

If the owner decides to pass any capital costs related to complying with these requirements through to tenants, please note that the City Manager Rules require that these costs be amortized as follows, rather than passed through in a bulk assessment in a single year:

- For the energy assessment and RCx study: costs must be amortized over a 10-year period.
- For the required RCx measure implementation: costs must be amortized over the length of the predicted payback period (as determined by the Retrocommissioning Professional).

The city has developed a [Split Incentive Guide](#) to help distinguish the specific responsibilities of the building owners and tenants as it relates to compliance with the ordinance. In general, the building owner is responsible for implementing the energy assessment and RCx within the required timeframe.

If a tenant owns the lighting or HVAC systems, it is still the responsibility of the owner to ensure that all requirements are met. Depending on the lease arrangements, the financial responsibility for the upgrade may fall to the tenant.

⁹ The ordinance requires that tenants provide access to tenant space within 30 days of request, so allow time in your plan for this advance notice and discuss with your tenants and provider.

2.5.2 Service Provider Responsibilities

The service provider is responsible for carrying out the services they are contracted to perform with the owner. This includes meeting the scope and requirements outlined in the [City Manager Rules](#) such as the required reporting to the City of Boulder as described in **2.6 Reporting Findings to the City**.

As part of the Level II energy assessment bidding process, the City Manager Rules require the service provider complete a preliminary site visit to scope and price the assessment and conduct a quick evaluation to determine if there are any possible RCx opportunities for the building. This RCx recommendation is based upon factors such as level of building controls, operations practices, current equipment scheduling and operability of equipment. If the provider determines the building is not recommended for retro-commissioning, the building owner will need a statement including justification from the provider for not recommending RCx in order to apply for an exemption from RCx as outlined in the [Exemption Reference Guide](#). However, if there is potential for RCx, the service provider must submit the bid with a scope and price estimate for the energy assessment alone and concurrently provided with RCx.

Per the City Manager Rules, the energy assessor is also required to assess at a high-level whether the building is currently in compliance with the ordinance lighting upgrade requirement, as part of either a Level I or Level II energy assessment

2.6 Reporting Findings to the City

The service provider, the owner, or a representative on their behalf, must submit materials and information to the city to verify compliance with these requirements. Upon completion of the energy assessment services and the retro-commissioning services, the service provider must submit the report to the building owner, drafted in accordance with the report scopes outlined in the city manager rules and above in section:

Energy Assessment Report .

Retrocommissioning Report.

A copy of each report¹⁰ must be submitted to the city no later than end of business on the day of each requirement **deadline**. The reports can be submitted to the Program Administrator via the directions on the [website](#) under Complete Energy Assessment and Complete Retro-commissioning.

¹⁰ If a report contains confidential information about building operations that a building owner does not want to provide to the city, upon request the city may allow the owner to provide only the required information through completion of a separate reporting template in lieu of submitting the entire report.

3. Lighting Upgrades

This section provides information on the requirements, deadlines, and implementation of the lighting upgrades required by the ordinance. The checklist on the website should be used by affected building owners to ensure compliance with this requirement and is available here:

<https://bouldercolorado.gov/media/4486/download?inline>

3.1 Summary of Requirements

The City of Boulder’s Building Performance Ordinance requires that building owners implement one-time lighting upgrades within five years of the building’s first R&R deadline. The lighting upgrade must be compliant with the following codes and sections:

- 1) Replace or upgrade an exterior lighting fixtures as necessary to meet lighting power allowances for exterior lighting established in the 2012 International Energy Conservation Code (IECC);¹¹
- 2) Replace or upgrade any interior lighting fixtures as necessary to meet lighting power allowances for interior lighting established in the 2017 City of Boulder Energy Conservation Code (COBECC);
- 3) Comply with requirements for automatic time switch control devices, occupancy sensors, and exterior lighting controls as necessary to meet the 2017 City of Boulder Energy Conservation Code.

Energy codes are typically updated in three-year cycles, and typically become more stringent over time. Therefore, it may be in owner’s best interest from a cost perspective to perform the lighting upgrades sooner than later.

What do the “Lighting Power Allowances” really mean?

The lighting code calculations for lighting power allowance are capping the amount of power that goes to lighting the interior and exterior of the building - this maximum allowable power is measured in watts per square foot (W/sf). This unit of measure is known as the building’s lighting power density (LPD). Typically, the allowed LPD is lowered with each code cycle to match the improving energy efficiency of commercially available lighting and controls.

The specific code sections for compliance are listed in the table below.

Lighting Requirement	Code	Section
Occupancy Sensor Controls	2017 COBECC	C405.2.2.2
Time-switch Controls	2017 COBECC	C405.2.2.1
Exterior Lighting Controls	2017 COBECC	C405.2.4
Interior Lighting - Power	2017 COBECC	C405.5
Exterior Lighting - Power	2012 IECC	C405.6

¹¹ Any exterior lighting upgrades must also comply with the [City of Boulder Outdoor Lighting Ordinance](#) passed in 2003 that seeks to prevent light trespass, reduce light pollution, reduce excessive glare, promote energy conservation, and improve safety and security.

There are several exceptions to these requirements such as emergency lighting, special needs lighting, and historic landmarks. The applicable [IECC exceptions](#) and [COBECC exceptions](#) are available online in the sections of the code identified above.

3.2 Preparing for and Managing the Lighting Upgrade

Although the lighting service provider will perform most of the work, there are still tasks that the building owner must perform for the lighting upgrade to be successful. These tasks are all based on industry best practices and are not required by code unless otherwise indicated.

- 1) Draft a work plan to include the tasks for the owner and the tenants, such as compliance schedule, required meetings and attendees, and arrangements for the provider to access the building.¹²
- 2) Work with the service provider to apply for available lighting rebates (see available rebates under [Rebates, Incentives, and Financing Options](#)).
 - a) The federal tax code section 179D provides tax deductions of from \$0.30 to \$0.60 per square foot for meeting specific lighting requirements. Be sure to discuss this specific incentive with the lighting service provider selected to see if these benefits may apply to the affected building.
- 3) Ensure that the chosen lighting service provider is familiar with the COMcheck™ tools¹³ and the [Interior Lighting Compliance Form](#) and what information is required to complete the lighting power density (LPD) calculation for compliance. See [Reporting Upgrades to the City](#) for more information on information needed for compliance.
- 4) Provide the lighting service providers with the following documents:
 - a) Drawings such as electrical one-line diagrams,
 - b) Lighting equipment schedules,
 - c) Reflected ceiling plans, and
 - d) Lighting maintenance records and materials list.
- 5) Ensure facility management personnel responsible for lighting operations and maintenance are available to answer questions.

3.2.1 Owner and Tenant Responsibilities

If the owner decides to pass any capital costs related to complying with these requirements through to the tenants, the [City Manager Rules](#) require those costs be amortized over the length of the predicted payback period, not as a lump sum payable in a single year.

The city has provided a [Split Incentive Guide](#) to help distinguish the specific responsibilities of the building owners and tenants as it relates to compliance with the new energy ordinance. In general, the building owner is responsible to implement the lighting upgrade within the required timeframe.

If a tenant owns the lighting systems, it is still the responsibility of the owner to ensure that all requirements are met. Depending on the lease arrangements, the financial responsibility for the lighting upgrades may fall to the tenant.

¹² The ordinance requires that tenants provide access to tenant space within 30 days of request, so allow time in your plan for this advance notice and discuss with your tenants and provider.

¹³ [COMcheck™](#) is a Dept. of Energy tool that simplifies the process of determining whether a building meets IECC requirements, as well as other code requirements.

3.2.2 Lighting Provider Responsibilities

The lighting upgrade provider is responsible for:

- Understanding the lighting requirements of the Building Performance Ordinance;
- Understanding the requirements of the [City of Boulder Outdoor Lighting Ordinance](#);
- Determining what upgrades are necessary for compliance;
- Implementing those upgrades (if needed); and
- Developing and working with the owner to submit the required documentation to the city, to include the [Interior Lighting Compliance Form](#) and/or a copy of [COMcheck Certification for Outdoor Lighting](#).

If a building permit is required for the lighting renovation, please note that there is a special permit application available for lighting renovations required by the Building Performance Ordinance.

Additional information on this permit is available on the [program website](#) under Lighting Upgrades.

Appendix A: Required Retrocommissioning Scope

If the retro-commissioning is conducted through a local energy utility program, the scope for that will satisfy the requirements of the ordinance, as long as it addresses both electricity and natural gas-consuming equipment and controls. Please also be prepared to upload your Xcel Recommissioning/Building Tune-up Rebate Application as part of your online submission.

If the retro-commissioning is conducted outside of a local energy utility program, the scope of the retro-commissioning shall include the activities below. A monitoring-based commissioning approach may be used to investigate and evaluate building systems as part of the retro-commissioning process. However, while monitoring based commissioning is an excellent strategy to maintain the persistence of savings generated from a full RCx effort, but it is not a substitute for the RCx.

Activity	Buildings ≥ 50,000 sf	Buildings < 50,000 sf	Activity Description
Develop and RCx Plan	✓		Develop a plan that outlines the activities, roles and responsibilities, schedule and documentation requirements of the RCx process.
Review and Optimize Equipment Scheduling	✓	✓	Any time of day schedules that are programmed in a building management system (BMS), programmable thermostat or time clock system shall be reviewed and if necessary, corrected to ensure they reflect the current facility requirements.
Review BMS Sequence of Operations	✓	✓	The current BMS sequence of operations shall be reviewed to ensure they are appropriate for the current facility requirements.
Review BMS Temperature, Pressure and Airflow Setpoints	✓	✓	The current BMS setpoints shall be reviewed to ensure they reflect the sequence of operations and current facility requirements. If needed, adjust the setpoints to meet the current facility requirements.
Test BMS Automatic Reset Functionality	✓	✓	Any automatic reset function that is currently programmed in the building management system shall

			be tested to confirm proper operation per the sequence of operations. An automatic reset function may include but is not limited to supply air temperature reset, static pressure reset, and chilled water supply temperature reset.
Pre-functional Checks on All Major Equipment	✓		Visually check all equipment identified in the RCx plan as ones to be functionally tested to ensure proper equipment and component assemblies are in proper condition and sensors are properly calibrated.
Comprehensive Functional Testing on All Major Base Building Equipment	✓		Perform functional testing on all major Base Building Systems to verify the sequence of operations and proper component functionality to include but not be limited to damper and valve actuation, motor modulation, on/off commands, lighting occupancy sensors and controls, etc.
Boiler Combustions Testing	✓		A combustion efficiency test shall be conducted for each boiler serving a Base Building System.
Review Economizer Functionality	✓	✓	If economizer functionality exists and is included in the sequence of operations, perform functional testing to verify proper operation during economizer conditions including proper damper controls. If economizer is not functioning properly, adjust sequence of operations and setpoints, adjust and/or repair damper linkage and actuator motors for proper operation and current facility requirements.
Sensor Calibration Checks (All Critical Sensors)	✓		Each critical sensor that is part of an HVAC control sequence shall be tested to ensure proper calibration. For each sensor that is out of calibration, recalibrate or replace this sensor.
Sensor Calibration Checks (OAT & RAT Only)		✓	All outside air temperature (OAT) sensors and return air temperature (RAT) sensors that are part of an HVAC control sequence shall be tested to ensure proper calibration. For each sensor that is out of calibration, recalibrate or replace the sensor.
Check Coils for Cleanliness	✓	✓	Visually inspect hot water, chilled water, steam and DX coils for cleanliness. If coils are visually loaded, clean all coils as appropriate.
Boiler/Furnace Tune-Up	✓	✓	Perform a tune-up on any boilers or furnaces serving Base Building Systems.
Review & Adjust Domestic Hot Water Temperatures	✓	✓	Review current domestic hot water temperature setpoints and compare to the current facility requirements. If needed, adjust the setpoints to meet the current facility requirements.
Check Air Filters	✓	✓	All air filters shall be checked to verify that the pressure drop across the filters are within the manufacturer's recommended limits.
Install Programmable Thermostats if No Controls Exist	✓	✓	If there is no central building Energy management system, and no programmable thermostats, install programmable thermostats in every regularly occupied thermal zone.

Appendix B: RCx Report Sample Outline

If a building owner chooses to meet the RCx requirement by participating in the Xcel Energy RCx or Building Tune-up program, the program report AND a copy of the Xcel Recommissioning/Building Tune-up Rebate Application is required for compliance.

If a building owner chooses to hire a service provider to complete RCx outside of an existing program (such as completing RCx concurrently with the energy assessment), the final RCx report should include the following information:

1. Title Page
2. Executive Summary
3. Summary of building use (with square footage breakdown) and typical operation
4. Summary of building systems including mechanical, electrical, and control systems
5. Summary of the results of each completed activity required in the retro-commissioning scope
6. Table of recommended retro-commissioning measures including:
 - a. Capital costs
 - b. Applicable rebates and incentives
 - c. Annual energy savings
 - d. Annual maintenance savings
 - e. Payback period
 - f. Recommended implementation timeline for each measure
7. Documentation of RCx measures
 - a. Finding description
 - b. How the measure was found
 - c. How the measure is to be implemented
 - d. How the measure will save energy
 - e. How the savings were determined (calculation methodology)
 - f. What evidence of implementation is required

Appendix C: How to Maintain and Track Your Energy Savings

To realize the most benefit from complying with these efficiency requirements, build owners should adopt on-going best practices to maintain and track their building's energy savings. Performing annual rating and reporting on the building's energy use is an important first step and is required by the City's Building Performance Ordinance. But beyond that, building owners should consider adopting the following best practices:

- Provider Engagement
- Measure commissioning
- Staff Training
- Operations and Maintenance (O&M) Practices
- Measurement and Verification (M&V)
- Periodic RCx and Ongoing Commissioning

Measure Commissioning

Measure commissioning (MCx) includes performance testing and documentation of implemented measures similar to what would be done in a new building. These services should adhere to the appropriate ASHRAE commissioning standards and typically include design review, performance testing, drawings that include improved sequences of operations, performance testing results, logging and trending recommendations for important data points, and recommended re-testing intervals.

Training

Staff training should always be carried out with the implementation of new measures. This can be classroom or hands-on training typically done by equipment vendors during equipment start-up. The crucial aspect of this training is that those people responsible for the operation and maintenance of this equipment have a thorough understanding of any new equipment, what the intended operation is, and how to maintain it.

Operations and Maintenance Practices

O&M practices should be provided at during implementation and include new equipment drawings, warranty information, recommended operations practices, maintenance schedules and sensor calibration intervals. Ensure that all calibrations are done to the equipment manufacturer's recommended precision levels.¹⁴

Measurement and Verification

M&V allows for the tracking of energy use and compares this to a benchmark usage. M&V should follow the international industry standard for energy retrofits by the Efficiency Valuation Organization, called the [IPMVP](#) (International Performance Measurement and Verification Protocol) standard. An M&V effort typically consists of an M&V Plan completed before the measure is implemented, and M&V Reports one year after implementation of the measures.

Periodic RCx and Ongoing Commissioning

Periodic RCx has been shown to greatly improve the persistence of measures that have been implemented. With recent advances in computer and wireless technologies, a new approach known as ongoing commissioning (OCx), or monitoring-based commissioning (MBCx) has evolved over the last

¹⁴ Calibration equipment should follow the [National Institute of Science and Technology Traceability](#) policy.

few years and promises to improve energy savings persistence, occupant comfort, systems uptime, and awareness of energy users in modern buildings.

These OCx/MBCx systems are typically comprised of sensors that monitor critical systems, push this information into a database, and report the data in a user-friendly format like an energy dashboard. More importantly, these systems also have algorithms that look for problems with systems that can affect energy use, comfort and equipment life.

Although OCx/MBCx systems can improve persistence in the interim period between RCx efforts, they do not replace the RCx effort required by the Ordinance once each ten-year period.

Glossary

- “Base Building Systems” mean the systems or sub-systems of a building that use Energy and/or impact Energy consumption including but not limited to: Primary HVAC (heating, ventilation, air conditioning) systems; Conveying systems; Domestic hot water systems, and; Electrical and lighting systems. Base Building Systems shall not include equipment used for Industrial Processes.
- “Cost Effective” means any investment or project with a predicted Payback Period of five years or less.
- “Current Facility Requirements” means the Owner’s current operational needs and requirements for a building and systems including but not limited to space temperature and humidity set points, operating hours, ventilation, filtration and any integrated requirements such as controls, personnel training, warranty review, and service contract review.
- “Energy” means electricity, natural gas, steam, hot or chilled water, heating oil, or other product for use in a building, or renewable on-site electricity generation, for purposes of providing heating, cooling, lighting, water heating, or for powering or fueling other end-uses in the building and related facilities.
- “Energy Assessment” means a systematic evaluation to identify modifications and improvements to building equipment and systems which use Energy.
- “Energy Assessment Report” means a report prepared and certified by an Energy Assessor on the approved list on the Project Website, covering the scope provided by the City Manager.
- “Energy Performance Score” means the numeric rating generated by the ENERGY STAR Portfolio Manager tool or equivalent tool adopted by the City Manager that compares the Energy usage of the building to that of similar buildings.
- “ENERGY STAR” means the U.S. Environmental Protection Agency program related to improving Energy efficiency in buildings and products.
- “ENERGY STAR Portfolio Manager” means the Internet-based tool developed and maintained by the U.S. Environmental Protection Agency to track and assess the relative Energy performance of buildings nationwide.
- “Energy Use Intensity (EUI)” means the total kBtUs (1,000 British Thermal Units) used per square foot of floor area.
- “Industrial Processes” means any business related process supported by mechanical or electrical terms other than Base Building Systems.
- “Large Industrial Campus” means a facility in which three or more buildings, at least partially used for manufacturing uses, are served by a central plant or single utility meter.
- “Manufacturing” means any building which has a primary use of assemblage, processing, and/or manufacturing products from raw materials or fabricated parts OR one that has the majority of its Energy usage come from process loads.
- “Owner” means any person who is a commercial or industrial building Owner, or is an Owner's representative, such as a property manager, who has charge of, or controls any building or parts thereof.
- “Partners for a Clean Environment” (PACE) is a joint program with the City and County of Boulder that provides free expert advisor services, financial incentives and a certification program to help businesses measure and gain recognition for their Energy, waste, water, and transportation achievements. EnergySmart is PACE’s Energy service program.
- “Payback Period” means the length of time required to recover the capital cost (less rebates and incentives) of an investment through operational savings.

- “Project Website” means www.BoulderBuildingPerformance.com, the website maintained by the City Manager for the implementation of these requirements.
- “Rating and Reporting Tool” means the U.S. Environmental Protection Agency’s Internet-based tool, ENERGY STAR Portfolio Manager, and any additional tool adopted by the City Manager for this purpose.
- “Requests for Qualifications” RFQ and “Requests for Proposals” (RFP). RFQs and RFPs are typically requested for very large and complex projects (in the million dollar or more project cost range), or where there is a policy requiring these efforts. Typically there will be two levels of selection, although sometimes the RFQ and RFP are combined. If split, RFQs are requested first. The list of possible candidates is then reduced based on the provider’s qualifications through a selection of remaining candidates for the RFP. This pre-selected group of providers then responds to an RFP after scoping the project, and a single provider is chosen.
- “Retro-commissioning” means identifying and correcting building system issues to achieve optimal building performance, in a manner specified by the City Manager.
- “Retro-commissioning Measure” means a corrective action or facility improvement identified during the investigation or evaluation phase of Retro-commissioning.
- “Retro-commissioning Report” means a report prepared and certified by a Retro-commissioning Professional on the approved list on the Project Website, covering the scope provided by the City Manager.
- “Site Energy” means the amount of Energy consumed by a building as reflected in utility bills or other documentation of actual Energy use.
- “Source Energy” means all the Energy used in delivering Energy to a building, including power generation and transmission and distribution losses, to perform a specific function, such as but not limited to space conditioning, lighting, or water heating.